

[VOLUME ONE]

Edited by Patrick McNamara



EVOLUTION, GENES, AND THE RELIGIOUS BRAIN

PRAEGER PERSPECTIVES

*Where God
and
Science Meet*

[HOW BRAIN AND EVOLUTIONARY STUDIES
ALTER OUR UNDERSTANDING OF RELIGION]

WHERE GOD AND
SCIENCE MEET

**Recent Titles in
Psychology, Religion, and Spirituality**

J. Harold Ellens, Series Editor

Married to an Opposite: Making Personality Differences Work for You
Ron Shackelford

Sin against the Innocents: Sexual Abuse by Priests and the Role of the
Catholic Church
Thomas G. Plante, editor

Seeking the Compassionate Life: The Moral Crisis for Psychotherapy and
Society
Carl Goldberg and Virginia Crespo

Psychology and the Bible: A New Way to Read the Scriptures, 4 Volumes
J. Harold Ellens and Wayne E. Rollins, editors

Sex in the Bible: A New Consideration
J. Harold Ellens

WHERE GOD AND SCIENCE MEET

How Brain and Evolutionary Studies
Alter Our Understanding of Religion

VOLUME 1
Evolution, Genes, and the Religious Brain

Edited by Patrick McNamara

PRAEGER PERSPECTIVES

Psychology, Religion, and Spirituality

J. Harold Ellens, Series Editor

PRAEGER

Westport, Connecticut
London

Library of Congress Cataloging-in-Publication Data

Where God and science meet : how brain and evolutionary studies alter our understanding of religion / edited by Patrick McNamara.

p. cm. — (Psychology, religion, and spirituality, ISSN 1546-8070)

Includes index.

ISBN 0-275-98788-4 (set) — ISBN 0-275-98789-2 (v. 1) — ISBN 0-275-98790-6 (v. 2) — ISBN 0-275-98791-4 (v. 3)

1. Psychology, Religious. 2. Genetic psychology. 3. Evolutionary psychology. 4. Experience (Religion) 5. Neurology. I. McNamara, Patrick H.

BL53.W511 2006

200.1'9—dc22 2006021770

British Library Cataloguing in Publication Data is available.

Copyright © 2006 by Patrick McNamara

All rights reserved. No portion of this book may be reproduced, by any process or technique, without the express written consent of the publisher.

Library of Congress Catalog Card Number: 2006021770

ISBN: 0-275-98788-4 (set)

0-275-98789-2 (vol. 1)

0-275-98790-6 (vol. 2)

0-275-98791-4 (vol. 3)

ISSN: 1546-8070

First published in 2006

Praeger Publishers, 88 Post Road West, Westport, CT 06881

An imprint of Greenwood Publishing Group, Inc.

www.praeger.com

Printed in the United States of America



The paper used in this book complies with the Permanent Paper Standard issued by the National Information Standards Organization (Z39.48-1984).

10 9 8 7 6 5 4 3 2 1

CONTENTS

VOLUME 1 EVOLUTION, GENES, AND THE RELIGIOUS BRAIN

<i>Series Foreword</i> by J. Harold Ellens	vii
<i>Acknowledgments</i>	xi
<i>Preface</i> by Patrick McNamara	xiii
CHAPTER 1 The Evolutionary Psychology of Religion <i>Steven Pinker</i>	1
CHAPTER 2 Sacred Emotions and Affective Neuroscience: Gratitude, Costly Signaling, and the Brain <i>Robert A. Emmons and Patrick McNamara</i>	11
CHAPTER 3 Genetic and Environmental Influences on the Traditional Moral Values Triad— Authoritarianism, Conservatism, and Religiousness—as Assessed by Quantitative Behavior Genetic Methods <i>Laura B. Koenig and Thomas J. Bouchard Jr.</i>	31
CHAPTER 4 Religious Behaviors, Badges, and Bans: Signaling Theory and the Evolution of Religion <i>Richard Sosis</i>	61

CHAPTER 5	Nature's Medicine: Religiosity as an Adaptation for Health and Cooperation <i>Joseph Bulbulia</i>	87
CHAPTER 6	The Cognitive Psychology of Belief in the Supernatural <i>Jesse M. Bering</i>	123
CHAPTER 7	The Ritual Healing Theory: Therapeutic Suggestion and the Origin of Religion <i>James McClenon</i>	135
CHAPTER 8	Religion Is Not an Adaptation <i>Lee A. Kirkpatrick</i>	159
CHAPTER 9	The Cognitive and Evolutionary Roots of Religion <i>Scott Atran</i>	181
CHAPTER 10	Amazing Grace: Religion and the Evolution of the Human Mind <i>Ilkka Pyysiäinen</i>	209
CHAPTER 11	The Significance of the Evolution of Religious Belief and Behavior for Religious Studies and Theology <i>Wesley J. Wildman</i>	227
	<i>Index</i>	273
	<i>About the Editor and Contributors</i>	285
	<i>About the Advisory Board</i>	291

SERIES FOREWORD

The interface between psychology, religion, and spirituality has been of great interest to scholars for a century. In the last three decades a broad popular appetite has developed for books which make practical sense out of the sophisticated research on these three subjects. Freud expressed an essentially deconstructive perspective on this matter and indicated that he saw the relationship between human psychology and religion to be a destructive interaction. Jung, on the other hand, was quite sure that these three aspects of the human spirit, psychology, religion, and spirituality, were constructively and inextricably linked.

Anton Boisen and Seward Hiltner derived much insight from both Freud and Jung, as well as from Adler and Reik, while pressing the matter forward with ingenious skill and illumination. Boisen and Hiltner fashioned a framework within which the quest for a sound and sensible definition of the interface between psychology, religion, and spirituality might best be described or expressed.¹ We are in their debt.

This series of General Interest Books, so wisely urged by Greenwood Press, and particularly by its editors, Deborah Carvalko and Suzanne I. Staszak-Silva, intends to define the terms and explore the interface of psychology, religion, and spirituality at the operational level of daily human experience. Each volume of the series identifies, analyzes, describes, and evaluates the full range of issues, of both popular and professional interest, that deal with the psychological factors at play (1) in the way religion takes shape and is expressed, (2) in the way spirituality functions within human persons and shapes both religious formation and expression, and (3) in the ways that

spirituality is shaped and expressed by religion. The interest is psycho-spiritual. In terms of the rubrics of the disciplines and the science of psychology and spirituality this series of volumes investigates the *operational dynamics* of religion and spirituality.

The verbs “shape” and “express” in the above paragraph refer to the forces which prompt and form religion in persons and communities, as well as to the manifestations of religious behavior (1) in personal forms of spirituality, (2) in acts of spiritually motivated care for society, and (3) in ritual behaviors such as liturgies of worship. In these various aspects of human function the psychological and/or spiritual drivers are identified, isolated, and described in terms of the way in which they unconsciously and consciously operate in religion, thought, and behavior.

The books in this series are written for the general reader, the local library, and the undergraduate university student. They are also of significant interest to the informed professional, particularly in fields corollary to his or her primary interest. The volumes in this series have great value for clinical settings and treatment models, as well.

This series editor has spent an entire professional lifetime focused specifically upon research into the interface of psychology in religion and spirituality. These matters are of the highest urgency in human affairs today when religious motivation seems to be playing an increasing role, constructively and destructively, in the arena of social ethics, national politics, and world affairs. It is imperative that we find out immediately what the psychopathological factors are which shape a religion that can launch deadly assaults upon the World Trade Center in New York and murder 3,500 people, or a religion that motivates suicide bombers to kill themselves and murder dozens of their neighbors weekly, and a religion which prompts such unjust national policies as pre-emptive defense; all of which are wreaking havoc upon the social fabric, the democratic processes, the domestic tranquility, the economic stability and productivity, and the legitimate right to freedom from fear, in every nation in the world today.

This present set of three volumes, the project on religion and the brain, is an urgently needed and timely work, the motivation for which is surely endorsed enthusiastically by the entire world today, as the international community searches for strategies that will afford us better and deeper religious self-understanding as individuals and communities. This project addresses the deep genetic and biological sources of human nature which shape and drive our psychology and spirituality. Careful strategies of empirical, heuristic, and phenomenological research have been employed to give this work a solid scientific foundation and formation. Never before has so much wisdom and intelligence been brought to bear upon the dynamic linkage between human physiology, psychology, and spirituality. Each of these three aspects

has been examined from every imaginable direction through the illuminating lenses of the other two.

For fifty years such organizations as the Christian Association for Psychological Studies and such Graduate Departments of Psychology as those at Boston University, Fuller, Rosemead, Harvard, George Fox, Princeton, and the like, have been publishing significant building blocks of empirical, heuristic, and phenomenological research on issues dealing with religious behavior and psycho-spirituality. In this present project the insights generated by such patient and careful research are synthesized and integrated into a holistic psycho-spiritual world view, which takes the phenomenology of religion seriously.

Some of the influences of religion upon persons and society, now and throughout history, have been negative. However, most of the impact of the great religions upon human life and culture has been profoundly redemptive and generative of great good. It is urgent, therefore, that we discover and understand better what the psychological and spiritual forces are which empower people of faith and genuine spirituality to give themselves to all the creative and constructive enterprises that, throughout the centuries, have made of human life the humane, ordered, prosperous, and aesthetic experience it can be at its best. Surely the forces for good in both psychology and spirituality far exceed the powers and proclivities toward the evil that we see so prominently perpetrated in the name of religion in our world today.

This series of Greenwood Press volumes is dedicated to the greater understanding of *Psychology, Religion and Spirituality*, and thus to the profound understanding and empowerment of those psycho-spiritual drivers which can help us transcend the malignancy of our earthly pilgrimage and enormously enhance the humaneness and majesty of the human spirit, indeed, the potential for magnificence in human life.

J. Harold Ellens

NOTE

1. Aden, L., & Ellens, J. H. (1990). *Turning points in pastoral care: The legacy of Anton Boisen and Seward Hiltner*. Grand Rapids, MI: Baker.

ACKNOWLEDGMENTS

I would like to thank Debbie Carvalko from Greenwood Press for her advocacy of this project, for her help at every step of the way, and for her advice and encouragement at critical junctures of the project. I would also like to thank J. Harold Ellens for his belief in the importance of this project and for his sage advice throughout. Our advisory board members—Ray Paloutzian, Kenneth Pargament, Harold Koenig, Andrew Newberg, Scott Atran, and Donald Capps—in addition to their help in identifying topics to be covered also helped us to find the best authors to cover them! Advisors also kept the editor from making mistakes that could have cost the project dearly. In short, these advisors have immeasurably increased the quality of these volumes. I would also like to thank Lena Giang, Pattie Johnson, Anna Kookoolis, Jocelyn Sarmiento, and Sarah Varghese for their help with editing and formatting the references for all the chapters in the series—a thankless task at best, but these assistants did it both conscientiously and carefully. Finally, I would like to thank Ms. Erica Harris, my head research assistant, who helped out on all aspects of this project. Her organizational help has meant all the difference throughout. She did yeoman's work on the project Web site, kept track of correspondence with authors, and generally kept the project running smoothly and on schedule.

PREFACE

In recent years, several lines of evidence have converged on the conclusion that religiousness is associated with a specific and consistent set of biological processes. Religion appears to be a cultural universal. There may be a critical period (adolescence) during the life cycle of normally developing persons when religiousness is best transmitted from an older to a younger generation (see volume II, chapter 4). Individual differences in religiosity are associated with consistent health benefits (see volume I, chapter 7; volume III, chapter 2) as well as unique health risks (see volume III, chapters 4 and 8). Twin studies have shown that religiousness is moderately to highly heritable (see volume I, chapter 3). Genetic studies have implicated specific genes in religiousness (mostly genes that code for regulatory products of monoamine transmission in limbic-prefrontal networks; for reviews, see Comings, Gonzales, Saucier, Johnson, & MacMurray, 2000; D'Onofrio, Eaves, Murrelle, Maes, & Spilka, 1999; Hamer, 2004; see also volume I, chapter 3). Consistent with these preliminary genetic studies, neurochemical and neuropharmacologic studies have implicated limbic-prefrontal serotonergic and dopaminergic mechanisms in mediation of religious experiences (see volume II, chapters 1 and 2; volume III, chapters 1 and 10). Neuroimaging and neuropsychologic studies have implicated a consistent set of neurocognitive systems and brain activation patterns in religious activity (mostly limbic-prefrontal networks (see volume II, chapters 2, 3, 8, and 9; volume III, chapter 7). A cognitive psychology of religious belief has revealed both the unique aspects of religious cognition as well as its commonalities with other basic cognitive processing routines (see volume I, chapters 6, 9, and 10; volume II, chapter 10). Finally, changes in self-reported

religious experience by individuals suffering from obsessive-compulsive disorder; schizophrenia, Parkinson's disease, and temporal lobe epilepsy are in the expected direction if the previously mentioned neurocognitive networks (limbic-prefrontal) do in fact mediate core aspects of religiousness (see volume II, chapters 1 and 8; volume III, chapter 1).

Although the array of previously mentioned findings suggests to some investigators that it is reasonable to speak about potential neurocognitive specializations around religiosity, caution is in order when attempting to interpret the findings (see volume II, chapters 3, 5, 6, and 8; and all three commentaries). As in every other scientific enterprise, what is investigated in any given study is not the whole phenomenon of interest but rather only a small constituent part of the whole. The previously cited studies could not investigate "religion" *per se*. That is too vast a phenomenon to be studied in a single project. Instead, they tried to operationalize religiousness in various ways—with everything from a score on an inventory about religious practices to measurements on those practices themselves. Thus, we are reduced to making inferences about the nature of religiousness from data we collect via these questionnaire and observational/experimental methods. Making inferences about the nature of religion as a whole from neurobiologic correlations of one aspect of religiosity is, of course, fraught with danger (as all three commentators and several of our authors point out), but there is simply no other way to proceed. Inference and extrapolation from observations you collect on operationalized measures of the phenomenon you are interested in is necessary if you want to make progress. What is all-important, however, is to extrapolate, infer, and proceed with caution and humility. Constraints on incautious claims and inferences can often be obtained if you have a good theoretical framework from which to generate inferences about data meanings and from which you can develop falsifiable hypotheses. When it comes to biologic correlates of religiousness, the best available theory is evolution. Thus, several of the essays in these volumes discuss potential evolutionary and adaptive functions of religion.

Claims, however, about potential adaptive functions of religiousness also need to be treated with great caution and tested against the evidence. Several authors in these volumes address the question of whether religiousness can be considered an evolutionary adaptation (see volume I, chapters 1, 4, 5, 7, 8, and 10; volume II, chapter 4; volume III, chapter 6; and all three commentaries). For those scientists who think the evidence supports some variant of an adaptationist position (see volume I, chapters 4, 5, 7, and 10; volume II, chapter 4; volume III, chapter 6), the questions shift to what part of religiousness is actually adaptive and what functions might religiousness enact? Some theorists suggest that it is reasonable to speak about a "common core" religious experience fundamental to all forms of religiosity (see volume I, chapter 7; volume III, chapters 5 and 6). Some investigators suggest that the aspect of religiousness that was "selected" over evolutionary history was the

capacity for trance, placebo responding, or altered states of consciousness, or ASC (see volume I, chapters 5 and 7; volume III, chapter 6). The capacity for trance, placebo responding, and ASC, of course, would yield both health benefits and arational or even irrational belief states over time. Other theorists (see volume I, chapters 4 and 5; volume II, chapter 4) suggest that the aspect of religiousness that was selected over evolutionary history was its ability, primarily via ritual displays and other “costly signals” (see volume I, chapters 2, 4, and 5; volume II, chapter 10), to solve the free-rider problem (where unscrupulous individuals exploit the benefits of group cooperation without paying any of the costs of that cooperation) and thereby promote cooperation among individuals within early human groups. Other theorists who tilt toward some kind of adaptationist position emphasize both costly signaling theory as well as gene–culture interactions to explain particular associations of religiosity, such as its ability to promote character strengths (volume I, chapter 2), its ability to protect against death-related fears (volume I, chapter 9; volume III, chapter 8), its ability to generate life meanings (volume III, chapter 3), its ability to address attachment needs (volume I, chapter 8; volume II, chapter 6), its links with the sources and phenomenology of dreams (volume III, chapter 9), and its similarities with special perceptual capacities of the aesthetic sense (volume II, chapter 7).

Although it has to be admitted that all these investigators have marshaled an impressive array of evidence to support their claims concerning religion’s potential adaptive functions, all the authors of these theories realize that it is nearly impossible to demonstrate conclusively that some biopsychologic process is an adaptation, in the classical sense of that term. Several authors in these volumes have pointed out just how easy it is to get muddled when attempting to think through evolutionary approaches to a phenomenon as complex as religiousness (see volume I, chapters 1, 8 and 10; volume II, chapter 6; and all three commentaries). It is all too easy to overlook the harmful (and presumably nonadaptive) aspects of religiousness (see volume I, chapters 1 and 6; volume III, chapters 4 and 8). Ignorance of the complexity of religious phenomena, an underappreciation of the pervasive effects of social learning and cultural transmission on cognitive functions, and confusion around technical terms in evolutionary biology (such as adaptation, exaptation, and so forth) all militate against progress in this new science of the biology of religion.

To help think through problems of evolutionary change and adaptations in animals, the evolutionary biologist has often utilized the principles and methods of cladistics and phylogenetic analysis. Debates on potential adaptive functions of religion may benefit by taking a look at these methods. Cladistic methodology is used to analyze phylogenetic relationships in lineages that are recognized by the presence of shared and derived (advanced) characteristics. When cladistic methodology is supplemented with the advanced

statistical tools of “phylogenetic analysis,” you get precise and powerful techniques for reconstructing evolutionary history. These techniques have now been successfully used in the cultural arena, as in analyzing biocultural changes (e.g., language evolution). Scholars of ritual and religious practices have now amassed a huge amount of data on the historical development of ritual practices and on ritual practices in premodern human groups. There may therefore be enough data to reconstruct the evolutionary history of ritual practices in certain human lineages. If there is also enough data available on the history of various forms of healing practices of cooperative enterprises (e.g., farming or herding), it may be possible to assess change in ritual practices against change in these other forms of human activity. By superimposing phenotypic features (e.g., ritual practices) over accepted language phylogenies, one can reconstruct the history of evolutionary change in ritual practices as well as potential correlated change in health or in cooperative practices. Thus, hypotheses about potential adaptive functions of key aspects of religiousness may be tested quantitatively using these sorts of methods. With these sorts of methods, one could also potentially assess whether some aspect of religiousness (e.g., ritual practices) fit criteria for an adaptation or an exaptation. An adaptation involves the modification of a phenotypic feature (e.g., a particular ritual practice) that accompanies or parallels an evolutionary acquisition of a function (new healing practices or new forms of cooperation). However, in exaptation, the feature originates first rather than in parallel and only later is co-opted for the function in question. In short, because phylogenetic analysis involves quantitative reconstruction and analysis of histories of shared and derived traits, it provides powerful methods for identification of potential adaptive functions of religion. I draw attention to these techniques only to point out their potential. They have significant limitations, and they have not yet been applied to many problems in biocultural evolution. In particular, phylogenetic techniques have not yet been brought to bear on questions of the evolutionary history of religious practices. Nevertheless, they may be one way to shed some light on the problem of potential adaptive functions of religion.

The fact that reasonable speculations about potential adaptive functions of religion can be advanced at all is partly due to the startling consistency of the evidence summarized in these volumes on the neurobiologic correlates of religiousness. While tremendous progress has been made in identifying neurobiologic correlates of religiousness, it will be a challenge to place these findings in new theoretical frameworks that can do justice to the richness and complexity of the religious spirit. The essays in these volumes provide the necessary first tools to do just that.

Patrick McNamara

REFERENCES

- Comings, D. E., Gonzales, N., Saucier, G., Johnson, J. P., & MacMurray J. P. (2000). The DRD4 gene and the spiritual transcendence scale of the character temperament index. *Psychiatric Genetics, 10*, 185–189.
- D’Onofrio, B. M., Eaves, L. J., Murrelle, L., Maes, H. H., & Spilka, B. (1999). Understanding biological and social influences on religious attitudes and behaviors: A behavior genetic perspective. *Journal of Personality, 67*, 953–984.
- Hamer, D. (2004). *The God gene: How faith is hardwired into our genes*. New York: Doubleday.

CHAPTER 1

THE EVOLUTIONARY PSYCHOLOGY OF RELIGION

Steven Pinker

Do we have a “God gene” or a “God module”? I’m referring to claims that a number of you may have noticed. Recently, a cover story of *Time* magazine was called “The God Gene: Does Our Deity Compel Us to Seek a Higher Power?” Believe it or not, some scientists say yes. And a number of years earlier, there were claims that the human brain is equipped with a “God module,” a subsystem of the brain shaped by evolution that causes us to have a religious belief. “Brain’s God Module May Affect Religious Intensity,” according to the headline of the *Los Angeles Times*. I want to evaluate those claims.

There certainly is a phenomenon that needs to be explained, namely, religious beliefs. According to surveys by ethnographers, religion is a human universal. In all human cultures, people believe that the soul lives on after death, that ritual can change the physical world and divine the truth, and that illness and misfortune are caused and alleviated by a variety of invisible personlike entities: spirits, ghosts, saints, evils, demons, cherubim or Jesus, devils, and gods.

All cultures? you might ask. Yes, all cultures. I give you an example of a culture we’re well familiar with, that of the contemporary United States. The last time I checked the figures, 25 percent of Americans believe in witches, 50 percent believe in ghosts, 50 percent believe in the devil, 50 percent believe that the Book of Genesis is literally true, 69 percent believe in angels, 87 percent believe Jesus was raised from the dead, and 96 percent believe in a god or a universal spirit. You’ve got your work cut out for you!

So what’s going on? In many regards, the human mind appears to be well engineered. Not literally well engineered, but it has the signs or appearance

of engineering in the biologist's sense. That is, we can see, think, move, talk, understand, and attain goals better than any robot or computer. You can't go to Circuit City and buy Rosie the Maid from *The Jetsons* and expect to it to put away the dishes or run simple errands. These feats are too difficult for human-made creations, though they're things that a five-year-old child could do effortlessly. The explanation for signs of engineering in the natural world is Darwin's theory of natural selection, the only theory we've come up with so far that can explain the illusion of design in causal terms.

The question is, How can a powerful taste for apparently irrational beliefs evolve? H. L. Mencken said that "the most common of all follies is to believe passionately in the palpably not true. It's the chief occupation of humankind." This poses an enigma to the psychologist.

There is one way in which religious belief could be an adaptation. Many of our faculties are adaptations to enduring properties of the real world. We have depth perception because the world really is three-dimensional. We apparently have an innate fear of snakes because the world has snakes, and they are venomous. Perhaps there really is a personal, attentive, invisible, miracle-producing, reward-giving, retributive deity, and we have a God module in order to commune with him. As a scientist, I like to interpret claims as testable hypotheses, and this certainly is one. It predicts, for example, that miracles should be observable, that success in life should be proportional to virtue, and that suffering should be proportional to sin. I don't know anyone who has done the necessary studies, but I would say there is good reason to believe that these hypotheses have not been confirmed. There's a Yiddish expression: "If God lived on earth, people would break his windows."

There have been other, more plausible attempts to explain religion as a biological adaptation. Even though I'm far more sympathetic to Darwinian explanations of mental life than most psychologists, I don't find any of these convincing.

The first is that religion gives comfort. The concepts of a benevolent shepherd, a universal plan, an afterlife, or just deserts ease the pain of being a human; these comforting thoughts make us feel better. There's an element of truth to this, but it is not a legitimate adaptationist explanation because it begs the question of why the mind should find comfort in beliefs that are false. Saying that something is so doesn't make it so, and there's no reason why it should be comforting to think it so when we have reason to believe it is not so. Compare: If you're freezing, being told that you're warm is not terribly soothing. If you're being threatened by a menacing predator, being told that it's just a rabbit is not particularly comforting. In general, we are not that easily deluded. Why should we be in the case of religion? It simply begs the question.

The second hypothesis is that religion brings a community together. Those of you who read the cover story of *Time* might be familiar with this

hypothesis because the geneticist Dean Hamer, whose new book *The God Gene* inspired the cover story, offered this as his Darwinian explanation of religion. Again I think there's an element of truth in this. Religion certainly does bring a community together. But again it simply begs the question as to why. Why, if there is a subgoal in evolution to have people stand together to face off common enemies, would a belief in spirits or a belief that ritual could change the future be necessary to cement a community together? Why not just emotions like trust and loyalty and friendship and solidarity? There's no a priori reason you would expect that a belief in a soul or a ritual would be a solution to the problem of how you get a bunch of organisms to cooperate.

The third spurious explanation is that religion is the source of our higher ethical yearnings. Those of you who read the book *Rock of Ages* by Steven Jay Gould, who argued that religion and science could coexist comfortably, are familiar with his argument: since science can't tell us what our moral values should be, that's what religion is for, and each "magisterium" should respect the other. A big problem for this hypothesis is apparent to anyone who has read the Bible, which is a manual for rape and genocide and destruction. God tells the Israelites invading all Midianite villages, "Kill all the men, kill all the kids, kill all the old women. The young women that you find attractive, bring them back to your compound, lock them up, shave their heads, lock them in a room for 30 days till they stop crying their eyes out because you've killed their mom and dad, and then take her as a second or third or fourth or fifth wife." So the Bible, contrary to what a majority of Americans apparently believe, is far from a source of higher moral values. Religions have given us stonings, witch burnings, crusades, inquisitions, jihads, fatwas, suicide bombers, gay bashers, abortion-clinic gunmen, and mothers who drown their sons so they can happily be united in heaven.

To understand the source of moral values, we don't have to look to religion. Psychologists have identified universal moral sentiments such as love, compassion, generosity, guilt, shame, and righteous indignation. A belief in spirits and angels need have anything to do with it. And moral philosophers such as Peter Singer who scrutinize the concept of morality have shown that it is logically rooted in the interchangeability of one's own interests and others. The world's enduring moral systems capture in some way the notion of the interchangeability of perspectives and interests, the idea that "I am one guy among many": the golden rule, the categorical imperative, Singer's own notion of "the expanding circle," John Rawls's "veil of ignorance," and so on. A retributive, humanlike deity meting out justice doesn't have a role in our best explanations of the logic of morality.

To answer the question "Why is *Homo sapiens* so prone to religious belief?" you first have to distinguish between traits that are adaptations, that is, products of Darwinian natural selection, and traits that are by-products of adaptations, also called spandrels or exaptations. For example, why is our

blood red? Is there some adaptive advantage to having red blood, maybe as camouflage against autumn leaves? Well, that's unlikely, and we don't need any other adaptive explanation, either. The explanation for why our blood is red is that it is adaptive to have a molecule that can carry oxygen, mainly hemoglobin. Hemoglobin happens to be red when it's oxygenated, so the redness of our blood is a by-product of the chemistry of carrying oxygen. The color per se was not selected for. Another nonadaptive explanation for a biological trait is genetic drift. Random stuff happens in evolution. Certain traits can become fixed through sheer luck of the draw.

To distinguish an adaptation from a by-product, first you have to establish that the trait is in some sense innate, for example, that it develops reliably across a range of environments and is universal across the species. That helps rule out reading, for example, as a biological adaptation. Kids don't spontaneously read unless they are taught, as opposed to spoken language, which is a plausible adaptation because it does emerge spontaneously in all normal children in all societies.

The second criterion is that the causal effects of the trait would, on average, have improved the survival or reproduction of the bearer of that trait in an ancestral environment—the one in which our species spent most of its evolutionary history, mainly the foraging or hunter-gatherer lifestyle that pre-dated the relatively recent invention of agriculture and civilization.

Crucially, the advantage must be demonstrable by some independently motivated causal consequences of the putative adaptation. That is, the laws of physics or chemistry or engineering have to be sufficient to establish that the trait would be useful. The usefulness of the trait can't be invented ad hoc; if it is, you have not a legitimate evolutionary explanation but a "just-so story" or fairy tale. The way to tell them apart is to independently motivate the usefulness of the trait. For example, via projective geometry, one can show that by combining images from two cameras or optical devices, it is possible to calculate the depth of an object from the disparity of the projections. If you write out the specs for what you need in order to compute stereoscopic depth, you find that humans and other primates seem to have exactly those specs in our sense of stereoscopic depth perception. It's exactly what engineers would design if they were building a robot that had to see in depth. That similarity is a good reason to believe that human stereoscopic depth perception is an adaptation.

Likewise for fear of snakes. In all societies, people have a wariness of snakes; one sees it even in laboratory-raised monkeys who had never seen a snake. We know from herpetology that snakes were prevalent in Africa during the time of our evolution and that getting bitten by a snake is not good for you because of the chemistry of snake venom. Crucially, that itself is not a fact of psychology, but it helps establish that what is a fact of psychology, namely, the fear of snakes, is a plausible adaptation.

Our sweet tooth is yet another example. It's not terribly adaptive now, but biochemistry has established that sugar is packed with calories and therefore could have prevented starvation in an era in which food sources were unpredictable. That makes a sweet tooth a plausible adaptation.

In contrast, it's not clear what the adaptive function of humor is or of music. I think the explanations of religion that I've reviewed have the same problem, namely, not having an independent rationale, given an engineering analysis of why that trait should, in principle, be useful.

The alternative, then, is that just as the redness of blood is a by-product of other adaptations, so may our predisposition to religious belief. A crucial corollary of the theory of evolution is that conflicts of interests among organisms, of different species or of the same species, lead to the biological equivalent of an arms race. An organism evolves more clever or lethal weapons, another organism evolves even more ingenious defenses, and so on, spiraling the process spiral. At any given stage in an arms race, a feature can be adaptive for one organism but not for its adversaries, as long as the first is overcoming the defenses of the second. That's another reason why not everything in biology is adaptive, at least not for every organism. What's adaptive for the lion is not so adaptive for the lamb.

So a way of rephrasing the question "Why is religious belief so pervasive?" is to ask, "Who benefits?" Another way of putting it is that one must distinguish the possible benefits of religion to the producers of religious belief—the religious establishment of shamans and priests and so on—from the benefits to the consumers of religion—the parishioners, the flock, the believers. The answer might be different for the two cases. One must distinguish the question "What good is an inculcation of religious belief by priests, shaman, and so on?" from the question "What good is an acceptance of religious belief by believers?"

A number of anthropologists have pointed out the benefits of religion to those causing other people to have religious beliefs. One ubiquitous component of religion is ancestor worship. And ancestor worship must sound pretty good if you're getting on in years and can foresee the day when you're going to become an ancestor. Among the indignities of growing old is that you know that you're not going to be around forever. If you plausibly convince other people that you'll continue to oversee their affairs even when you're dead and gone, that gives them an incentive to treat you nicely up to the last day.

Food taboos are also common in religious belief and might be explained by the psychology of food preference and dispreference, in particular, disgust. If you withhold a food, especially a food of animal origin, from children during a critical period, they'll grow up grossed out at the thought of eating that food. That's why most of us would not eat dog meat, monkey brains, or maggots, things that are palatable in other societies. There are often ecological reasons

why food taboos develop, but there are probably also reasons of control. Since neighboring groups have different favored foods, if you keep your own kids from having a taste for the foods favored by your neighbors, it can keep them inside the coalition, preventing them from defecting to other coalitions, because to break bread with their neighbors they'd have to eat revolting stuff.

Rites of passage are another intelligible feature of religion. Many social decisions have to be made in categorical, yes-or-no, all-or-none fashion. But a lot of our biology is fuzzy and continuous. A child doesn't go to bed one night and wake up an adult the next morning. But we do have to make decisions such as whether they can vote or drive or buy a gun. There's nothing magical about the age of 13 or the age of 18 or any other age. But it's more convenient to arbitrarily anoint a person as an adult on a particular, arbitrarily chosen day than to haggle over how mature every individual is every time he wants a beer. Religious rites of passage demarcate stages of life, serving the function that we have given over to driver's licenses and other forms of identification. Another fuzzy continuum is whether someone is available as a potential romantic partner or is committed to someone else. Marriage is a useful way of demarcating that continuum with a sharp line.

Costly initiations or sacrifices are also present in almost all the world's religions. A general problem in the maintenance of cooperation is how to distinguish people who are altruistically committed to a coalition from hangers-on and parasites and free riders. One way to test who's genuinely committed is to see who is willing to undertake a costly sacrifice. To take an example close to home: To see whether someone is committed to an ethnic group I am familiar with, you can say, "You've just had a baby. Please hand over your son so I can cut some skin off his penis." That's not the kind of thing that anyone would do unless they took their affiliation with the group seriously. And there are far more gruesome examples from the rest of the world.

Yet another explicable feature of religion is signs of expertise in occult knowledge. If you're the one who knows mysterious but important arcane knowledge, then other people will defer to you. Even in nonreligious contexts, most societies have some division of labor in expertise, where we accord prestige and perquisites to people who know useful stuff. So a good strategy for providers of religion is to mix some genuine expertise—and, indeed, anthropologists have shown that the tribal shaman or witch doctor really is an expert in herbal medicine and folk remedies—with a certain amount of hocus-pocus, trance-inducing drugs, stage magic, sumptuous robes and cathedrals, and so on, reinforcing the claim that there are worlds of incomprehensible wonder, power, and mystery that are reachable only through one's services.

These practical benefits take some of the mystery over why people like to encourage religious belief in others without committing oneself to a specific

biological adaptation for religion. The inculcation of religious belief would be a by-product of these other, baser motives.

What about the other side of these transactions, namely, the consumers? Why do they buy it? One reason is that in most cases we should defer to experts. That's in the very nature of expertise. If I have a toothache, I open my mouth and let a guy drill my teeth. If I have a bellyache, I let him cut me open. That involves a certain amount of faith. Of course, in these cases the faith is rational, but that deference could, if manipulated, lead to irrational deference, even if the larger complex of deference can be adaptive on the whole.

There are also emotional predispositions that evolved for various reasons and make us prone to religious belief as a by-product. The anthropologist Ruth Benedict summed up much of prayer when she said, "Religion is universally a technique for success." Ethnographic surveys suggest that when people try to communicate with God, it's not to share gossip or know-how; it's to ask him for stuff: recovery from illness, recovery of a child from illness, success in enterprises, success in the battlefield. (And of course, the Red Sox winning the World Series, which almost made me into a believer.) This idea was summed up by Ambrose Bierce in *The Devil's Dictionary*, which defines "to pray" as "to ask that the laws of the universe be annulled in behalf of a single petitioner, confessedly unworthy." This aspect of religious belief is thus a desperate measure that people resort to when the stakes are high and they've exhausted the usual techniques for the causation of success.

Those are some of the emotional predispositions that make people fertile ground for religious belief. But there also are cognitive predispositions, ways in which we intellectually analyze the world and that have been very skillfully explored by the anthropologists Dan Sperber, Pascal Boyer, and Scott Atran. Anyone who is interested in the evolutionary psychology of religion would enjoy Pascal Boyer's *Religion Explained* and Scott Atran's *In Gods We Trust*. Hamer's *The God Gene* is also good, but I am more sympathetic to Boyer and Atran.

The starting point is a faculty of human reason that psychologists call intuitive psychology or the "theory of mind module"—"theory" here referring not to a theory of the scientist but rather to the intuitive theory that people unconsciously deploy in making sense of other people's behavior. When I try to figure out what someone is going to do, I don't treat them as just a robot or a windup doll responding to physical stimuli in the world. Rather, I impute minds to those people. I can't literally know what someone else is thinking or feeling, but I assume that they're thinking or feeling something, that they have a mind, and I explain their behavior in terms of their beliefs and their desires. That's intuitive psychology. There is evidence that intuitive psychology is a distinct part of our psychological makeup. It seems to be knocked out in a condition called autism: autistic people can be

prodigious in mathematics, art, language, and music, but they have a terrible time attributing minds to other people. They really do treat other people as if they were robots and windup dolls. There's also a concerted effort under way to see where intuitive psychology is computed in the brain. Parts of it seems to be concentrated in the ventromedial and orbital frontal cortex, the parts of the brain that kind of sit above the eyeballs, as well as the superior temporal sulcus farther back.

Perhaps the ubiquitous belief in spirits, souls, gods, angels, and so on consists of our intuitive psychology running amok. If you are prone to attributing an invisible entity called "the mind" to other people's bodies, it's a short step to imagining minds that exist independently of bodies. After all, it's not as if you could reach out and touch someone else's mind; you are always making an inferential leap. It's just one extra inferential step to say that a mind is not invariable housed in a body.

In fact, the nineteenth-century anthropologist Edward Tyler pointed out that in some ways, there is good empirical support for the existence of the soul, or at least there used to be, until the fairly recent advent of neuroscience, which provides an alternative explanation for how minds work. Think about dreams. When you dream, your body is in bed the whole time, but some part of you seems to be up and about in the world. The same thing happens when you're in a trance from a fever, a hallucinogenic drug, sleep deprivation, or food poisoning.

Shadows and reflections are rather mysterious—or were until the development of the physics of light with its explanation of those phenomena. But they appear to have the form and essence of the person but without any of their actual matter.

Death, of course, is the ultimate apparent evidence for the existence of the soul. A person may be walking around and seeing and hearing one minute and the next minute be an inert and lifeless body, perhaps without any visible change. It would seem that some animating entity that was housed in the body has suddenly escaped from it.

So before the advent of modern physics, biology, and especially neuroscience, a plausible explanation of these phenomena is that the soul wanders off when we sleep, lurks in the shadows, looks back at us from a surface of a pond, and leaves the body when we die.

To sum up: The universal propensity toward religious belief is a genuine scientific puzzle. But many adaptationist explanations for religion, such as the one featured in *Time*, don't, I think, meet the criteria for adaptations. There is an alternative explanation, namely, that religious psychology is a by-product of many parts of the mind that evolved for other purposes. Among those purposes one has to distinguish the benefits to the producer and the benefits to the consumer. Religion has obvious practical effects for producers. When it comes to the consumers, there are possible emotional

adaptations in our desire for health, love and success, possible cognitive adaptations in our intuitive psychology, and many aspects of our experience that seem to provide evidence for souls. Put these together, and you get an appeal to a mysterious world of souls to bring about our fondest wishes.

NOTE

This talk was presented at the annual meeting of the Freedom from Religion Foundation, Madison, Wisconsin, on receipt of “The Emperor’s New Clothes Award.”

CHAPTER 2

SACRED EMOTIONS AND AFFECTIVE NEUROSCIENCE: GRATITUDE, COSTLY SIGNALING, AND THE BRAIN

Robert A. Emmons and Patrick McNamara

Our concern in this chapter is with religious emotions and how these might link to brain mechanisms and with evolutionary approaches to understanding character strengths. Given that religion is a human universal, evolutionary and cultural perspectives on the emotions are incomplete without a comprehensive understanding of the role of religion. Religion provides context and direction for emotion, and the influence of religious systems on emotional experience and expression is considerable. For example, religions encourage certain emotions and discourage others. Religion also influences the expression of emotion—both its intensity and its quality. This chapter examines emotions and emotional processes that normally occur in the context of religion. Recent scientific research on the religious emotion of gratitude is highlighted. Specifically, we argue that as a “strength of character,” gratitude, like other virtues, can function as a hard-to-fake signal of fitness (Sosis, 2003) that signals religious commitment and enhances cooperative exchanges. “Fitness” is a technical term from evolutionary biology that means, roughly, the ability of an organism to survive to reproductive age and to get its genes transmitted to the following generations. One component of fitness is an animal’s or a person’s ability to cooperate with others of its kind. In the context of human societies, cooperation requires certain “strengths of character,” such as honesty, trustworthiness, and integrity, and we argue that all the sacred emotions/virtues serve as strengths of character, including gratitude. We use gratitude as a case in point because a lot of data have been gathered on how gratitude functions in both secular and sacred contexts.

RELIGION AND EMOTION: AN OVERVIEW

The connection between religion and emotion is a long and intimate one. For one, religion has always been a source of profound emotional experience. Commenting on this historical association, Pruyser (1968) wrote that “there is something about emotion that has always had a great appeal to the religious” (p. 142). More recently, philosopher Loyal Rue (2005) pithily stated that if our objective is to understand religion and human nature, then “we must begin with the emotions” (p. 79).

Religion likely influences both the generation of emotion and the regulation of emotional responses. Links between religion and emotion can also be seen in religious attitudes toward emotional experience and expression. Historically, there are two main notions about the role of emotions in religious life. The charismatic movement stresses the cultivation of intense positive emotions and their importance in religious experience and collective religious rituals (see also McCauley, 2001), whereas the contemplative tradition stresses a calming of the passions and the development of emotional quietude. Religion also provides a broad framework for considering what view to take of particular emotions. Although approaches that reduce unpleasant emotions are certainly often appropriate, a religious perspective will also want to consider when emotions are appropriate, how they can best be employed to serve a constructive purpose, and what the appropriate response to them should be (Watts, 2006).

Silberman (2003) suggests three ways in which religious and spiritual meaning systems influence emotion. First, religion encourages appropriate and inappropriate emotions and their level of intensity. For example, within Judaism, people are encouraged to love God with all their hearts (Deuteronomy 6:5) and to serve God with joy (Deuteronomy 28:47). Second, beliefs about the nature and attributes of God may give rise to specific emotions as well as influence overall emotional well-being. For example, a belief about a loving personal God may have a positive effect on emotional well-being, while a belief about a punitive vengeful God may have the opposite effect. Third, religion offers the opportunity to experience a uniquely powerful emotional experience of closeness to the sacred (Otto, 1958).

The role of emotion in religion found was central in several prominent accounts of religious experience, including Jonathan Edwards’s (1746/1959) analysis of the religious affections, such as fear, hope, love, hatred, desire, joy, sorrow, gratitude, compassion, and zeal, and Friedrich Schleiermacher’s (1799) notable treatise that placed emotion at the center of conscious religious experience. Reverence, humbleness, gratefulness, compassion, remorse, and zeal were described as essential elements of religious experience by Schleiermacher. Within emotion theory, Magda Arnold (1960) was quite possibly the first psychology of emotion theorist to write extensively about

human religious emotions in her book *Emotion and Personality*. In the chapter on positive emotions, she included a section on religious emotions in which she noted that in addition to the prototypical religious emotions of reverence and awe that Otto (1958) and others had identified, several other emotions can be experienced toward God (which was her criteria for a religious emotion). In particular, love, joy, and happiness are “reactions to overwhelming abundance, an infinity, of the good and the beautiful” (Arnold, 1960, p. 328) and contain “a hint of eternity” (p. 160).

One might rightfully ask what makes emotions sacred (or religious?) We can identify several characteristics of sacred emotions. First, sacred emotions are those emotions that are more likely to occur in religious (e.g., churches, synagogues, mosques) *settings* than in nonreligious settings. However, this does not mean that sacred emotions cannot be experienced in nonreligious settings. Second, sacred emotions are those that are more likely to be elicited through spiritual or religious activities or *practices* (e.g., worship, prayer, meditation) than by nonreligious activities. However, this does not mean they cannot be activated through nonreligious channels as well. Third, sacred emotions are more likely to be experienced by *people* who self-identify as religious or spiritual (or both) than by people who do not think of themselves as either spiritual or religious. However, sacred emotions can be felt (on occasion) by people who do not think of themselves as religious or spiritual. Fourth, sacred emotions are those emotions that religious and spiritual *systems* around the world have traditionally sought to cultivate in their adherents. Fifth and last, sacred emotions are those emotions experienced when individuals imbue seemingly secular aspects of their lives (e.g., family, career, events) with a spiritual significance (Mahoney, Pargament, Tarakeshwar, & Swank, 2001; Pargament, 2002). Spiritual emotions such as gratitude, awe and reverence, and love and hope are likely to be generated when people perceive sacredness in various aspects of their lives.

GRATITUDE AS A SACRED EMOTION

Among the emotions that might be thought of as sacred or religious, gratitude has recently emerged as a concept that has generated sustained theoretical and research attention (for an overview, see Emmons & McCullough, 2004). Emmons and his colleagues have undertaken a research program on gratitude, defined as an emotional appreciation of and thankfulness for favors received. Feelings of gratitude stem from two stages of information processing: (1) an affirmation of goodness or “good things” in one’s life and (2) the recognition that the sources of this goodness lie at least partially outside the self. Gratitude also has a dual meaning: a material one and a transcendent one. In its material sense, gratitude is simply a feeling that occurs in interpersonal exchanges when one person acknowledges receiving a valuable

benefit from another. In this sense, it, like other social emotions, functions to help regulate relationships. Its other nature is more ethereal, spiritual, and transcendent. Philosophies and theologies have viewed gratitude as central to the human–divine relationship. As long as people have believed in God, believers have sought ways to express gratitude and thanksgiving to this God, their ultimate giver. An instance of the emotion of gratitude will thus be religious if the perceived benefactor is God, conceived of as either a personal being or a “higher power” that is the source of goodness or “the first giver of all gifts.” Even in a nontheistic sense, gratitude retains its spiritual nature. This fundamental spiritual quality to gratitude that transcends religious traditions is aptly conveyed by Streng (1989): “in this attitude people recognize that they are connected to each other in a mysterious and miraculous way that is not fully determined by physical forces, but is part of a wider, or transcendent context” (p. 5).

Gratitude has been well established as a universal human attribute. Its presence is felt and expressed in different ways by virtually all peoples, of all cultures, worldwide (Emmons & McCullough, 2004). The fact that gratitude is universal across all cultures suggests that it is part of human nature. Gratitude is thus a universal religious sentiment, for it is based on gift exchange between humans and their gods, which is ubiquitous in the history of religion (Burkert, 1996). Some of the most profound reported experiences of gratitude can be religiously based or associated with reverent wonder toward an acknowledgment of the universe (Goodenough, 1998), including the perception that life itself is a gift. In the great monotheistic religions of the world, the concept of gratitude permeates texts, prayers, and teachings. Worship with gratitude to God for the many gifts and mercies are common themes, and believers are urged to develop this quality.

Gratitude from an Evolutionary Perspective

Like other emotions, gratitude can be analyzed at many levels of analysis. For example, from a biocultural or evolutionary perspective emphasizing social functional accounts of emotion (Keltner, 2003), gratitude helps individuals form and maintain relationships; relationships are essential to the survival and well-being of individuals, groups, and societies. A biocultural approach to gratitude suggests that it, like other social emotions, evolved to solve certain recurring problems in the human social landscape.

Specifically, the emotion of gratitude has been hypothesized to have developed in order to solve problems of group governance. Sociologist Georg Simmel (1950) argued that gratitude was a cognitive-emotional supplement serving to sustain one’s reciprocal obligations. Because formal social structures such as the law and social contracts are insufficient to regulate and ensure reciprocity in human interaction, people are socialized to have

gratitude, which then serves to remind them of their need to reciprocate. Thus, during exchange of benefits, gratitude prompts one person (a beneficiary) to be bound to another (a benefactor) during exchange of benefits, thereby reminding beneficiaries of their reciprocity obligations. He referred to gratitude as “the moral memory of mankind . . . if every grateful action . . . were suddenly eliminated, society (at least as we know it) would break apart” (Simmel, 1950, p. 388).

Gratitude also provides an emotional basis for reciprocal altruism. In his seminal article, Robert Trivers (1971) speculated on the evolutionary functions of gratitude. Trivers viewed gratitude as an evolutionary adaptation that regulates people’s responses to altruistic acts. Gratitude for altruistic acts is a reward for adherence to the universal norm of reciprocity and is a mediating mechanism that links the receipt of a favor to the giving of a return favor. The effect of this emotion is to create a desire to reciprocate. From this perspective, gratitude serves as a mental mechanism that calibrates the extent of debt owed—the larger the debt, the larger the sense of gratitude. Recent research indicates that gratitude may be a psychological mechanism underlying reciprocal exchange in human and nonhuman primates (Bonnie & de Waal, 2004).

Emmons and his colleagues synthesized historical perspectives and recent research on gratitude in their theory of gratitude as a moral affect. They theorized that gratitude is a moral affect—that is, one with moral precursors and consequences (McCullough, Kilpatrick, Emmons, & Larson, 2001). By experiencing gratitude, a person is motivated to carry out prosocial behavior, energized to sustain moral behaviors, and inhibited from committing destructive interpersonal behaviors. Because of its specialized functions in the moral domain, they likened gratitude to empathy, sympathy, guilt, and shame. Like empathy, sympathy, guilt, and shame, gratitude has a special place in the grammar of moral life. Whereas empathy and sympathy operate when people have the opportunity to respond to the plight of another person and guilt and shame operate when people have failed to meet moral standards or obligations, gratitude operates typically when people acknowledge that they are the recipients of prosocial behavior. Specifically, McCullough et al. posited that gratitude serves as a *moral barometer*, providing individuals with an affective readout that accompanies the perception that another person has treated them kindly or prosocially. Second, they posited that gratitude serves as a *moral motive*, stimulating people to behave prosocially after they have been the beneficiaries of other people’s prosocial behavior. Recent empirical evidence does indeed suggest that gratitude can shape costly prosocial behavior (Bartlett & DeSteno, 2006). Third, they posited that gratitude serves as a *moral reinforcer*, encouraging prosocial behavior by reinforcing people for their previous prosocial behavior.

Emmons and colleagues have argued that gratitude is a human strength in that it enhances one's personal and relational well-being and is quite possibly beneficial for society as a whole. Results on the correlates of dispositional gratitude appear to bear this out. As a disposition, gratitude is a generalized tendency to recognize and respond with positive emotions (appreciation, thankfulness) to the role of other persons' (moral agents) kindness and benevolence in the positive experiences and outcomes that one obtains. Existing research suggests that gratitude is a typically pleasant experience that is linked to contentment, happiness, and hope.

Gratitude has also been scientifically examined at the level of a personality trait, or disposition. As a trait, gratitude is the tendency to perceive benevolence on the part of others and to respond with grateful feelings and cognitions (e.g., perceptions of being "gifted") and a desire to reciprocate. Two trait measures of gratitude have been published: the GQ-6 (McCullough, Emmons, & Tsang, 2002) and the GRAT (Watkins, Woodward, Stone, & Kolts, 2003). High scorers on the GQ report more frequent positive emotions, life satisfaction, vitality, and optimism and lower levels of depression and stress (McCullough et al., 2002). Similarly, scores on the GRAT correlate positively and moderately with positive states and traits, such as internal locus of control, intrinsic religiosity, and life satisfaction; moreover, scores correlate negatively and moderately with negative states and traits such as depression, extrinsic religiosity, narcissism, and hostility. In one experiment, high scorers on the GRAT showed a positive memory bias: they recalled a greater number of positive memories when instructed to do so and even rated their memories of unpleasant experiences more positively over time relative to the initial emotional impact of these negative events (Watkins, Grimm, & Kolts, 2004). Importantly, these data showing that gratitude is correlated with beneficial outcomes are not limited to self-reports. Notably, the family, friends, partners, and others who surround them consistently report that people who practice gratitude seem measurably happier and are more pleasant to be around. Grateful people are rated by others as more helpful, more outgoing, more optimistic, and more trustworthy (McCullough et al., 2002).

Gratitude and Costly Signaling Theory

It is possible to draw a conceptual linkage between evolutionary and theological perspectives on gratitude by invoking the "costly signaling theory" (CST) of religious behavior (Bulbulia, 2004; Irons, 2001; Sosis, 2003). Recent developments in the scientific study of religion have applied this theory to explain religious belief and behavior. According to CST, both public and private religious behaviors (i.e., ritual activities such as fasting, prayer, worship, tithing) can be regarded as "costly" in that they incur significant effort

without prospect of immediate returns. In their roles as signaling devices, these religious rituals and behaviors can become reliable indicators of commitment (of the person enacting them) to the religious community (for a similar analysis, see Rappaport, 1999). By engaging in these religious practices the religious adherent is saying, in effect, “Look, I would not be devoting so much time to these irrational and useless activities unless I was truly committed to the group.” No free rider would be willing to consistently engage in apparently useless ritual activities; thus, you can separate the sheep from the goats by looking at their willingness to comply with all the ritual obligations of the community. Identifying who is in and not in compliance with the rules facilitates group cohesion and cooperation, as you can have confidence that you are not being exploited by free riders (Fehr & Rockenbach, 2004; Sosis, 2003).

Theologians have recognized the effectiveness of public expression of compliance with ritual forms. A public religious expression, such as a public testimony of thanksgiving in response to answered prayer, can authenticate commitment to one’s God and to one’s faith community. This testimony, if it is repetitive and sincere, provides concrete evidence of one’s commitment that not only reinforces and strengthens one’s faith but also signals to other believers the person’s level of the commitment to the group and to their shared ideology. For instance, a family ritual of saying grace before meals is a simple example of how thanksgiving practices can be inculcated within groups and lead to increased cohesiveness. Theologian Patrick Miller (1996) documented the communal character of praise and thanksgiving in biblical theology. When an individual corporately testifies to God’s gracious beneficence, the faith community becomes a “circle of thanksgiving to God” (p. 195), and the resultant effect is the enhancing and strengthening of communal ties and a powerful reminder to the individual that he or she is not autonomous and self-sufficient.

But CST carries implications for other religious forms beyond public ritual displays and practices. We contend that it illuminates certain aspects of the religious emotions as described previously and in particular gratitude and trustworthiness. If we treat the religious emotions, in part, as signaling displays intended to convey a message to others, then we can bring evolutionary theory and “affective neuroscience” into the conversation on religious emotions.

As already mentioned, “costly signals” require strategic costs—costs that extend beyond the baseline costs that all behavioral actions entail—and are therefore hard to fake by individuals not truly committed to cooperative interchange. Cooperative relationships can greatly benefit participating individuals, but they are at risk of exploitation by free riders, or individuals who want to take but not give. It is important to realize just how destructive a free rider can be in attempts to cooperate (de Quervain et al., 2004). If a group of people who are engaged in a common work begin to sense that one of their members

is not putting anything into the work but is nevertheless still drawing salary or benefits from the work, then every other individual in the group begins to adjust his or her performance accordingly until eventually all trust collapses among members of the group and it disbands before accomplishing its purpose. Successful group cooperation requires reliable methods of identifying cheats and free riders. The ability to identify genuine cooperators and fakes or free riders is crucial for those wishing to pursue cooperative exchanges. Interestingly, recent studies combining neuroimaging with behavioral game experiments have shown that neostriatal and limbic prefrontal dopaminergic networks are activated when cheaters/free riders are identified and punished (Fehr & Gächter, 2002; de Quervain et al., 2004).

While multiple institutional procedures have evolved to spot and punish free riders, we are interested here in how the religious emotions might contribute to the process. It is clear how the common emotions contribute: you get angry, even enraged, when you are being exploited by a free rider, and you vow never to trust that person again. By contrast, after a successful bout of cooperation with a trustworthy individual, you increase your level of liking, comfort, and trust of that individual. But what about the religious versions of the emotions of trust, gratitude, and so forth?

We contend that religious emotions help us identify free riders and genuine cooperators because all the religious emotions contribute to the *virtues* or “strengths of character.” If a person has genuinely acquired the traditional religious virtues, then he or she is likely to be a trustworthy companion. The crucial distinction we believe is that *genuine cooperators will acquire a reputation for trustworthiness and integrity, while free riders will not be able to sustain the high costs of acting with integrity, consistency, and generosity.* The importance of trustworthiness and character is even more pronounced when social groups increase in size and number such that you can no longer rely on reputation or repeated interactions with an individual. In large groups of people, free riders find ways to escape identification in the crowd. Perceived strength of character or “trustworthiness” of an individual should, therefore, reliably indicate an individual’s willingness to engage in cooperative enterprises. Thus, considerations derived from CST predict that a premium will be placed on the neurobehavioral ability to both perceive and signal trustworthiness. The religious emotions would facilitate the ability to both perceive and display traits of trustworthiness. If I am, for example, perceived as a grateful person, then it likely means that I have received an unmerited gift at some point in the recent past. If I have received an unmerited gift, then it is likely that some important person or group trusted me enough to cooperate with me and liked me enough to confer extraordinary benefits on me in the course of that cooperation. Thus, sustaining over time the behavioral disposition of “gratitude” could bring even more *benefits* to the grateful individual because it will mark the person as trustworthy. We discuss the signaling capacities

of gratitude further later in this chapter, but first we wish to say more about the benefits of acquiring a grateful disposition, as these data support the evolutionary and neuroscience-motivated analyses presented here.

RESEARCH ON THE BENEFITS OF GRATITUDE

The significance of gratitude stems not only from its role in regulating human social relationships but also from its effects on intrapersonal functioning. An exploration into the effect of gratitude on psychological functioning has occurred within the positive psychology movement, which has sought to systematically classify human strengths and virtues into a comprehensive taxonomy (Peterson & Seligman, 2004). Basic research as well as interventions to cultivate these virtues are beginning to yield significant fruit.

As an illustration of an effective intervention, recent research has demonstrated that mood and health benefits can accrue from grateful thinking. In experimental studies, persons who were randomly assigned to keep gratitude journals on a weekly basis exercised more regularly, reported fewer physical symptoms, felt better about their lives as a whole, and were more optimistic about the upcoming week compared to those who recorded hassles or neutral life events (Emmons & McCullough, 2003, study 1). A daily gratitude journal-keeping exercise with young adults resulted in higher reported levels of the positive states of alertness, enthusiasm, determination, attentiveness, and energy compared to a focus on hassles or a downward social comparison (ways in which participants thought they were better off than others; Emmons & McCullough, 2003, study 2). Participants in the daily gratitude condition were more likely to report having helped someone with a personal problem or having offered emotional support to another, relative to the hassles or social comparison condition. This indicates that, relative to a focus on complaints, an effective strategy for producing reliably higher levels of pleasant affect is to lead people to reflect, on a daily basis, on those aspects of their lives for which they are grateful. Other benefits have extended to the physical realm including better sleep quality and more time spent exercising for those keeping gratitude journals (Emmons & McCullough, 2003).

The benefits of gratitude were further confirmed in a recent study that compared the efficacy of five different interventions that were hypothesized to increase personal happiness and decrease personal depression (Seligman, Steen, Park, & Peterson, 2005). In a random assignment, placebo-controlled Internet study, a gratitude intervention (writing and delivering a letter of thankfulness to someone who had been especially helpful but had never been properly thanked) was found to significantly increase happiness and decrease depression for up to one month following the visit. Results indicated that “participants in the gratitude visit condition showed the largest positive changes in the whole study” (Seligman et al., 2005, p. 417). Thus, the benefits

of gratitude do not appear to be limited to the self-guided journal keeping methodology utilized by Emmons and McCullough (2003).

Why Is Gratitude Good? Exploring Mechanisms

The research literature to date indicates that gratitude, either measured dispositionally or activated by specific tasks, is linked to improved well-being and general positive functioning. How does one account for the psychological, emotional, and physical benefits of gratitude? A number of mechanisms have been suggested to account for the psychological benefits of grateful thinking (Watkins, 2004); our focus here is primarily on physical effects. There appears to be growing evidence that gratitude and related states can impact physiological functioning and physical health. Activation studies are beginning to examine the physiological concomitants of gratitude and related positive emotional states. Researchers at the Institute of HeartMath and Quantum Intech in Boulder Creek, California, have developed a behavioral technique for inducing a positive emotion they call “appreciation” (McCraty & Childre, 2004). The technique consists in consciously disengaging from unpleasant emotions by shifting attention to one’s physical heart, which they think most people associate with positive emotions, and focusing on feeling appreciation toward someone, appreciation being an active emotional state in which one dwells on or contemplates the goodness of someone. McCraty and Childre have found that heart rhythm patterns associated with “appreciation” differ markedly from those associated with relaxation (neutral emotion) and anger (negative emotion). Appreciation increases parasympathetic activity and also produces entrainment or coherence across various autonomic measures (e.g., heart rate variability, pulse transit time, respiration rate), a pattern that is associated with cardiovascular health.

This finding provides a criterion for the presence of “appreciation” that may be more reliable than self-report. McCraty and Childre (2004) admit that they have not been able to discriminate “between specific positive . . . emotions on the basis of heart rhythm patterns alone” (p. 250), suggesting that “appreciation” might function as a summary term for such widely different positive emotions as hope, gratitude, joy, admiration, contentment, relief, pride, and gloating. Thus, heart rhythm patterns currently discriminate emotion types only roughly, but McCraty and Childre optimistically contend that “future developments in pattern analysis technologies will enable a more refined discrimination of emotions than is currently possible” (p. 250).

Relatedly, recent studies of autonomous nervous system activity during meditation have reported a pattern of mutual activation of both the parasympathetic and the sympathetic system that is associated with the subjective experience of a sense of overwhelming calmness as well as significant alertness. We bring this up here because the conscious activation of gratitude

through the journaling exercise resulted in increased *calmness* and *alertness* (Emmons & McCullough, 2003). And, to complete the story, other studies have found that certain meditative techniques do in fact lead to an increased sense of gratitude and thankfulness (Gillani & Smith, 2001).

More broadly, sacred positive emotions such as gratitude can serve as resources that a person can draw on in times of need, including coping with stress and dealing with and recovering from physical illness. It is also plausible, for example, that the biology of emotions and related states activated during religious worship (praise, reverence, awe, gratitude, love, hope) could have neuroendocrine or immunological consequences, thus potentially accounting for the salubrious effects of religious practices on health outcomes. Any examination of the neurobiology of these states will likely have to rely on the phenomenological properties of worship or other related religious experiences, thus taking the “religio” in “religious” emotions seriously.

GRATITUDE, POSITIVE EMOTIONS, AND THE BRAIN

Given the centrality of gratitude to the religious stance, to prosocial behavior, and to moral behavior (as reviewed previously) as well as its manifestly positive effects on mood and health, it is worth attempting to construct a tentative cognitive neuroscience of gratitude (and this takes us into the realm of affective neuroscience). Affective neuroscience is far broader than the field of emotion, as it examines the behavioral, social, and neural components of emotional processes (Schmidt, 2003).

Why bother with neural processes involved in gratitude? Well, for one reason, modeling and examining the brain correlates of a complex emotion such as gratitude, though fraught with difficulties, may help us decide between competing accounts of the nature and functions of gratitude. In addition, it may provide clues as to how gratitude and other positive emotions can influence health, thus enhancing clinical attempts to elicit the emotion.

If, for example, investigation led us to assign gratitude to neural networks handling motivational states rather than to networks supporting consummatory pleasure or reward states, then it would be reasonable to conclude that the neurological data are more consistent with functional treatments of gratitude as promoting “reciprocity” for favors received and “moral behavior” for social debts incurred than with nonfunctional accounts of gratitude as simply a readout mechanism that informs us that we have received an unmerited benefit. Obviously, our neurologic investigations could lead us to believe that gratitude involves both a pleasurable emotion and a motivational state. In this case, the neurologic data help us place the psychological accounts of gratitude into a process framework, thus allowing the investigator to place further constraints on the object of his or her investigation. Measurement

instruments would then need to address both the state-emotional aspects of gratitude as well as its motivational effects. It seems likely that a process account of gratitude would involve an initial experience of relatively intense positive affect, such as joy, appreciation, or happiness, for some significant benefit received, with the intensity of this positive emotion and its concomitant motivational effects likely decreasing over time. After the initial benefit is received from a benefactor, the recipient would experience a sense of appreciation or even joy, depending on the size of the gift. Arriving at a given level of intensity of gratitude (and presumably a related motivational state) would require the calculation of degree of benefit received along with anticipated costs of reciprocating. In addition, both the felt emotion and the accompanying motivational state would require a certain amount of memory involving the favor received and of the benefactor. In short, a process account of gratitude would involve a recipient of a benefit (1) recognizing that a gift has been received, (2) calculating benefits/costs associated with the gift, (3) experiencing an emotion that begins in appreciation and emerges into gratitude, (4) with memory of the benefit and benefactor as well as the emotion of gratitude initiating and sustaining a motivational state to reciprocate the benefit received. All four of these steps can be handled by limbic–frontal interactions (Damasio & Anderson, 2005), as such interactions have been shown to support (1) assigning significance levels to events and stimuli in the individuals' environment/experience (Rolls, 2004; Schultz et al., 1995), (2) assessing probabilities and costs of current decisions and events (Aldophs, Jansari, & Tranel, 2001; Barkley, 1997), (3) supporting positive emotionality as well as motivational and approach tendencies (Berridge, Espana, & Stalnaker, 2003; Davidson et al., 2002), and (4) supporting autobiographical memory retrieval as well as memory of recent social interactions (Craik et al., 1999; Wheeler, Stuss, & Tulving, 1997). The neurologic data therefore support the process approach to emergence of gratitude, and the process approach in turn is consistent with standard direct and indirect reciprocity accounts of the functions of gratitude. As discussed previously, in the standard reciprocity account of gratitude, its function is to support human cooperation by facilitating “giving back” to a benefactor.

But what happens when you receive a gift that you can't possibly reciprocate? Here the standard reciprocity accounts of gratitude may break down as the benefits/costs analyses of the gift cannot be computed and no conventional motivational state to reciprocate the giver can emerge. We can receive such unrepayable gifts from multiple sources, as when a comrade saves our life in war or when God confers his gifts, as in the miraculous recovery of an alcoholic in Alcoholics Anonymous when all seemed utterly lost. Certainly, the potlatch feasts in certain North American Indian tribes tended to move in the direction of conferring gifts on rivals that could not be reciprocated. Perhaps costly signaling approaches (as described previously) may be more applicable here than standard reciprocity models of gift giving

(and, by implication, gratitude). If costly signaling accounts of gratitude as a commitment device are correct, then calculation of costs/benefits is less likely to play a role, as the more costly the emotional and behavioral display associated with gratitude, the more effective the signal.

From a neurologic perspective, costly signaling models would likely involve recruitment of circuits that support positive emotions *regardless of costs*. Instead of the four-step process model described previously for standard reciprocity models of gratitude, we would need to substitute the following: (1) the cost/benefit analysis system is inhibited or shut down temporarily, as the recipient receives a gift that he or she construes as unmerited, unrepayable, or even of ultimate significance; (2) the recipient is flooded with an extreme emotion of appreciation and perhaps joy that stabilizes into gratitude; (3) depending on context, this form of gratitude issues into one of two possible motivational states/outcomes: either the recipient gives up the attempt to reciprocate in any way and rests in the memory of the gift, or the recipient dedicates his or her life to gifting others as much as possible. The second option occurs most often in a religious or spiritual context. When it does occur, it may be experienced as a kind of conversion to a new way of life.

On the face of it, the costly signaling approach to gratitude (and we must emphasize here that we are only sketching one such approach here) can more adequately account for the specifically *religious* aspects of gratitude, as religious gratitude appears to eschew finely calibrated tit-for-tat calculations of cost-benefit. Instead, religious gratitude never concludes that the debt to the benefactor has been discharged, as the gifts received are incalculable. Thus, religious expressions of gratitude may sometimes take on the most extravagant manifestations, such as the “gift of tears” or extreme altruistic self-sacrifice as we see in the life of the saints and martyrs.

Does CST allow us to examine potential benefits of adopting the strategic stance of a more or less permanent display of gratitude? Can gratitude itself (rather than gifting *per se*) be treated as a costly display that accomplishes some strategic social goal? If we assume that “being in a state of gratitude” can be detected by onlookers, then it is reasonable to ask whether the emotion can be usefully recruited into the strategic social goals of the individual as CST might predict. Certainly coming across a “grateful” person provides valuable strategic information to an onlooker looking for potential allies and attempting to avoid potential enemies or free riders. Detecting a hint of gratitude in a person with whom you have not previously interacted tells you that that person (1) has likely received a gift and therefore likely holds potentially valuable resources; (2) is likely to be trustworthy when cooperating, as gratitude inclines a person to reciprocate for favors received; (3) is not likely to be a freeloader, as gratitude is a costly complex emotion that is hard to fake; and (4) may likely still be in touch with another coalition that contains individuals who can confer gifts or other benefits.

From the previous analysis, it follows that the human brain likely contains neural networks that are efficient at both detecting and displaying telltale signs of gratitude. The cues are likely to include facial expressions and vocal and behavioral displays. Thus, from the point of view of CST, the neurology of gratitude would need to include (1) the fusiform face-processing areas near the temporal–occipital junctions; (2) the amygdala and limbic emotional processing systems, which support emotional states; and (3) interactions between these two subcortical centers with the prefrontal regions controlling executive and evaluative processes.

Gratitude in Persons with Neurological Deficits

Although the costly signaling approach may give us a better account of religious gratitude than does the standard reciprocity theory, it is clear that both approaches would require the neurological participation of limbic–prefrontal networks. Thus, like the other social emotions, gratitude likely relies on limbic–prefrontal networks to mediate its positive effects on the individual (Blakemore, Winston, & Frith, 2004). Admittedly, this is only a general neurologic area and therefore does not help us much in constraining evolutionary and cognitive models of gratitude. But it is a start, and until classical neuropsychologic and neuroimaging procedures are brought to bear on the issue of gratitude, we can't do much better than this.

Additional evidence comes from findings that patients with Parkinson's disease (PD) have deficits in counterfactual thinking (the ability to imagine alternatives to events that have happened). There is some reason to believe that gratitude could be considered a counterfactual emotion or response. Gratefulness or thankfulness to someone who has done you a kindness may often be accompanied by a cognition about how things could have gone differently. Teigen (1997) required his or her subjects to tell a story about two occasions when they felt grateful and then later asked them if they had thought of what might have happened instead (i.e., engaged in counterfactual thinking) and found that there was indeed a close relationship between gratitude and counterfactual thinking. A recently published study found a counterfactual deficit in patients with frontal dysfunction (McNamara, Durso, Brown, & Lynch, 2003), and thus there may be a connection between ability to adopt a grateful attitude and ability to generate counterfactuals.

To test the general conclusion that gratitude differentially relies on limbic–prefrontal networks, we conducted a pilot investigation with individuals who evidence clinically significant prefrontal dysfunction—namely, individuals with midstage PD (Starkstein & Merello, 2002). If the emotion of gratitude depends on prefrontal networks, then measures of gratitude should correlate with measures of prefrontal function. In addition, individuals with prefrontal dysfunction should not display the normal benefit in mood that

occurs when an individual conjures up a memory of an experience that induced gratitude (Emmons & McCullough, 2003). Normally, if you ask an average person to remember a time when they felt grateful for something that someone did for them or for something that happened to them, their mood slightly changes into a more positive, happy one. If, however, gratitude and its beneficial effects depends critically on prefrontal networks, then we would expect no such mood improvement in persons with prefrontal dysfunction if they are asked to recall an experience involving gratitude. That is what we indeed found when testing PD patients. We compared a group of midstage PD patients ($N = 22$) to age-matched healthy controls ($N = 18$) on the mood induction procedure (described in Emmons & McCullough, 2003). In the mood induction procedure, the subject is asked to use both an explicit self-report and an implicit unconscious report of his or her mood before and after he or she recalls either a gratitude memory or a “control” positive memory. While neither group reported a mood change when recalling a positive memory, there was a slight improvement in mood in the healthy controls after recalling a gratitude memory but no such improvement in mood for the PD patients. The postinduction mood scores for healthy controls, furthermore, were correlated with several measures of prefrontal function, while no such correlations were obtained (between postinduction mood scores and prefrontal performance) for PD patients. In addition, though the overall score on the GQ-6 questionnaire showed no difference between the PD versus control groups (mean gratitude level out of 42 total = 36.0 [4.40] for controls and 34.8 [4.2] for PD patients; $t < 1$, $p = 0.35$), it was nonetheless significantly correlated with several measures of prefrontal performance in the healthy controls but not in the PD patients. Finally, we also found significant group differences in the latency to retrieval of a gratitude memory as well as the mean length (in number of words) of gratitude memories with PD patients taking longer to retrieve memories (16.16 seconds vs. 23.45 seconds) that were also significantly more wordy or verbose than those of control subjects (100.13 words vs. 65.94 words). The latter finding was to be expected given that a classic symptom of PD is a deficit in speech monitoring (see Tables 2.1 and 2.2).

These data merely scratch the surface of what might be accomplished by examining neurologic correlates of a religious emotion like gratitude. It might also, for example, be possible to conduct brain-imaging studies during prayers of thanksgiving compared to different prayers (liturgical, petitionary), and blood flow could be detected in each prayer state. Additionally, the co-occurrence of gratitude with other positive emotional states that are activated in meditation (compassion, loving kindness, empathy) suggests that gratitude, like other positive emotions, could conceivably be associated with neuroendocrine and immunological measures (Davidson et al., 2003). One might also examine limbic prefrontal

Table 2.1 Gratitude Memory, Patient with Parkinson's Disease

Latency of response initiation: 1 minute, 15 seconds

Word Count: 229

- A: So now once again I'm going to ask you to try to remember something from the past month. Alright, I want you to tell me about a specific event that happened when you felt grateful to someone. You can take as long as you want to remember.
- P: Let me look at my calendar to see what I did this month; maybe it'll jog my mind. I can't think of anything specific in here. All I do is go to the doctor's and do my gigs.
- A: So any time that you felt grateful towards a doctor or you felt grateful towards someone, you . . .
- P: I never feel grateful towards a doctor because he's always prescribing more pills.
- A: Anytime during a gig that you felt grateful towards someone?
- P: Well it's always nice when I finish the gigs, when I finish doing the hour show, when somebody, when I get the people in the audience to stand up and applaud. And that happens quite a bit.
- A: So that happened in the past month?
- P: Yeah.
- A: And you feel grateful about that.
- P: But as I say, I think that I mentioned this earlier, my speech is deteriorating. It's slower. My voice is softer. I have to use a microphone more extensively. So that's kind of nice when I finish a program, you know in my own mind I think I was slurring my words and not saying what I wanted to say, and they still applaud. And seem to mean it. So that makes me feel good.
- A: Right. So you're grateful about that.
- P: Yeah, I would say so.
- A: OK. Now do you think that something else could easily have happened? Like do you think that maybe they wouldn't have applauded, do you ever think about that?
- P: Well that's possible. There's no reason why they should have to stand up and give me a standing ovation. But it's happened on several occasions.
- A: And that would be pretty unpleasant.
- P: They would bother me, that I had put my best out and maybe somebody didn't like it. But I haven't come across that.
- A: Good, but do you ever think that way? Do you ever think when you go into a show, "Uh oh, they might not applaud for me tonight."
- P: Oh sure, but lots of times it's only in my own mind.

dopaminergic activity in dispositionally grateful and less grateful individuals including more dopamine receptors or whether there are increases in dopamine function as a result of systematic gratefulness training (cf. Davidson et al., 2003). Certainly these are viable hypotheses for future research and would significantly advance the science of gratitude as well as religion–brain interactions more generally.

Table 2.2 Gratitude Memory, Patient in Control Condition

Latency to response initiation: 12 seconds Word Count = 199

- A: So now I'm going to ask you to talk about a memory you have, OK? I want you to tell me about a time in the past month that you felt grateful to someone. And that person can be someone you know, it can be to God, to anyone, just about a time in the past month that you felt grateful to someone.
- C: Well, how about this morning.
- A: Ok, tell me about it.
- C: Tell you about it. Well, OK. I had bought a Super Bowl video from Strawberries and if you send in the barcode and receipt they will reimburse you \$10 of the cost. Well I got a card in the mail this morning and it says you didn't send in the barcode so you can't get the \$10. So what I did, I went to Strawberries and I showed the man the card, and he gave me 10 bucks. So I was grateful.
- A: So who were you grateful to?
- C: The gentleman that took care of the issue.
- A: OK, so you were grateful to the guy at Strawberries.
- C: Yeah, manager or whoever he was.
- A: Very good. OK, so I'm going to ask you some questions about that experience. So this man at Strawberries, he gave you the \$10 back. Now, do you think that something else could easily have happened?
- C: He could have said "I can't do anything for you. You need to get the barcode." The barcode right now is, if I'm lucky, it would be in Texas because I sent it to my son. So I'd never get it.
- A: So you think that definitely something else easily could've happened?
- C: Oh sure.
- A: OK, so where would you say?
- C: I would say that could've happened. Oh sure, up here somewhere.
- A: So you were saying that he could have said to you . . .
- C: He could have said that "I can't do anything for you because you don't have the barcode."
- A: Alright now if that had happened, how pleasant or unpleasant would that have been?
- C: It would have been unpleasant because I'd think it was either my stupidity or something and would've resulted in the loss of 10 bucks. So, unpleasant. That would be about a 2.

CONCLUSION

In conclusion, for the psychology of religion there are lessons to be learned from the success of affective neuroscience. An interdisciplinary approach such as we have sketched here and provided a concrete example of can expand our knowledge of religion and the brain in interesting new directions. Clearly, both costly signaling evolutionary theory and social affective neuroscience (including brain imaging) are really just "works in progress,"

but we believe that, when combined, they have the potential of extending the mind and brain sciences to a much broader range of phenomena than are typically studied by neuroscientists, including those that are of most interest to psychologists of religion and spirituality. We anticipate that, in accordance with several other contributors to this volume, the combination of the evolutionary and affective neuroscience paradigms will ultimately anchor the psychology of religion as strongly in the biological sciences as in the social and clinical sciences and will yield new and scientific ways to talk about the human spirit.

REFERENCES

- Aldophs, E., Jansari, A., & Tranel, D. (2001). Hemispheric perception of emotional valence from facial expressions. *Neuropsychology, 15*(4), 516–524.
- Arnold, M. B. (1960). *Emotion and personality*. New York: Columbia University Press.
- Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin, 121*(1), 65–94.
- Bartlett, M. Y., & DeSteno, D. (2006). Gratitude and prosocial behavior: Helping when it costs you. *Psychological Science, 17*(4), 319–325.
- Berridge, C. W., Espana, R. A., & Stalnaker, T. A. (2003). Stress and coping: Asymmetry of dopamine efferents within the prefrontal cortex. In K. Hugdahl & R. Davidson (Eds.), *The asymmetrical brain* (pp. 69–104). Cambridge, MA: MIT Press.
- Blakemore, S. J., Winston, J., & Frith, U. (2004). Social cognitive neuroscience: Where are we heading? *Trends in the Cognitive Sciences, 8*(5), 216–222.
- Bonnie, K., & de Waal, F. (2004). Primate social reciprocity and the origin of gratitude. In R. Emmons & M. McCullough (Eds.), *The psychology of gratitude* (pp. 213–229). New York: Oxford University Press.
- Bulbulia, J. (2004). Religious costs as adaptations that signal altruistic intention. *Evolution and Cognition, 10*, 19–38.
- Burkert, W. (1996). *Creation of the sacred: Tracks of biology in early religions*. Cambridge, MA: Harvard University Press.
- Craik, F. I. M., Moroz, T. M., Moscovitch, M., Stuss, D. T., Winocur, G., Tulving, E., et al. (1999). In search of the self: A PET study. *Psychological Science, 10*(1), 26–34.
- Damasio, A., & Anderson, S. W. (2005). The frontal lobes. In K. Heilman & E. Valenstein (Eds.), *Clinical neuropsychology* (4th ed., pp. 404–446). New York: Oxford University Press.
- Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., et al. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*, 564–570.
- Davidson, R. J., Lewis, D. A., Alloy, L. B., Amaral, D. G., Bush, G., Cohen, J. D., et al. (2002). Neural and behavioral substrates of mood and mood regulation. *Biological Psychiatry, 52*, 478–502.
- de Quervain, D. J., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., et al. (2004). The neural basis of altruistic punishment. *Science, 305*(5688), 1254–1258.

- Edwards, J. (1746/1959). Religious affections. In J. Smith (Ed.), *Religious affections: His works* (Vol. 2.) New Haven, CT: Yale University Press.
- Emmons, R. A., & McCullough, M. E. (2003). Counting blessings versus burdens: Experimental studies of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology, 84*, 377–389.
- Emmons, R. A., & McCullough, M. E. (Eds.). (2004). *The psychology of gratitude*. New York: Oxford University Press.
- Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. *Nature, 415*, 137–140.
- Fehr, E., & Rockenbach, B. (2004). Human altruism: Economic, neural and evolutionary perspectives. *Current Opinion in Neurobiology, 14*, 784–790.
- Gillani, N. B., & Smith, J. C. (2001). Zen meditation and ABC relaxation theory: An exploration of relaxation states, beliefs, dispositions, and motivations. *Journal of Clinical Psychology, 57*, 839–846.
- Goodenough, U. (1998). *The sacred depths of nature*. New York: Oxford University Press.
- Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 292–309). New York: Russell Sage Foundation.
- Keltner, D. (2003). Expression and the course of life: Studies of emotion, personality, and psychopathology from a social-functional perspective. *Annals of the New York Academy of Sciences, 1000*, 222–243.
- Mahoney, A., Pargament, K. I., Tarakeshwar, N., & Swank, A. B. (2001). Religion in the home in the 1980s and 1990s: A meta-analytic review and conceptual analysis of links between religion, marriage, and parenting. *Journal of Family Psychology, 15*(4), 559–596.
- McCauley, R. N. (2001). Ritual, memory, and emotion: Comparing two cognitive hypotheses. In J. Andresen (Ed.), *Religion in mind: Cognitive perspectives on religious belief, ritual, and experience* (pp. 115–140). New York: Cambridge University Press.
- McCraty, R., & Childre, D. (2004). Gratitude and the heart: The psychophysiology of appreciation. In R. Emmons & M. McCullough (Eds.), *The psychology of gratitude* (pp. 230–255). New York: Oxford University Press.
- McCullough, M. E., Emmons, R. A., & Tsang, J. (2002). The grateful disposition: A conceptual and empirical topography. *Journal of Personality and Social Psychology, 82*, 112–127.
- McCullough, M. E., Kilpatrick, S. D., Emmons, R. A., & Larson, D. B. (2001). Is gratitude a moral affect? *Psychological Bulletin, 127*, 249–266.
- McNamara, P., Durso, R., Brown, A., & Lynch, A. (2003). Counterfactual cognitive deficit in patients with Parkinson's disease. *Journal of Neurology, Neurosurgery, and Psychiatry, 74*, 1065–1070.
- Miller, P. D. (1996). *They cried to the Lord: The form and theology of Biblical prayer*. Minneapolis, MN: Fortress Press.
- Otto, R. (1958/1917). *The idea of the holy* (J. W. Harvey, Trans.). London: Oxford University Press.
- Pargament, K. I. (2002). The bitter and the sweet: An evaluation of the costs and benefits of religiousness. *Psychological Inquiry, 13*, 168–181.

- Peterson, C. P., & Seligman, M. E. P. (Eds.). (2004). *Character strengths and virtues: A handbook and classification*. New York: Oxford University Press.
- Pruyser, P. W. (1968). *A dynamic psychology of religion*. New York: Harper & Row.
- Rappaport, R. (1999). *Ritual and religion in the making of humanity*. Cambridge: Cambridge University Press.
- Rolls, E. T. (2004). The functions of the orbitofrontal cortex. *Brain and Cognition*, *55*, 11–29.
- Rue, L. (2005). *Religion is not about God*. New Brunswick, NJ: Rutgers University Press.
- Schleiermacher, F. (1799). *On religion: Speeches to its cultured despisers*. (J. Oman, Trans.) New York: Frederick Ungar Publishing.
- Schmidt, L. A. (2003). Special issue on affective neuroscience: Introductory remarks. *Brain and Cognition*, *52*, 3.
- Schultz, W., Romo, R., Ljungberg, T., Mirenowicz, J., Hollerman, J., & Dickinson, A. (1995). Reward-related signals carried by dopamine neurons. In J. Houk, J. Davis, & D. Beiser (Eds.), *Models of information processing in the basal ganglia* (pp. 233–248). Cambridge: MIT Press.
- Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, *60*, 410–421.
- Silberman, I. (2003). Spiritual role modeling: The teaching of meaning systems. *International Journal for the Psychology of Religion*, *13*, 175–195.
- Simmel, G. (1950). *The sociology of Georg Simmel*. Glencoe, IL: Free Press.
- Sosis, R. (2003). Why aren't we all Hutterites? Costly signaling theory and religious behavior. *Human Nature*, *14*, 91–127.
- Starkstein, S. E., & Merello, M. (2002). *Psychiatric and cognitive disorders in Parkinson's disease*. Cambridge, England: Cambridge University Press.
- Streng, F. J. (1989). Introduction: Thanksgiving as a worldwide response to life. In J. Carman & F. Streng (Eds.), *Spoken and unspoken thanks: Some comparative soundings* (pp. 1–9). Dallas, TX: Center for World Thanksgiving.
- Teigen, K. H. (1997). Luck, envy, and gratitude: It could have been different. *Scandinavian Journal of Psychology*, *38*, 313–323.
- Trivers, R. L. (1971). The evolution of reciprocal altruism. *Quarterly Review of Biology*, *46*, 35–57.
- Watkins, P. C. (2004). Gratitude and subjective well-being. In R. Emmons & M. McCullough (Eds.), *The psychology of gratitude* (pp. 167–192). New York: Oxford University Press.
- Watkins, P. C., Woodward, K., Stone, T., & Kolts, R. L. (2003). Gratitude and happiness: Development of a measure of gratitude and relationships with subjective well-being. *Social Behavior and Personality*, *31*, 431–452.
- Watkins, P. C., Grimm, D. L., & Kolts, R. (2004). Counting your blessings: Positive memories among grateful persons. *Current Psychology: Developmental, Learning, Personality, Social*, *23*, 52–67.
- Watts, F. (2006). Emotional regulation and religion. In J. Gross (Ed.), *Handbook of emotion regulation*. New York: Guilford Press.
- Wheeler, M. A., Stuss D. T., & Tulving, E. (1997). Toward a theory of episodic memory: The frontal lobes and autonoetic consciousness. *Psychological Bulletin*, *121*(2), 331–354.

GENETIC AND ENVIRONMENTAL
INFLUENCES ON THE TRADITIONAL
MORAL VALUES TRIAD—
AUTHORITARIANISM, CONSERVATISM,
AND RELIGIOUSNESS—AS ASSESSED
BY QUANTITATIVE BEHAVIOR
GENETIC METHODS

Laura B. Koenig and Thomas J. Bouchar d Jr.

WHY STUDY GENETIC INFLUENCE ON SOCIAL
ATTITUDES HIGHLY RELATED
TO RELIGIOUSNESS?

The purpose of this chapter is to review data on the genetic and environmental influences on religiousness. The common perception is that religiousness and related variables are formed by socialization processes within the family and that genetic influences are largely irrelevant. Despite this perception, there are reasons why one should examine the possibility of genetic influence on religiousness. First, religiousness may be a biological adaptation, and it may be worthwhile to try to understand it from this perspective. Second, studies that control for or estimate genetic influence provide a clearer picture of the true environmental influences on the trait. Finally, unless religiousness is unlike most other psychological characteristics, it should be heritable. Each of these reasons is addressed in turn before we turn to the structure of social attitudes and the quantitative genetic findings related to religiousness.

Is Religiousness a Biological Adaptation?

Religiousness is a powerful driving force in all human societies—a human universal (Brown, 1991). Wilson (1978) has argued that “the predisposition to religious belief is the most complex and powerful force in the human mind and in all probability an ineradicable part of human nature” (p. 169). Indeed, despite the growth of scientific rationalism in the twentieth century, religion

continues to flourish. The huge body of writing on religious topics generated by literate societies and the commitment to religious beliefs by individuals of extremely high intellect testify loudly to the fact that religious belief systems can attain high levels of complexity and persuasiveness. Universality and complexity of a trait or characteristic strongly suggests that it is an evolutionary adaptation (Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998; Williams, 1966). Yet it is also clear that religious fervor can lead to genetic extinction for particular individuals as witnessed by celibate religious orders over the centuries and suicide bombers in recent years.

These latter observations seemingly throw doubt on the idea that “religiousness” is an adaptation, but that is an incorrect interpretation for a number of reasons. First, behavioral expression by individuals at the extremes of a trait addresses the power of the trait to influence behavior, but behavior at the extremes may not reflect its most important function. This may be determined by the mean value. Indeed, one hypothesis generated by the adaptationist argument is that the trait is under some degree of balancing selection; that is, individuals at both extremes have a lower level of fitness. Second, the mechanism by which the trait influences fitness may be costly yet adaptive. Zahavi and Zahavi’s (1997) handicap principle (costly signaling theory [CST]) has been fruitfully applied to the role of religious ritual by Sosis (2004). We do not have space to explicate this theory here. Suffice it to say that a straightforward prediction of CST is that religious groups with the most stringent requirements for continuing membership generate the highest levels of commitment. This fact has been well known to the field of social psychology for many years, and the evidence overwhelmingly supports the hypothesis. Both military basic training and fraternity hazing draw on this principle for generating member commitment. Finally, it is probably a mistake to think that the adaptiveness of religious beliefs is mediated through a single process or mechanism. For example, religiousness could influence reproductive fitness by encouraging (a) families to have more children, (b) better health practices (avoidance of alcohol and drugs), or (c) greater paternal involvement in the care of children. Of course, a trait that evolved in the Pleistocene (the so-called environment of evolutionary adaptation [EEA]) may not express itself in the same way in modern environments. This fact makes testing the adaptiveness hypothesis difficult but not impossible. Nevertheless, if religiousness is/was an adaptation in the EEA, it follows that it must have a genetic basis. Demonstrating that it is a heritable trait, however, does not prove it is an adaptation.

Understanding the Factors That Influence Religiousness

A second reason for carrying out behavior genetic studies of religiousness is in order to get a better understanding of the reasons why some parental

child-rearing practices and parents' characteristics correlate with offspring characteristics such as religiousness. It is widely believed that parenting is the major determinant of attitudes. Altemeyer (1988), quoting Mark Twain (1935), argued that we "get our opinions where we get our corne pone—at home" (p. 63). This "corne pone" theory is based, for example, on a correlation of 0.40 between parents and their adult offspring's right-wing authoritarianism (RWA) scores. This view of attitude and personality formation has come under considerable criticism in recent years (Harris, 1995, 1998, 2000; Rowe, 1994; Scarr, 1996, 1997). These critics have pointed out correctly that correlations between parenting/child-rearing behavior and offspring characteristics are ambiguous with regard to causation, as they may well reflect genetic factors. Indeed, the magnitude of "genetic influence" may be so great as to swamp the purported environmental influence. Developmental psychologists have come around to admitting the seriousness of this design "flaw," pointing out that they "often overstated conclusions from correlational findings; relied excessively on singular, deterministic views of parental influence; and failed to attend to the potentially confounding effects of heredity" (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000, p. 218). The correlation between a measure of child rearing, no matter how it was obtained (observation at the time the behavior was emitted or retrospectively by either the parent or the child), and a measured characteristic of the child (phenotype) can be mediated in whole or in part by genetic factors. The relative influence of each is an empirical question that must be determined by an appropriate research design. We also note here that while the correlation may exist at one age, it may well disappear later. We illustrate this interesting possibility with age curves for conservatism and longitudinal research on authoritarianism and put the findings in a "life history/evolutionary" context. The error of interpreting correlations between parental behavior and offspring psychological traits continues to be repeated on a regular basis by correlational psychologists, although some investigators are now explicit about the possibility of a genetic confound (Koestner, Walker, & Fichman, 1999; Kraft & Zuckerman, 1999).

If Religiousness Is Just Another Trait, It Should Be Heritable

Religiousness as trait falls into the domain of values/social attitudes. Until quite recently, the idea that social attitudes could be influenced by genetic factors was considered far-fetched. Psychologists (Adorno, Frenkel-Brunswick, Levinson, & Sanford, 1950; Altemeyer, 1981), sociologists (Freese, Li, & Wade, 2003), and even geneticists (Cavalli-Sforza & Feldman, 1981) simply assumed without much evidence that transmission of social attitudes was entirely cultural. Attitudes toward the possibility of genetic

influence on attitudes, however, have changed. Major textbooks on attitudes now acknowledge genetic influence (Eagly & Chaiken, 1993), as do experimental researchers in social psychology (Bourgeois, 2002; Crelia & Tesser, 1996; Tesser, 1993; Tesser, Whitaker, Martin, & Ward, 1998). This change reflects widespread recognition of what Turkheimer and Gottesman (1992; see also, Turkheimer, 2000) call the first law of behavior genetics, namely, that “all human behavioral traits are heritable.” Religiousness and related variables are no exception and should not be left out of the purview of behavior geneticists. As Lynch and Walsh (1998) have pointed out, “Almost every character in almost every species that has been studied intensively exhibits nonzero heritability” (p. 174). The use of the term “almost” is not accidental, as biology is the science of exceptions.

RELIGIOUSNESS AND THE STRUCTURE OF SOCIAL ATTITUDES

There is no widely agreed-on structural model in the field of social attitudes comparable to the “big five” in personality (Bouchard & Loehlin, 2001) or the hierarchical (*g*) theory in mental abilities (Johnson & Bouchard, 2005). The major dimensions typically revealed in important studies, however, are religiousness, authoritarianism, and conservatism, and as Saucier (2000) has shown, they “form a strong mutually correlating cluster” (p. 375), or what might otherwise be called a syndrome. We call this syndrome the Traditional Moral Values Triad (TMVT). For example, intrinsic religiousness (discussed later in this chapter) correlates about 0.40 with RWA (Altemeyer, 1988, p. 218, table 7), and conservatism (Lorr’s Conservatism scale; Tarr & Lorr, 1991) correlates 0.57 with RWA. A reverse measure of authoritarianism is the Multidimensional Personality Questionnaire (MPQ) Traditionalism scale (Tellegen, 2000). It correlates about 0.76 with RWA (Altemeyer, 1996, p. 36) and 0.58 with conservatism as measured by the Wilson-Patterson Conservatism scale (Bouchard et al., 2003). It would be possible to conduct a behavior genetic study of genetic and environmental influence on the general factor, which accounts for the correlation between these variables, as well as on traits themselves with the general factor removed. To our knowledge, no one has carried out such a study. In any event, because of the high correlations between these related constructs, we report behavior genetics findings for all of them.

It is our view that scores on authoritarianism scales (RWA and traditionalism) reflect, to a considerable degree, a person’s concern with how families are organized (a sample RWA item reads as follows: Obedience and respect for authority are the most important virtues children should learn.). Scores on conservatism scales tend to contain items relevant to social policy and reflect concern with how societies are organized (sample items, responded to yes, ?,

or no: death penalty, abortion). Scores on religiousness scales tend to contain items about who controls the universe (sample item: My religion is important because it answers many questions about the meaning of life.). Items from each domain are interspersed throughout all three instruments. A research program that addressed this issue would be of considerable interest. In any event, the psychological focus of the TMVT appears to be the imposition of some sort of order/control/organization on the important entities in one's life. This is, of course, a hypothesis that remains to be tested. For a different point of view regarding the psychological meaning of these dimensions, see Eckhardt (1991), who also sees the "origin of these personalities in frustrating childhood disciplines (anxious, directive, hypocritical, inconsistent, and punitive)" (p. 118; see also Jost, Glaser, Kruglanski, & Sulloway, 2003).

A NOTE ON RELIGIOUSNESS, SPIRITUALITY, MYSTICISM, AND EXISTENTIALISM

A related research program worth mentioning is the study of spirituality by MacDonald (2000), who, as a result of a comprehensive review of the literature (MacDonald, Friedman, & Kuentzel, 1999; MacDonald, Kuentzel, & Friedman, 1999) and a major scale development program, has demonstrated that there are five robust factors in this domain: cognitive orientation toward spirituality, experiential/phenomenological dimension (or the mysticism factor), paranormal beliefs, religiousness, and existential well-being. The correlations between his scales are shown in Table 3.1.

It is obvious that existential well-being is uncorrelated with any of the other factors. Cognitive orientation towards spirituality and religiousness form a higher-order factor, as do paranormal beliefs and experiential/phenomenological dimension. We note here that the best marker variable for religiousness and cognitive orientation toward spirituality is the Allport

Table 3.1 Oblique Factor Intercorrelations for the MacDonald Expression of Spirituality Inventory ($N = 938$)

Factor	1	2	3	4
Cognitive orientation toward spirituality				
Paranormal beliefs	0.13			
Experiential/phenomenological	0.39	0.28		
Existential well-being	0.08	-0.07	0.02	
Religiousness	0.63	-0.01	0.12	0.02

Source: MacDonald (2000, table 2).

and Ross (1967) Intrinsic Religiousness scale with loadings of 0.56 and 0.59. The best marker for experiential/phenomenological dimension is the Hood Mysticism scale (Hood, 1975; Hood et al., 2001). These two scales correlate near zero (Hood et al., 2001). MacDonald's work therefore suggests strongly that intrinsic religiousness is a reasonably good measure of the construct of religiousness, at least in Western populations, and the construct of mysticism is distinctly different. In our view, the Mysticism scale captures, to a large extent, what many people call spirituality/transcendence (MacDonald & Holland, 2002). The discriminant validity of the scales is demonstrated by the fact that the Intrinsic Religiousness scale correlates 0.37 with traditionalism and 0.02 with the MPQ Absorption scale (a measure of how easily one can be caught up in sensory experiences and relinquish a realistic frame of reference; Bouchard, McGue, Lykken, & Tellegen, 1999), whereas mysticism correlates 0.03 with traditionalism and 0.44 with absorption (unpublished data). Mysticism/spirituality does not appear to be a part of the TMVT, so is not discussed here, though we do regard it as an important concept.

QUANTITATIVE BEHAVIOR GENETIC METHODS

Here we briefly introduce the reader to standard quantitative genetic methods (Falconer & Mackay, 1996; Plomin, DeFries, McClearn, & McGuffin, 2001; Posthuma et al., 2003) in order that the next section of this chapter will be readily interpretable. The variance (the extent to which people differ) in a quantitative phenotype (V_p) is decomposed into three components: a genetic component (V_g), a shared environmental component (V_c), and a nonshared environmental component (V_e). The typical form of the equation is:

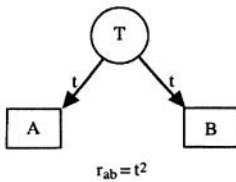
$$V_p = V_g + V_c + V_e \quad (1)$$

Figure 3.1 shows how various kinships are used to estimate the components. Figure 3.1a is the basic model that underlies all the others. It is the widely used (by psychologists) Hoyt Parallel Form Reliability (Hoyt, 1941; also called Alternate Form or Equivalent Form) discussed in most measurement textbooks. The circle is used to characterize a latent (underlying) construct, in this instance the "True scores," or T , of the individuals who has completed both forms of the test (A and B). The test scores represented by A and B are measured phenotypes, and phenotypes are shown in boxes. The correlation (r_{ab}) is estimated via analysis of variance. The correlation between two parallel tests is interpreted as a measure of the variance accounted for by the True scores. It is a direct measure of variance due to a latent trait. The important point to note here is that we do not square the correlation to get "variance accounted for by the true score." The correlation tells us that directly. Psychologists are accustomed to squaring correlations

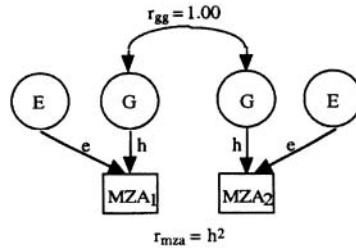
to obtain “variance accounted for,” but that procedure is not applicable when the influence of latent traits is being assessed, as in kinship models used to assess latent genetic and environmental influences. Figure 3.1a illustrates this interpretation in the form of a path model. The influence of T on test scores (A and B) is shown by a directed arrow labeled t . By the rules of path analysis (Li, 1975), we multiply the value of all the paths connecting the phenotypes to determine the correlation. In this instance, it is simply $t * t$, or t^2 .

Figure 3.1 Path Diagrams

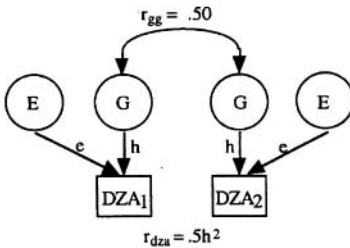
(a) Hoyt Parallel Form Reliability



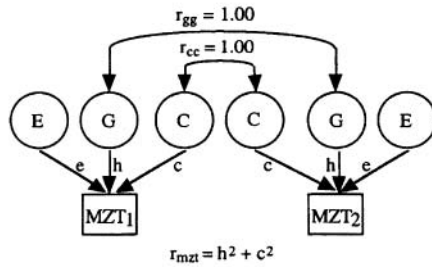
(b) Monozygotic Twins Reared Apart



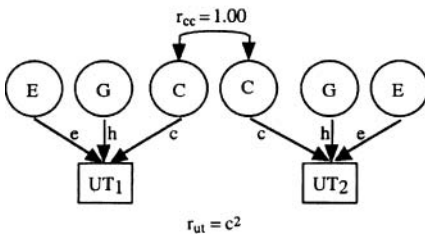
(c) Dizygotic Twins Reared Apart



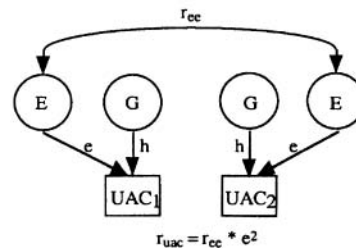
(d) Monozygotic Twins Reared Together



(e) Unrelated Individuals Reared Together



(f) Unrelated Individuals Reared in Correlated Environments



Notes: (a) reliability, (b) monozygotic twins reared apart, (c) dizygotic twins reared apart, (d) monozygotic twins reared together, (e) unrelated individuals reared together, and (f) unrelated individuals reared in correlated environments.

Figure 3.1b shows precisely the same model as it is used for monozygotic twins reared apart (MZA). Monozygotic twins have identical genotypes thus they can be considered “parallel forms.” Consequently, $r_{gg} = 1.00$. Assuming random placement (see the following discussion), the correlation between them can be due only to genetic factors, indexed as h on the paths joining the twins to the phenotype in the box. Because the twins are reared apart, they do not share environmental influences; thus, the latent trait E (for environment) is not connected by an arrow. The correlation between MZA twins thus estimates the variance due to the latent trait G (genetic influence), which is calculated as $h * 1.00 * h$, or h^2 . We could have had only one G in a circle in this figure, but two G 's with a correlation of 1.00 represents the actual situation more clearly and facilitates the generalization to dizygotic twins. The symbol h^2 represents heritability (where heritability is defined as the proportion of variance in a trait that can be explained by genetic variance). We do not square the value. Figure 3.1c represents the path diagram for dizygotic twins reared apart (DZA) and is identical to Figure 3.1b except for the fact that dizygotic twins share only half their genes in common by descent. Consequently, the G 's are correlated only 0.5 instead of 1.00, and the twin correlation estimates half the heritability. Figure 3.1d represents the correlations between monozygotic twins reared together (MZT). As in the reared apart case, the latent trait G is correlated 1.00, but in addition these twins are reared together and may share some environmental influences in common. This is represented by the correlation of 1.00 between the latent C factor (C for common environment, which is defined as environments that make individuals in the same family similar to one another, while the E represents environments that make individuals in the same family different from one another). This model represents the well-known view that MZT twins may be similar for two broad reasons: shared genes and shared (common) environment. Notice that the difference between the MZT and MZA correlation is the influence of C . Figure 3.1e illustrates the correlation between unrelated individuals reared together. Ideally, such individuals would be the same age, or “virtual twins” (Segal, 2000). The only reason for similarity, barring selective placement based on knowledge of their status on a trait (or that of one of their biological parents), is shared environmental influence. This correlation could be reduced by restriction of range in the trait-relevant environments in which they were placed (Stoolmiller, 1999). We specify “trait-relevant environments” because placement with regard to environments that do not influence the development of the trait are irrelevant, and demonstration of placement as a source of bias is unconvincing unless the variable on which placement has occurred is shown to be “causal.” Figure 3.1f shows a more general case of Figure 3.1e. UAC stands for unrelated individuals reared apart in correlated environments. It is obvious that if $r_{ee} = 0.00$ (there was no correlation between their environment), we would be simply matching pairs of

people at random, and the expected correlation would be zero. The correlation thus depends on two factors: the degree of environmental influence on the trait (e) and the degree of placement. What most people not trained in quantitative methods do not realize is how large these components have to be in order to generate very much of similarity. Bouchard, Lykken, McGue, Segal, and Tellegen (1990) present an example showing how much placement bias and degree of environmental influence is necessary to explain the similarity in IQ of MZAs.

Observed kinship correlations of the sort shown previously are fit to models using computer programs such as Mx (see also Loehlin, 2004; Neale, Boker, Xie, & Maes, 1999). These models can be quite elaborate and incorporate many special effects. For instance, many critics of twin research have argued that some monozygotic twins are monochorionic and others dichorionic (do or do not share the chorionic membrane) and that monochorionic twins therefore may be more similar because of this influence, which would inflate heritability estimates (Martin, Boomsma, & Machin, 1997). This effect has been built into the twin model with a data set that contained information on chorion type, and, at least for IQ, chorion type was shown to be inconsequential (Jacobs et al., 2001). As far as we are aware, almost any interesting hypothesis can be formulated in the elegant language of quantitative genetics, as it is simply a variant of the more fundamental analysis of variance.

We note here that the reason we speak of “causal influences” based on the analysis of kin correlations (actually most analyses are of covariances, but we will not pursue the distinction here) is because the twins are an experiment of nature and adoption is an experiment of society. In the case of adoption, since the participants are not necessarily randomly assigned to families (although this might well be approximated with regard to trait-relevant environmental factors because we have such limited knowledge of the causal factors), we should perhaps speak of a quasi-experimental design. Quasi-experimental designs are, of course, widely used in the social sciences (Campbell & Stanley, 1966).

INTERPRETING BEHAVIOR GENETIC DATA IN A LIFE HISTORY CONTEXT

It is important to remember that from an adaptationist point of view, a trait or character functions within the context of a life history. That means that its expression has maximum importance only during part of the life span. It is also the case that every adaptation is not necessarily expressed. For example, the thick skin called callus on the hands and feet is largely expressed when these parts of the body are exposed to wear and tear. They are considered an adaptation because there is an advantage to being born with thicker skin in areas of the body subject to constant wear and tear and to having phenotypic

plasticity. As Nesse (2005) has shown, many psychological defenses may never be elicited, but there is little doubt that they are there.

An objection to the idea that genetic factors may influence attitudes is that attitudes are malleable. Altemeyer (1988) provides a nice example. He has shown that student scores on his RWA scale decrease systematically over the course of a college career, the drop being greater among liberal arts students than nursing majors or administrative studies majors (Altemeyer, 1988, p. 93, fig. 3). This is a powerful and systematic environmental effect, although it is somewhat contaminated by self-selection and by systematic attrition—students with different levels of RWA go into different majors, and lower-ability students tend to drop out at a higher rate, as RWA is correlated with IQ. In any event, Altemeyer tested 90 college students as freshman and again 12 years later. The correlation between scores at the two time periods was 0.62, indicating both stability and change in ranking. The mean score in adulthood was 145.5 versus 152.5 as freshmen. The sample became “less authoritarian” but there was much less change than would have been predicted from the four-year student data reported here. What happened? A subgroup of more than half the follow-up sample had nearly the same scores as when they were freshman. Who were they? They were the participants who had become parents. This group ($N = 41$) originally has a mean score of 152.1, and at the end of the 12-year period it was 151.1. Becoming a parent had entirely reversed the effects of a college education. The only systematic theory that we are aware of that would predict such an effect is evolutionary parental investment theory (Trivers, 1985, chap. 9). A look at the RWA items quickly explains the results. While a young college student might well answer positively to the item (number 7 on the 1982 RWA scale), “the sooner we get rid of the traditional family structure, where the father is the head of the family and the children are taught to obey authority automatically, the better. The old-fashioned way has a lot wrong with it” (Altemeyer, 1988, p. 97). It is unlikely the parent of a young child would do so. It would be desirable to see how much change occurs in a sample of non-college students over the same period and what influence having a child had on them. Note that the group that did not have children scored more nearly where they would have been expected to given the trajectory established in college. From the point of view of evolutionary theory, a couple with children is in “the average expected environment” (Hartman, 1958), as a family is a key part of the EEA. Couples without children do not pass on their genes or their environments to the next generation.

Altemeyer’s RWA scale is highly correlated with religiousness (authoritarians are more religious), so it is reasonable to believe that a similar effect would be found for religiousness were the appropriate study to be carried out. Most academics have friends who for years did not observe

any religious practices but who, on having children, resumed the practices of their upbringing or joined a new church. Although some longitudinal data have been collected in this area, these studies have measured church involvement/membership as opposed to a multidimensional measure of religiousness (O'Connor, Hoge, & Alexander, 2002; Sandomirsky & Wilson, 1990; Wilson & Sherkat, 1994). These studies have assessed individuals at a couple points in time starting in high school and ending with a measurement in the thirties and have found that getting married or having children increases the chance that an individual will belong to a church. Whether or not religiousness and not just church attendance/membership follows this same trajectory needs further investigation, and whether the same pattern of results seen with RWA in the Altemeyer studies where scores return to the precollege levels with parenthood is yet to be investigated.

These types of cultural and environmental influences on attitudes emphasize the need for the data on attitudes to be interpreted with a life history context, as scores may change with age and with certain life events. Studies that show environmental influences like those discussed previously provide fodder for individuals who think attitudes are completely socialized traits. In reality, however, the presence of cultural/environmental effects does not preclude any evidence for genetic effects. Data have shown that both are obviously at work, as we now turn to the evidence for the genetic influences on the TMVT.

GENETIC INFLUENCE ON AUTHORITARIANISM

There are only four studies of genetic influence on authoritarianism that we are aware of. The first, by Scarr and Weinberg (1981), was an adoption study of adolescents and their parents that made use of the original F-Scale (F for "fascism"; Adorno et al., 1950; Christie, 1991). As Scarr and Weinberg put it, their study turned out to be "the empirical history of a control variable that failed" (p. 399). The F-scale was included in their adoption study of IQ as a contrast variable. Specifically, they expected much greater similarity between adoptive parents and their children on the F-scale (due to familial environmental influence—similar to c^2 in Figure 3.1e but across generations rather than within generations) than on IQ, which they correctly hypothesized to be more influenced by genetic factors. What they found was that "differences in social-political attitudes, measured by the F-scale, appear to be genetically transmitted from parents to their children in the form of verbal ability and personality and to show no effect of direct learning" (p. 400). As their summary indicates, the findings have some interesting twists. First, the F-scale was highly correlated with IQ, a well-known fact that they had missed when choosing it as a control variable, and genetic transmission was largely through

this route. This finding was entirely consistent with the large literature in the heritability of IQ (Bouchard, 1998; Toga & Thompson, 2005). However, there was also evidence of a small amount of genetic transmission of authoritarianism from parent to child independent of IQ. Second, contrary to most theorizing up to that point, differences in F-scale scores (authoritarianism) among the adoptive children were unrelated to social class differences in the families. To be very specific, social class of rearing, long thought to be a causal factor, was not a cause of individual differences in authoritarianism. These results largely refute Eckhardt (1991) as cited earlier.

The second behavior genetic study of authoritarianism was conducted in our laboratory (McCourt, Bouchard, Lykken, Tellegen, & Keyes, 1999) using Altemeyer's (1981) RWA scale. The RWA scale had been included in the Minnesota Study of Twins Reared Apart (MISTRA; Bouchard et al., 1990) and also part of the Minnesota Twin Registry (MTR; Lykken, Bouchard, McGue, & Tellegen, 1990). Consequently, we had data from four groups: monozygotic twins reared apart (MZAs; $N = 39$), monozygotic twins reared together (MZTs; $N = 423$), dizygotic twins reared apart (DZAs; $N = 38$), and dizygotic twins reared together (DZTs; $N = 434$). All the participants in the studies were mature adults. The reared-apart sample was small, so the findings are determined mostly by the twins reared together. The basic findings from the study were as follows:

- a. Contrary to claims by Altemeyer that the RWA scales are free of correlation with IQ, we found a correlation of -0.37 , a figure in much the same range as many of the studies of the correlation of IQ with the F-scale (Christie, 1991; Goldberg, Tucker, Altemeyer, Dawes, & Rothbarth, 1984; Stone, Lederer, & Christie, 1993).
- b. The MZA correlation, a direct estimate of heritability, was 0.69 (95% confidence interval [CI] = 0.48 to 0.82). Partialing out IQ reduced the correlation to 0.59 (95% CI = 0.34 to 0.76).
- c. The DZA correlation, an estimate of half the heritability under a simple additive model, was $.00$ (95% CI = -0.31 to 0.33) or -0.09 (-0.39 to -0.23) partialing out IQ. The large confidence intervals reflect the small twins-reared-apart sample sizes.
- d. The MZT correlation was 0.63 (95% CI = 0.57 to 0.68), and the DZT correlation was 0.43 (95% CI = 0.34 to 0.49). We did not have IQ data for the reared-together twin sample, so we could not partial out the influence of IQ. The larger MZT than DZT correlation suggests genetic influence.
- e. The RWA correlation for spouses (assortative mating) was 0.62 ($N = 79$). Assortative mating for a heritable trait increases the trait variance and the correlation between relatives, and this effect can be estimated with the four-group design that was available to us. Assortative mating is highly

characteristic of attitude variables as opposed to personality variables, and our data were consistent with the findings reported by others. Nevertheless, it is important to recognize that the assortative mating coefficient is based on the current sample and not their parents. Obviously, the parental data, if they were available, would be the best for model fitting. In addition, one can ask, Do parents of children who are put up for adoption mate assortatively to the same degree as parents who raise their own children? McCourt et al. (1999) provide a more detailed discussion of this issue.

We fit biometric models to our data using the program Mx (Neale et al., 1999) in order to estimate genetic additive effects, common environmental effects, nonadditive genetic (dominance) effects, and unshared environmental (plus error) effects. A purely environmental model failed badly and could easily be rejected. No model required nonadditive genetic effects. There were two equally parsimonious models. Ignoring assortative mating, a model with 50 percent additive genetic variance, 16 percent common environmental variance, and 34 percent unshared environmental variance, fit well. If assortative mating was included, we got an equally good fit with 64 percent additive genetic variance and 36 percent unshared environmental variance. The trade-off between common environment and additive genetic variance due to assortative mating is well known, and the choice between models given the available data set is arbitrary. We note here that for conservatism, which as we pointed out previously is highly correlated with RWA, one very large study as reported later was able to distinguish between common environment and assortative mating and found considerable variance due to assortative mating and very little variance due to shared environment. Consequently, we would argue that the McCourt study suggests a heritability of around 0.55 to 0.60 with very little shared environmental variance.

An additional feature of the study, because of its inclusion of adoptees, was the ability to examine environmental correlates of RWA. We included the Family Environment Scale (FES; Moos & Moos, 1994) to index the family-rearing environment experienced by the participants in our study. If any of these measures were truly causal and free of genetic influence, we would expect correlations between the FES scales and RWA in both the adoptees and the nonadoptees. If the influences were mediated genetically, then we would expect correlations only in the sample of nonadoptees. As Table 3.2 indicates, we found significant correlations only for the nonadoptees, and the strongest correlation was for moral religious orientation (0.35). The Organization and Control scales yielded correlations of 0.28 and 0.26, respectively. The simplest explanation of these findings is that family environmental influences of the sort measured by the FES do not “cause” variation in RWA. It must,

Table 3.2 Correlations between RWA Scores and Retrospective Rearing Environment Scores Derived from the Family Environment Scales

Measure of Rearing Environment	Nonadopter (<i>N</i> = 104)	Adoptees (<i>N</i> = 139)
Cohesion	0.12	0.04
Expressiveness	-0.02	-0.02
Conflict	-0.13	-0.03
Independence	0.04	0.05
Achievement orientation	0.22*	0.07
Intellectual cultural orientation	-0.12	-0.08
Active recreational orientation	0.05	-0.08
Moral religious emphasis	0.35**	0.1
Organization	0.28**	0.08
Control	0.26**	0.13

Note: Spouses are the major portion of the sample of nonadoptees.

**p* < 0.05.

***p* < 0.01.

however, be kept in mind that our FES data were gathered retrospectively and that longitudinal data from adoptive and biological families would be far superior. One possible inference from this evidence would be that the same genetic influence is “causing” families to exert a moral religious orientation as well as organization and control. This inference, however, runs up against the fact that these scales do not appear to be heritable. Table 3.3 shows the estimated heritabilities of the FES scales from three studies: the Western Ontario Twin Study (Vernon, Jang, Harris, & McCarthy, 1997), which used ordinary adult twins who were reared together; our study of twins reared apart (MISTRA; Hur & Bouchard, 1995); and a recent twin study of contemporaneous perceptions of one’s rearing environment using 17-year-old twins (Herndon, McGue, Krueger, & Iacono, 2005). The results of the different kinds of studies are roughly in agreement, especially with regard to the inference that the measure of moral religious orientation has a near zero heritability.

As was pointed out earlier, the MPQ Traditionalism scale correlates 0.76 with RWA. Since the four-year test–retest reliability of RWA is 0.75, the Traditionalism scale, while not an alternate form, is a reasonable proxy for RWA. Consequently, we consider the study reported next a third study of authoritarianism.

Finkel and McGue (1997) addressed the question of the heritability of traditionalism using a 12-group design (twins reared together, parents, siblings,

Table 3.3 Correlations between RWA Scores and Family Environment Scales for Non-Adoptees ($N = 104$) and Adoptees ($N = 139$) and Heritabilities for the FES from the Western Ontario Twins Study (WOTS), the Minnesota Study of Twins Reared Apart (MISTRA), and the Minnesota Twin Family Study (MTFS)

FES Measure	Correlations from MISTRA		Heritabilities		
	Nonadoptees	Adoptees	WOTS	MISTRA	MTFS
Cohesion	0.12	0.04	0.58	0.35	0.25
Expressiveness	-0.00	-0.02	0.39	0.10	0.44
Conflict	-0.13	-0.03	0.30	0.27	0.20
Independence	0.04	0.05	0.00	0.36	0.22
Achievement orientation	0.22*	0.07	0.50	0.00	0.27
Intellectual cultural	-0.12	-0.08	0.00	0.09	0.36
Active recreational orientation	0.05	-0.08	0.53	0.14	0.37
Moral religious orientation	0.35**	0.10	0.00	0.15	0.01
Organization	0.28**	0.08	0.00	0.00	0.00
Control	0.26**	0.13	0.00	0.00	0.46

Note: Heritabilities in bold are statistically significant.

* $p < 0.05$.

** $p < 0.01$.

offspring, spouses of various genders; total $N = 4,300$ pairs). Note that this sample did not include MZA and DZA twins. The heritability of traditionalism was 0.52 for men and 0.55 for women (not a significant difference) and was all simple additive genetic variance. This design had considerable power to detect shared environmental influence, yet there was no statistically significant evidence for such a source of influence. Unfortunately, these investigators did not attempt to fit a model with assortative mating. Personality traits, on average, show modest assortative mating at best. If we exclude traditionalism, the mean spousal correlation for the remaining 10 MPQ scales is 0.08 ($N = 1,185$; Lykken & Tellegen, 1993), but the assortative mating coefficient for traditionalism is 0.48. In any event, the heritability estimate of 0.52 to 0.55 from the Finkel and McGue study is nicely replicated by an MZA correlation of 0.54, as reported in Bouchard et al. (2004), which directly estimates the broad heritability ($N = 74$, with no sex difference). The DZA correlation is 0.32 ($N = 54$), roughly half the MZA correlation as expected if differences in the trait are largely under additive genetic influence. Again,

confidence intervals around these estimates were large because of the small sample sizes.

The fourth behavior genetic study of authoritarianism, an adoption study, is superficially discordant with the previous three. It consists of adoption data reported briefly (three short paragraphs) by Altemeyer (1996). Altemeyer reports almost all his findings in books (Altemeyer, 1981, 1988, 1996) as opposed to refereed scientific publications, and as a consequence of this practice, many details are lost. In this case, the specific age of the parents and the offspring are not reported. The data are summarized in Table 3.4.

The biological parent \times offspring data are a little higher than one would expect from a moderately heritable trait. If only genes were at work, we would simply double the correlation to estimate the heritability. In any event, the adoptive correlations are higher than the biological, thus clearly refuting a genetic interpretation of the data. Recall that the adoptive correlations estimate environmental influence. As Altemeyer (1996) puts it, “These numbers do *not* support the notion of fascism genes and instead direct our attention to environmental influences” (p. 75). As stated, this conclusion is out of line with the other results just discussed. A possible explanation for this is given next.

GENETIC INFLUENCE ON CONSERVATISM

Directly related to Altemeyer’s (1996) adoption study demonstrating environmental influence is a twin study that also demonstrates environmental influence. In this instance, the outcome is shown on a highly related trait—conservatism. Figure 3.2 shows cross-sectional twin data from the Virginia Twin Registry taken from Eaves et al. (1997).

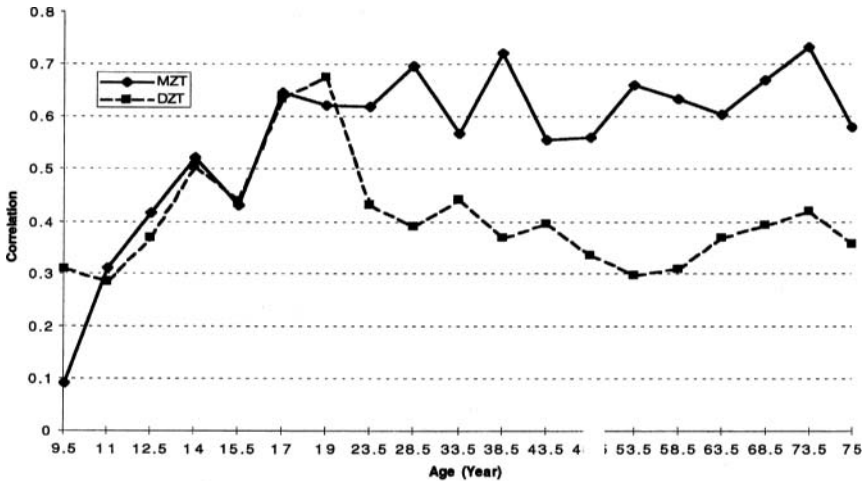
The figure illustrates two important points. First, age is important. Using the differences between the monozygotic and dizygotic correlations as a rough approximation of one-half the heritability (see Figure 3.1), it is clear that there is no genetic influence on the trait prior to age 20. After that, there

Table 3.4 Correlations between RWA Scores of Parents and Offspring in Biological and Adopted Families and 95 Percent Confidence Intervals for Adoptive Families

Kinship	Correlation	Sample Size
Biological parents \times offspring	0.27 to 0.51 Mean = .40	2,097
Adoptive mother \times child	0.61 (0.35 to 0.78)	35
Adoptive father \times child	0.5 (0.22 to 0.75)	40

Note: Altemeyer reports that daughters tend to resemble their parents more than the sons but does not report any data (Altemeyer, 1998, p. 64). He also does not report the age of the parents or children but implies the children are about age 16 (p. 65).

Figure 3.2 Monozygotic Twin (MZT) and Dizygotic Twin (DZT) Correlations for Conservatism at Different Ages, as Reported in Eaves et al. (1997)



is considerable genetic influence. These findings are entirely consistent with those of Altemeyer's (1996) adoption study. Altemeyer's conclusion, however, is incorrectly stated, as it does not take age into account. A more reasonable conclusion based on both studies is that twin and adoption studies are consistent and suggest that environmental factors clearly account for much of the variance in conservatism and authoritarianism prior to age 20; after age 20 genetic factors become highly influential. We refrain from a stronger statement because of the Scarr and Weinberg (1981) findings with an adolescent sample that there was genetic influence on the F-scale mediated by IQ and a small amount of genetic influence mediated by personality. In our opinion, the items in all the instruments used to measure authoritarianism and conservatism lack appropriate salience for younger individuals, and there is reason to question the meaningfulness of the measures generated by such samples. Whether a valid Authoritarianism scale could be constructed for young people is an open question. The second important point made by Figure 3.2 is the large variability in heritability estimates one would obtain had the adult estimates been based on only one sample drawn at one age. The average sample size at each age grouping is 180 monozygotic and 100 dizygotic twin pairs, and most are over 100. Consequently, these data nicely demonstrate that only very large twin studies will generate highly reliable heritability estimates.

The most definitive behavior genetic study of conservatism is the study of the Virginia 30,000 (Eaves et al., 1999). This study used 80 distinct kinships and was able to estimate many genetic and environmental influences not estimable using twins alone. The results of this study are presented in

Table 3.5. This study suggests a somewhat high heritability for females (0.645) and about what might be expected on the basis of other studies for males (0.447). It also reveals considerable genetic variance due to assortative mating. Most other effects are modest in size. Note that the Twin and Sibling effects under the heading “Environmental” are shared environmental effects and are essentially zero for males and quite modest for females (0.052 and 0.042). Another presentation of the data of conservatism from the Virginia 30,000 that draws out the implications for political scientists can be found in Alford, Funk, and Hibbing (2005). These authors have also formulated an interesting evolutionary approach to political science (Alford & Hibbing, 2004).

The MISTRA study incorporated the Conservatism scale used in the Virginia 30,000 study in 1986 as a result of an important paper in the *Proceedings of the National Academy of Sciences* (Martin et al., 1986). This paper reported a heritability of 0.62 for conservatism based on a large twin study. The authors, acknowledging numerous criticisms of the twin method, also challenged their critics to what we call a “strong inference” test of their ideas. Specifically, Martin et al. asserted:

The problem with many “social” explanations of our data is that they do not lead to predictions about other kinds of relationship unless social interaction is based ultimately on genetic differences. . . . Our model can be used

Table 3.5 Estimates of Sources of Variance (%) for Males and Females to Conservatism Scores Based on Data from the Virginia 30,000

Sources of Variance	Males	Females
Genetic		
Additive	35.5	19.8
Assortative mating	22.2	12.4
Nonadditive	6.7	12.5
Total genetic	64.5	44.7
Environmental		
Maternal	1.5	0.1
Paternal	0	0
Sibling	0	5.2
Twin	0.1	4.2
Residual	40.1	36.6
Total environmental	41.7	47.2
G by E covariance	-6.2	8.1

to predict the results of other studies. For example, we predict a zero correlation between foster parent and adult foster child for all our attitude scales. Our model . . . predicts a parent-offspring correlation of .52 for conservatism. We predict a correlation of31 for the offspring of monozygotic twins and an $h^2 = .62$ for separated monozygotic twins. (p. 4368)

MISTRA took up that challenge (Bouchard et al., 2004). The results strongly confirmed the prediction and are consistent with the Virginia 30,000 findings as well. Specifically, MISTRA found a heritability of 0.56 (95% confidence interval 0.38 to 0.70) based on a sample of 54 MZA twins and 46 DZA twins (Bouchard et al., 2003), quite close to the prediction, especially for social science research. The MISTRA study also reported a considerable amount of information regarding the validity of the Conservatism scale, including evidence that it is highly correlated with the RWA scale (0.72) but much less influenced by IQ than the RWA scale (a correlation of -0.23 with IQ). These findings suggest that conservatism as measured with this version of the Wilson-Paterson scale is a valid psychological construct and that most of the genetic variance in conservatism is not mediated by IQ.

GENETIC INFLUENCE ON MEASURES OF RELIGIOUSNESS

Behavior genetic findings on measures of religious affiliation, attitudes, and behavior have been reviewed in some detail by D'Onofrio, Eaves, Murrelle, Maes, and Spilka (1999). They demonstrate that religious affiliation, the religion that one practices, is cultural and little influenced by genetic factors. Genetic influence is more specific to religious behaviors and traits. Our focus will be on "trait" measures of religiousness rather than on single-item reports of behavior (i.e., frequency of attendance at religious ceremonies or church attendance). Attendance at religious ceremonies indexes numerous psychological factors, such as conformity to contemporary norms, sociality, interest in rituals, and so on. For example, frequency of attendance at religious ceremonies is almost always included as an item within a measure of religiousness because when used as an item on a scale with other items (items that correlate with each other and in part also reflect religiousness), the factor common to all the items can be more reliably assessed. Consequently, frequency of church attendance as a single item is a much less reliable estimator of religiousness than a composite of related items, and a heritability estimate based on the item alone reflects factors other than religiousness. In Table 3.6 we have reproduced those findings from the D'Onofrio et al. (1999) review that deal with trait measures, and we have added recent studies. We then comment on the studies in order to put them into context.

Table 3.6 Adult Twin Estimates of Genetic and Environmental Influence on Trait Measures of Religiousness

Scale	Sample	Heritability (genetic influence)	Shared Environmental Influence	Source
Religious fundamentalism (MMPI)	MZA, DZA, MZT, and DZT	0.54	0.00	Bouchard et al. (2004)
Religious occupa- tional interests	MZA, DZA, MZT, and DZT	0.44	0.00	Bouchard et al. (2004)
Religious leisure- time interests	MZA, DZA, MZT, and DZT	0.57	0.00	Bouchard et al. (2004)
Religious activities (SCII)	MZA, and DZA	0.43	ne	Bouchard et al. (2004)
Religious values	MZA, and DZA	0.46	ne	Bouchard et al. (2004)
Intrinsic religiousness	MZA, and DZA	0.43	ne	Bouchard et al. (1999)
Extrinsic religiousness	MZA, and DZA	0.39	ne	Bouchard et al. (1999)
Religious fundamentalism (MMPI)	Adoption data	0.28	0.26	Beer et al. (1998)
Religious funda- mentalism (MMPI)	Adoption, MZT, and DZT	0.41	0.50	Beer et al. (1998)
Personal devotion	Female MZT, and DZT	0.29	0.24	Kendler et al. (1997)
Personal conservatism	Female MZT, and DZT	0.00	0.45	Kendler et al. (1997)
Religiousness	Male MZT, and DZT	0.44	0.18	Koenig et al. (2005)

Note: MZA = morozygotic twins reared apart; DZA = dizygotic twins reared apart; MZT = monozygotic twins reared together; DZT = dizygotic twins reared together; ne = cannot be estimated with this design.

The findings for the first three scales (Religious Fundamentalism, Religious Occupational Interests, and Religious Leisure Time Interests) come from a joint analysis of data from MISTRA and MTR. The Religious Fundamentalism scale (10 items in this study) was derived by Wiggins (1996), and other scales constructed from Minnesota Multiphasic Personality Inventory (MMPI) items are almost identical to the Wiggins scale. The Religious Occupational Interest (four items) and Religious Leisure Times Interest (six items) scales were derived from the Minnesota Interest Inventory (Lykken, Bouchard, McGue, & Tellegen, 1993). These

findings are dominated by the twin-reared-together data, as the sample sizes for these kinships are much larger than those for twins reared apart. These findings for these samples suggest that a variety of approaches to the measurement of religious attitudes and interests lead to a heritability of around 0.50.

The next four scales were studied with the MISTRA twins-reared-apart samples. The Religious Activities scale is from the Strong Campbell Interest Inventory (Hansen & Campbell, 1985), a widely used instrument in counseling psychology. The Religious Values scale was from the Allport-Vernon-Lindzey measure called the Study of Values (Allport, Vernon, & Lindzey, 1960). The Intrinsic and Extrinsic Religiousness scales come from a revision of older scales with the same name by Gorsuch and Venable (1983). These data, also based on a variety of measures but only twins reared apart, suggest a heritability of around 0.40 to 0.45.

The next study by Beer, Arnold, and Loehlin (1998) carried out two different analyses. The first analysis was limited to adoption data from the Texas Adoption Project, while the second combined twins-reared-together data from a college sample with the adoption data. The first analysis suggested a heritability of 0.28 and shared environmental influence of 0.26. The more comprehensive analysis with multiple kinships suggested higher values for both sources of influence: a heritability of 0.41 and shared environmental influence of 0.50. These authors acknowledge that their findings are a bit difficult to reconcile with the Waller, Kojetin, Bouchard, Lykken, and Tellegen (1990) findings, which were updated by Bouchard et al. (2004) and are reported in Table 3.6. We suggest that age is mostly likely the source of much of the shared environmental influence and somewhat lowered genetic influence. The adoptees and biological offspring used in the Texas Adoption Study were aged 17.7 and 20.2, respectively. The twins were a little older but were all still in college. Studies of young twins have regularly shown that religiousness is at best modestly heritable. For example, Winter, Kaprio, Viken, Karvonen, and Rose (1999), in a study of 16-year-old twin pairs, using the MMPI Religious Fundamentalism scale, found a heritability of 0.11 for girls and 0.22 for boys (see also Abrahamson, Baker, & Caspi, 2002; Boomsma, de Geus, van Baal, & Koopmans, 1999; Loehlin & Nichols, 1976). These findings are consistent with the age data on conservatism presented earlier and a study from our laboratory (Koenig, McGue, Krueger, & Bouchard, 2005) to be discussed shortly.

The next study by Kendler, Gardner, and Prescott (1997) is based on a very large sample of female twins who were part of a study of substance use and abuse. Their two scales were derived from a factor analysis of 10 items. The first factor, Personal Devotion, appears to us to be the better measure of religiousness, and the results are not entirely out of line with others, with a heritability of 0.29 and shared environmental influences of 0.24. The Personal Conservatism factor yields a zero heritability and a large shared

environmental component and is out of line with other studies. We are not sure what to make of these findings. We do, however, find the results of the factor analysis a bit odd and the items atypical. It would be desirable to see these scales validated.

The last study shown in Table 3.6, from our lab (Koenig et al., 2005), used a sample of adult male twins from the MTR. These twins were assessed on a nine-item measure of religiousness when they were approximately 33 years old. The scores for the nine items were summed to create a total Religiousness score. The heritability of this scale was 0.44, with a small shared environmental effect. These results are very similar to the estimates given by the other studies in the table. The more interesting analysis in the Koenig et al. study, however, made use of retrospective ratings of religiousness provided by the twins. Along with the current, adulthood ratings, these twins were also asked to respond to the same items with respect to when they were growing up. The retrospective, childhood ratings were less heritable (0.12). There was also a stronger shared environmental influence for these ratings (0.56). These results support the conclusion stated previously that age moderates the heritability of religiousness, as it does in the Eaves et al. (1997) study of conservatism.

Koenig et al. (2005) also examined the heritability of what they called internal and external Religiousness subscales. The nine items of the full scale were divided into items that were more external in nature (e.g., frequency of church attendance and membership in youth/study groups) and those that were more internal in nature (e.g., seeking help through prayer and deciding moral actions for religious reasons). As hypothesized, the external scale had very little genetic influence (8%) and a strong shared environmental influence (53%) in childhood. This was not surprising, as these external items were likely to be influenced by parents or other adults when children were young. However, the relative strength of these effects were switched for the current ratings (39% genetic and 18% shared environment). For the internal scale, shared environmental effects were strong in childhood (44%) but not estimated to be as large as they were for the external ratings. The shared environmental effect for the internal items was only 24 percent for adulthood ratings. Genetic effects were moderate at both time points (20% and 34% for retrospective and current internal Religiousness ratings, respectively). The authors found that the difference in heritability and shared environmental estimates were not significantly different for the internal ratings (i.e., the internal ratings did not become more heritable and less environmental with age), though the current and retrospective genetic and environmental influences were different for the external items of religiousness. As we stated in the paper, these findings suggest that the increase in heritability seen with age may be due to the increase in importance of personal factors and a decrease in importance of other external

factors. The differences in heritability and shared environmental influence for different aspects types of religiousness deserve further study.

CONCLUSION

The evidence presented in this review certainly and strongly suggests that the components of the TMVT are partly heritable: differences in observed variance on these traits can be partly explained by genotypic variance. Heritability estimates tend to run in the range of 0.40 to 0.50, with some exceptions. How big are these genetic effects? They are large in comparison to typical findings in the social sciences. Richard, Bond, and Stokes-Zoota (2003), on the basis of a meta-analysis summarizing 100 years of social psychology, recently reported an effect size (Pearson correlation) for “social psychological effects” of 0.21 (standard deviation = 0.15). The smallest effect sizes came from “Social Influence” studies (0.13), and the largest came from “Group Process” studies (0.32). Hemphill (2003) reported on two large meta-analyses of the psychological literature (psychological assessment and treatment). Similar effects were found for assessment and treatment, so they were combined. The lower third of the distribution of correlations ranged from -0.08 to 0.17. The middle third of the distribution ranged from 0.18 to 0.29, and the upper third of the distribution ranged from 0.29 to 0.78. These three ranges might well be called small (<0.20), medium (0.20 to 0.30), and large effects (>0.30). All these correlations should be squared in order for them to reflect “variance accounted for,” while heritability estimates already index “variance accounted for” without the need for squaring the value. Another basis of comparison would be the magnitude of genetic effects in other psychological domains. Various reviews (Bouchard, 2004; Bouchard & Loehlin, 2001; Devlin, Daniels, & Roeder, 1997; Waldman & Rhee, 2006) suggest that most reliably measured psychological traits yield heritabilities in the range 0.40 to 0.60 and thus are quite comparable to those reported here. For example, the heritability of intelligence (*g*) is around 0.50 to 0.70, and the heritabilities of the liability to schizophrenia and attention deficit/hyperactivity disorder are around 0.70 to 0.80. Personality variables and occupational interests have heritabilities in the 0.35 to 0.50 range, much like the TMVT. Estimates of 0.40 to 0.50 for the heritabilities for the TMVT traits are moderate and significant—certainly larger than common effect sizes seen in social psychology.

More important than the actual heritability estimate, however, is the fact that there *is* significant heritability. Different studies provide different estimates of genetic influence, depending on the specific sample and the type of kinships represented in the sample, but the majority of studies provide evidence that these TMVT traits are under genetic influence. Socialization researchers must take account of the fact that any

correlation seen between a parent and child for religiousness, conservatism, or authoritarianism cannot be automatically explained by a shared family environment.

An important moderator of the heritability of the TMVT is age. Younger samples or retrospective ratings almost invariably produce smaller heritability estimates and larger effects of the shared environment. One interpretation of this finding is that the TMVT can be influenced by parents while the child is still at home, but once the child leaves the home, parental influence wanes. Genetic differences then become more important in determining differences in the TMVT. A good example of this would be frequency of church attendance, which, as previously stated, is in almost all multiple-item indexes of religiousness. It is easy to see how the frequency of church attendance would be the same for all members of a family when the members live in the same household. Children would have no choice as to whether they attend religious services. Once a child leaves the home, however, he or she is free to choose whether to attend religious services, and parental influence wanes. How this example translates to the items used on Conservatism or Authoritarianism scales is less clear.

A further question that arises with behavior genetic studies is how the results from quantitative genetic analyses compare to those from molecular genetics. For example, Hamer (2004) has written a book with the title *The God Gene*. Hamer, however, is a careful investigator and in the text makes it clear that individual genes will account for only a tiny fraction of the variation in a trait. The gene he discusses (VMAT2, also called SLC18A2) may be important in influencing the kinds of traits we are discussing, as their products modulate mechanisms through which psychoactive drugs work on the central nervous system. It is likely that continuous psychological traits of the sort discussed in this chapter will be influenced by many genes of small additive effect acting in a manner similar to those found for quantitative characters in other biological organisms, such as oil and protein in corn (Hill, 2005).

In conclusion, religiousness and the rest of the TMVT are moderately heritable, especially in adulthood. Certainly, family influences are important in childhood, and further research should be carried out to determine the specific factors at work. More research also needs to be done to explicate the genetic influences seen on these traits. A moderate heritability for a trait does not mean that there is one gene for that trait. The influence is quantitative; that is, there are many genes, acting within the context of the environments, that support the development of these traits. These genetic effects may be shared with other attitudes or personality traits, and, as mentioned earlier, there may be genetic and environmental influences that are common to the TMVT as well as genetic or environmental influences that are unique to each measure. These types of questions call for more

research on the TMVT and the genetic and environmental influences on differences in these traits.

REFERENCES

- Abrahamson, A. C., Baker, L. A., & Caspi, A. (2002). Rebellious teens? Genetic and environmental influences on the social attitudes of adolescents. *Journal of Personality and Social Psychology, 83*, 1392–1408.
- Adorno, T. W., Frenkel-Brunswick, E., Levinson, D. J., & Sanford, R.N. (1950). *The authoritarian personality*. New York: Harper.
- Alford, J. R., Funk, C. L., & Hibbing, J. R. (2005). Are political orientations genetically transmitted? *American Political Science Review, 99*, 1–15.
- Alford, J. R., & Hibbing, J. R. (2004). The origin of politics: An evolutionary theory of political behavior. *Perspectives in Politics, 2*, 707–723.
- Allport, G. W., & Ross, J. M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology, 5*, 432–443.
- Allport, G. W., Vernon, P. E., & Lindzey, G. (1960). *Manual for the study of values* (3rd ed.). Boston: Houghton Mifflin.
- Altemeyer, B. (1981). *Right-wing authoritarianism*. Winnipeg, Manitoba, Canada: University of Manitoba Press.
- Altemeyer, B. (1988). *Enemies of freedom*. San Francisco: Jossey-Bass.
- Altemeyer, B. (1996). *The authoritarian specter*. Cambridge, MA: Harvard University Press.
- Beer, J. M., Arnold, R. D., & Loehlin, J. C. (1998). Genetic and environmental influences on MMPI factor scales: Joint model fitting to twin and adoption data. *Journal of Personality and Social Psychology, 74*, 818–827.
- Boomsma, D. I., de Geus, E. J. C., van Baal, G. C. M., & Koopmans, J. R. (1999). A religious upbringing reduces the influence of genetic factors on disinhibition: Evidence for interaction between genotype and environment on personality. *Twin Research, 2*, 115–125.
- Bouchard, T. J., Jr. (1998). Genetic and environmental influences on adult intelligence and special mental abilities. *Human Biology, 70*, 257–279.
- Bouchard, T. J., Jr. (2004). Genetic influence on human psychological traits: A survey. *Current Directions in Psychological Science, 13*, 149–151.
- Bouchard, T. J., Jr., & Loehlin, J. C. (2001). Genes, personality, and evolution. *Behavior Genetics, 31*, 243–273.
- Bouchard, T. J., Jr., Lykken, D. T., McGue, M., Segal, N. L., & Tellegen, A. (1990). Sources of human psychological differences: The Minnesota study of twins reared apart. *Science, 250*, 223–228.
- Bouchard, T. J., Jr., McGue, M., Lykken, D. T., & Tellegen, A. (1999). Intrinsic and extrinsic religiousness: Genetic and environmental influences and personality correlates. *Twin Research, 2*, 88–98.
- Bouchard, T. J., Jr., Segal, N. L., Tellegen, A., McGue, M., Keyes, M., & Krueger, R. F. (2003). Evidence for the construct validity and heritability of the Wilson-Patterson conservatism scale: A reared-apart twins study of social attitudes. *Personality and Individual Differences, 34*, 959–969.

- Bouchard, T. J., Jr., Segal, N. L., Tellegen, A., McGue, M., Keyes, M., & Krueger, R. F. (2004). Genetic influence on social attitudes: Another challenge to psychologists from behavior geneticists. In L. F. DeLilla (Ed.), *Behavior genetic principles: Perspectives in development, personality, and psychopathology* (pp. 89–104). Washington, DC: American Psychological Association.
- Bourgeois, M. J. (2002). Heritability of attitudes: Constraints on dynamic social impact. *Personality and Social Psychology Bulletin*, *28*, 1063–1072.
- Brown, D. E. (1991). *Human universals*. Philadelphia: Temple University Press.
- Buss, D. M., Haselton, M. G., Shackelford, T. K., Bleske, A. L., & Wakefield, J. C. (1998). Adaptations, exaptations, and spandrels. *American Psychologist*, *53*, 533–548.
- Campbell, D. T., & Stanley, J. C. (1966). *Experimental and quasi-experimental designs for research*. Chicago: Rand McNally.
- Cavalli-Sforza, L. L., & Feldman, M. W. (1981). *Cultural transmission and evolution: A quantitative approach*. New York: Princeton University Press.
- Christie, R. (1991). Authoritarianism and related constructs. In J. P. Robinson, P. R. Shaver, & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 501–572). San Diego, CA: Academic Press.
- Collins, W. A., Maccoby, E. E., Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist*, *55*, 218–232.
- Crelia, R. A., & Tesser, A. (1996). Attitude heritability and attitude reinforcement: A replication. *Personality and Individual Differences*, *21*, 803–808.
- Devlin, B., Daniels, M., & Roeder, K. (1997). The heritability of IQ. *Nature*, *388*, 468–471.
- D'Onofrio, B. M., Eaves, L. J., Murrelle, L., Maes, H. H., & Spilka, B. (1999). Understanding biological and social influences on religious attitudes and behaviors: A behavior genetic perspective. *Journal of Personality*, *67*, 953–984.
- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. San Diego, CA: Harcourt Brace Jovanovich.
- Eaves, L. J., Heath, A. C., Martin, N. G., Maes, H. H., Neale, M. C., Kendler, K. S., et al. (1999). Comparing the biological and cultural inheritance of personality and social attitudes in the Virginia 30,000 study of twins and their relatives. *Twin Research*, *2*, 62–80.
- Eaves, L. J., Martin, N. G., Heath, A. C., Schieken, R., Meyer, J., Silberg, J., et al. (1997). Age changes in the causes of individual differences in conservatism. *Behavior Genetics*, *27*, 21–124.
- Eckhardt, W. (1991). Authoritarianism. *Political Psychology*, *12*, 97–124.
- Falconer, D. S., & Mackay, T. F. (1996). *Introduction to quantitative genetics* (4th ed.). Harlow, England: Longman.
- Finkel, D., & McGue, M. (1997). Sex differences and nonadditivity in heritability of the Multidimensional Personality Questionnaire Scales. *Journal of Personality and Social Psychology*, *72*, 929–938.
- Freese, J., Li, J. C. A., & Wade, L. D. (2003). The potential relevance of biology to social inquiry. *Annual Review of Sociology*, *29*, 223–256.
- Goldberg, L., Tucker, D., Altemeyer, B., Dawes, R., & Rothbarth, M. (1984). The Tucker hypothesis that liberalism/conservatism is related to individual

- differences in the strength of the fundamental attribution error. Unpublished manuscript.
- Gorsuch, R. L., & Venable, G. D. (1983). Development of an "age universal" I-E scale. *Journal of the Scientific Study of Religion*, 22, 181–187.
- Hamer, D. (2004). *The God gene: How faith is hardwired into our genes*. New York: Anchor Books.
- Hansen, J. C., & Campbell, D. P. (1985). *Manual for the SVIB-SCII* (4th ed.). Stanford, CA: Stanford University Press.
- Harris, J. R. (1995). Where is the child's environment? A group socialization theory of development. *Psychological Review*, 102, 458–489.
- Harris, J. R. (1998). *The nurture assumption: Why children turn out the way they do*. New York: Free Press.
- Harris, J. R. (2000). The outcome of parenting: What do we really know? *Journal of Personality*, 68, 625–637.
- Hartman, H. (1958). *Ego psychology and the problem of adaptation*. New York: International Universities Press.
- Hemphill, J. F. (2003). Interpreting the magnitude of correlation coefficients. *American Psychologist*, 58, 78–79.
- Herndon, R. W., McGue, M., Krueger, R. F., & Iacono, W. G. (2005). Genetic and environmental influences on adolescents' perceptions of current family environment. *Behavior Genetics*, 35, 373–380.
- Hill, W. G. (2005). A century of corn selection. *Science*, 307, 683–684.
- Hood, R. W., Jr. (1975). The construction and preliminary validation of a measure of reported mystical experience. *Journal of the Scientific Study of Religion*, 14, 29–41.
- Hood, R. W., Jr., Ghorbani, N., Watson, P. J., Ghramaleki, A. F., Bing, M. N., Davison, H. K., et al. (2001). Dimensions of the mysticism scale: Confirming the three-factor structure in the United States and Iran. *Journal for the Scientific Study of Religion*, 40, 691–705.
- Hoyt, C. (1941). The reliability estimated by analysis of variance. *Psychometrika*, 6, 153–160.
- Hur, Y. M., & Bouchard, T. J., Jr. (1995). Genetic influence on perceptions of childhood family environment: A reared apart twin study. *Child Development*, 66, 330–345.
- Jacobs, N., van Gestel, S., Derom, C., Thiery, E., Vernon, P., Derom, R., et al. (2001). Heritability estimates of intelligences in twins: Effect of chorion type. *Behavior Genetics*, 31, 209–217.
- Johnson, W., & Bouchard, T. J., Jr. (2005). The structure of human intelligence: It's verbal, perceptual, and image rotation (VPR), not fluid crystallized. *Intelligence*, 33, 393–416.
- Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin*, 129, 339–375.
- Kendler, K. S., Gardner, C. O., & Prescott, C. A. (1997). Religion, psychopathology, and substance use and abuse: A multimeasure, genetic-epidemiologic study. *American Journal of Psychiatry*, 154, 322–329.
- Koenig, L. B., McGue, M., Krueger, R. F., & Bouchard, T. J., Jr. (2005). Genetic and environmental influences on religiousness: Findings from retrospective and current religiousness ratings. *Journal of Personality*, 73, 471–488.

- Koestner, R., Walker, M., & Fichman, L. (1999). Childhood parenting experiences and adult creativity. *Journal of Research in Personality, 33*, 92–107.
- Kraft, M. R., & Zuckerman, M. (1999). Parental behavior and attitudes of their parents reported by young adults from intact and stepparent families and relationships between perceived parenting and personality. *Personality and Individual Differences, 27*, 453–476.
- Li, C. C. (1975). *Path analysis: A primer*. Pacific Grove, CA: Boxwood Press.
- Loehlin, J. C. (2004). *Latent variable models: An introduction to factor, path, and structural analysis* (4th ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Loehlin, J. C., & Nichols, R. C. (1976). *Heredity, environment, and personality: A study of 850 sets of twins*. Austin: University of Texas Press.
- Lykken, D. T., Bouchard, T. J., Jr., McGue, M., & Tellegen, A. (1990). The Minnesota Twin Family Registry: Some initial findings. *Acta Geneticae Medicae et Gemellologiae, 39*, 35–70.
- Lykken, D. T., Bouchard, T. J., Jr., McGue, M., & Tellegen, A. (1993). Heritability of interests: A twin study. *Journal of Applied Psychology, 78*, 649–661.
- Lykken, D. T., & Tellegen, A. (1993). Is human mating adventitious or the result of lawful choice? A twin study of mate selection. *Journal of Personality and Social Psychology, 65*, 56–68.
- Lynch, M., & Walsh, B. (1998). *Genetics and analysis of quantitative traits*. Sunderland, MA: Sinauer Associates.
- MacDonald, D. A. (2000). Spirituality: Description, measurement, and relation to the Five Factor Model of personality. *Journal of Personality, 68*, 153–197.
- MacDonald, D. A., Friedman, H. L., & Kuentzel, J. G. (1999). A survey of measures of spiritual and transpersonal constructs: Part one—Research update. *Journal of Transpersonal Psychology, 31*, 137–154.
- MacDonald, D. A., & Holland, D. (2002). Examination of the psychometric properties of the temperament and character inventory self-transcendence dimension. *Personality and Individual Differences, 32*, 1013–1027.
- MacDonald, D. A., Kuentzel, J. G., & Friedman, H. L. (1999). A survey of measures of spiritual and transpersonal constructs: Part two—Additional measures. *Journal of Transpersonal Psychology, 31*, 155–177.
- Martin, N. G., Boomsma, D. I., & Machin, G. (1997). A twin-pronged attack on complex traits. *Nature Genetics, 17*, 155–177.
- Martin, N. G., Eaves, L. J., Heath, A. C., Jardine, R., Feingold, L. M., & Eysenck, H. J. (1986). Transmission of social attitudes. *Proceedings of the National Academy of Sciences of the United States of America, 83*, 4364–4368.
- McCourt, K., Bouchard, T. J., Jr., Lykken, D. T., Tellegen, A., & Keyes, M. (1999). Authoritarianism revisited: Genetic and environmental influence examined in twins reared apart and together. *Personality and Individual Differences, 27*, 985–1014.
- Moos, R. H., & Moos, B. S. (1994). *Family Environment Scale: Manual* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.
- Neale, M., Boker, S. M., Xie, G., & Maes, H. H. (1999). *Mx: Statistical modeling* (5th ed.). Richmond: Department of Psychiatry, Virginia Commonwealth University.
- Nesse, R. M. (2005). Natural selection and the regulation of defenses: A signal detection analysis of the smoke detection principle. *Evolution and Human Behavior, 26*, 88–105.

- O'Connor, T. P., Hoge, D. R., & Alexander, E. (2002). The relative influence of youth and adult experiences on personality spirituality and church involvement. *Journal for the Scientific Study of Religion*, *41*, 723–732.
- Plomin, R., DeFries, J. C., McClearn, G. E., & McGuffin, P. (2001). *Behavior genetics*. New York: Worth.
- Posthuma, D., Beem, A. L., de Geus, E. J. C., van Baal, C. M., van Hjelmborg, J. B., Iachine, I. A., et al. (2003). Theory and practice in quantitative genetics. *Twin Research*, *6*, 361–376.
- Richard, F. D., Bond, C. F., Jr., & Stokes-Zoota, J. J. (2003). One hundred years of social psychology quantitatively described. *Review of General Psychology*, *7*, 331–363.
- Rowe, D. (1994). *The limits of family influence: Genes, experience, and behavior*. New York: Guilford Press.
- Sandomirsky, S., & Wilson, J. (1990). Processes of disaffiliation: Religious mobility among men and women. *Social Forces*, *68*, 1211–1229.
- Saucier, G. (2000). Isms and the structure of social attitudes. *Journal of Personality and Social Psychology*, *78*, 366–385.
- Scarr, S. (1996). How people make their own environment: Implications for parents and policy makers. *Psychology, Public Policy, and Law*, *2*, 204–228.
- Scarr, S. (1997). Why child care has little impact on most children's development. *Current Directions in Psychological Science*, *6*, 143–148.
- Scarr, S., & Weinberg, R. (1981). The transmission of authoritarianism in families: Genetic resemblance in social-political attitudes. In S. Scarr (Ed.), *Race, social class, and individual differences* (pp. 399–427). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Segal, N. L. (2000). Virtual twins: New findings on within-family environmental influences on intelligence. *Journal of Educational Psychology*, *92*, 442–448.
- Sosis, R. (2004). The adaptive value of religious ritual. *American Scientist*, *92*, 166–172.
- Stone, W. F., Lederer, G., & Christie, R. (Eds.). (1993). *Strength and weakness: The authoritarian personality today*. New York: Springer-Verlag.
- Stoolmiller, M. (1999). Implications of the restricted range of family environments for estimates of heritability and nonshared environment in behavior-genetic adoption studies. *Psychological Bulletin*, *125*, 392–409.
- Tarr, H., & Lorr, M. (1991). A comparison of right-wing authoritarianism, conformity, and conservatism. *Personality and Individual Differences*, *12*, 307–311.
- Tellegen, A. (2000). *Manual for the Multidimensional Personality Questionnaire*. Minneapolis: University of Minnesota Press.
- Tesser, A. (1993). The importance of heritability in psychological research: The case of attitudes. *Psychological Review*, *100*, 129–142.
- Tesser, A., Whitaker, D., Martin, L., & Ward, D. (1998). Attitude heritability, attitude change, and physiological responsivity. *Personality and Individual Differences*, *24*, 89–86.
- Toga, A. W., & Thompson, P. M. (2005). Genetics of brain structure and intelligence. *Annual Review of Neuroscience*, *28*, 1–23.
- Trivers, R. (1985). *Social evolution*. Menlo Park, CA: Benjamin-Cummings.
- Turkheimer, E. (2000). Three laws of behavior genetics and what they mean. *Current Directions in Psychological Science*, *9*, 160–164.

- Turkheimer, E., & Gottesman, I. I. (1992). Is $h^2 = 0$ a null hypothesis any more? *Behavioral and Brain Sciences*, *14*, 410–411.
- Twain, M. (1935). *The family Mark Twain*. New York: Harper Brothers.
- Vernon, P. A., Jang, K. L., Harris, J. A., & McCarthy, J. M. (1997). Environmental predictors of personality differences: A twin and sibling study. *Journal of Personality and Social Psychology*, *72*, 177–183.
- Waldman, I. D., & Rhee, S. H. (2006). Genetic and environmental influences on psychopathy and antisocial behavior. In C. J. Patrick (Ed.), *Handbook of psychopathy* (pp. 205–228). New York: Guilford Press.
- Waller, N. G., Kojetin, B. A., Bouchard, T. J., Jr., Lykken, D. T., & Tellegen, A. (1990). Genetic and environmental influences on religious interests, attitudes, and values: A study of twins reared apart and together. *Psychological Science*, *1*, 138–142.
- Wiggins, J. S. (1966). Substantive dimensions of self-report in the MMPI item pool. *Psychological Monographs*, *80*, 42.
- Williams, G. C. (1966). *Adaptation and natural selection: A critique of some current evolutionary thought*. Princeton, NJ: Princeton University Press.
- Wilson, E. O. (1978). *On human nature*. Cambridge, MA: Harvard University Press.
- Wilson, J., & Sherkat, D. E. (1994). Returning to the fold. *Journal for the Scientific Study of Religion*, *33*, 148–161.
- Winter, T., Kaprio, J., Viken, R. J., Karvonen, S., & Rose, R. J. (1999). Individual differences in adolescent religiosity in Finland: Familial effects are modified by sex and region of residence. *Twin Research*, *2*, 108–114.
- Zahavi, A., & Zahavi, A. (1997). *The handicap principle*. New York: Oxford University Press.

RELIGIOUS BEHAVIORS, BADGES, AND BANS: SIGNALING THEORY AND THE EVOLUTION OF RELIGION

Richard Sosis

Among the Iahita Arapesh, boys as young as three years old are pinned down by adult males dressed as frightening boars, and their genitals are forcefully rubbed with stinging nettles. Having just watched slightly older boys attacked by these boars and suffer lacerations to their penises, these toddlers have something to look forward to in a few years. After these molestations, all the youth are tossed into a pool filled with stinging nettles. Later in childhood, their penises are abused again with bamboo razors and pig incisors, this time in a wooden structure built over a stream. Following the assault, the boys insert their penises through the floorboards to let the blood drip into the water below. Marriage brings little relief to the abuses of childhood. After their first evening together, the naked couple walk to the stream in the presence of spectators, where the wife builds a dam and the husband lacerates his own penis (see Tuzin, 1982).

The Iahita Arapesh are not an anthropological oddity. Ritual practices throughout the world are often torturous and terrifying (Glucklich, 2001). Consider several initiation ceremonies historically performed by Native Americans: Apache boys were forced to bathe in icy water, Luiseño initiates were required to lie motionless while being bit by angry hordes of ants, and Tukuna girls had their hair plucked out. Of course, not all communities demand such sacrificial behavior of their members. Indeed, putting ashes on one's forehead, dunking an infant in water, avoiding hamburgers on Fridays, and erecting an evergreen in the living room are admittedly much more benign. Even in religious communities that place few demands on their adherents, however, ritual activities minimally require time and energy, time and energy that cannot be invested in other, more "productive" activities.

Why is there so much variance across religious communities in the costs imposed on adherents, and what are the determinants of this variance? If we are rational thinking beings, which most of us like to believe we are, why do we spend so much time, energy, and resources pursuing such activities?

To answer these questions, a theory is needed that can explain the universality of religious behavior as well as its variance within and across populations. Only a theory grounded in the process of natural selection can offer such a comprehensive explanation, but how? Religious behavior appears to *contradict* the principles of natural selection, which claims that to secure the resources necessary for reproduction and survival, organisms, including humans, are designed to maximize the rate at which they extract energy from the environment. Most religious behaviors seem entirely counterproductive to this goal, and, indeed, some religious practices, such as ritual sacrifices, are a blatant conspicuous display of wasted resources. It is one thing to share your food with a friend or someone in need, but why would anyone willingly give up part of their dinner to a fire that will burn it to ashes on an altar? The knee-jerk response to this issue is that humans engage in religious practices because they believe in the efficacy of the rituals and the tenets of the faith that give meaning to the rituals. However, this response begs the question. Why has natural selection favored a human psychology that believes in the supernatural as well as the behavioral patterns that are manifestations of these beliefs?

What follows in this chapter is a description of a signaling theory of religious behavior that aims to answer this question and a summary of some of the data that have been brought to bear on this theory. In the history of science, it is often the case that new and revolutionary ideas, while overlooked for centuries, are nearly simultaneously discovered by multiple independent scholars (for numerous example, see Bryson, 2003). The application of signaling theory to religious behavior fits that historical pattern precisely. More or less independent literatures within economics (Berman, 2000; Carr & Landa, 1983; Iannacone, 1992, 1994), anthropology (Cronk, 1994; Irons, 2001, 2004; Sosis, 2003, 2004; Sosis & Alcorta, 2003), cognitive science (Atran, 2002, Atran & Norenzayan, 2004), and philosophy (Bulbulia, 2004a, 2004b) have converged on what has been variously (and clumsily) called the club-goods model of religion, hard-to-fake sign of religious commitment model, commitment theory of religion, religious costs model, and the costly signaling theory of religious behavior. In this chapter, I hope to synthesize some of these emerging and diverging literatures that wrestle with understanding the evolution, endurance, and diversity of religion.

RELIGION AS COMMUNICATION

When most people consider religion and its myriad of moral strictures, bizarre rituals, puzzling myths, exotic gurus, and mysterious mystics,

“communication” is not the first thought that comes to mind. Indeed, communication evokes images of information, clarity, and pragmatic interactions, whereas religion is shrouded in mystery and grapples with unfathomable existential issues. Nonetheless, drawing on the work of ethologists and their study of animal rituals, anthropologists have long considered religion a form of communication. Granted, religions use “standard” forms of communication, such as speaking, singing, and writing, but religions most effectively and uniquely communicate through what I will informally refer to as the three B’s: religious behavior (ritual), badges (the physical manifestations of some ritual behaviors, such as tattoos or religious garments), and bans (behavioral restrictions known in anthropological circles as taboos). When individuals pray to deities, they are of course attempting to “communicate” with these supernatural agents; however, for understanding the selective pressures that have shaped prayer and other religious behaviors, badges, and bans, the most relevant communicants are not the deities but rather the other congregants.

To grasp how religion is a form of communication, two critical questions need to be answered. First, what do religious behaviors, badges, and bans communicate? What message is a worshipper sending to the other worshippers? Is there also a message intended for those not in the pews? Second, why are the three B’s effective at communicating whatever it is that is being communicated? If someone has something to say to another congregant, why not just say it?

Answering these questions and discerning why natural selection has universally favored religiously communicated messages requires that we approach our subject from the mind-set of an evolutionary biologist. Whether studying human language, religion, the color of peppered moths, or any potentially adaptive trait, evolutionary scholars must first determine what problem the trait solved in the organism’s evolutionary history if they are to uncover the causes of its emergence. Regarding religion, if it is an adaptive strategy, it must have solved some environmental problem that all societies face. William Irons, a behavioral ecologist from Northwestern University, has suggested that this universal dilemma is how to promote cooperation. Irons argues that in human history the adaptive advantage of group living was the benefits that individuals attained through cooperating with each other in activities such as hunting, food sharing, defense, and warfare. However, as Irons notes, although everyone is better off if everybody cooperates, it is often very difficult to coordinate and achieve this cooperation. The problem is that although everyone is better off if everybody cooperates than if nobody cooperates, each person is even better off if everyone else does the cooperating while they sit at home enjoying an afternoon siesta. Throughout our evolutionary history, there were likely to have been conditions in which everyone in a group would benefit if they all worked together, possibly to kill a few bison or men in the

tribe next door, but individuals themselves could do even better by watching everyone else expending energy and putting their lives at risk. Obviously, however, if everyone pursues the latter strategy, at best there will be no bison for dinner; at worst, your tribe will be decimated by those who figured out how to cooperate. Thus, although everyone may gain if all group members invest in the cooperative goal, attaining such large-scale cooperation is often difficult to achieve without social mechanisms that prevent individuals from slacking off and free riding on the efforts of others. Irons argues that religion is such a mechanism.

In order to appreciate his argument, let's consider the shortcomings of messages communicated through our most common means of communication, language. A number of researchers have noted that trust lies at the heart of the problem of securing cooperation. If everyone knows that it is in everyone else's best interest to watch the hunt or war from the sidelines, how do groups of individuals develop the mutual trust that could ensure everyone that everybody else will participate? Of course, hunters and warriors can promise, "You have my word, I'll show up tomorrow. You can count on me." Unfortunately, unless there is trust already established between these individuals, such statements are not believable. As Shakespeare warned in *The Life of King Henry the Fifth*, "Trust none, for oaths are straws." (Of course, the statement *is* believable if the hunter or warrior would be severely punished if he failed to show up, in which case there is no need for him to promise anything because it is actually in his best interest to show up.) But what if a man does really intend to show up to the hunt or battle? How does he indicate to others the truth of his promises? Well, an overused truism never seemed more appropriate: actions speak louder than words. Or, to translate into our discussion, religious behaviors, badges, and bans are a more reliable means of communicating commitment than spoken promises.

HONEST HANDICAPS

Why should this be the case? Isn't human language the evolutionary apex of communication? For an explanation, I turn to the work of Israeli biologist Amotz Zahavi, who studied warblers rather than religion, yet his writings inspired Irons and others to apply his reasoning to religious phenomena. Zahavi recognized that when it is in an organism's best interest to send a dishonest signal (such as "I'm really much bigger, quicker, stronger, healthier, or more beautiful than I actually am"), the signals that are most believable are those that are costly to fake. He referred to such signals as handicaps. Handicaps are reliable because they are too costly to display or perform for those of low quality (in other words, those who are smaller, slower, weaker, sicker, and uglier than they want others to believe they are). All behaviors incur time and energy costs as well as the costs of missed opportunities

when performing one behavioral alternative over another. Costs that extend beyond these baseline costs (also known as efficacy costs) are called strategic costs. Strategic costs can take the same form as baseline costs of production (e.g., time and energy) but also often include the risk of consequences if a false signal is discovered.

Zahavi argued that selection has favored handicaps in a variety of species (see Zahavi & Zahavi, 1997); however, this has been more difficult to confirm than is generally appreciated. As the British evolutionary biologists John Maynard Smith and David Harper (2003) explain, for a signal to classify as a handicap, the net benefits for displaying the signal must be higher for a high-quality individual than a low-quality individual. This could mean that the costs are higher for low-quality individuals, that the benefits are higher for high-quality individuals, or both. Critically, to classify as a handicap, it must be possible to send a false signal, in other words, for a low-quality signaler to send a signal suggesting high quality. The signal must be costly to fake but not impossible to fake. The handicap principle asserts that low-quality signalers generally don't send false signals because it simply does not pay; the net costs are too high.

Given the rigorous standards of evidence needed, few handicaps have been convincingly demonstrated. One of the better-worked-out examples, however, is musth in African elephants. Musth is a state of heightened aggressiveness and sexual arousal that occurs in adult male elephants for several weeks to several months per year, depending on the elephant's age. Testosterone levels are frighteningly increased by a factor of 50, accompanied by vocalizations, threatening poses, and dribbling urine. As in most species, size determines who wins a fight, and as most organisms recognize this, including elephants, most agonistic encounters end with the smaller individual retreating without any combat ever occurring. However, Joyce Poole, who has studied African elephants for more than two decades, observed that smaller males occasionally escalate a fight with larger males, and it is almost always the case that the smaller are in musth while the larger are not. Interestingly, the smaller who are in musth generally win these conflicts. So why don't smaller males continually remain in musth so that they can at least win conflicts when larger males are not in musth? As Poole (1989) suggests, musth is physically costly for males, including increased metabolic rate from high testosterone levels and loss of liquid through urination. Smaller males likely pay higher costs since musth inhibits growth, preventing smaller males from growing into successful larger males. In other words, it doesn't pay for smaller males to be in musth unless larger males are not in musth, which is typically what happens. Unfortunately for the smaller males, the larger males time their musth for when females are in estrus. Musth is thus a handicap: a costly trait that reliably signals aggressiveness and willingness to escalate agonistic encounters.

INGENUOUS INDICES

When there are gains from deception, handicaps are not the only signals that are honest. As mentioned previously handicaps must be costly to fake, but some signals are actually impossible to fake and are consequently quite reliable. These are referred to as indexical signals. More generally, an index is a signal that refers to what it denotes by being truly affected by it. Rashes, rain clouds, and weather vanes are common examples of indexical signs that indicate measles, rain, and wind direction, respectively (Rappaport, 1999). As a further example, let's return to the animal kingdom and consider some rather strange behavior by Thompson gazelles. When these gazelles spot a predator, they often stot, which means they jump up and down. This behavior is extraordinary and has understandably puzzled biologists for years; why should a gazelle waste precious energy leaping up and down, energy that will be necessary if she is pursued by a predator? And why would a gazelle make herself *more* visible to a predator? It turns out that stotting gazelles are probably advertising to predators their ability to escape. They are effectively saying, "Don't bother chasing me. Look how strong my legs are, you won't be able to catch me." The only reason that a predator believes the gazelle is because the signal is reliable, precisely because it is indexical. Only gazelles that are actually quick enough to escape can jump to a certain height, displaying their leg strength. Gazelles that are not strong enough to jump high are simply not able to imitate the signal; it is impossible to fake, and thus stotting serves as an honest signal of a gazelle's speed.

SIGNALS OF SOLIDARITY

So what do elephants, gazelles, and the pious have in common? They all send reliable signals under conditions in which deceit can reap rewards. Whereas musth signals a willingness to escalate an agonistic encounter and stotting signals speed, religious behaviors, badges, and bans signal commitment to a particular group. Consider a religious population I work with in Israel, Ultra-Orthodox Jews, who prefer to be known as *Haredim* ([God] fearing or trembling ones). One of the most notable features of the Jerusalem summer landscape is how overdressed the Haredim are for the season. Women sport long-sleeve shirts, head coverings or wigs (and occasionally both), and heavy skirts that scrape the ground. In their thick beards, long black coats, and black pants, Haredi men spend their days fervently swaying and sweating as they sing praises to God in the desert sun. Many of them wear *striemels*, thick fur hats that were undoubtedly helpful in surviving the long and cold eastern European winters where their ancestors had lived but probably should have been left at the border when they immigrated to the Holy Land. By donning several layers of clothing and standing out in the midday desert sun, these

men are signaling to others, “Hey! Look, I’m a Haredi Jew. If you are also a member of this group, you can trust me because why else would I be dressed like this? Only a lunatic would spend their afternoon doing this *unless* they believed in the teachings of Ultra-Orthodox Judaism and were fully committed to its ideals and goals.” Thus, the “quality” that these men are signaling is their level of commitment to a specific religious group.

Adherence to a set of religious beliefs entails a host of ritual obligations and expected behavioral patterns. Although there may be physical or mental health benefits associated with some ritual practices, the significant time, energy, and financial costs involved in imitating such behavior serve as effective deterrents for anyone who does not believe in the teachings of a particular religion. There is no incentive for nonbelievers to join or remain in a religious group because the costs of maintaining membership (such as praying three times a day, eating only kosher food, donating a certain part of your income to charity, growing *peyos*, and so on) are too high. Hence, those who engage in the suite of behaviors, badges, and bans required by a religious group can be trusted to sincerely believe in the doctrines of the group, which often includes behaving altruistically to other group members. As a result of increased levels of trust and commitment among group members, religious groups are able to overcome free-rider problems that typically plague communal pursuits and limit overconsumption and exploitation of the mutual benefits they generally offer their adherents. And these mutual benefits can be quite significant. For example, during my fieldwork among Haredi communities, I repeatedly observed invitations for meals, lodging, and rides by residents to unknown Haredi travelers. On several occasions, I witnessed cars being loaned to complete strangers, and interviews revealed a surprising number of interest-free loans offered and accepted between people who had previously not known each other. Costly ritual behaviors, badges, and bans serve to protect these benefits—and similar benefits offered by religious communities throughout the world—from free-riding nonbelievers.

It is important to note that there is nothing inherent in these religious behaviors, badges, and bans that tie them to a particular group. They are symbolic signals; in other words, the relationship between the signal and its referent is completely arbitrary, similar to language. While there are historical factors that likely explain why religious Jews wear head coverings or why Sikh men do not cut their hair or beards, there is not anything intrinsically sacred in these badges that make them connected to these populations. Only because the community collectively identifies with these badges (similar to the way we agree that what I am typing on is a “computer” rather than a “dog,” “cat,” “zat,” or infinite other possibilities) do they serve as signals of commitment to each respective group. Under different historical conditions, different badges would have emerged and effectively served as signals of group commitment. This is not to deny the importance of environmental

factors in shaping successful signals. For instance, the Haredi dress code is certainly more challenging to endure in the desert climate than in eastern Europe, making it a particularly effective commitment signal in modern Israel, which may explain why the Haredim are so reluctant to abandon their uncomfortable attire. Nonetheless, whether they don black frocks or orange robes to signal group identity is a result of historical factors and has nothing to do with any intrinsic holiness bestowed to these garments.

STABLE SIGNALS

Understanding the ecological problem that a trait such as religious behavior evolved to overcome provides the biologist with the reason *why* a trait evolved. In our case, I have argued that the primary ecological problem driving the emergence of religious behaviors, badges, and bans was the consistent challenges of collective action that our ancestors faced. However, equally important in any adaptationist analysis is understanding *how* the trait evolved. Why is the trait maintained within the observed population, and how did it achieve stability? Anthropologists Rebecca Bliege Bird and Eric Alden Smith (2005) outline four necessary conditions for the evolutionary stability of a costly signal in a population. Let's address them one by one and return to our African elephants to illustrate. First, Bliege Bird and Smith note that there must be within-group variance in some unobservable attribute. As far as we know, no elephant can observe the inner physiology of another elephant; thus, testosterone production, which varies across males, meets this first condition. Second, group members should benefit from reliable information about this variance. Indeed, it is quite beneficial to know which elephants are hormonal since there may be reproductive opportunities for those that take advantage of males not in musth, whereas picking a fight with one that is in musth can have devastating consequences. Third, signalers must be able to achieve benefits at the expense of those receiving the signal. In other words, there needs to be the potential for deceit, such as smaller elephants gaining reproductive benefits by pretending to be in musth when in fact they are not. Fourth, the cost or benefit to the signaler of sending the signal should be correlated with the signaler's quality of the attribute. As discussed previously, it is costlier for smaller males to produce all that testosterone than it is for larger males because of both the physical hardships of musth and the forgone future opportunity to become a larger male.

Presumably, you are reading this with greater interest in mystics than musth, so let's apply these conditions to religious behaviors, badges, and bans. First, the intensity of religious beliefs varies within communities, and this variance is unobservable. Many people attend church, roughly 40 percent of Americans per week, but worshippers of course do not share the same level of belief in their churches' tenets, and their dedication to their churches

also varies. Second, individuals benefit from accurate information about how beliefs and commitment vary across members. Intensity of belief is related to one's commitment to the group and its goals; committed members are more likely to be cooperative and trustworthy and thus preferred social interactants. When choosing friends or simply facing situations where you must rely on another, such as watching your kids for an hour or taking in your mail while you are away, it is important to know who can be trusted and who cannot. Third, religious groups offer various benefits for in-group members that are mutually provided and are at risk of exploitation by those not committed to group goals. Most notably, religious groups tend to offer mutual insurance benefits. For instance, a teacher in my Connecticut suburban neighborhood severely broke his leg while playing basketball on vacation, and his insurance did not cover such an out-of-state calamity. Fortunately for him, the members of his Orthodox synagogue contributed generously to his recovery. Fourth, the cost or benefit of religious performance is weighed against opportunity costs that are expected to be higher for nonbelievers than for believers. This last condition will take a little more space to explain. For sake of simplicity, imagine a population divided between believers and skeptics. Believers will have genuinely forsaken many worldly behaviors, while skeptics have not. In the case of my Haredi study population, for example, they shun the secular media entirely, including secular newspapers, radio, movies, television, and the Internet (although exceptions are made for the latter). Since they avoid these pursuits, their opportunity costs, that is, the costs associated with missed opportunities while performing a behavior or displaying a badge, are much lower for believers than for those who have not relinquished such activities. Men in these communities are expected to dedicate their days to praying and studying religious texts. Since alternative activities are severely restricted, the cost of spending long hours in religious devotions is less for them as believers, in terms of viable missed opportunities, than for skeptics who still have all those secular activities at their disposal.

BEHAVIORS, BADGES, AND BANS

Thus far, I have treated the obligations that religious groups demand of their members, namely, the three B's, as a suite of requirements. There is some justification for this, as most religious groups do not allow their members to pick and choose which obligations they want to fulfill and which they wish to ignore. You can wear the Haredi garb, but if you like to dine on pork chops, you won't be counted among the community. Nevertheless, it will be useful to point out some of the distinguishing characteristics of the three B's.

Let's start with bans. The astute reader is likely wondering how a taboo, such as avoiding the consumption of pig products, can be a signal. Ritual behaviors and badges can be observed by others in the community, but how

can one observe something that is not done? In contrast to ritual performances and symbolic markers, bans can be “observed” only when they are at risk of being violated. The Jew who refrains from eating in a social setting because the food is not kosher is signaling his identity and commitment to the Jewish community. Sometimes linguistic messages, such as “I don’t eat nonkosher food,” are required to signal adherence to a ban. Generally however, other badges and rituals imply the adherence to a suite of taboos: donning a Catholic priest’s frock implies celibacy, and attending services at a Mormon temple implies abstinence from coffee and tobacco. Since bans cannot be directly displayed, they are effective as signals only when they are in jeopardy of being transgressed, such as the Mormon accompanying a friend to Starbucks or the Muslim whose employer requires him to attend a business lunch during the fasting month of Ramadan.

While bans do not constitute “complete” signals, they are especially proficient at increasing group solidarity and commitment. We can thank economists for this insight. Economists refer to what we have been calling bans or taboos as *prohibitions*. They explain that prohibitions are efficient gatekeepers, eliminating those not dedicated to a group, because they effectively tax secular items. By decreeing that certain activities or goods are off limits for adherents, it becomes more costly to pursue those activities or acquire those goods because offenders will suffer the costs of punishment. This tax on secular activities and goods consequently encourages religious activity, making it “cheaper” and thus more attractive to those who accept a religious community’s prohibitory decrees. By raising the price of secular activities, the opportunity costs for religious activities are lowered. For example, as mentioned previously, Haredim are forbidden to watch television or subscribe to secular newspapers. The pursuit of these pastimes is costly because harsh communal punishments will be enacted if a transgression is discovered. Concomitantly, permitted religious activities, such as prayer and textual study, become less costly and more desirable because of fewer competing alternatives of how Haredim can spend their time.

Distinguishing between prohibitions (or bans and taboos) and ritual behaviors and badges is useful since it underscores the separate processes that ultimately result in increased intragroup solidarity and commitment. For many religious behaviors and badges, though, both social processes seem to be at work. For instance, we can confidently categorize the distinct turbans and beard styles of Sikhs as badges that signal group commitments. However, these badges also prevent them from participating in activities where Sikhs are unwelcome, which in the United States following 9/11 was apparently quite a few, as Sikhs found themselves the misplaced targets of anti-Muslim bigotry. These badges essentially put a tax on events that, whether implicitly or explicitly, sought to restrict Sikh participation. If to pursue an activity Sikhs must hide their identity badges, adherents face the risk of punishment

if the community discovers their covert transgression. Consequently, in addition to their role as signals, these badges also impact solidarity through a process similar to how bans serve as gatekeepers, namely, by making forbidden activities costly. Rituals can operate similarly, as any American Muslim who has tried to inconspicuously fulfill their five-times-daily religious devotions will attest. The relative impact of these separate processes, namely, signaling and taxing alternative activities, on group solidarity for any behavior or badge that engages both mechanisms is unclear and will likely vary across practices and cultures, thus requiring empirical examination on a case-by-case basis.

HARD-TO-FAKE HANDICAPS OR IMPOSSIBLE-TO-FAKE INDICES?

To take stock of how far we've gotten, it appears that religious behaviors, badges, and bans meet the conditions for the evolutionary stability of a costly signal, as outlined by Bliege Bird and Smith. So, depending on your preference, the three B's are hard to fake, costly to fake or, in Zahavi's terms, can be classified as a handicap. But are some religious behaviors, badges, and bans also impossible to fake? Could they be defined as indexical signals, such as the stotting of gazelles?

Certain badges, such as tattoos and ritual scars, are permanent (barring the wonders of modern surgery) and are thus quite difficult to fake. It is conceivable that charlatans can be illegitimately tattooed while avoiding the initiation rites that typically result in such badges; however, the collective memory of the community will make such a ploy dubious. Roy Rappaport, the eminent cultural ecologist and anthropologist of religion, claimed that all rituals, badges, and bans are indexical signals. While the logic of his argument applies to all the B's, let's focus on ritual, as Rappaport himself does. He argued that while ritual behaviors appear to be shrouded in mystery, they are deliberate, and their message to other adherents is clear: participation in a ritual performance indexically signals acceptance of (and not necessarily belief in) the moral values encoded in the ritual. He maintains that regardless of whether or not individuals believe in the moral values encoded in a ritual performance, by participating they are signaling that they accept the moral code of the community and can be held accountable if these rules are compromised.

Rappaport stresses the distinction between belief and acceptance, a distinction that is certainly important in order to assess a signal's message. Are ritual performers signaling their religious beliefs and group commitments, or are they signaling their acceptance of a moral code that is implied by the performance of a ritual? It is likely both, but it is only acceptance that is indexical and thus nearly impossible to fake. In a classic example drawn from

his own fieldwork among the Maring of New Guinea, Rappaport describes how to dance at a *kaiko* ceremony is to unambiguously commit oneself to assist the community one is dancing with during the inevitable next round of warfare. To dance at a *kaiko* is an indexical signal of one's pledge to fight. The formality of the dance ensures that it will not be mistaken for some other behavior, and the ritual has been observed by all community members, thus making one's participation impossible to deny.

To take a more familiar ritual, consider a wedding. During a wedding ceremony, the bride and groom send a public signal that they accept the moral values, as defined by the community, incumbent on the institution of marriage. This signal is indexical; by performing the ritual, the performers can't help but indicate their acceptance of the moral code. Nonetheless, despite their acceptance, the newlyweds may not believe in the moral code's virtues. Note that the moral code itself varies widely by community; a Haredi wedding, for example, endorses different values than, say, a mainline Protestant wedding.

To summarize, performing a ritual indexically signals acceptance of the moral values implicit in the ritual but also signals belief in the doctrines that support and provide meaning for the ritual. Acceptance is nearly impossible to fake; the community observed the wedding or the *kaiko* dance, and thus one's performance cannot be denied. An individual is therefore held accountable for the moral values implied in a marital union (such as sexual and financial fidelity) and a *kaiko* (fight in the next round of warfare). Nonetheless, the performance of these rites also signals that the actor believes in these morals (that infidelity is wrong and that the group he is militarily supporting is right), but these beliefs are fakable. A husband may leave the wedding canopy and commit adultery, and a Maring may not show up to fulfill his pledge of support during warfare. Thus, although performing a ritual does signal belief, it is not an indexical signal of belief but rather a hard-to-fake signal or handicap that faces the potential of deception.

THE FOURTH B: BELIEF

Any reader who has persevered to this point in the chapter is likely pondering, "Signaling theory does indeed appear to explain some puzzling features of religion, but religion is so much more than shaving your head and becoming vegan; this theory surely cannot explain *all* of religion." And, indeed, your thoughts (if I am clairvoyant) would be correct. I am skeptical that any lone theory can explain all the extraordinarily diverse beliefs and behaviors that fall under the umbrella we call religion; nonetheless, signaling theory does provide many valuable insights into the selective pressures that have shaped religious practices in our evolutionary history. While the theory has not explored various features of religion, such as myths and mystical

states of consciousness, there are three universal characteristics of religion that I have yet to discuss that play an important role in making the three B's effective signals: beliefs in supernatural agents, internalizing these beliefs, and the emotional significance of these beliefs. These features of religion are addressed in other chapters, so here I limit my discussion to their relevance in understanding religious practices as signals of group commitment.

Many scholars, past and present, define religion as "belief in the supernatural." Indeed, belief in the supernatural—specifically, supernatural agents such as ghosts, demons, angels, spirits, and gods—is one of the most robust features of religion. How are these ubiquitous unobservable beings related to the signaling function of religious practices? For impatient readers, the quick answer is that they are proximate mechanisms, but I need to explain what I mean by this term. Evolutionary biologists distinguish between ultimate and proximate causes of behavior. Ultimate explanations refer to evolutionary explanations that either provide the historical trajectory of a trait or offer a functional explanation for its existence. In contrast, proximate explanations address the cognitive and physiological underpinnings of a behavior. An ultimate explanation for why a smaller elephant may combat a larger one is his increase in access to fertile females; extraordinary testosterone levels provide a proximate explanation for this same behavior. Ultimate and proximate accounts are not competing but rather offer complementary explanations for understanding behavioral patterns. Our discussion thus far has concerned ultimate explanations, focusing on the gains individuals can achieve through costly religious practices, namely, the ability to overcome problems of collective action. From the view of signaling theory, supernatural beliefs are proximate mechanisms that facilitate the efficient functioning of religious signals. But how?

There is an abundance of experimental and experiential evidence that suggests that humans have a tough time paying immediate costs to achieve long-term gains. Most of us would prefer receiving \$5 immediately than paying \$5 to receive \$25 in a month despite the fact that every economist on the planet will tell you that this is utterly irrational. No bank could offer such a generous interest rate. Many people, of course, put money into retirement funds or pay the costly tuitions for a college education with the aim of increased future salaries. However, when humans pay short-term costs to achieve long-term gains, their decisions are typically strategic, and their information concerning the probability of ultimately achieving the long-term gains is high. Religious communities generally do not offer such clear instruction manuals, and the functional effects of religious practices are hidden or ignored. I have yet to hear the preacher who exclaims, "Pray five times daily, and you'll reap all the mutual insurance benefits we offer!" On the contrary, when trying to motivate religious practice, clergy typically rely on exhortations that promise supernatural rewards or punishments. There is a good reason for this.

Supernatural rewards and punishments can change the payoffs that individuals perceive when performing religious practices (see Bulbulia 2004a, 2004b; Johnson and Kruger 2004; Sosis 2003). When eternal damnation lies in the balance, fasting during daylight hours for a month doesn't sound so bad, and some of course have been convinced to take their own lives for the promise of 70 virgins. But we still haven't solved our dilemma of how to encourage individuals to pay short-term costs to achieve long-term gains; indeed, introducing otherworldly payoffs seems to have exacerbated the problem. Even if supernatural rewards and punishments alter the perceived payoffs so that individuals expect gains or losses depending on their actions, the payoffs are still in the future. In fact, they are even further in the future, awaiting the performer's arrival in the afterlife. Moreover, since these rewards and punishments cannot be proven or even indirectly demonstrated, why would anyone include them in their calculations when determining whether to pursue a religious practice? To understand how supernatural payoffs are effective at encouraging religious practices, we turn to our second noted feature of religion, internalizing supernatural beliefs.

Consider a Sunday churchgoer. Following our earlier argument, by attending church one indexically signals the acceptance of the moral strictures that are the foundation of the church's theology. Attendance signals participation in the community, and thus one is accountable for transgressing the community's moral code. Church attendance also signals belief, let's say, in God, but we argued that this signal is fakable. Not all church attendees necessarily believe in God, and even those who do vary in their confidence about their beliefs. However, signaling theory suggests that while such signals are fakable, they are certainly useful indicators of belief and more reliable than uttered statements of belief. The reliability of church attendance as an indicator of belief, of course, increases with intensity and costs, such as more frequent attendance, higher financial contributions, or more tedious sermons. Nonetheless, it is possible to regularly attend church for ulterior motives rather than communion with God. In fact, psychologists have distinguished between those who attend church to worship and connect with their Creator (known as intrinsically motivated) and those who attend for reasons other than the religious experience (known as extrinsically motivated). For instance, some individuals ignore the majority of their religious obligations but are encouraged to attend church by family members (extrinsic motivation). If not motivated by belief, they presumably accede to these familial requests because they find the benefits of domestic stability to outweigh the costs of attending church.

Despite the potential for deception, in other words, regularly attending church as an atheist, generally, repeated ritual performance will foster and enhance belief. Since ritual performance is unambiguously associated with overt group values, psychological processes, including the popularized

phenomenon known as cognitive dissonance, will cause nonbelievers to either modify their belief or discontinue the ritual actions. Unless there are strong extrinsic motivations, at some introspective moment the attendee will ask, "If I don't believe in any of this, what I am doing here every week?" Two options then remain: start believing or stop attending. What is remarkable is how often the former is chosen. Ritual participation can foster and internalize belief.

The success of cults in attracting new members, for example, is testament to the ability of religious practices to transform attitudes. Although the proselytization methods employed by cults are diverse, joining a cult is typically not a process of "brainwashing," at least as it is popularly conceived (Robbins & Anthony, 1982). Some cults, such as the Unification Church, attract members not by introducing them to the wisdom of their teachings; potential members are simply drawn into the group by participating in activities such as workshops, group singing, sport competitions, and distributing flowers at airports. The majority of recruits drop out, but for those who endure, it is only after several months of such ritualized activity that they are even introduced to the teachings of the Reverend Sun Myung Moon (Galanter, 1999; Pesternak, 1988). When these new members encounter dissonance (Why am I in this airport holding flowers?), teachings that several months before would have found unreceptive ears are now willingly accepted. Nonetheless, it is important to emphasize that ritual is most effective at transforming beliefs when initial views and attitudes are either ambiguous or not too divergent from those implied in the ritual performance. Research on proselytizing religions suggests that missionaries are most successful at converting those who already share many of their beliefs. For example, Mormon proselytization efforts have been most effective where Christianity has already gained wide acceptance (Stark, 1987).

Religious practices generally possess four characteristics that enable them to promote and internalize supernatural beliefs. First, religious behaviors, badges, and bans are physically manifested displays or actions. Physical participation, which provides performers with concrete evidence of their personal involvement, contributes to psychological uneasiness if the performer does not share the values encoded in the religious action. Second, religious practices are typically performed or displayed publicly. Since they are widely observed, there are additional social pressures to reconcile any contradictions between belief and behavior, pressures that would be absent if the practices were only privately performed. Third, religious behaviors, badges, and bans are formal. Their lack of ambiguity makes them effective modes of communication. Religious practices, while rarely understood, are even less frequently mistaken for anything other than religious practices. Fourth, religious practices are often repetitive, cyclical, or even continuous. Although some rituals, such as weddings and rites of passage, occur only once, countless

religions require daily, weekly, monthly, seasonal, yearly and/or multiyearly rituals. And, of course, many bans and badges, such as pig avoidance and circumcision, are in force from cradle to grave. The repetition of formal, publicly observed religious actions demands greater reconciliation with any conflicting beliefs.

The third feature of religion that I promised to briefly discuss, religious emotions, further serves to internalize religious beliefs. Religion is an emotional affair. Indeed, staid religious practices soon become the data of historians rather than the routines and principles by which living populations organize their lives. Religious practices are supported and sustained by the emotions they evoke. Moreover, supernatural religious beliefs, which cannot be established logically, are verified by believers “emotionally.” Religious practices, rituals in particular, often increase arousal in the limbic system and generate what is typically referred to as a “religious experience.” Rappaport (1971) notes, “The truth of such an experience seems to the communicant to be sufficiently demonstrated by its mere occurrence, and since a sacred proposition or its symbol (e.g., the cross) is taken to be intrinsic to the experience, the sacred proposition partakes of this often powerful and compelling sense of truth” (p. 31). Eugene d’Aquili and Andrew Newberg (1999), pioneers in the neurobiology of religion, argue that not only are religious experiences perceived as true, they “appear to be ‘more real’ than baseline reality and are vividly described as such by experiencers after they return to baseline reality. . . . So real do these experiences appear when recalled in baseline reality that they have the ability to alter the way the experiencers live their lives” (p. 192). In addition, since emotions are generated from limbic structures that are out of conscious control, they are difficult to “fake” (Ekman, Levenson, & Friesen, 1983; Levenson, 2003) and can consequently serve as reliable signals of trustworthiness and commitment (Alcorta & Sosis, 2005; Bulbulia, 2004b).

So it appears that through psychological and physiological processes, as well as inherent structural characteristics such as formality and repetitiveness, religious practices are effective at internalizing the supernatural beliefs with which they are associated. Why is it important that beliefs are internalized? Internalizing religious beliefs make the perceived payoffs for religious performance, in which supernatural punishments or rewards ensure that the religious performance is profitable, the real payoffs. The distinguished University of Chicago sociologist James Coleman (1990) observes that norm internalization is efficient when there are a range of actions that are sought to be controlled by a community. This aptly characterizes religious communities, which generally seek members who behave prosocially toward coreligionists under diverse conditions; in other words, they wish to encourage cooperation and trust between members regardless of the situation that arises. Furthermore, Coleman argues that external policing to encourage norm compliance becomes less efficient when members must be monitored

continuously, especially if they are dispersed. Under these conditions, societies are more likely to rely on internalization strategies. Since the intragroup trust and cooperation promoted within religious communities is not limited in time (such as just during work hours) and place (such as just in a house of worship) but is a continuous obligation, it is impossible to monitor members' commitment to this ethic all the time. Consequently, internalizing this ethic is important.

What is particularly interesting about this whole system is that religious communities do not rely exclusively on these internalization strategies (Sosis, 2005). All religious communities impose punishments, either institutionally or through informal means like cutting off social interactions. Formal punishments include fines, executions, and excommunication, among many others. Thus, religious communities rely on both supernatural and material punishment systems to ensure conformity with community norms. Likewise, these communities do not fully depend on the goodwill they cultivate through their moral teachings; systems that monitor behavior are completely intact. However, there is little emphasis on observing members' daily routines, which are too costly to continuously monitor anyway. Efficiently and ingeniously, the monitoring costs are shifted from observing daily life to observing adherence to religious obligations, which, because of their formality, conspicuousness, repetitiveness, and public performance, are much less costly to scrutinize. The system works because religious practices are worth watching since they are reliable signals of community commitment.

PRIVATE PRACTICE

Our discussion on monitoring religious practices raises an important question: Why do groups require that their members engage in private rituals, badges, and bans even though they are rarely witnessed and compliance cannot be enforced? Two reasons seem to be germane, the first for the individual, the second for the group.

First, engaging in private practices appears to be an extremely effective method of convincing *oneself* that one believes in the doctrine that gives meaning to the rituals. And the best way to convince others of your group commitment is to convince yourself first. If individuals engage in private religious practices, they cannot rationalize such actions as coercion by group members. Because of the opportunity to defect on private obligations without risk of detection, engagement in such practices is the sole responsibility of the individual. However, some privately performed rituals, such as prayer recitation or textual study, can be evaluated in the public sphere by assessing knowledge, and thus it is difficult to fake their private performance. Moreover, many rituals, including prayer and textual study, are practiced both publicly and privately. In a number of contemporary religions, for instance, prayers

before meals are expected regardless of whether or not anyone else is at the table. The failure to say grace when alone may result in an increased likelihood of forgetting to say it in a public setting. Nevertheless, individuals are more apt to question their own commitment if they are failing to perform ritual duties that they believe others in the community are practicing, even if the rituals are never performed in public. The performance of private religious practices reinforces group commitment by convincing their performers that they are committed to the group.

The group-level benefits of private obligations further account for their prevalence. Somewhat paradoxically, by requiring adherents to perform private practices, it drives up the price of performing public practices for free-riding skeptics, thus enhancing the reliability of public practices as signals of group commitment. To understand the logic behind this surprising twist, let's start with a little more obvious assumption: believers perceive net gains from religious activity (which is why they engage in it), whereas skeptics perceive net costs from religious activity (which is why they refrain). The critical point is that within these internal calculations, which are, of course, unconscious, believers must include the costs of private practices while skeptics do not; there is no incentive for a skeptic to fake piety when nobody is watching. Since believers pay the costs of private practice while skeptics do not and believers perceive net benefits from following the full suite of religious obligations while skeptics do not, believers must either perceive public practices to be much less costly than skeptics do, or they must perceive much greater benefits from these practices than skeptics do. Therefore, private obligations force the perceived net gains of public obligations to be significantly higher for believers than skeptics (which is, of course, usually achieved through supernatural rewards), and consequently private obligations ensure that those performing public religious practices are those who are genuinely committed to the group (Sosis, 2003). Groups that successfully maintain commitment probably encourage a mix of public and private practices, although it is not yet clear how the optimal mix is determined. It is clear, however, that the costs of private practices cannot be too high because the net benefits of performance must outweigh the costs.

COMMUNES, COMBAT, AND COSTLY SIGNALS

While the costly signaling theory of religion offers numerous predictions, few of them have been directly evaluated, although there appears to be abundant circumstantial evidence that is supportive of the theory. One prediction of the theory, for instance, is that groups that impose greater membership demands will elicit higher levels of devotion and commitment from their members. (There are limits, though, to the costs that can be functionally imposed; demands that exceed members' commitment levels can result in

the collapse of the community, as the ephemeral existence of many strict sects and cults attests.) Groups that maintain more committed members are also likely to be able to offer more to their members because they will find it easier to attain their collective goals than groups whose members are less committed. This may explain a paradox in the American religious marketplace: churches that require the most of their adherents are growing the most rapidly. Indeed, while liberal mainline Protestant denominations such as Episcopalians, Methodists, and Presbyterians have been steadily losing members, groups that require much more of their members, such as Islam, the Church of Jesus Christ of Latter Day Saints (Mormons), and Seventh Day Adventists, who, among other things, abstain from alcohol, caffeine, and meat, respectively, have been growing at exceptional rates. Economist Lawrence Iannaccone has also noted that religious groups that require more of their members not only are growing at a faster rate than less demanding groups but also have the most committed members. He found a strong positive correlation between the distinctiveness of a religious group (in other words, how much their life style differed from mainstream America) and attendance rates at services (Iannaccone, 1994). Sociologists Roger Finke and Rodney Stark (1992) have argued that when the Second Vatican Council in 1962 repealed many of the Catholic Church's prohibitions and reduced the level of strictness in the Church, it initiated a decline in church attendance among American Catholics as well as reduced seminary enrollments. Indeed, in the late 1950s, almost 75 percent of American Catholics were attending mass weekly. Since the Vatican's actions in the early 1960s, there has been a continuous steady decline to the current attendance rate of about 45 percent.

The costly signaling theory of religion also predicts that levels of commitment should be a function of how important cooperative interactions are within a community. Under conditions where cooperation is critical for survival, religious signals should flourish. Consistent with this expectation, economist Daniel Chen (2005) has shown that among Indonesian Muslims, investments in religiosity reflect economic conditions. During economic crises, religiosity increases, presumably because when times are hard, greater displays of commitment are necessary to counter the higher incentives to defect in social exchanges and the increased relative costs one faces if exploited. When the fiscal crisis passes, lower levels of religious practice are restored.

The costly signaling theory of religion additionally assumes that increased commitment among the faithful will translate into successful cooperation. Groups that require the most of their members are expected to achieve the highest levels of cooperation, whereas groups that demand less of their members will find it more difficult to achieve collective goals. In historical work I pursued with psychologist Eric Bressler (Sosis & Bressler, 2003), we found

that among nineteenth-century communes, the definitive place to study human cooperation, religious communes did indeed demand more of their members than their secular counterparts, such as celibacy, relinquishing all material possessions, and vegetarianism. Whereas religious communes that demanded more of their members survived longer, this was not true for secular communes; there was no relationship between the requirements imposed and commune longevity. We were surprised by this latter result since secular groups such as militaries and fraternities appear to successfully employ costly rites to maintain cooperation. While both religious and secular practices can promote cooperation, religious practices may ironically generate greater belief and commitment because they sanctify unverifiable ideologies. Because of their reliance on supernatural elements, religious theologies are generally beyond the possibility of examination; indeed, contemporary religions struggle when they extend beyond this border into convictions that can be evaluated, such as the claim that we reside on a 6,000-year-old flat planet orbited by the sun. In contrast, secular ideologies are subject to the vicissitudes of examination and are thus less stable than religious ideologies. Successful secular groups often incorporate unverifiable elements into their ideologies, such as “brotherhood” and “liberty,” both of which are commonly trumpeted in fraternities and militaries. The ability of religious practices to evoke emotional experiences that can be associated with enduring supernatural concepts and symbols differentiates them from secular rituals, badges, and bans and may explain why they achieve greater long-term commitment and cooperation, as was evidenced in our sample of nineteenth-century communes.

Further research has extended these historical results to modern communes in Israel known as *kibbutzim*. For most of their 100-year existence, *kibbutzniks* (i.e., *kibbutz* members) have lived according to the dictum, “From each according to his abilities, to each according to his needs.” While 16 *kibbutzim* are religious, the majority of *kibbutzim* are secular and often ideologically antireligious. Similar to their historical predecessors in the United States, religious *kibbutzim* on average have been economically more successful than secular *kibbutzim*. Currently, the *kibbutzim* are undergoing significant change, largely in the direction of increased privatization and reduced communality. This is a consequence of a massive economic failure that saw the *kibbutzim* collectively fall over \$4 billion in debt. When news of their extraordinary debt surfaced in the late 1980s, what went largely unnoticed in the academic and media reports about the inevitable collapse of the *kibbutz* movement was that the religious *kibbutzim* had achieved economic stability. In the words of the Religious *Kibbutz* Movement Federation, “The economic position of the religious *kibbutzim* is sound, and they remain uninvolved in the economic crisis” that has affected so many of the *kibbutzim*. In fact, they have on average economically outperformed the secular *kibbutzim* in every

decade of their existence (Fishman & Goldshmidt, 1990). The economic success of the religious kibbutzim is especially remarkable given that many of the religious practices performed on the religious kibbutzim inhibit economic productivity. For example, Jewish law does not permit Jews to milk cows on the Jewish Sabbath. Although rabbinic rulings have permitted these religious kibbutzniks to milk their cows to prevent the cows from suffering, in the early years of the religious kibbutzim none of this milk was used commercially. There are also significant constraints imposed by Jewish law on agricultural productivity. Fruits are not allowed to be eaten during the first several years of the life of a tree, agricultural fields must lie fallow every seven years, and the corners of fields can never be harvested but must be left for society's poor. Although these constraints appear detrimental to the productivity of the religious kibbutzim, costly signaling theory suggests that they may actually be their key to economic success.

I decided to study this further with economist Bradley Ruffle from Israel's Ben Gurion University. We conducted experiments on secular and religious kibbutzim aimed at measuring cooperative behavior in order to determine if there were differences across kibbutzim in members' levels of cooperation with other members of their own kibbutz (Ruffle & Sosis, 2005; Sosis & Ruffle, 2003, 2004). Controlling for effects such as the age of the kibbutz, level of privatization, size of the kibbutz, and numerous other variables, we found that religious kibbutzniks exhibit much higher levels of intragroup cooperation than secular kibbutzniks. Furthermore, when the data were examined more closely, an interesting pattern emerged. Religious males were significantly more cooperative than religious females. Among secular kibbutzniks, we found no sex difference at all. This result is understandable if we appreciate the types of rituals and demands imposed on religious Jews. Although there are a variety of requirements that are equally imposed on males and females, such as keeping kosher and not working on the Sabbath, male ritual requirements are largely publicly oriented, whereas female requirements are generally pursued privately or in the home. Indeed, the three major requirements imposed on women—the laws of family purity (e.g., attending a *mikveh*, or ritual bath), separating a portion of dough when baking bread, and lighting Shabbat candles—are done privately. They are not rituals that signal commitment to a wider group; they appear to signal commitment within the family. Males, on the other hand, engage in highly visible ritual requirements, most notably public prayer, which occurs three times daily. Among male religious kibbutz members, we found synagogue attendance to be positively correlated with our measures of cooperative behavior. There was no similar correlation among females, which is not surprising; attending services is not a requirement for women and thus does not serve as a signal of commitment to the group. Thus, the costly signaling theory of religion is able to offer a unique explanation for our results.

While these studies focused on how communities overcome the free-rider dilemmas surrounding cooperative resource acquisition and consumption, throughout our evolutionary history individuals have faced an array of other collective action problems, most notably warfare and defense, which likely pose the greatest free-rider problems in human communities. As Steven Pinker (1997), the celebrated linguist and evolutionary psychologist remarks, “A war party faces the problem of altruism par excellence. Every member has an incentive to cheat by keeping himself out of harm’s way and exposing others to greater risk” (p. 626). The ethnographic literature on warfare is replete with examples of men who defect en route to an attack or raid (e.g., Chagnon, 1997). Each individual that defects on a warring party places the remaining members at greater risk of injury or death. Thus, when warfare is frequent within a society, reliable signals of intragroup commitment, such as religious practices, should be highly favored by selective mechanisms.

To evaluate whether costly behaviors and badges were associated with warfare frequency or, alternatively, associated with cooperative resource production and consumption, I conducted a cross-cultural study with University of Connecticut colleagues Howard Kress and James Boster (Sosis, Kress, & Boster, 2005). Using ethnographic sources, we collected data from 60 geographically dispersed societies on the costs of religious practices, intensity of cooperative food production and consumption, warfare frequency, and a host of other control variables. As expected, we found that warfare frequency was the strongest predictor of the costliness of a society’s male rites. Moreover, we demonstrated that the types of religious practices that have been favored as commitment signals depend on the nature of warfare prevalent within a society. In societies in which internal warfare (fought within a cultural grouping) is common, communities continually fission and fuse; thus, an enemy one day may be an ally the next. Because of the mobility of individuals across kin groups and consequent shifting of alliances, individuals within communities that engage in frequent internal warfare should not be willing to submit to rituals that leave permanent badges, such as tattoos or scars, which can signal group identity. Indeed, we found a negative correlation between frequency of internal warfare and permanent badges, and in societies where internal warfare was prevalent, there was a greater reliance on nonpermanent rituals and badges, such as ingesting toxic substances and body painting. On the other hand, warfare fought against other cultural groups, referred to as external warfare, poses alternative problems. Groups engaged in external warfare are concerned about uniting unrelated males and fielding as large a combat unit as possible. When imbalances of power occur within a region, smaller groups are at risk of their members defecting to larger and more powerful groups. For these communities, permanent badges would serve to minimize the ability of men to abscond to another group. And, indeed, our results showed a positive correlation between external warfare and permanent badges, such as

scars, tattoos, and subincisions. Overall, our result offers strong support for the thesis that costly male rites emerge to signal commitment and promote solidarity among males who must organize for warfare.

REMAINING MYSTERIES AND CEREMONIAL CONCLUSIONS

While signaling theory has thus far offered some compelling insights into understanding the evolution and diversity of religious practices, numerous questions remain. Among the most significant of these is why signals remain so costly in tight-knit populations where interactions are regularly repeated. Under conditions where individuals interact repeatedly, theorists have shown that reputation and punishment mechanisms can maintain the reliability of signals while driving down their costs (Lachmann, Szamado, & Bergstrom, 2001; Silk, Kaldor, & Boyd, 2000). In religious communities that remain isolated from mainstream populations, such as the Haredim, reputations are vital for cooperative interactions, and punishments are efficiently and successfully implemented. Nonetheless, despite effective reputation and punishment mechanisms in sects, cults, and other closed religious groups, it is in these communities that the costliest religious signaling tends to occur. This may suggest that the signals are less important for communicating group commitments to fellow community members but rather serve to indicate their commitments to coreligionists who reside in disparate communities and thus interact infrequently (Sosis, 2005). In addition, they may function as signals to non-group members. Religious displays can often stigmatize individuals limiting outside opportunities, as noted previously, but they can also confer benefits when outsiders view religious practices as signs of cooperativeness and trustworthiness. For example, Frank (1988) observes that affluent New York City families place advertisements in the newspapers of Salt Lake City for Mormon governesses for their children. Apparently, “persons raised in the Mormon tradition are trustworthy to a degree that the average New Yorker is not” (p. 111).

To conclude, let’s return to our initial questions: What do religious behaviors, badges, and bans communicate, and why are they effective signals? The three B’s primarily communicate group commitments, but in addition they indexically signal acceptance of the community’s moral codes. They are effective signals because their costliness ensures their reliability. Adherents are able to endure their costliness because repeated performance of religious activities can foster belief in the theologies, which provide enduring meaning for the practices by arousing emotions and generating dissonance. Various universal characteristics of religious behaviors, badges, and bans, such as their formality and repetitiveness and that they are physically and publicly performed, also facilitate internalizing supernatural beliefs. Internalizing

beliefs increases the perceived net benefits that adherents encounter when fulfilling religious obligations, including cooperative relations with coreligionists.

We have just begun to evaluate the merit of signaling theory as a lens through which we can discern the selective pressures that have favored religious practices in the human lineage. The value of the theory, however, is not limited to its evolutionary insights. Much more pressing than evolutionary reconstruction is explaining current patterns of religious practice, including new age, fundamentalist, as well as secular trends. It is hoped that further work on the costly signaling theory of religion will provide us with insights about how these trends vary across societies and the ways in which communities use religious behaviors, badges, and bans to promote trust, commitment, and cooperation.

REFERENCES

- Alcorta, C., & Sosis, R. (2005). Ritual, emotion, and sacred symbols: The evolution of religion as an adaptive complex. *Human Nature, 16*, 323–359.
- Atran, S. (2002). In *Gods we trust: The evolutionary landscape of religion*. Oxford, England: Oxford University Press.
- Atran, S., & Norenzayan, A. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences, 27*, 713–770.
- Berman, E. (2000). Sect, subsidy and sacrifice: An economist's view of Ultra-Orthodox Jews. *Quarterly Journal of Economics, 115*, 905–953.
- Bliege Bird, R., & Smith, E. (2005). Signaling theory, strategic interaction, and symbolic capital. *Current Anthropology, 46*, 221–248.
- Bryson, B. (2003). *A short history of nearly everything*. New York: Broadway Books.
- Bulbulia, J. (2004a). Area review: The cognitive and evolutionary psychology of religion. *Biology and Philosophy, 18*, 655–686.
- Bulbulia, J. (2004b). Religious costs as adaptations that signal altruistic intention. *Evolution and Cognition, 10*, 19–38.
- Carr, J., & Landa, J. (1983). The economics of symbols, clan names and religion. *Journal of Legal Studies, 13*, 135–156.
- Chagnon, N. (1997). *Yanomamo*. Fort Worth, TX: Harcourt Brace College Publishers.
- Chen, D. (2005). Club goods and group identity: Evidence from Islamic resurgence during the Indonesian financial crisis. Unpublished manuscript.
- Coleman, J. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.
- Cronk, L. (1994). Evolutionary theories of morality and the manipulative use of signals. *Zygon: Journal of Religion and Science, 29*, 32–58.
- d'Aquili, E., & Newberg, A. (1999). *The mystical mind*. Minneapolis, MN: Fortress Press.
- Ekman, P., Levenson, R., & Friesen, W. (1983). Autonomic nervous system activity distinguishes among emotions. *Science, 22*, 1208–1210.

- Finke, R., & Stark, R. (1992). *The churching of America, 1776–1990: Winners and losers in our religious economy*. New Brunswick, NJ: Rutgers University Press.
- Fishman, A., & Goldschmidt, Y. (1990). The orthodox kibbutzim and economic success. *Journal for the Scientific Study of Religion*, 29, 505–511.
- Frank, R. (1988). *Passions within reason: The strategic role of the emotions*. New York: Norton.
- Galanter, M. (1999). *Cults: Faith, healing, and coercion*. New York: Oxford University Press.
- Glucklich, A. (2001). *Sacred pain*. New York: Oxford University Press.
- Iannaccone, L. (1992). Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. *Journal of Political Economy*, 100, 271–291.
- Iannaccone, L. (1994). Why strict churches are strong. *American Journal of Sociology*, 99, 1180–1211.
- Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 292–309). New York: Russell Sage Foundation.
- Irons, W. (2004). An evolutionary critique of the created co-creator concept. *Zygon: Journal of Religion and Science*, 39, 773–790.
- Johnson, D., & Kruger, O. (2004). The good of wrath: Supernatural punishment and the evolution of cooperation. *Political Theology*, 5(2), 159–176.
- Lachmann, M., Szamado, S., & Bergstrom, C. (2001). Costs and conflict in animal signals and human language. *Proceedings of the National Academy of Sciences of the United States of America*, 98, 13189–13194.
- Levenson, R. (2003). Blood, sweat and fears: The autonomic architecture of emotion. In P. Ekman, J. J. Campos, R. J. Davidson, & F. B. M. de Waal (Eds.), *Emotions inside out* (pp. 348–366). New York: New York Academy of Sciences.
- Maynard Smith, J., & Harper, D. (2003). *Animal signals*. Oxford, England: Oxford University Press.
- Pesternak, V. (1988). Recruitment and commitment. *Society*, 25, 48–51.
- Pinker, S. (1997). *How the mind works*. New York: Norton.
- Poole, J. (1989). Announcing intent: The aggressive state of musth in African elephants. *Animal Behaviour*, 37, 140–152.
- Rappaport, R. (1971). The sacred in human evolution. *Annual Review of Ecology and Systematics*, 2, 23–44.
- Rappaport, R. (1999). *Ritual and religion in the making of humanity*. Cambridge, England: Cambridge University Press.
- Robbins, T., & Anthony, D. (1982). Religious movements and the brainwashing issue. In K. Levi (Ed.), *Violence and religious commitment* (pp. 133–138). University Park: Pennsylvania State University Press.
- Ruffle, B., & Sosis, R. (2005). Does it pay to pray? Evaluating the economic return to religious ritual. Unpublished manuscript.
- Silk, J., Kaldor, E., & Boyd, R. (2000). Cheap talk when interests conflict. *Animal Behaviour*, 59, 423–432.
- Sosis, R. (2003). Why aren't we all Hutterites? Costly signaling theory and religion. *Human Nature*, 14, 91–127.
- Sosis, R. (2004). The adaptive value of religious ritual. *American Scientist*, 92, 166–172.

- Sosis, R. (2005). Does religion promote trust? The role of signaling, reputation, and punishment. *Interdisciplinary Journal of Research on Religion*, 1, 1–30.
- Sosis, R., & Alcorta, C. (2003). Signaling, solidarity and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, 12, 264–274.
- Sosis, R., & Bressler, E. (2003). Cooperation and commune longevity: A test of the costly signaling theory of religion. *Cross-Cultural Research*, 37, 211–239.
- Sosis, R., Kress, H., & Boster, J. (2005). Scars for war: Evaluating alternative explanations for cross-cultural variance in ritual costs. Unpublished manuscript.
- Sosis, R., & Ruffle, B. (2003). Religious ritual and cooperation: Testing for a relationship on Israeli religious and secular kibbutzim. *Current Anthropology*, 44, 713–722.
- Sosis, R., & Ruffle, B. (2004). Ideology, religion, and the evolution of cooperation: Field tests on Israeli kibbutzim. *Research in Economic Anthropology*, 23, 89–117.
- Stark, R. (1987). How new religions succeed. In D. Bromley & P. Hammond (Eds.), *The future of new religious movements* (pp. 11–29). Macon, GA: Mercer University Press.
- Tuzin, D. (1982). Ritual violence among the Ilahita Arapesh. In G. H. Herdt (Ed.), *Rituals of manhood: Male initiation in Papua New Guinea* (pp. 321–356). Berkeley: University of California Press.
- Zahavi, A., & Zahavi, A. (1997). *The handicap principle: A missing piece of Darwin's puzzle*. New York: Oxford University Press.

NATURE'S MEDICINE: RELIGIOSITY AS AN ADAPTATION FOR HEALTH AND COOPERATION

Joseph Bulbulia

INTRODUCTION

Many people express religious commitments, and these commitments strongly influence how they lead their lives. In this chapter, I discuss two hypotheses about the biological functions that strongly motivating religious commitments may serve. The first hypothesis is the healing placebo hypothesis, that religiosity evolved as a mechanism for self-healing—if you will, as nature's medicine. The second hypothesis is the costly signaling hypothesis, that religiosity evolved as a hard-to-fake signaling system to motivate trust, solidarity, and cooperation among nonkin in the ancestral world. I hope to show that by integrating these two hypotheses, we can gain a new understanding to the psychological design that equips us for religious thought and behavior.

“Religion” and its cognates are contested terms, but in science we can operationally define our meanings in ways that depart somewhat from ordinary language (Chomsky, 2000). By “religiosity,” I am interested in motivating commitments to supernatural beings, powers, and places as well as dispositions to form these beliefs. Departing from common usage somewhat, I will call all such supernatural objects “gods.”¹ Lots of us believe in supernatural realities—gods—and why this is so presents one of the most fascinating and underexamined questions in the naturalistic study of our species. Yet it is far from obvious how selection could have tolerated dispositions to beliefs and practices relative to supernatural worlds for selection is intolerant of excess.

Knowing only that organisms inhabit a hostile world, it is surprising that blind evolutionary processes did not rapidly eliminate religious inclinations from ancestral populations.² Whether or not the gods exist, it is far from clear how we should have evolved to believe in them. Indeed, because selection is interested only in how organisms interact with nature, it is surprising that we could have evolved anything but strong skepticism to any nonnatural reality. Yet, far from it, we are almost fated to costly god commitment from birth. Protoreligiosity appears early in childhood development, even before external cultural scaffolding has been laid (Evans, 2001), and endures at least until early adolescence, even in strongly secular environments (Kelemen, 2004). Moreover, religions are found everywhere, even in scientifically advanced societies (strikingly so in the case of the United States and Japan) and in isolated cultural lineages. Given the pervasiveness of religion and its developmental prominence, I suggest that religiosity cannot be fully explained through cultural processes—for example, as the by-product of “meme” lineages (Blakemore, 2000; Dawkins, 1976). As one prominent developmental psychologist expresses it, “we are born to believe” (Bering, personal communication; but see Dennett, 2006). While full-blown religion is modulated through local contexts, the capacity for religion appears to be invariant, a dimension of biological endowment (for discussion, see Bulbulia, 2005). How did our religious inclinations become ingrained in human nature?

One plausible hypothesis is that religiosity evolved to foster placebo health (McClenon, 1997, 2002). “Placebos” are beliefs and attitudes whose nonspecific causal properties make us better. I want to consider the hypothesis that selection amplified dispositions to believe in gods because such beliefs helped our ancestors live longer and healthier, leaving more god-believing progeny. On this hypothesis, religious beliefs are placebos, and religion evolved because the salubrious effects of religious commitment outstrip the associated costs. Isn’t it just obvious that religion is a sugarcoated pill that helps people overcome all that life throws at us? Not at all.

First, it seems that the psychological mechanisms that underlie and prompt religiosity are very poorly suited to producing good health. Unlike three-dimensional vision, aerobic metabolism, or language competence, religious cognition does not manifest uncontested design—certainly not for restoring health or combating pathogens. Very few competent medical practitioners today would recommend posturing around a temple as medically indicated when sick. “The doctor asked me to take two aspirins and endure a religious circumcision” sounds like the punch line to a bad joke. Contrasting religion with the lymphatic system or the elegant design of the white blood cell illustrates how badly contrived religiosity seems to be for healing. Indeed, sacrificing livestock before statues and worshipping the sky are practices that seem *contrary* to effective health maintenance, a point to which I will return repeatedly in this chapter for religious practice is costly in ever so many ways.

Indeed, the costs of religion are so extreme that a vocal minority of naturalists view religion as itself a variety of illness. On their view, religion is a form of mental harm—barking madness—caused when our brains become infected by compelling but rationally disabling ideas or “memes.” Religious ideas swamp the psychological faculties of religious agents because they are ruthlessly successful at reproducing and spreading. Religious ideas are adapted but for their own success, not ours. And so religious living is a condition lacking an intrinsic connection to human flourishing (Dawkins, 1976).

Nevertheless, the data on religion and health challenge Dawkins’s view and more generally the view that religion is not intrinsically healthful. In an impressive, systematic review of more than 1,600 articles on religion and health, Koenig and colleagues observe that religious commitment and ritual participation correlate with marked improvements to physical well-being. In their own words:

The majority of studies indicate that religiousness is associated with less coronary artery disease, hypertension, stroke, immune system dysfunction, cancer, and functional impairment, fewer negative health behaviours (e.g., smoking, drugs and alcohol abuse, risky sexual behaviours, and sedentary lifestyle), and lower overall mortality. (Koenig, McCullough, & Larson, 2001, p. 394)

Moreover, with respect to mental health, the authors conclude:

In the majority of studies, religious involvement correlated with:

- Well-being, happiness, and life satisfaction
- Hope and optimism
- Purpose and meaning in life
- Higher self-esteem
- Adaptation to bereavement
- Greater social support and less loneliness
- Lower rates of depression and faster recovery from depression
- Lower rates of suicide and fewer positive attitudes toward suicide
- Less anxiety
- Less psychosis and fewer psychotic tendencies
- Lower rates of alcohol and drug use or abuse
- Less delinquency and criminal activity
- Greater marital stability and satisfaction. (p. 228)

True, the data do not point unequivocally to an adaptive design. Benefits accrue unevenly to different forms of religiosity and practice (Park, Cohen, &

Herb, 1990) and to different age-groups (Neighbors, Jackson, Bowman, & Gurin, 1983), and some studies suggest that religiosity may exacerbate stress as well (Strawbridge, Shema, Cohen, Roberts, & Kaplan, 1998). (For discussion of the costs and benefits of religiosity, see Pargament, 2002.) Obviously, the following equations are too simplistic:

1. religiosity = good health
2. more religiosity = more good health

Also true, we must take care in any adaptationist extrapolation from the positive data. Most empirical studies on religion and health have been conducted in North America and Europe, yet the life conditions of first-world nations are substantially different to those of our hunter-gather ancestors. The health effects of religion may therefore be due to some aspect of modern culture not directly related to religion. For example, religious persons may have better access to medicine and health care. More basically, religious persons may be genetically predisposed both to religion and to good health or may express deeper personality traits that cause them to refrain from novel, unhealthy lifestyles as well as to worship at the altar. To test these relationships among foragers, we require controlled experiments, yet it is difficult to run such experiments because such communities are exceedingly rare in “McWorld.” Perhaps most important, such communities tend to be religiously homogeneous, rendering randomized trials more difficult (Lee & DeVore, 1999). So, even if we could find participants, we would lack many of the proper controls. The case for a salubrious adaptation here, if it can be made at all, needs to be carefully constructed, not assumed. We cannot read an adaptive psychological design off these data alone.

However, the evidence that Koenig et al. (2001) produce is nevertheless interesting, for it runs contrary to what naturalists might expect. Given the costs of religious practice, it is surprising anyone benefits from it at all. Moreover, there is a fair amount of anecdotal evidence that religious healing is part of our ancestral way of living (Koenig et al., 2001; McClenon, 2002). Richard Katz’s excellent studies on the ecstatic healing dance of the Khoisa (!Kung) illustrate both the importance and the perceived success of supernatural healing rituals among these foragers.³ At the center of !Kung social life is the healing dance, which occurs several times a month (depending on need and season). In this ritual, the entire community gathers in song and dance at a fire, and healing shamans enter trance states. The !Kung believe that these states allow healers to release a spiritual healing energy from the gods called *num*. Moreover, shamans are thought to travel to otherworldly sky realms to debate with ancestor spirits over the lives of those threatened by illness. The shamans then lay their hands over patients, who report experiences that Katz characterizes as profoundly religious. And patients describe healing success through the

experience of a shaman's ordeal. Katz observes that this common healing ritual performs multiple functions in !Kung social life: "The full range of what in the West would be called physical, psychological, emotional, social, and spiritual illnesses are treated at the healing dance" and "Nearly every !Kung . . . can describe how the healing dance has cured someone" (Katz, 1984, p. 54; see also Katz, Biesele, & St. Denis, 1997). I will return to !Kung healing ritual later in this chapter, for it raises many intriguing questions about the diverse social functions the ritual serves. For now, it is enough to note that when we observe foraging communities—glimpsing at our ancestral lifeways—we notice that a central focus of religious life has always been healing practice (Eliade, 1972).

Our own recent recorded history tells a similar story of interconnection between religious and healing practice. Mesopotamian medicine of the fourth century B.C.E. merged supernatural and natural elements, treating illness through magic and various herbal remedies. Ancient Chinese healing practitioners viewed disease as chaos caused by malevolent spirits who must be pacified, another common theme among foragers and premodern pastoral communities. In the Hebrew tradition, God is envisioned as the supreme cause of all to well-being: "I put to death and I bring to life, I have wounded and I will heal, and no one can deliver out of my hand" (Deuteronomy 32:39; for discussion, see Prioreshi, 1995, cited in Koenig et al., 2001, chap. 2). In sum, our recent and deep history suggests that we are a faith-healing primate.

But how could religiosity strongly buffer religious agents from poor mental and physical health and early death? One obvious candidate is chemically efficacious healing technology in traditional medicines maintained and transmitted through priestly classes. Perhaps religious castes partially invent and improve specialized chemical technologies that sustain health. It is worth considering whether religious healing flows from hominid "cognitive niche construction" (Odling-Smee, Laland, & Feldman, 2003). For we do not merely respond to the world, we actively alter it, rendering our environments more stable and suitable for our reproductive interests, for ourselves, and, with downstream cumulative effects, for our progeny. Consider how the invention of antibiotics forever altered the evolutionary dynamic of our encounter with bacteria. It may well be that some religious healing draws on medical technologies—real, causally effective technologies—that are retained and enhanced through cultural improvement and transmission. On this scenario, religious beliefs and practices don't heal directly, just as hospitals don't heal directly. Like a hospital, religious institutions could be best described as vehicles for administering good, causally efficacious therapies and drugs.

It is surely plausible that religious healing intermingles with effective medical technology. For example, it would be unsurprising to learn of cases where shamans are taught to apply herbal remedies, later discovered to be powerful antibiotics and so on (an idea brilliantly explored in Dennett, 2006, chap. 5).

Yet this story cannot generalize to all religious healing and certainly cannot explain all aspects of religiosity (strong motivating beliefs in demons, statue worship, tattooing, self-immolation, celibacy, and so on). Indeed, the list of the drugs employed by healers in near recorded history includes skull moss, viper's flesh, crab's eyes, live frogs and worms, fox lung, oil of brick, ants and wolves, arsenic-coated mummy wrappings, saliva of a fasting man, bile, and other disgusting and dangerous substances (Shapiro & Shapiro, 1997, pp. 13–14). Many such “remedies” are very toxic. Consider the health effects of dehydrating a sick infant or subjecting someone with a headache to arsenic therapy (as happened in the medieval period). After surveying thousands of ancient medicines and treatments, Shapiro and Shapiro (1997) conclude, “The panorama of treatment since antiquity provides ample support for the conviction that, until recently, the history of medical treatment is essentially the history of the placebo effect” (p. 13).

So the interesting case to consider is whether religiosity forms an effective part of therapy *even apart* from those chemically effective medical niches we construct. How can religious healing help us if not through a deployment of remedies with intrinsic health-giving qualities?

James McClenon's recent book on the evolution of religious healing argues that shamans cure by inducing forms of religious consciousness with placebo-producing powers (McClenon, 1997, 2002). On McClenon's view, we have evolved a susceptibility to altered states of awareness—forms of “hypnotic” consciousness—because these states unleash the body's natural healing powers.⁴

I want to examine the core of McClenon's hypothesis, namely, that religious commitment evolved because religious beliefs help us to heal ourselves. While this hypothesis is a good start, it needs to be stated in a way that (1) enables us to understand the underlying causal mechanism behind religious placebos and (2) test for their presence (Bulbulia, 2003a). For to say that religion heals through placebo effects does not bring us to an understanding for why *religion* heals rather than secular placebos. We also need to understand whether this explanation can generalize to cover the hard cases of religious expression—instances where religious practice appears to be deliberately risky or terrifying. Believing that the lung of a fox will heal me and then getting better is a candidate instance for placebo explanation. Believing in Judgment Day, ritually chopping bits of my penis off, and consuming the flesh and blood of the deity seem far removed from health. Can McClenon's theory generalize to these cases? Indeed, how was healing religiosity tolerant of these cases?

As a means to understanding religious placebo healing, I suggest considering very generally how getting the world wrong can sometimes

make us better. From here, we will see how it is possible that through error—but only ever so subtle error—religious consciousness is able to heal.

THE ARCHITECTURE OF RELIGIOUS ERROR

At the outset, I assumed that (1) religiosity is a dimension of human nature and that (2) religiosity errs. Naturalist raised on Darwin will notice the problem. The central nervous system evolved to regulate internal states and to track, negotiate, and manipulate objects and agents in distal environments (Godfrey-Smith, 1996, 2002). Brains are metabolically costly artifacts of design and so must pay their way. Yet what advantage could there be to getting the world wrong? Consider the ancestral forager who falsely believes that there is no tiger in a bush or mistakenly estimates the resources necessary for a mountain crossing. Even when not deadly, error brings opportunity costs, and these surely harm. For why contemplate pies in the sky when we could be hatching earthly plans for success? We need to explain how selection could have tolerated religious dispositions in our species, for with them we drag heavy reproductive anchors.

Many Darwinians (indeed Darwin himself [Darwin 1871/1981, pp. 67–69]) resist thinking of religion as an adaptation. Instead, they use evolutionary cost-benefit analysis in one of the following two ways.

First, selection may tolerate perceptual error within adaptive thresholds. We are animals, not angels, and as such are limited in our ability to know the world. Consider the rain dance and all the epistemic problems that surround it. A useful heuristic in this case may be, “When in doubt, believe what everyone else does” or “Believe what successful people believe,” for such a rule is on average going to bring success. But it is also a rule that can easily perpetuate error; superstitions are dangerous sinks that cultural agents may fall into. However, as long as error is on average not too costly—dance, but not to the exclusion of a decent fallback plan and so on—a design manifesting error may creep in. On this scenario, religiosity has low error costs when compared to the benefits of the more basically helpful culture-equipping heuristics that drive it (Atran, 2002; Barrett, 2000; Boyer, 2001; Dennett, 2006).

Second, precisely because we are fallible creatures, selection may actively foster an error-prone design. For wherever the costs of false positives are lower than the costs of true negatives (or lower than the costs of a perfect design, if evolvable), selection will err on the side of caution, actively promoting tendencies for cautious mistakes. I may want to know whether the rustling in that bush is caused by a viper, but given my epistemic situation, I can’t tell, so I hedge my bets conservatively and jump at the wind. Caution may simply be more efficient and thus more evolvable

than perfection (Sterelny, 2003). Some naturalists view religious errors as emerging from an actively cost-prone psychological design—an architecture wired for safety, not accuracy (Atran, 2002; Guthrie, 1993, 2001).

Whatever the explanatory preference, there are plausible by-product or “spandrelist” options for explaining religious errors (but see Bering, 2004).⁵ However, the data seem to me to favor a third hypothesis.

We know that, when structured, error itself may bring powerful reproductive advantages to an error-prone organism. It is not merely that error is tolerated or actively promoted for caution’s sake. Rather, actively distorting the world may be intrinsically beneficial to duped organisms. Strange though it may seem in a Darwinian world, there are circumstances where error itself is inherently more beneficial than accuracy. In our own lineage, these circumstances have provided a stable, recurring platform from which selection has been able to trial, develop, and preserve an intricate error-prone psychological design.

Consider moralist self-deception. Trivers (2001) notes that tendencies to misconceive one’s moral goodness and competence may advance one’s self-interest and so benefit a deception-prone agent more than high-fidelity assessment. Suppose Bob wishes to convince Barbara that he is trustworthy and reliable. Suppose further that Bob has not always been so “beneffective” in the past. An accurate assessment of Bob’s value may be “4 percent reliable and 2 percent effective”—Bob is well and truly, let us suppose, an unreliable ass. With this knowledge, Barbara should not have much confidence. Thus, all things equal, Bob’s optimal strategy will be to deceive. One path to deception is to lie, uttering a locution like “I am very effective and totally reliable.” But knowing this cheap, obvious strategy, Barbara will scrutinize the available evidence. One key information channel comes through Bob’s expressions and postures. Although we may sometimes deceive with words, our emotions—including their manifestations in our vocal patterns—give reliable evidence to the lie (Frank, 1988). Audiences search faces, postures, and intonations for emotional sincerity, which is hard to fake.⁶ Emotional responses resist active manipulation because they are processed in limbic brain, thus removed from the neocortical areas that enable self-conscious facial and bodily control (Ramachandran & Blakeslee, 1998). So where deception is self-conscious, the risk is for audience scrutiny to eventually uncover the fraud.

Now imagine that Bob’s self-judgment is biased to favor his goodness and reliability. Suppose he successfully blots out the past and convinces himself he is worth Barbara’s while. Bob is self-deceived. But his self-deception serves his self-interest. For being deceived, he may better deceive others and secure exchange. Bob’s mistaking his own virtues has strategic value. Believing self-inflating falsehoods about himself helps him secure valuable exchange with Barbara, at least initially, before a new

record of unhelpfulness uncovers the deceit (Trivers, 2001).⁷ We can compare the outcomes:

ACCURACY VS. STRATEGIC SELF-DECEPTION

Judgment	Display Options	Outcome
I am 4 percent trustworthy and 2 percent effective	1. Lie ineffectively or 2. Tell a scary truth	No friends
I am 100 percent beneffective	Trustworthiness	Friends (at least initially)

Suppose, plausibly, that

$$\text{Average fitness effects of outcome [no friends]} < \text{Average fitness effects of outcome [friends (at least initially)]}$$

Then, all things equal, selection will ratify tendencies to self-deception as a form of strategic investment in exchange futures.

I discuss Trivers's analysis because it illustrates a variety of what I shall now call *adaptive error*, a cognitive strategy to deceive oneself. Clearly, the evolution of adaptive error is bound by powerful empirical and developmental constraints. For errors to be adaptive, they must be managed. Unpacking these constraints is precisely what an adaptationist approach to religiosity requires. For with an optimal psychological design in hand, adaptationists can begin to look for evidence of such a design and further psychological intricacy.

One very general constraint is *assessment confidence*: adaptive error works best when agents remain unaware of the error. To the extent that Bob is conscious of distortion and bias, he will be less deceived and thus less effective at deceiving others. On the other hand, the more fully Bob is able to convince himself of his worth, the more effective his deceit will be. Self-deception works best when buried from consciousness. We can see how this constraint plays out in other problem domains. Consider another case of functionally benefiting error: optimism in abysmal circumstances. Imagine that Jane finds herself shipwrecked at sea and that prospects are grim. Given the rest of Jane's cognitive design, a likely response would be, "Yikes, I'm shark bait." Such panic may well trigger a cascade of unhealthy physical and metabolic responses—for example, shark-attracting thrashing. However, Jane's optimistic belief that someone will find her, however unfounded, may indeed provide her best chance for survival. For in calming herself, she can devise and then hatch a plan. If Jane requires that a false estimation of her prospects is to save herself, then a disposition to this form of error on slender or zero evidence would be adaptive. This example is just an idealization. It is doubtful whether surviving

shipwrecks constituted a stable, long-enduring task repeatedly faced by our ancestors throughout the vast epochs of evolutionary history. Yet it is most certainly true that abysmal situations of this kind were common throughout the environments of evolutionary adaptation. Given functional discrimination between situations where action can bring benefit and those where it cannot, selection will favor optimistic tendencies to a high degree of certainty no matter how deplorable the objective odds. For when caught out, it is generally important to keep your head, even if doing so requires the illusion that prospects aren't so bad.

Such distortion operates under a further constraint: (2) *specialization of error to a strategic problem domain*. Again let's consider Bob. Although self-deceived, Bob must not get everything about himself wrong. He must not accidentally shut down his liver—turning bright yellow to get Barbara interested—for such a response neither helps Bob nor appropriately interests Barbara. Nor should Bob convince himself that he is a former Tour de France champion (“Good to meet you, I'm Lance Armstrong”), as such a claim is readily falsified. Armstrong is a public figure. Nor should Bob hold his hand to the fire saying, “I will do anything for you Barb,” as the flesh melts away, for the harm is not offset by Barbara's interest in Bob for the spectacle. Instead, Bob's inferences must converge to the conclusion that he is decent and trustworthy, this as a way to getting others to think the same. Deception and bias are directed to inferences about goodness and effectiveness. This point about specialization generalizes to any disposition to adaptive error. At sea, it is important that optimism relates to the prospects of rescue. Global optimism about the New York Yankees, oil futures, or peace on earth is irrelevant, for it does not mitigate Jane's rather maladaptive thrash-and-panic response. We can see that adaptive errors must be specially configured to particular tasks. It must not, for example, rely on a generalized dumbing down of our cognitive systems.

Finally, deception works best when motivationally insulated from other problem domains, that is, through (3) *encapsulation constraints*. Bob's unjustified self-confidence should not flow into other task-solving arenas. Accurate, reliable self-assessment is generally helpful. When contemplating a desert crossing or estimating foot speed relative to a gaining predator, Bob had better assess his abilities rightly. At sea, optimism should not interfere with Jane's waving and screaming loudly when a ship comes into view. The error that one will be saved must be quickly forgotten when planning how to get out of a bind. Where evolvable, compartmentalized deception will be favored over forms that make information globally available to other problem domains. Adaptive errors can't bleed; they need to be contained.

Applying informal task analysis to adaptive error helps us to understand more precisely how dispositions to error are structured to possess biological functionality. For such analysis reveals how through biasing and distorting

information strategically, we may better manipulate ourselves and other agents to promote our interests. Such qualitative analysis also places more formal quantitative analysis within reach. Once we have defined the constraints under which adaptive error operates, we can develop models predicting the degree to which agents are aware of their errors, how targeted those errors are, and how far they are encapsulated from other problem domains where they may harm. And we can search for evidence able to test our hypotheses.⁸

For now, we can see how evolutionary pressures may target and amplify dispositions to error. Where *FACT* is the average fitness effect of a disposition to form accurate judgments of the world and *ERROR* is average fitness effect of a structured misunderstanding of the world, then selection will tend, all things equal, to ratify *ERROR* where $ERROR > FACT$.⁹

So far I have shown very generally how specialized tendencies to error can manifest design when subject to constraints. The hard part lies ahead. For the question we face is how religious errors are capable of healing, and there are no easy answers.

A SKETCH OF AN OPTIMAL PSYCHOLOGICAL DESIGN FOR RELIGIOUS HEALING

Let's focus on the placebo argument that McClenon develops—tendencies to religious/hypnotic experience are embedded in our natures because the practices that produce and rely on religious experience unleash placebo responses. How might such a system have evolved? One plausible pathway to the evolution of religious error is through *stress mitigation*. Consider the data. Countless studies suggest that psychological stress adversely affects health (for a review, see Rabin, 2002). Yet religiosity can help mitigate psychological stress, for religious beliefs often paint the world to be a less stressful place than it is, and religious practices calm us (Newberg, d'Aquili, & Rause, 2002). Consider religious belief first: with religion, the half-empty cup is not merely half full; it is mistakenly perceived to be full. Half the water, as it were, is projected into the metaphorical glass of life.

Stress typically emerges from particular judgments of how things stand in the world, judgments related to *stressors*. Bob looks at his bank account, believes that it accurately reflects his financial position, and sweats coldly. Again, when reflecting on the stable and enduring conditions of the ancestral environment, it is clear that ancestral life was replete with stressors. Whatever the landscape, culture, and epoch, Pleistocene environments were framed by threat, disability, disease, pain, loss, and suffering. Cosmides and Tooby (1992) have described the ancestral world as a camping trip that never ends. Yet life in the ancestral world was surely much harsher!—there was no first aid, few reliable medicines, no police or animal controls, no indoor heating, poor dentistry, high child mortality, and low life expectancy.¹⁰ In such a world, there

would have been ample scope for selection to act on our misapprehension of miserable reality. Call such mistakes “religious healing errors,” or RERRORS. Comparing outlooks:

STRESSFUL FACT VS. RELIGIOUS ERROR (RERROR)

Judgment	Response	Outcome
Stressful world	Dread, fear, malaise, anxiety, depression, despair, angst, lower immune function, elevated blood pressure, elevated triglycerides, elevated LDL cholesterol, etc.	Poor health
RERROR (healing religiosity)	Joy, hope, calm, optimism, courage, greater immune functioning, lower blood pressure, etc.	Good Health

If religious errors mitigate anxiety and anxiety is damaging, then it is at least plausible that RERROR > FACT and thus plausible that selection could have acted to promote such error. Getting the world wrong may help make us right. Moreover, religious outlooks at least sometimes frame the world in ways that provide hope. Here we have a candidate hypothesis, and we can grind this hypothesis through the more general constraints that face the evolution of *any* adaptive disposition to error.

First, given that error must be functionally specialized to adjust agents adaptively to specific problem domains, we can expect that RERROR will be functionally adjusted to the task of reducing damaging stress, that is, will be sensitive to healing problem domains. Culture supplies the relevant conceptual timber for placebo belief, and, though not unbounded, there are fairly elastic parameters to the conceptual configurations capable of generating optimistic outlooks. To consider a few examples:

1. RERROR = belief that stressors are unreal. For example, an agent believes that we live in a world of appearances, where the reality our senses convey is illusionary, concealing a deeper, truer, better, but less stressor-infested reality. Suffering is displaced when we appreciate that the cause of suffering is misunderstanding. Here the natural world is looked on as a house of mirrors. (Varieties of Buddhism express this view.)
2. RERROR = belief stressors are real but, in proper perspective, not genuinely stressful. For example, an agent believes that whatever happens, this real world is only passing, and that there is a better world to come, one lacking stressors. Although real, suffering is

viewed as only temporary. All is passing. (Varieties of Christianity express this view.)

3. RERROR = stressors are real but necessary for better life. For example, we interpret the slings and arrows of life as tests, which, if met with fidelity to God's way, leverage reward in a better life to come. Here the world is a ladder that, once climbed, may be thrown away. (Varieties of Western monotheisms.)
4. RERROR = stressors are real, but the gods or ancestors will help us combat them. For example, the gods have given us healing substance that we can use to fight disease. Here the gods are like antibiotics, real but hidden from view. (An understanding found in many Eastern and African religious outlooks.)

While the class of representational structures capable of animating a functional religious outlook appears to be fairly large, it is not unbounded. For example, RERROR must be vague enough to avoid easy empirical disconfirmation, lest assessment certainty wane. As with self-deceptive error, RERROR must not diminish sensitivity to stressors, for stress responses, though unpleasant, are generally adaptive. Hence, as with strategic self-deception, stress-mitigating judgments operate under powerful constraints, and a fuller evolutionary theory of religious healing must unpack them. Henceforth, call agents prone to RERROR *religious healers*. I now consider an optimal cognitive design for faith psychology, focusing only initially on individual health targets. I'll consider other functions and the role religious practice plays when I integrate this hypothesis with the costly signaling theory later.

Cognitive Complexity

Obviously, the faith system is constrained by substantial prior cognitive complexity. Religious healers must be capable of elaborate second-order reflection about their desires, circumstances, relationships, projects and plans, possible futures, the minds of other agents, and other intricate cognitive activity. In fact, it is in virtue of capacities for rich, decoupled representational thought that agents feel stress in the first place. We fear death because we have a robust concept of our individuality and of death as a prospect for us. We shouldn't expect, for example, the felines to believe in cat gods that will save them. Cats won't pray because they can't represent gods (as far as we know). Other constraints on the system are less obvious, though task analysis can help bring them into focus.

Assessment Confidence

We have seen before that the systems that control self-deception and moral supernatural outlooks are bound by assessment confidence. This parameter

also binds RERROR. An agent that doubts her healing religiosity is more likely to feel stress and anxiety and so, all things equal, is more likely to suffer damage. Where doubt corrodes adaptive functionality, religious beliefs optimized to health outcomes will tend to certainty. Suppose you live in a culture that relies heavily on supernatural healing practices. If the patient believes that “saliva and viper flesh will only make me sicker,” he will quite plausibly get sicker. Skepticism about the ability of a treatment to heal does not diminish the stress response, and a psychological design that channels information to mitigate skepticism can well be selected for. As I noted previously, religious therapies are frequently harmful—they are real and additional stressors!—though the less inclined agents are to notice, the better off they will be.

In an optimal psychological design, religious healers will seek and harbor evidence backing their broader judgments in healing supernature: they will be RERROR biased. Such agents will find religious healing important enough to remember and will factor these memories into their judgments and behavior, but again, in ways globally encapsulated from other problem domains. Recall the Katz quotation “Nearly every !Kung . . . can describe how the healing dance has cured someone.” Clearly, health-favoring biases anchor the healing dance in this hunter-gatherer society. Although I am limiting my focus to psychological tendencies, it is worth noting that once such a tendency to healing religion emerges, it will undoubtedly shed effects at the level of cultural selection—on culturally transmissible public religion. If religious healing is effective and if members of cultural groups share effective knowledge, then examples of religious healing will become embedded in lore, in the horizontal and intergenerational flow of cultural information.

Of course, the fact that religious agents *actually* benefit from their cognitive dispositions brings further real evidence to favor healing religiosity. Notice that the world loses *real* stressors when supernatural understandings benefit religious agents. On the other side, where accurate assessments of a stressful world cause bad health, accuracy in judgments may well compound negative trends in well-being; poor health actually makes the world more stressful over time, with successive negative impacts on health. Thus, healing religiosity is not causally inert. Over time, it will tend to drive a genuine reduction in stress and misery, potentially altering the selective landscape. To be sure, through activities that support their healing supernatural outlooks, religious agents are actively engaged in a form of niche construction—though not one dependent on naturally efficacious medicines, technologies, and therapies. Individuals and groups capable of mitigating stress (without otherwise reducing fitness) transform their worlds into friendlier places through their integration of the imagined world with our own.

EVIDENCE FOR A HEALING SUPERNATURAL WORLD

Judgment	Patient Outcome	Epistemological Outcome
Stressful world	Poor health	Further evidence for stressful world
Supernatural world	Good health	Further evidence for supernatural world

There are other means by which to shore up confidence in religious healing. Consider social influence. In a classic experiment on conformity, Sherif (1935) demonstrated that individuals in groups tend to converge in their interpretation of ambiguous events (assessment of the perceived movement of a fixed light point projected in the dark, the so-called autokinetic effect). This convergence effect holds even though revised communal judgments frequently differ from initial individual assessments. Moreover, Sherif observed variation in the assessments between isolated groups. Groups differ, but individuals within groups converge. Subsequent studies revealed that individuals express common judgments not only in public but also in private, ruling out social pressures to conform (Sherif, 1936). Moreover these convergent judgments persist over time (Rohrer, Baron, Hoffman, & Swander, 1954). Such experiments suggest that when faced with ambiguity or uncertainty, individuals are prone to adopt the opinions and attitudes of those around them. Given social influence, common expressions of healing religious understandings in public will serve to bolster confidence in such understandings among individuals in groups.

SOCIAL INFLUENCE

Social Group	Group Judgment	Individual Response	Outcome
Secular	Miserable world	Stress and low immune response	Poor health
Religious healers	Happy world	Low stress and normal or high immune response	Good health

While the cost to individuals of such expressions is relatively low, the aggregate benefits to religious placebos for individuals participating in rituals of public avowal are high. Public forums shore up commitment to the idea that the world is an enchanting place—they strengthen assessment confidence—a commitment that brings health by reducing the damaging effects of stress.

Can we account for religiosity in virtue of success biases alone? Probably not. For there is evidence that failure does not deter agents from their religious healing. Katz (1984) writes that for a !Kung healer, “sometimes you heal and god helps you. Sometimes you heal and heal and heal, and you lose the person” (p. 55). With respect to healing success rates, it appears the !Kung do not habitually update their databases. There is another reason that success biases are insufficient for explaining the persistence of religion. Religious commitment has a powerful motivational dimension—religion puts us in touch with the inner zealot—and the pattern of desire and commitment it prompts looks different from the pattern of belief about ambiguous events. As we shall see momentarily, it is biologically problematic that people invest so heavily in imaginary worlds on the advice of others, for the interests of our nonrelated comrades do not always converge with ours. The default setting should be suspicion of our nonkin (Sterelny, 2003). Yet an optimal psychological system geared to heal through placebo effects will render even rare successes cognitively salient, including information passed to us secondhand. And given the pervasiveness of religious healing, something like that design seems to have worked its way into place.

Informational Encapsulation

For RERROR to evolve, it must be substantially encapsulated. Whatever benefits agents draw from religion, religious healers remain present in a hostile world, and we must detect real threats and avoid them or perish. Although not of this world, we remain always in this world. It is worth emphasizing that stress responses are not usually, on average, more damaging than indifference, for stress responses too have evolved—and with exquisite functionality. It is useful to experience fear as the bull charges or to suffer persistent anxiety for a lost child. Such “negative” feelings may cause discomfort, but they motivate powerfully adaptive responses (because they cause strong discomfort) and are part of a broader functional design that mediates one’s relationship to the world. And religiosity must integrate itself to the demands reflected in that design. Thus, RERROR must be inferentially and motivationally encapsulated to a strong degree. Paradoxically, religious healers should both believe in the gods where doing so is functional and not believe in the gods where doing so is disastrous. Religious belief is thus not free flowing.

Notice, intriguingly, that encapsulation constraints cut against assessment certainty. The hemorrhaging of certainty in supernatural belief to other problem domains is potentially lethal. If I were to believe without limit that this world is only an illusion, then it would be unclear why I should bother with the exigencies of life—why I should care *at all* about any stressors, for they are, on my belief, tissues of unreality. And yet a hostile world will not

let me get away with this commitment. My religion *must* be fenced off from the rest of life. Not only must RERROR not interfere with a more broadly adaptive information tracking and processing design, it must especially not interfere with the stress system itself. For this system just is—in the main anyway—a highly adaptive system! Put another way, stressors—the charging lion, physical disfigurement, a lost child—are justifiably stressful from an evolutionary stance.

The consideration that religiosity must be encapsulated leads to nontrivial predictions. Given the assessment certainty constraint, we can predict a high level of conviction in expressions of commitment to healing supernatural. But for $RERROR > \text{Fact}$, these expressions must not generally interfere with global adaptive functionality. We can therefore predict that religious healers will be of two minds. They will strongly believe that the gods protect and heal but in most problem domains will nevertheless act as if they do not—that is, act for their own safety and success. Similarly, religious healers will believe that the world is better than it is only where the net effects of this belief do not, on average, tend to hinder adaptive prospects. RERROR cannot paint the world out so favorable that we give ourselves over to it.

The encapsulation constraint suggests a further prediction; that is, the problems that supernatural causation is imagined to solve should generally lie outside the ambit of human problem-solving capacity. Practically speaking, religion should be a means of last resort. If error is to be adaptive, it must be limited to problem domains in which agents can do no better through the deployment of fact-driven response and avoidance systems. An adaptive placebo system will therefore target those cases in which we can, through our ordinary natural responses, do no better (on average) than through error-driven acceptance or indifference. It may seem as if the domain for such response is narrow, that we can always do at least something to make our stakes better than by burying accuracy from consciousness. Yet consider the slings and arrows that life throws our way that we can do nothing about. Illness, loss, death, irretrievably thwarted plans—the whirl of suffering that inevitably arises in any human life and from which we cannot, no matter how hard we try, protect ourselves. Life is reliably miserable. And where natural armor fails and on the healing hypothesis *only* where it fails—there is scope for supernatural to front.

It is time to summarize the state of play so far. I have just reviewed features of what I take to be a plausible psychological design optimized to generate adaptive placebo responses. I have supplied important detail to McClenon's design—confidence and encapsulation constraints and a guidance system that tracks healing domains. I now want to suggest that this design—taken alone—is inadequate to explaining religious consciousness. Let me again repeat an important fact that is overlooked in most discussions about religious healing. Religion is extremely costly, and these costs, *prima facie*, bear

no relationship to healing functionality. Through the course of their religious practice, practitioners expend massive resources—in time, energy, and material outpouring. But placebo healing does not depend on this costly practice for natural or secular placebos appear fully sufficient to reduce stress and unleash the body's healing powers. Why believe in resource-draining supernatural reality rather than heal through secular hypnotic effects? While the religious healing thesis succeeds in showing how a highly designed cognitive design can evolve to render agents susceptible to placebo errors, it has a hard time showing why the gods need to figure in such a design. Lost at sea, Jane needs to believe only that she will be saved but not necessarily through the agency of a demanding deity. Thus, given the two variants, religious placebo and secular placebo, it would appear that, all things considered, selection will favor dispositions to the less costly secular alternatives. But, again, it was not to be so. For as McClenon has splendidly shown, healing arts form the central ritual components of our ancestral folk religious practices. Thought to repeat: we must not forget that this fact presents an evolutionary problem!

Indeed, when we consider the costs that religion brings, we can see that many of them involve willing exposure to supplementary health risk. The Aztecs are famous for their blood sacrifices, but the practices were not limited to the execution of prisoners of war. At certain points in Aztec history, most of the population engaged in ritual bloodletting, opening their veins to feed bloodthirsty gods who were conceived to maintain the natural order (Carrasco, 2000). Wandering Buddhas in ancient Thai traditions would meditate in front of vicious animals as a means to focus their hearts (Tiyavanich, 1997). And the foot-blistering traditions of fire walking, ritual scarification, tattooing, and bodily mutilation are common throughout religious cultures. These are far from healthful modes of acting. Even beyond the potentially health-damaging effects of religious ritual, very often religious representations are terrifying, literally, as hell. And though it is not groundbreaking science to note that terror is incompatible with stress reduction, this fact is frequently overlooked in discussions of religious healing. We could say that religiosity leaves agents prone to health-damaging “nocebo” effects. Thus, it would appear that any evolutionary approach to religious cognition needs to consider how the *reproductive costliness* of religiosity was tolerated. In the next section, I examine how this costliness paradoxically helps religious agents advance their common interests.

MORAL FUNCTIONS AND RELIGIOUS NOCEBOS

To understand evolutionary obstacles to cooperation, briefly consider the “prisoners’ dilemma.” The scenario is familiar to political strategists and economists. Two prisoners, Richardo and Slone, are held for a crime. Each faces the same choice, to turn the accomplice in (defect) or to remain silent

(cooperate). The time each will serve in prison depends in part on this choice and in part on the choice of the accomplice, and the options for each prisoner are exactly symmetrical. There are four possible outcomes:

1. IF I defect and my accomplice cooperates, THEN I go free, and he gets 10 years in prison.
2. IF I defect and my accomplice defects, THEN I get 9 years in prison, and he gets 9 years in prison.
3. IF I cooperate and my accomplice cooperates, THEN I get 1 year in prison, and he gets 1 year in prison.
4. IF I cooperate and my accomplice defects, THEN I get 10 years in prison, and he goes free.

THE PRISONERS' DILEMMA

	Ricardo Defects	Ricardo Cooperates
Slone Defects	-9	-10
Slone Cooperates	-9	-1

The best total outcome in this case is mutual cooperation, but this outcome depends on each prisoner making a sacrifice. One year in jail is not as good as freedom, but it beats 9 or 10 years in jail—and this compromise is both desirable and available to the prisoners if they can coordinate their choices. Mutual cooperation is “strictly efficient” (Skyrms, 1996). Yet the cruel lesson of game theory is that rational agents seeking to maximize self-interest will *always* defect. Because the defection strategy always yields fewer years in prison no matter what the other agent chooses, defection strongly dominates cooperation. Sacrifice is not rationally warranted because no matter what the other prisoner does, an agent always does better by defecting. The second cruel lesson of game theory is that the prisoners’ dilemma generalizes to innumerable social interactions—from marriage to trade to warfare to employment relations (Frank, 1988). Wherever interests overlap imperfectly, strictly efficient cooperation comes under threat. What game theorists call “generalized prisoners’ dilemmas” menace the social fabric (see Schelling, 1960).

One of the most important insights into the evolution of religion has come through the realization that structured supernatural illusions can powerfully induce religious agents to resolve generalized prisoners’ dilemmas (Bulbulia, 2004b; Irons, 2001; Sosis, 2003). These benefits render such illusions highly evolvable. Imagine that Ricardo and Slone falsely come to believe that cooperation always brings the best outcome. That is, they

systematically and reliably get the world wrong. For example, each believes that defection brings a result worse than a long jail term. Call this outcome CHOP. Suppose further that each believes that if he cooperates, something better than freedom will happen. Call this outcome LOTTERY. Here, CHOP and LOTTERY are just variables. LOTTERY could be terrible (lips cut off) yet less terrible than CHOP (lips and legs cut off). What matters is that, for each:

The subjective value of cooperation $>$ the subjective value of defection

Assume that the real (N) payoff matrix remains fixed. All that has changed is the perception of the relevant outcomes. Because the causation required for such belief to be true exceeds anything in nature, we can call this form of interaction “the supernature game.”

THE SUPERNATURE PRISONERS’ DILEMMA: PERCEIVED OUTCOMES

	Ricardo Defects	Ricardo Cooperates
Sloan Defects	Chop – 9	Lottery – 10
	Chop + 9	Chop + 9
	Chop + 0	Lottery – 1
Sloan Cooperates	Lottery – 9	Lottery – 1

In this game, structured erroneous judgment, when shared, motivates strictly efficient exchange, rendering both agents better off. Here we have what appears to be a highly evolvable form of supernatural commitment. Call this type of commitment *moral religiosity*, henceforth MR. Where MR is shared:

All things equal, $MR > N$, thus MR

However, notice a problem in the “all things equal” clause. *Pure groups* of MR cooperators carry an advantage over pure groups of individual N defectors. But *mixed groups* of MR cooperators and N defectors (greedy rational naturalists) will always fair better—for, once again, defection in a one-off prisoners’ dilemma always pays better than cooperation. This renders MR cooperation strategies open to invasion by defectors. For playing against defectors, supernaturalists will always receive the worst possible draw. Transposing the game to biological landscapes and iterating it, selection will quickly snuff out MR cooperators, yielding a population of defectors (for precise modeling of these effects, see Skyrms, 1996). Hence, selection will endorse MR strategies only if N defectors can be kept out.

Clearly, then, for the MR system to evolve, religious cooperators must *also* evolve the capacity to identify other religious cooperators. That is, religious cognition must further satisfy a *recognition constraint*. Without the ability to sift genuinely motivated religious cooperators from lying defectors, religious solidarity will not easily evolve. But how may MR cooperators find and exchange only with other MR cooperators?

Selection needs to equip religious agents with the capacity to produce signals that only religious persons can reliably produce and with capacities to accurately track and record these signals. It must discover and magnify cues available only to those who believe in supernatural reward. This recognition constraint is far from trivial. For what could count as such a signal? Comparing the fitness benefits of the relevant strategies:

$$\text{Signal} + \text{defection} > \text{Signal} + \text{cooperation}$$

In exploring the functionality of religious signals, adaptationists have examined how the *practical* costs of religion have adaptive value, noting that the various emotional, material, and opportunity costs and the risks associated with religious practice enable religious agents to identify each other (for excellent empirical testing of this theory, see Sosis, 2000; Sosis & Bressler, 2003; Sosis & Ruffle, 2003, 2004). Costly religious signals are configured to assess the presence and strength of religious commitments, satisfying the recognition constraint, thus enabling selection to endorse religious dispositions. Religious signals are either direct (e.g., emotional display) or indirect (e.g., ritual display). For all direct signals:

$$\text{Signal} \rightarrow \text{IF AND ONLY IF} \rightarrow \text{MR}$$

For all indirect signals:

$$\text{The subjective value of cooperation—signal costs} > \text{The subjective value of defection—signal costs} - \text{subjective weighting of potential retribution costs}$$

It thus appears that moral religiosity requires costly displays of solidarity/commitment to work. And again, there is a growing body of experimental evidence that moral religiosity is adaptive (for further discussion, see Bulbulia, 2004a; Sosis & Alcorta, 2003). While it is plausible that moral religiosity is a cultural invention that co-opts non-targeted psychological systems, the evidence from childhood development and cross-cultural studies is that much of the relevant scaffolding for our religious dispositions comes through biological inheritance (Bulbulia, 2005).

However, notice that if religion evolved to promote cooperation as well as health, then its proximate functions are diverse and stand in tension! For

consider the startling range of signaling costs that religious persons generate to prove religious commitment. At one end of the spectrum, we find extraordinary risky and painful ordeals—trials by needles and fire, teeth punching, nonsterile circumcisions, practices of leaping from great heights, soul quests in hostile environments, potent drug use, lifelong celibacy, and much else. At the other end, we find apparently fruitless investments of time and energy through long, tedious rituals for which agents incur massive opportunity costs.

On the costly signaling model, the benefits of these practices to reproductive interests are more than offset by their associated costs and thus ultimately “healthy” with respect to our inclusive reproductive interests. But notice—and this is critical—that this form of “health” is not optimized to McClenonian stress mitigation. Indeed, moral religiosity will frequently ramp stress levels up to new thresholds, for often a stressful response to the gods functions precisely as the hard-to-fake signal that an audience seeks to evaluate. It is precisely because viewing the circumcision knife causes anxiety and angst that the ritual works to promote solidarity and cooperation, for only the committed will drop their trousers for it. If rituals are stressful or anxiety provoking, the function of moral religiosity and healing religiosity will at least occasionally diverge. It appears that religion may well promote success because it functions as a placebo at some times and as a nocebo at others. And these discrepant functions place further constraints on the design of our religious faculties, which I now consider.

Shared Information and Motivation Flow for Healing and Moral Religiosity

How can evolutionary psychology help us reverse engineer the religiosity systems? One thing is certain: because we live in a hostile world, both healing and moral religious representations must be strongly encapsulated from other, practical problem domains. Religion can’t evolve if it impairs survival—if god loving and fearing causes us to forget about the necessities of life:

[Healing + Moral supernatural systems] // encapsulated from other problem domains

Nevertheless an efficient psychological design will integrate information flow within these systems. Optimally, agents prone to health-giving supernatural outlooks will also be prone to moral-policing supernatural outlooks, for in doing so the realm of supernatural commitments is reduced. With respect to religious epistemologies, if a religious outlook is allowed to cover both healing and policing functions, then the costs associated with error are likewise minimized. For religion to work adaptively, we do not need two

separate supernatural realms of commitment—the healing and the policing. Rather, the supernatural world should be cut from one supernatural fabric in which aspects of the gods that heal and those that restore life are portrayed together. To believe and practice a religion is to see the world as a moral forum (policing function) to which we can reconcile ourselves for the better (healing function).

Let's consider this overlap more carefully. Notice that if the gods that heal and the gods that enforce reciprocity generally belong to the same theological outlook (or indeed are imagined as one and the same), then evidence favoring commitment to supernatural reality may support each separate function.¹¹

The potential for mutual supporting information channels becomes clear when we consider evidence flow within the religion faculty. For healing religiosity provides empirical support and justification for morally religious commitments.

HEALING AS EVIDENCE FOR MORAL SUPERNATURE

Judgment	Patient Outcome	Inference
Stressful world	Poor health	No gods to help us
Healing supernatural world	Good health	Further evidence that the gods reward the faithful

Moreover, the supporting relationship runs in reverse: moral religiosity coordination effects may support broader religious placebo perspectives:

POLICING AS EVIDENCE FOR HEALING SUPERNATURE

Judgment	Inference	Outcome	Inference
Naturalistic Prisoners' dilemma	Reduced cooperation	More misery	Further evidence for stressful world
Policing Supernatural world	More exchange	Less misery	Further evidence for healing supernatural world (the gods have blessed us)

Not only is internally translucent religious information mutually supporting, but an optimal design will display unevenness and bias in the systems that employ such evidence. Although the results of religious healing may be used to prop up religious morality and vice versa in an optimal design, confirmation biases will be positioned to reduce unsupportive inferences. Like a one-way valve or trapdoor, evidence that supports religious commitment—and only such evidence—will come in and be integrated to the relevant behavioral and response systems. Although bad things frequently happen to good people, the model predicts that we will nevertheless come to believe in healing and moral supernatural—believe that the gods protect and reward the faithful. Looking at inferential processing:

Supernature supporting evidence → utilizable by the [moral religious, healing religious] religion faculty // generally encapsulated from practical problem domains

Unsupportive evidence → possibly utilizable by practical problem systems // generally encapsulated from the [moral religious, healing religious] religion faculty

It would be relatively straightforward to test for these relations by studying the practical inferences that religious persons (as compared to nonreligious controls) make in response to various forms of supporting and unsupportive evidence. I have already noted that the !Kung do not accept failure to heal as warranting skepticism over their healing practices; to the contrary, the !Kung can list many cases where the healing dance brought miraculous cures to the desperately ill in their cohort. And healing rituals generally bring further respect for the sacred values that underpin !Kung social existence and increased solidarity. As Katz notes, it is not just the patient but the entire community, including the shaman healers, that experience spiritual, social, and bodily healing.

Cultural Variation

So far I have considered how the functions of supernatural moral and healing illusions support each other through integration. Yet on standard costly signaling theory, there are significant prospects for tension. Again, though moralistic gods are potential benefactors who reward the faithful, in their capacity to harm they are also potential stressors. Policing supernatural agents concepts are generally uncanny and frequently motivate precisely *because* they project new and imaginary stressors. Moreover, healing supernatural gods may be poorly suited to performing tasks as moralizing police agents. A supernatural healing force is not necessarily an optimal instrument by which to police, for it lacks the motivational power of karma, heaven and

hell, sacred and inviolable value, and other such concepts, at least among the already well. Because religious agents inhabit a multifarious problem environment, the systems that control religiosity must sort tasks and match them to appropriate supernatural concepts by considerations of relevance, cost-to-gain, and feasibility. Computationally, these are difficult problems. One possibility would be that a religiosity system exploits fairly simple heuristics (e.g., when in trouble, shift to a healing religious emphasis; when cooperating, shift to a morally religious emphasis). Yet it is doubtful whether fast and frugal heuristics could be functionally optimal in the diverse range of social and natural landscapes we inhabit. Mutually supportive information flow suggests such a picture is far too crude. The following heuristic, for example, seems possible: “When in pain, think about my moral shortcomings” or “When at the healing dance, observe for signs of piety as a signal of cooperative intent” (a prospect I discuss shortly). More basically, I suspect that culturally selected norms strongly mediate interpretations (“When in pain, think of Jesus on the cross” and so on). Such norms are impossible to predict from sketchy blueprints of internal psychological design and are subject to the vagaries that beset the microevolution of cultural frameworks. Given computational intractability, my hunch is that the switches that trigger the operation of these systems emerge from local, contingent historical contexts.

Yet in noticing this contingency, we are not fated to abandon an evolutionary task analysis of the religious mind. For in understanding the types of problems it is adapted to solve, we can better understand the functionally elaborate psychological design underlying our capacity for specific forms of cultural engagement—for without that psychological undergirding, a religious culture would not be possible. All would scoff at religion as pure fantasy or return only blank stares when asked to contemplate religious worlds rather than understanding religion, as most clearly do, as the greatest calling of our lives.

Placebo Health as a Reproductively Beneficial Costly Signaling Device

The most important benefit to integrating the health and moral hypotheses for the evolution of religiosity is that it exposes a powerful selection pressure acting to favor religious placebos over their merely secular alternatives. I suggest that we can solve the cost problem with respect to religious healing only by understanding more generally how religious costs function as adaptations for social exchange. As I noted previously, it is hard to see why the gods are necessary to stress reduction—for it appears that we could unleash the body’s healing properties with common or garden-variety nonreligious placebos. And we could do so with much less resource expense. Indeed, some

gods are imagined as frightening and ghoulish beings who exact a high price on we mortals who are bound to serve them. Notice, however, that healing religiosity offers a new form of hard-to-fake signaling in religious communities whose members are interested in detecting and evaluating religious commitments. I suggest that it is because healing religiosity functions as a powerful, low-cost signaling device that selection has targeted it over ordinary, secular placebos.

Clearly, from a patient's vantage point, the gathering of a community is a hard-to-fake signal of the support from others who wish for a restoration to health and well-being. In !Kung healing rituals, community members gather very closely around a sick individual, holding each other in song and dance. !Kung shamans place their almost naked bodies directly against those afflicted with illness. It is noteworthy that this spectacle displays commitment not only for the time, energy, and material investment in a healing dance but also because contact at such close quarters increases the risk of pathogen infection. You have got to love someone to get very close to him or her when he or she is sick. While the microbiology of human illness remains undiscovered among hunter-gatherers, there is evidence that selection has outfitted us with a suite of disease avoidance systems (Boyer, 2001) that must be disabled in the case of !Kung healing (or indeed with anyone who risks infection through contact with persons afflicted by many kinds of infection). Clearly, not all illness is transmissible, but some clearly is—and the !Kung do not adjust their practices accordingly. Whatever the ailment, very close physical contact with the sick is maintained. And this is a costly signal of commitment to him or her.

More important to the evolution of religious healing, a patient's resorted health serves as a reliable signal of the patient's commitment to a religious outlook. Recall that assessment certainty improves the prospects for placebo healing and so forms a powerful constraint on the evolution of religious healing. To the degree that doubt creeps in, placebo healing becomes less effective. Thus, actually getting well in the presence of a religious placebo is a hard-to-fake signal capable of authenticating intention to cooperative exchange. For only those who believe beyond a threshold of assessment certainty will be healed. And because moral religiosity and healing religiosity admit of mutually supporting information flow, this healing certainty is commitment to a religious world that motivates solidarity and cooperation. Defectors can verbally express commitment, but without genuine belief they cannot benefit from religious placebos. Notice that the "cost" involved in such healing is not reproductive costs. Indeed, from a reproductive angle, there are no costs to religious-healing signaling at all but rather benefits that only the genuinely religiously committed can produce.

HEALTH AS COSTLY SIGNAL OF COMMITMENT

Judgment	Intention	Perception	Outcome	Signal	Group Effect
Secular world	Defect	World is miserable	Bad health	Signal of possible intention to defect	Weaker group (commitment and health)

As a *moral* signal, then, religious healing is highly evolvable, for it targets religious commitment and evaluates an agent's certainty about those commitments. Far from damaging a religious agent's reproductive interests, religious healing enhances those interests by restoring and maintaining health and well-being. Crucially, such healing is hard to fake but not reproductively costly. It should therefore not surprise us that religious signaling figures as a central component in so many traditional religious communities and is especially vivid among hunter-gatherers, whose life-ways closely resemble those of our distant ancestors.

CONCLUSION

Let me summarize the argument and discuss how the integration of healing religiosity to moral domains has helped us reverse engineer core aspects of religious cognition. At the outset, I suggested that religious thought is both a human universal and error prone. This presents a problem to naturalists. Given the costs of religious error, it appears that blind evolutionary processes should have extirpated religious tendencies. Yet in spite of the costliness of religion, there is overwhelming evidence that religious agents live healthier, longer, and better-adjusted lives. It is thus plausible that selection endorsed religious cognition because religion assists in restoring and maintaining individual well-being. To bring substance to this approach, I began with the familiar case of self-deception. I examined how a false self-image can function as a strategic response to social environments in which deceiving others relies critically on our ability to deceive ourselves. Given an evolutionary target, it was possible to formulate an optimal design for self-deception as a cognitive adaptation. Self-deception works best too when it is (1) complete, (2) targeted to exchange, and (3) encapsulated from other problem domains. An optimal design would thus produce a self-deception design optimized to these parameters. I noted that these features generalize to other forms of cognitive error.

I then considered how beliefs in healing supernatural could evolve by reducing damaging stress responses. This idea stands at the center of McClenon's hypothesis about the evolution of religious healing. By believing that the world is supernatural, the faithful are able to adjust themselves to hardship and disease more effectively than their secularist counterparts. Given the general constraints under which cognitive error operates, I suggested that if we have evolved to distort and bias experience in ways that support religious healing, then the system will work best when the representational outputs of this system are (1) certain, (2) targeted to stress reduction, and (3) encapsulated from other problem domains. I used this analysis to develop a hypothesis about features of the information processing design that control religious healing. For example, I noted that in promoting well-being, religious healing actually does make the world a less stressful place, and this evidence will be reintegrated into the systems that promote religious conviction and certitude. And because these effects add to the overall credibility of religious assessments, I suggested that an optimal cognitive design would render such facts salient. It would be straightforward to assess this aspect of the theory by observing whether there are biases in how religious agents respond to religiously edifying and nonedifying evidence and experience. If there are prohealth biases, then religiosity may indeed function to improve well-being and may well have evolved in part to satisfy that function.

However, I noted that religious healing provides an unstable foundation on which to base an adaptationist explanation for human religiosity. In the first instance, it is hard to discern an intrinsic relationship between placebo healing and god worship. Every doctor who has cured with sugar pills knows that we need no deity to achieve placebo health. It therefore remains mysterious why selection, given the alternative, would have favored religious over nonreligious healing belief. More important, and more mysterious still, religious belief and practice is very often unhealthy, for it exposes agents to risk, harm, opportunity cost, disease, and, in some instances, early death and celibacy. Such effects are not healthful to individuals and their germ lines, and selection should have weeded them out. Such costs need to be offset by significant reproductive benefits. If religion evolved for healing, the nagging question here is why selection didn't favor less expensive, nonreligious variants.

I suggested that we go some way toward answering this question by integrating the healing hypothesis with the costly signaling solidarity hypothesis. Recent adaptationist inquiry into religiosity's social functions suggests that enhanced cooperation and coordination provided powerful inducements to the evolution of religious inclinations in our species. In the past several years, researchers have demonstrated how religiosity generates dramatic individual and group-level benefits by helping individuals overcome strong defection incentives in cooperative endeavors. Where religious conceptions

of the world promote cooperation, blind evolutionary processes will favor dispositions to belief in the culturally approved conceptions of our exchange groups, even where the relevant beliefs fly in the face of nature. Yet because this system is evolvable only if religious agents can reliably find each other, such dispositions are evolvable only if clear, unambiguous, and hard-to-fake signals of religious commitment can be produced and interpreted in religious communities. The signaling systems that have grown up around religion use hard-to-fake religious costs—like risky, time-consuming ritual participation and emotional display—as a means for authenticating religious (and thus social) commitment for only the truly committed will undertake such costs.

Given that healing and moral religiosity draw from the same collection of supernatural commitments, it is evident that religious healing can act as a hard-to-fake signal of cooperative commitment. For only those who truly believe will be made well by their faith. Because such signaling is available to cooperators but not to defectors—and is not reproductively costly—selection has a powerful inducement to conserve tendencies to religious placebo healing. Indeed, physiological constraints on our own ability to heal ourselves and the localization of poor health at any time to only a segment of the community have quite likely prevented placebo signaling from dominating all ritual forms for the signals are reliable and bring benefits rather than reproductive expense to those capable of producing them.

It is possible to render this conjecture more precise through experimental testing. For example, it would be interesting to compare how participants who score high for belief in morally motivating religious beliefs compare with irreligious controls in their reactions to a variety of perceived stressors for this would suggest informational integration at the interface of religious healing and religious policing. Likewise, it would be interesting to observe whether examples of religious health promote religious solidarity for individuals disposed to religious healing. That religious information in both moral and solidarity domains is encapsulated from other problem domains is almost certain for unimpeded inferences from religious belief to practical life is an evolutionary death sentence. We cannot believe the gods will provide and punish without doing so ourselves, lest we risk our lives. On the other side, if confidence in a better or morally motivating world is not massively dysfunctional—as appears to be the case—then we receive further confirmation for the encapsulation hypothesis. Finally, and perhaps most important, it would be intriguing to observe whether persons who exhibit healing responses to religious events are treated as more trustworthy and reliable—all things equal—when compared with those who do not. For if they are treated differently, this would suggest the hypothesis that religious placebo responses evolved as hard-to-fake signals of moral commitment have merit.

If the roughly sketched optimal design I have drawn here turns out to be approximately correct, it would suggest that religiosity has indeed evolved to help make us well, though not for the reasons most researchers have so far assumed. On the picture of mind I have been exploring, religiosity is a remedy in nature's medical bag. But it is much else besides. It appears that the psychosomatic systems regulating health and healing are optimized for social inputs as well as for personal expressions of care and concern.

Notice that if both of these claims survive empirical testing, then evolutionary approaches to religious healing may hold lessons for contemporary health care advocates. Religion and health in many Western countries are thought of as fairly separate domains of human life and are treated as such. Religion is generally considered a private interest, something relegated to the personal lives of patients and their families, not a matter for the medical professions to consider. Yet the very recent practice of locating religiosity outside the health care framework seems to leave important healing mechanisms untapped. Moreover, in shuffling patients off to the solitary confinement of their hospital rooms, we appear to have disconnected them from potential sources of well-being, namely, their family and community. Whatever the benefits of modern healing environments—don't get me wrong, there are many—these environments do not seem well structured to accommodate healing religiosity.

Finally, it should be apparent from the provisional nature of this inquiry that the naturalistic study of religious healing is in its early phases. My hope is that this chapter will motivate further empirical studies of the cognitive design that supports nature's medicine and give nonspecialist readers some idea of the intriguing pathways along which the evolutionary study of religion and mind is moving.

NOTES

1. Notice the category "supernatural" is more inclusive than the category "gods." For example, "karma" is supernatural, but it isn't a god. Nevertheless, I will use the concept of "gods" interchangeably with "supernatural," sacrificing accuracy for clarity. Although it is beyond the scope of this chapter to bring airtight conceptual precision to the concept "supernatural," I note there is evidence that we all intuitively share similar understandings (Boyer & Ramble, 2001). "Supernatural" appears to be a cultural universal.

2. Before proceeding, I need to defend the methodological naturalism that informs my approach, for I do not want to alienate religiously committed readers. In setting out the explanatory issues, I will bracket the question of whether gods exist and proceed as if (whatever their reality) they are not causally involved in our lives. This is a controversial assumption. Indeed, if basic elements of religiosity really are human universals, this stance is universally contestable. And I am tempting fate with the armies of religionists who will take umbrage at this position. Is this assumption

warranted? Clearly, naturalists should not be committed a priori to the unreality of the gods. Whether the gods exist is a contingent fact about the world—possibly true, possibly not—a matter for discovery not stipulation. Yet looking to past scientific success, explanations that make no appeal to the gods fare better than religious explanations. The history of science over the past several centuries records the erosion of natural theology in science. With respect to religious healing in particular, we lack any understanding of how a spiritual agency *could* interact with material nature to heal, for our concepts of interaction extend only to physical and chemical things and to their abstract functions. Indeed, we do not understand how a “spiritual thing” could be a “thing” at all—an entity located in space and time, for what is it, exactly, that is located? Because healing relies on the causation—something, a remedy, cures someone, a patient—I suggest we cannot fully understand the concept of religious healing without clear naturalistic conceptions about the remedies in question. Most important, in eschewing naturalism, questions inevitably arise over which gods to take seriously. And I see no nontendentious means of answering this question. So I take it that if we leave gods out of our explanations for why we come to believe in the gods, so much the better. Some readers will be uncomfortable with this “as if not” assumption, but I hope they will have the patience to see how far this stance takes us to an explanation for religiosity. Even religiously committed, I think, should be willing to engage in naturalistic inquiry as an intellectual exercise, for, as we shall see, the naturalistic stance can take us quite far in explaining the psychological design that enables religious thought in our lineage.

3. Although less and less so as Western lifestyles, commodities, and governmental policies threaten to destroy tradition Khoisa culture.

4. Note: On McClenon’s account, susceptibility to religious placebo healing varies in populations.

5. The earliest cognitive views hypothesized that religiosity flows from hair-trigger response mechanisms dedicated to tracking agency in the world. We over-generalize theory of mind because we are better safe than sorry when it comes to finding intentional agents (especially persons) at large. We thus find them even when they are not there. And this projective tendency enables belief in gods to take root (Guthrie, 1993, 2001). Later cognitive theorists noted this story can’t be right—the gods aren’t ordinary persons (Boyer, 2001). People don’t register them only (or even generally) in perceptually ambiguous settings (Barrett, 2000), and we don’t generally build altars and worship as a response to person sightings (for discussion, see Bulbulia, 2004a). The view that has come to dominate cognitive psychology is that multiple developmentally entrenched cognitive systems collectively produce god-centered religiosity as a by-product. Hypersensitive agency detection goes part of the way, though other mechanisms chime in to jointly evoke the elaborate supernaturalisms of our theological imaginations (see Atran, 2002, 2004; Boyer, 2003). So to sum up this stance, if the cost of this psychological noise is on average lower than any accurate evolvable alternative, selection will turn a blind eye.

6. Run this experiment. Observe yourself in a mirror consciously advertising your goodness and effectiveness while silently recalling your shortcomings and judge whether you are credible.

7. I note that agents may *really* be benefactive and come to believe they are and represent themselves as such. So “self-deception” here departs from ordinary usage

because the term does not imply that the relevant beliefs are necessarily false. Instead, it describes beliefs that are overdetermined by the psychological mechanisms that generate them, regardless of how the world is. Whether you are beneffective or not, selection will target a psychological architecture that prompts you to think you are. This point is exactly analogous with respect to religiosity. When I later hypothesize that religion is strategic self-deception, I do not claim that the world *necessarily* contains no gods. I claim only that agents will tend to believe in gods of a specific type, no matter how the world stands. That is, tendencies to such beliefs are overdetermined by psychological mechanisms (given specific developmental and social conditions). And, as stated previously, I think it's a good idea to assume methodological naturalism and so leave the gods out of the explanatory equation.

8. Here I simply describe some parameters constraining the system as a means to evaluate the hypothesis that religiosity evolved for healing. More formal, quantitative modeling advances with measurable knowledge of the fitness trade-offs of evolvable cognitive designs. Often the relevant information for such modeling is difficult to secure. On the general epistemological problems (and opportunities) for quantitative evolutionary modeling of cognition, see Sterelny (2003).

9. How can we know whether error is the product of selection rather than merely an effect of imperfect design? As with all adaptations, we are looking for evidence of design: functionality, intricacy, efficiency, encapsulation, integration, and overarching mesh (Godfrey-Smith, 2001; Sterelny, 2003, pp. 101–104). For by our naturalistic assumptions, functional designs do not appear magically; they are gradually wrought over time through selection.

10. I make no judgment about whether our world is on average more stressful than the ancestral world. Clearly, for some (perhaps many), our world is an acid bath of stress. I merely observe that the environment of evolutionary adaptation was consistently characterized by the presence of stressors.

11. Recall: "I put to death and I bring to life, I have wounded and I will heal, and no one can deliver out of my hand" (Deuteronomy 32:39). Does this verse evoke moral or healing supernature? Answer: both.

REFERENCES

- Atran, S. (2002). *In Gods we trust: The evolutionary landscape of religion*. New York: Oxford University Press.
- Atran, S. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences*, 27(6), 713–730.
- Barrett, J. L. (2000). Exploring the natural foundations of religion. *Trends in Cognitive Sciences*, 4(1), 29–34.
- Bering, J. (2004). The evolutionary history of an illusion: Religious causal beliefs in children and adults. In B. Ellis & D. F. Bjorklund (Eds.), *Origins of the social mind: Evolutionary psychology and child development* (pp. 411–437). New York: Guilford Press.
- Blakemore, S. (2000). *The meme machine*. New York: Oxford University Press.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.

- Boyer, P. (2003). Religious thought and behaviour as by-products of brain function. *Trends in Cognitive Sciences*, 7(3), 119–124.
- Boyer, P., & Ramble, C. (2001). Cognitive templates for religious concepts: Cross-cultural evidence for recall of counter-intuitive representations. *Cognitive Science*, 25, 535–564.
- Bulbulia, J. (2003a). Review of James McClenon's *Wondrous healing: Shamanism, human evolution and the origin of religion*. *Method and Theory in the Study of Religion*, 15(1), 15–18.
- Bulbulia, J. (2003b). Review of Nicholas Agar's *Life's Intrinsic Value: Science, ethics and nature*. *Sophia*, 42(1), 85–89.
- Bulbulia, J. (2004a). The cognitive and evolutionary psychology of religion. *Biology and Philosophy*, 18(5), 655–686.
- Bulbulia, J. (2004b). Religious costs as adaptations that signal altruistic intention. *Evolution and Cognition*, 10(1), 19–38.
- Bulbulia, J. (2005). Are there any religions? *Method and Theory in the Study of Religion*, 17(2), 71–100.
- Carrasco, D. (2000). *City of sacrifice: The Aztec empire and the role of violence in civilization*. Boston: Beacon Press.
- Chomsky, N. (2000). *New horizons in the study of language and mind*. New York: Cambridge University Press.
- Darwin, C. (1871/1981). *The descent of man and selection in relation to sex*. Princeton, NJ: Princeton University Press.
- Dawkins, R. (1976). *The selfish gene*. New York: Oxford University Press.
- Dennett, D. (2006). *Breaking the spell: Religion as a natural phenomenon*. New York: Viking Adult.
- Eliade, M. (1972). *Shamanism*. Princeton, NJ: Princeton University Press.
- Evans, E. M. (2001). Cognitive and contextual factors in the emergence of diverse belief systems: Creation versus evolution. *Cognitive Psychology*, 42, 217–266.
- Frank, R. (1988). *Passions within reason: The strategic role of the emotions*. New York: Norton.
- Godfrey-Smith, P. (1996). *Complexity and the function of mind in nature*. Cambridge: Cambridge University Press.
- Godfrey-Smith, P. (2001). Three kinds of adaptationism. In S. Hecht Orzack, E. Sober, & M. Ruse (Eds.), *Adaptationism and optimality* (pp. 335–357). Cambridge, England: Cambridge University Press.
- Godfrey-Smith, P. (2002). Environmental complexity, signal detection, and the evolution of cognition. In M. Bekoff, C. Allen, & G. Burghardt (Eds.), *The cognitive animal: Empirical and theoretical perspectives on animal cognition* (pp. 135–142). Cambridge, MA: MIT Press.
- Guthrie, S. (1993). *Faces in the clouds: A new theory of religion*. New York: Oxford University Press.
- Guthrie, S. (2001). Why gods? A cognitive theory. In J. Andresen (Ed.), *Religion in mind* (pp. 94–111). Cambridge, England: Cambridge University Press.
- Irons, W. (2001). Religion as hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 293–309). New York: Russell Sage Foundation.

- Katz, R. (1984). *Boiling energy: Community healing among the Kalahari Kung*. Cambridge, MA: Harvard University Press.
- Katz, R., Biesele, M., & St. Denis, V. (1997). *Healing makes our hearts happy: Spirituality and cultural transformation among the Kalahari Ju/'Hoansi*. New York: Inner Traditions International.
- Kelemen, D. (2004). Are children "intuitive theists"? Reasoning about purpose and design in nature. *Psychological Science, 15*, 295–230.
- Koenig, H. G., McCullough, M. E., & Larson, D. B. (2001). *Handbook of religion and health*. New York: Oxford University Press.
- Lee, R., & DeVore, I. (1999). *Kalahari hunter gatherers: Studies of the !Kung San and their neighbors*. New York: ToExcel.
- McClenon, J. (1997). Shamanic healing, human evolution, and the origin of religion. *Journal for the Scientific Study of Religion, 36*(3), 345–354.
- McClenon, J. (2002). *Wondrous healing: Shamanism, human evolution, and the origin of religion*. De Kalb: Northern Illinois University Press.
- Neighbors, H. W., Jackson, J. S., Bowman, P. J., & Gurin, G. (1983). Stress, coping, and black mental health: Preliminary findings from a national study. In R. Hess & J. Hermalin (Eds.), *Innovation in prevention* (pp. 5–9). New York: Haworth Press.
- Newberg, A., d'Aquili, E., & Rause, V. (2002). *Why God won't go away: Brain science and the biology of belief*. New York: Ballantine.
- Odling-Smee, J., Laland, K., & Feldman, M. (2003). *Niche construction: The neglected process in evolution*. Princeton, NJ: Princeton University Press.
- Pargament, K. I. (2002). The bitter and the sweet: An evaluation of the costs and benefits of religiousness. *Psychological Inquiry, 13*(3), 168–189.
- Park, C., Cohen, L. H., & Herb, L. (1990). Intrinsic religiousness and religious coping as life stress moderators for Catholics versus Protestants. *Journal of Personality and Social Psychology, 54*, 77–89.
- Prioreschi, P. (1995). *A history of medicine*. Omaha, NE: Horatius.
- Rabin, B. S. (2002). Understanding how stress affects the physical body. In H. G. Koenig & H. J. Cohen (Eds.), *The link between religion and health: Psychoneuroimmunology and the faith factor* (pp. 43–68). New York: Oxford University Press.
- Ramachandran, V. S., & Blakeslee, S. (1998). *Phantoms in the brain: Probing the mysteries of the human mind*. New York: Quill William Morrow.
- Rohrer, J. H., Baron, S. H., Hoffman, E. L., & Swander, D. V. (1954). The stability of autokinetic judgment. *Journal of Abnormal and Social Psychology, 49*, 495–497.
- Schelling, T. (1960). *The strategy of conflict*. New York: Oxford University Press.
- Shapiro, A., & Shapiro, E. (1997). The placebo: Is it much ado about nothing? In A. Harrington (Ed.), *The placebo effect* (pp. 12–36). Cambridge, MA: Harvard University Press.
- Sherif, M. (1935). A study of some social factors in perception. *Archives of Psychology, 27*(187), 53–54.
- Sherif, M. (1936). *The psychology of social norms*. New York: Harper & Row.
- Skyrms, B. (1996). *Evolution of the social contract*. New York: Cambridge University Press.
- Sosis, R. (2000). Religion and intragroup cooperation: Preliminary results of a comparative analysis of utopian communities. *Cross-Cultural Research, 34*(1), 77–88.

- Sosis, R. (2003). Why aren't we all Hutterites? *Human Nature*, 14(2), 91–127.
- Sosis, R., & Alcorta, C. (2003). Signalling, solidarity, and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, 12, 264–274.
- Sosis, R., & Bressler, E. (2003). Co-operation and commune longevity: A test of the costly signaling theory of religion. *Cross-Cultural Research*, 37(2), 11–39.
- Sosis, R., & Ruffle, B. (2003). Religious ritual and cooperation: Testing for a relationship on Israeli religious and secular Kibbutzim. *Current Anthropology*, 44(5), 713–722.
- Sosis, R., & Ruffle, B. (2004). Ideology, religion, and the evolution of cooperation: Field tests on Israeli Kibbutzim. *Research in Economic Anthropology*, 23, 89–117.
- Sterelny, K. (2003). *Though in a hostile world: The evolution of human cognition*. Oxford, England: Blackwell.
- Strawbridge, W. J., Shema, S. J., Cohen, R. D., Roberts, R. E., & Kaplan, G. A. (1998). Religiosity buffers effects of some stressors on depression but exacerbates others. *Journals of Gerontology. Series B. Psychological Sciences and Social Sciences*, 53(3), S118–S126.
- Tiyavanich, K. (1997). *Forest recollections: Wandering monks in twentieth-century Thailand*. Honolulu: University of Hawai'i Press.
- Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19–136). New York: Oxford University Press.
- Trivers, R. (2001). *Self-deception in service of deceit. Natural selection and social theory*. New York: Oxford University Press.

CHAPTER 6

THE COGNITIVE PSYCHOLOGY OF BELIEF IN THE SUPERNATURAL

Jesse M. Bering

One hot summer day several years ago, I lay holed up in a suffocating Fort Lauderdale hospital room—the result of an especially virulent bout of the flu. Having nothing but the buzzing of dying flies and the sound of muted television game-show applause to engage my interest, I turned my attention to the doleful lamentations of my elderly roommate, a handsome Navy veteran from World War II with a painfully defunct hip, and I gathered, an even more painful theological crisis on his hands. It seems that he had been yanked from the bedside of his aged wife, and he feared that she'd die without him being there. To make matters worse, he had the sneaking suspicion that his son wanted to jettison him off to a nursing home after her death, away from their cherished house and the beautiful garden they'd cultivated for the past 20 years. "I don't understand why God is doing this," he protested meekly to a sympathetic young nurse. "We've always been good people, my wife and me. What did we do to deserve this?"

That's strange, I thought. Didn't I ask the same thing just the other day as I was crawling about on the bathroom floor, expelling bodily fluids that I didn't even know I had in me? Indeed, I could distinctly recall the feverish mantra: "Oh, God, please, no more!" Just what was this connection between suffering and God all about anyway?

This observation got me thinking about other existential experiences. The same way that I couldn't help thinking of God under dire circumstances, I've also found that I can't fathom what it would be like not to have an afterlife. I'm a *materialist*—I think consciousness ends with death. But nonetheless, try as I might, I run into a brick wall whenever I attempt to imagine what

it would be “like” to be dead and not exist. I doubt I’m the only one. In the United States, as much as 95 percent of the population reportedly believes in life after death.

At least from a purely naturalistic perspective, one where we properly view ourselves as animals, such religious beliefs are an odd sort of thing. Not many people would classify their belief in God or heaven as “supernatural” beliefs, even though that’s precisely what they are. Just what is it about the human mind that leads so many members of our species, across cultures and geographic distances, to hold such an unshakable, sober, and highly personal belief in an invisible, all-powerful being whom westerners call God? On the face of it, this invisible being is a voyeur who knows all about you, an aloof sadist (as some people believe in the wake of personal misfortunes), a sexual totalitarian, and a personal friend, all rolled into one. The fact that, normally, none of this strange mix seems to strike us as bizarre may indicate that this trait has somehow had a deeper benefit for our species.

Mere desire to believe (or, using Sigmund Freud’s term, wish fulfillment; see Freud, 1961) doesn’t seem to cut it as an explanation of these traits. In studies I have conducted, people’s levels of death anxiety didn’t have much correlation with their types of religious beliefs—those with low fear of dying, for instance, are just as likely to be materialists as they are *immortalists* (who believe in consciousness after death; see Bering, 2002b). Religious beliefs could instead be a result of cultural indoctrination, a simple matter of exposure from birth to such ideas. But maybe it goes back even further than birth: perhaps human minds have a genetic predisposition toward supernatural belief.

To some, these questions are distasteful, even silly, because they suggest that God and the afterlife are phenomenological products of mind rather than an objective reality. But in my view, a serious empirical analysis of the natural foundations of such supernatural beliefs is fair game for science. Being a psychologist, I began to wonder whether there was some way to collect empirical evidence to see whether a belief in God and an afterlife were somehow the natural, default state of human consciousness. But to understand why such a thing might have come about, we first must look at how evolution has influenced the human mind.

EVOLUTIONARY PSYCHOLOGY

As psychologists such as David M. Buss of the University of Texas at Austin; Leda Cosmides of the University of California, Santa Barbara; and Steven Pinker of Harvard University have been arguing for more than a decade, not only are our bodies a product of natural selection—for example, our opposable thumbs for grasping and our bipedal posture for walking—but our minds bear the thumbprint of evolution as well (Buss, Haselton,

Shackelford, Bleske, & Wakefield, 1998; Cosmides & Tooby, 1997; Pinker, 2002). In many cases, the *way* we think about a particular class of events (the so-called structure of our psychology) reflects *why* we think that way (the so-called function of our psychology).

Take, for instance, our preference for sweet and fatty foods or our fear of heights and snakes or the fact that we go “coochie-coochie-coo” whenever we see a cute baby. These behaviors are all, according to evolutionary psychologists, caused by unconscious mental forces that helped our ancestors survive and thrive in the remote past. We may not know why we do, think, or feel as we do, but as biologist Richard Dawkins argues in his book *The Selfish Gene* (1976), from our genes’ point of view, this ignorance is entirely moot anyway, so long as we work on their behalf. Behavior is therefore one of the primary currencies used by natural selection, and it is psychological states that drive behavior.

Recognizing the evolutionary roots of much of human behavior, I began to wonder whether a psychological susceptibility to belief in God is the result of adaptive design. That hypothesis would make sense only if indeed there were behaviors associated with such susceptibility that made us genetically successful. Just as canine teeth evolved to help people rip the flesh off bones, could a belief in God have evolved to help people tear off bits of meaning from an otherwise meaningless existence? Or perhaps God is simply a *spandrel*—an architectural term (for an ornamental arch) adopted by Stephen Jay Gould and Richard Lewontin to indicate a biological feature that is passed down part and parcel with another trait and is not on its own a product of natural selection. God might be an accidental by-product of human cognitive evolution, a functionless leftover of the capacity to reason about other human minds in the everyday social world, as cognitive scientists such as Pascal Boyer of Washington University in St. Louis believe. There’s a third option, which I favor: that religious belief is an *exaptation*—a spandrel that turned out to be useful and so was subsequently selected for by evolutionary pressures.

TYPES OF MINDS

One way to assess the impact of evolution on supernatural beliefs is to study different types of minds. In 1996, I made regular excursions to a small town in Florida called South Hialeah to see one of the most famous residents of greater Miami. He was called simply “King.” Legend has it that he was born, one of a set of twins, somewhere in the dense African rain forest, but when his mother was murdered, he was made an orphan and shipped off to the United States to perform with his brother in a traveling circus. It was in these early circus days that the ringleader allegedly had King’s teeth knocked out with a hammer.

Now, under a canopy of palms, this 450-pound gorilla with calcified gums leaned imperiously against the wall of his enclosure and stole wary glances at me as I scribbled down my notes. Soon, King's trainer would have him put on his trademark show for shouting schoolchildren, performed three times a day for the past 17 years, in which he would sedately climb on top of a 20-gallon drum and belly dance for the modest price of a crisp head of lettuce. Over subsequent months, King and I had interactions that were both mutually unsettling and reinforcing: on some occasions he would pound his chest and charge at me or projectile vomit on me, while on others he would stick out his enormous feet between the steel bars, inviting me to tickle his plump, rubbery toes, purring with guttural affection. Through all his eclectic behaviors, one question remained in my mind: After a life so profoundly muddled by humans, would King think to ask God why this was his lot in life?

Could King think of God at all? As Darwin stated in *The Descent of Man*, "There can be no doubt, that the difference between the mind of the lowest man and that of the highest animal is immense. . . . Nevertheless, the difference in mind . . . , great as it is, certainly is one of degree and not of kind." If so, then we should find some psychological states in King that are evolutionary variants of human belief in souls or the afterlife.

Although it may be difficult to get King to discuss his thoughts on these matters, there is another way to figure out what level of cognitive development is needed to entertain existential beliefs: by seeing how these traits appear in children of different ages. Other mental systems, such as empathy, have been found to emerge piecemeal, with precursory components of the end state coming up gradually during a child's development. If humans are naturally inclined to believe in God and the afterlife, there is good reason to think that children will exhibit signs of these traits before receiving any cultural indoctrination.

This is the question that I explored for my doctoral dissertation, where I presented children of ages 4 through 12 with a puppet show—which we agreed was just a game—that portrayed an innocuous little mouse being eaten by a grumpy alligator. Afterward, I asked the children a series of questions. Now that the mouse was dead, did it miss its mom? Was it still hungry? Was it still angry at its brother? Could it still taste the grass it ate right before it died? Curiously, the younger the child, the more likely he or she was to endow the dead mouse with the capacity to experience various mental states despite the fact that even preschoolers generally understood that the mouse's body had stopped functioning after death. This is precisely the opposite of the pattern that one would expect to find if the origins of such beliefs could be traced exclusively to cultural indoctrination. In fact, "religious" answers—such as Heaven, God, or spirits—among the youngest children were extraordinarily rare (see Bering, 2006). If belief in an afterlife is entirely cultural, older children would have had more exposure and become more

socially aligned to prevailing metaphysical beliefs and therefore would be expected to attribute more traits to the afterlife.

Some of the most striking findings from this study involved a disconnection between closely related bodily and psychological processes. For instance, many of the youngest children reasoned that the dead mouse needn't eat or drink after death while simultaneously reasoning that it retained the capacity for hunger and thirst. Such responses dropped off when children better understood the biology of life. This seemed to show that children have naive theories about psychological functioning after death that initially include all psychological states, which are gradually pruned to a more restrictive range of functioning. For instance, even the youngest children knew that the brain stopped working at death, but most children, even the oldest, refused to say that the mouse stopped loving its mother at death.

THE INTUITIVENESS OF THE AFTERLIFE

By claiming that psychological states survive death (or even alluding to this possibility), one commits to a radical form of *mind-body dualism*, where each appears to be able to exist without the other. But what, exactly, does the brain do if mental activities can exist independently of it? The devil, it seems, is in the details. In cognitive science, this devil is welcome; indeed, it makes frequent appearances, asking very specific questions. My colleagues and I call this devil *reductionism* and invite others to watch it play a game of wits with what are perhaps some of their most sacred beliefs. After the devil has had its say, it makes a pretty convincing case. The distinctively human ideas of God, souls, and meaning are at once absolutely seductive and yet so disarmingly irrational.

A few years ago, I published the results of a series of interviews with college students who were asked to reason about the fate of the mind after death, much as I had asked the children in the study with the puppet show (Bering, in press). The questions I asked were of the reductionist variety: Could a man who was instantaneously killed in a car accident still experience lust? How's his sense of taste? Is he still angry at his wife about their spat the previous night? As expected, those students who reported that they had some belief in God were more likely to attribute mental states to dead agents. The big surprise was that people who categorized themselves as *extinctivists*—those who stated that personal consciousness is snuffed out entirely at death—often betrayed their real thinking about the afterlife during the interview. For example, when asked whether the dead protagonist knew that he was dead (a feat demanding ongoing cognitive abilities), one young *extinctivist's* answer was almost comical: "Yeah, he'd know because I don't believe in the afterlife. It is nonexistent; he sees that now." Despite himself, this alleged *extinctivist* was a dualist.

The results of this study, taken with the data from the puppet-show experiment, indicate that because no one knows what it's like to be dead, people attribute to dead agents the mental traits that they cannot imagine being without. The results also provide evidence that belief in supernatural agents pirates the brain's mental inference systems that are designed to reason about everyday intentional (living) agents. People know that other people have mental traits and actions, even when the other people are not being directly observed. So it may be the default cognitive state to give these traits to unseen dead agents.

Some psychologists, such as Boyer, put forward that supernatural beliefs arose through culture alone and that religious ideas are pervasive because they are counterintuitive—they violate the mind's understanding of the world, which in fact makes them easier to remember. My view is that afterlife beliefs are the default state and that it is in fact counterintuitive for people to deny them. In the students' and the older children's mental representation of dead agents, some traits were more easily lost than others. The students had to think about twice as long before answering questions about emotional or epistemic (feeling and knowing) states over biological or psychobiological (hearing or hunger, for instance) states after death. To humans, dead agents are therefore not just invisible beings but have a narrower range of experience than in life. Therefore, it seems that it's natural for human beings to reason about death as a transitional state of consciousness and that cultural communication serves to meter—either to enrich or degrade—these intuitive conceptions of the afterlife.

There are several other developmental psychologists who have recently begun investigating the natural foundations of religion using empirical methods from cognitive science, and their results are complementary to what I have found (Bloom, 2002). For example, in a recent study, Valerie Kuhlmeier, a psychologist at Queen's University in Ontario, and her colleagues positioned identical twin experimenters behind different partitions. This was done in order to test five-month-olds' ability to reason about the law of continuous motion as it applies to human bodies. Infants are known to show surprise at unexpected events by looking at them for longer periods of time. For inanimate objects, infants look longer when the object disappears behind one barrier and then seems to reemerge from another nonadjacent barrier. Seeing a person who violates the law of continuous motion, however, five-month-olds are not surprised. The authors speculate that "infants do not readily view humans as material objects" but may first think of people only as intentional agents. An "appreciation that people *are* just objects may be a developmental accomplishment."

SOCIETAL ADVANTAGES

The studies discussed so far have shown that existential beliefs require a certain level of cognitive development to be fully expressed (Bering, 2002a).

Afterlife beliefs thus depend on other cognitive systems to exist. Therefore, they are likely not an independent adaptive trait but more likely a spandrel or an exaptation. But to theorize further between the latter two possibilities, one needs to determine whether there has been an evolutionary advantage to believing in the supernatural.

Once humans developed speech and societies, selfish behavior, such as violence or cheating, could be reported. Such behaviors could therefore result in retaliation, such as social marginalization. This punishment would have physical impact: people labeled as poor cooperators might be considered to be poor reproductive partners. Thus, keeping in line became genetically adaptive. But maybe human *intelligence* couldn't be relied on to follow the rules. In some no-one-will-ever-know instances, the threat of detection may appear deceptively low, so *individuals* are tempted to profit from cheating tactics. But such temptations would be less attractive if there was a "Santa Claus" effect where *individuals* thought that they were constantly being watched by invisible beings. I thus reason that the idea of supernatural observation may serve to counteract such dangerous risk miscalculations, persuading the person to refrain from social deviance and, subsequently, to preserve their genetic fitness.

People in most hunter-gatherer societies have a fear of ancestral ghosts who they think are constantly watching them, but to gather empirical evidence for this theory, my colleagues Katrina McLeod, Todd K. Shackelford, and I set up a study of undergraduate students where we tempted them to cheat on a competitive computer task. Students were told that they were evaluating a new test of spatial intelligence but that there were still some glitches in the program so that occasionally the correct answer would appear on the screen. The students were instructed to immediately hit the space bar to clear the answer. Unbeknownst to them, the answer's appearance was not accidental. We were timing how long it took for students to hit the space bar, so we had a way to measure whether the students were cheating on the test. Students were left alone in a room during the task, but one group was told a "ghost story" beforehand—that a graduate student involved in the study had died suddenly and that sightings of his ghost had recently been reported in the testing room. A second group of students was given an "in memoriam" statement at the end of the test instructions, indicating that the test was dedicated to the dead student, but they were not told the ghost story. A third group of students was not told either of these stories. We found that students who were told the ghost story hit the space bar significantly faster than the other two groups, resisting the opportunity to cheat on the task.

So how does all this connect back to God and suffering? If it were evolutionarily advantageous for human beings to believe that omnipotent deities would punish them if they did wrong, they would always do right. It's possible that human logic might have then flipped this around so that people

began to believe by extension that if they do not do wrong, the supernatural being will not punish them. In other words, they believe that they have a “social contract” with the deity, who must adhere to these rules. Indeed, this belief has become so ingrained that if misfortune occurs, some cultures take this to mean that the person has done some unknown wrong.

SIGNS FROM BEYOND

If human beings have evolved to believe that dead agents are watching them, it would not be surprising to find that they are looking for messages from their observers, perhaps as reminders that they are indeed under surveillance. And it turns out that communing with the dead does come with well-oiled ease for most people. Granted, it’s an ambiguous and one-sided conversation, but for many, the environment is filled with signs from the great beyond.

Cognitive psychology has some explanations for this behavior as well. It turns out that understanding the “messages” of unseen agents is directly related to how we comprehend the minds of other human beings. Consider, for instance, that one day all human beings became hard-core *solipsists* (a philosophy that denies the existence of other minds). Imagine, say, that everyone was struck down with autism or otherwise lost the capacity to think about other minds. What would happen then? I’d venture that church attendance would reach an all-time low next Sunday. Here then is one key ingredient for belief in God or spirits: an innate disposition to see others not just as ambulant objects or brain-dead sacks of meat but as thinking, feeling beings that, just like oneself, are causal agents who do things intentionally. Once children are able to reason about the mental lives of others, developmental psychologists refer to them as possessing a *theory of mind*.

People and animals behave through their actions, whereas God is believed to “behave” through various events. For example, New Orleans Mayor Ray Nagin recently made comments—which he later retracted—suggesting that Hurricane Katrina was God’s wake-up call to African Americans about rampant urban violence: “Surely God is mad at America. Surely He’s not approving of us being in Iraq under false pretense. But surely He’s upset at black America, also. We’re not taking care of ourselves.”

In the case of people or deities, we appeal to other minds to explain and predict behaviors, to understand why others do what they do. Whether you admit it or not, just like the rest of us, you’ve probably asked yourself the question, “Why me?” If you’ve answered this by saying, “Things happen for a reason,” then you’re using your everyday social psychology to think about God.

I’ve experienced firsthand this phenomenon of finding supernatural messages in everyday events. The morning after my mother died, my siblings

and I were sitting in her living room, emotionally drained and drowned in our grief. Just then, the wind chimes outside my mother's window started to sound. We looked at one another, and I, the family skeptic, knew exactly what was going through everyone's heads: "That's her! She's telling us not to worry!" I knew because I was thinking precisely the same thing. How strange: although I didn't believe in the afterlife, I still couldn't help but make such automatic inferences about my dead mother's attempts to communicate with me.

From an experimental psychologist's perspective, this was very inspiring. The ability to see natural events as symbolic should also bootstrap on stages of cognitive development, such as a growing ability to read intentions and desires of others. So, naturally, I decided to invite my mother's ghost into my laboratory to see how children of different ages would respond to her antics (Bering, in press; Bering & Bjorklund, 2004).

For the sake of the children (and their parents), I had to alter my mother's identity somewhat, calling her "Princess Alice" rather than my "Dead Mother Alice," and telling them that she was a friendly magic princess who could make herself invisible. In addition, my research assistants had to give her a helping hand in her attempts to communicate, rigging a picture with a magnetic device so that it would fall "unexpectedly" to the ground, and affixing a remote control adapter to a table lamp so that it would "spontaneously" flash on and off during the experiment.

After being told that Princess Alice would help them play a game in which they were to guess the location of a ball hidden inside one of two boxes "by telling you, somehow, when you pick the wrong box," only the oldest children in the study, the seven-year-olds, chose the opposite box in response to the unexpected events. One of these second graders even thought that the bell chiming in the nearby university clock tower was Princess Alice "talking" to him. The five-year-olds, too, thought it was Princess Alice doing these things, but they didn't see any communicative attempts in the events (maybe she thought the picture just looked better on the ground?), and so they stuck with their initial choice. They could detect agency but not meaning in the unexpected events. The three-year-olds only shrugged their shoulders or gave physical explanations for the events, such as the picture not being sticky enough to stay on the door.

Unlike the puppet-show study, the children here were more susceptible to attributing abilities to supernatural agents because in this case it required that they had developed cognitively to have what's called *second-order reasoning*. They had to be able to understand that "Alice knows that I don't know where the ball is" in order to be susceptible to the "hidden messages."

So just what was my mother trying to tell me from beyond the grave anyhow? Although it's open for debate, I interpreted her message as follows: when combined with a cognitively ripe enough mind and when the

emotional climate is just right, there is no shape that evidence cannot assume in order to tempt the most recalcitrant of skeptics. In the words of one such wide-eyed little disbeliever who had just seen the lights inexplicably flicker, "I thought invisible was just make-believe; maybe it *is* real!"

Some investigators, such as Justin Barrett of the Institute of Cognition and Culture in Belfast and Scott Atran of the University of Michigan, theorize that there are evolutionarily advantageous reasons for such a ready susceptibility to believing that any activity in the environment was actively caused by some kind of agent. It is better for children to mistake a branch falling in the forest for a predator than it is for them to misinterpret signs of danger as a product of the weather, for instance. Such *hypervigilance mechanisms* kept people alert and ready, but they may also make them overly inclined to attribute a natural event as some kind of intentional act.

INCREASING IMPACT

It is clear that when it comes to the big questions in life, our brains have evolved so that science eludes us but religion comes naturally. There are still many pieces to fill in on the big picture of human cognitive evolution as it relates to supernatural beliefs. But I believe that this area of research could have positive impact on society. Bringing such discussions into a context where they could be understood by a larger range of people could have immense benefits in decreasing the divide that many people feel separates science from everyday life.

There are a number of scholars currently working on novel evolutionary theories of religion, but there are also a lot of exciting discoveries taking place in this field that have yet to strike the right chord with the educated public. I recently taught a graduate seminar on this topic by starting off with Boyer's excellent book *Religion Explained* (2001), which uses numerous anthropological examples to account for the origins of religious thought. One student told me, "It's all good in theory, and maybe it does explain religion, but I can't see what it has to do with *my* belief in God." Although it is absolutely critical to study a variety of cultures and different species if one aims to illustrate the commonalities of behavior across seemingly diverse groups, researchers in this area should increasingly begin talking about God and Western souls rather than, for instance, the ancestral spirits of the Tupi peoples or the concept of evil among the Igbo of Nigeria.

If one could answer what have traditionally been solely philosophical questions using testable means and place the results in a plausible theoretical context, areas that have historically been out of bounds for scientists could be rightfully claimed by psychological science. Despite the social quagmire surrounding all things religious, the rigorous study of supernatural beliefs could be necessary for a complete understanding of human cognitive

development. I believe that these new applications of cognitive science are particularly important to human understanding. Perhaps this field of experimental research has the potential to teach us—with minimal human bias—how we really, truly fit as individual “souls” in this world.

NOTE

“The Cognitive Psychology of Belief in the Supernatural,” by Jesse Bering. Reprinted with permission of *American Scientist* 92: 142–149, March–April, 2006.

REFERENCES

- Bering, J. M. (2002a). The existential theory of mind. *Review of General Psychology* 6, 3–24.
- Bering, J. M. (2002b). Intuitive conceptions of dead agents’ minds: The natural foundations of afterlife beliefs as phenomenological boundary. *Journal of Cognition and Culture* 2, 263–308.
- Bering, J. M. (2006). Children’s attributions of intentions to an invisible agent. *Developmental Psychology*, 42(2), 253–262.
- Bering, J. M. (in press). The folk psychology of souls. *Behavioral and Brain Sciences*.
- Bering, J. M., & D. F. Bjorklund. (2004). The natural emergence of reasoning about the afterlife as a developmental regularity. *Developmental Psychology* 40, 217–233.
- Bloom, P. (2002). *Descartes’ baby: How the science of child development explains what makes us human*. New York: Basic Books.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Buss, D. M., Haselton, M. G., Shackelford, T. K., Bleske, A. L., & Wakefield, J. C. (1998). Adaptations, exaptations and spandrels. *American Psychologist*, 53, 533–548.
- Cosmides, L., & Tooby, J. (1997). Evolutionary psychology: A primer. Retrieved January 3, 2005, from <http://www.psych.ucsb.edu/research/cep/primer.html>.
- Dawkins, R. (1976/1989). *The selfish gene* (New ed.). New York: Oxford University Press.
- Freud, S. (1961). *The future of an illusion*. New York: Norton.
- Pinker, S. (2002). *The blank slate: The modern denial of human nature*. New York: Viking.

CHAPTER 7

THE RITUAL HEALING THEORY: THERAPEUTIC SUGGESTION AND THE ORIGIN OF RELIGION

James McClenon

The ritual healing theory explains the origin of religion, arguing that human rituals were part of an evolutionary process bringing about the physiological basis for religion. Early hominids practiced repetitive, therapeutic rituals based on dissociative processes. These rituals, practiced over many millennia, provided survival advantages to those with genes allowing openness to ritual suggestion. Dissociative processes associated with rituals facilitated biologically based forms of unusual experience: trance, apparitions, paranormal dreams, waking extrasensory perceptions (ESP), and out-of-body experiences (OBE). These episodes created recurring patterns within folk religion, generating beliefs in spirits, souls, life after death, and magical abilities. These beliefs are the foundations for shamanism, humankind's first religious form. The ritual healing theory argues that ritual healing practices shaped genotypes governing the human capacity for dissociation and hypnosis, allowing modern forms of religiosity.

Dissociation can be defined as “experiences and behaviors that exist apart from, or have been disconnected from, the mainstream of one’s conscious awareness, behavioral repertoire, and/or self-concept” (Krippner, 1994, p. 357). Hilgard (1992) defines dissociation as “the splitting off of certain mental processes from the main body of consciousness with various degrees of autonomy” (p. 69). Trance states, central to shamanism, reflect dissociative processes. Dissociation can also refer to the “absence of conscious awareness of impinging stimuli or ongoing behaviors” (Cardeña, 1994, p. 17), “the coexistence of separate mental systems that should be integrated in the person’s consciousness, memory, or identity” (p. 19), or

“ongoing behavior or perception inconsistent with a person’s introspective verbal report” (p. 21).

When coupled with suggestion, dissociative processes often result in hypnosis. Early definitions of hypnosis refer to dissociative states and increased susceptibility to suggestion. Modern researchers have not found hypnosis to be related to any specific brain state (hypnosis can occur in both relaxed and stressful environments, for example; Fromm & Nash, 1992). Wickramasekera (1987) defines hypnosis as “a psychophysiological condition in which attention is so focused that there occurs a relative reduction of both peripheral awareness and critical analytic mentation, leading to distortions in perception, mood, and memory which in turn produce significant behavioral and biological changes” (p. 12).

Within the context of the ritual healing theory, the words “hypnosis” and “dissociation” are terms of convenience. Future researchers will, undoubtedly, refine present definitions. We should not expect specific genotypes to coincide perfectly with present definitions. The ritual healing theory predicts not that genotypes selected through shamanism over the millennia correspond precisely with current concepts of hypnosis or dissociation but that certain genotypes exist in modern people because they were selected as a result of the therapeutic benefits of shamanism—a process based on dissociation and hypnosis. The theory assumes that research regarding dissociation and hypnosis will continue to shed light on this evolutionary process.

The ritual healing theory provides a scenario explaining the biological basis for religion. It argues that dissociation facilitated hominid coping with negative life events. With increasing capacity for symbolization, hominids found that therapeutic rituals based on dissociation were beneficial. *Homo erectus* sat around fires, chanting and dancing in ways that facilitated therapeutic trance. These activities contributed to the development of vocal control, symbolization, and eventually language. The value of these rituals caused the frequency of dissociation genotypes—genes allowing dissociative experience—to increase. Over time, *Homo erectus* and *Homo sapiens* linked rituals with language, coupling verbal suggestion with altered states of consciousness. As a result, rituals shaped human hypnotizability, a genetically based trait correlated with the incidence of certain forms of unusual experience. These anomalous experiences include apparitions, paranormal dreams, waking ESP, OBE, and psychokinesis (PK). Over the millennia, these anomalous experiences generated beliefs in spirits, souls, life after death, and magical abilities. As a result, similarities exist within the folk religious traditions of all societies (McClenon, 1997a, 2002).

The connection between experience and belief is intuitively clear to those who have frequent anomalous experiences. People experiencing the apparition of a deceased relative who provides information not known but later verified as true come to believe in life after death. People perceiving that

they have left their bodies (OBE) gain belief in “souls” and the possibility of consciousness without a body. People who see magical movement of objects (PK) coinciding with a person’s death tend to believe that the deceased person spirit caused the anomalous movement. Those who feel that they have gained information through ESP come to believe they have magical abilities since those around them label such phenomena as magic. Such people often believe that ESP is facilitated through rituals inducing dissociative trance since they find themselves able to perform in such states. Their assumptions coincide with parapsychological research indicating that sensory restriction and hypnosis facilitate ESP (Schmicker, 2000). Although the ritual healing theory makes no judgment regarding parapsychological claims, it argues that certain experiential forms evolved with the development of human dissociative capacities and that religious beliefs developed as a result.

Evolutionary psychologists hypothesize that the brain developed in a modular fashion. They argue that components evolved as each proved useful for the survival of the entire organism. Dawkins (1999) suggests that genes are like oarsmen in a racing boat. After a number of races, the winning oarsmen (genes) are randomly assigned to new boats (bodies), and the races continue. Over time, those genes contributing to survival become more prevalent. His metaphor might be extended to include a more complex vessel—one with a variety of shipmate teams performing different functions. Evolutionists refer to these groups of genes as genotypes. Genotypes provide the basis for observable physiological processes and traits—called phenotypes—resulting from the interaction of genotypes and their environment.

Evolutionary psychologists recognize the complexity and inefficiency of the interaction between genes and environment. Although gene teams have members performing valueless actions, there is a tendency for useful genotypes to win—and these teams become more prevalent as they are more often passed down to future generations. Within the evolutionary scenario, teams are often effective only in certain environments. The ritual healing theory argues that teams allowing dissociation and hypnotizability proved valuable during humankind’s era of evolutionary adaptation—the many millennia during which hominids (and later humans) practiced therapeutic rituals in small groups. Dissociative genes facilitated trance, waking ESP, paranormal dreams, PK, OBE and near-death experience, apparitions, and other anomalous experiences sustaining shamanism. We need not assume that these experiences were valuable by themselves. It seems likely that such perceptions were by-products of the “cognitive flexibilities” related to dissociation and hypnotic suggestion.

Dissociative experiences occur as a result of brain activity. Dissociative people experience more frequent anomalous experiences because their mental processes deviate from “normal consciousness.” During everyday life, people focus their attention on the world outside their heads, generally maintaining

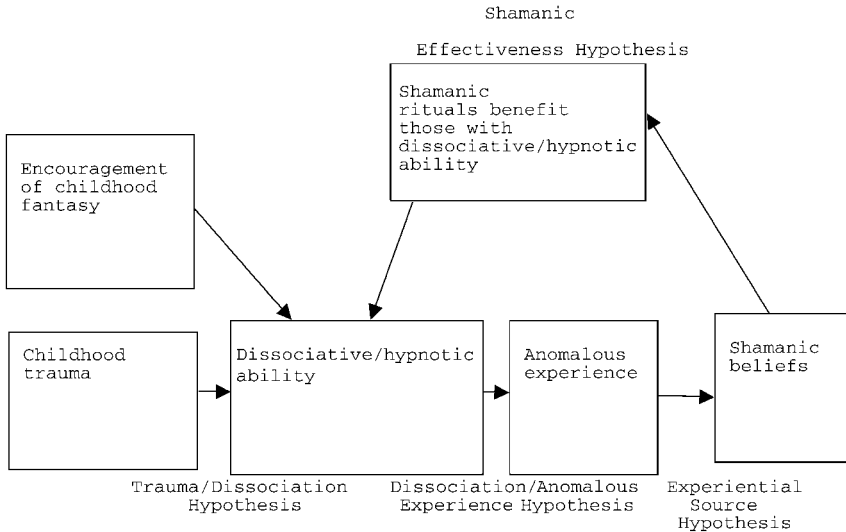
active cognitive states. As evening comes, their brain chemistry changes, and they feel drowsy, a process associated with decreased mental activity. Normally, a person then falls asleep and later passes in and out of dream states (forms of consciousness related to active mental states but focusing on inner processes). In the morning, a person typically wakes from sleep and returns to brain chemical systems associated with high activation and outer focus. Altered states of consciousness, associated with unusual experiences, are due to radical changes in focus of attention, altered brain activation levels (either highly activated or depressed), and changes of cognitive chemical processes (Hobson, 1994). Repetitive rituals induce these altered, dissociative states—forms of consciousness facilitating anomalous experiences. The ritual healing theory argues that shamanic rituals provided therapeutic benefits, causing the selection of genotypes linked to modern propensities for religiosity.

The ritual healing theory corresponds with current knowledge regarding the genetic basis for religion. A growing body of evidence based on twin studies indicates that religious attitude, interests, and practice and associated hypnotic processes have genetic basis (D'Onofrio, Eaves, Murrelle, Maes, & Spilka, 1999; Duke, 1969; Koenig, McGue, Krueger, & Bouchard, 2005; Morgan, 1973; Morgan, Hilgard, & Davert, 1970; Waller, Kojetin, Bouchard, Lykken, & Tellegen, 1990). Studies indicate that the genetic influence on religiosity becomes greater as a person grows older, implying that people tend to express their innate religious propensity more fully as they age (Koenig et al., 2005). These analyses imply that people tend to gain capacity to express inherent needs as they age.

Much evidence implies that the effectiveness of shamanic ritual is due, in part, to hypnotic and placebo effects (McClenon, 1997a, 1997b, 2002). Repetitive rituals induce hypnotic, suggestive states. Rituals may include sensory restriction or overload, fasting, ingesting drugs, repetitive movements, dancing, drumming, chanting, prayer, or prolonged postures—features inducing altered states of consciousness. Dissociation, coupled with suggestion, tends to result in hypnosis. Symptoms, procedures, and outcomes associated with spiritual healing are parallel to those associated with hypnosis. Cognitive states associated with shamanism are linked to hypnosis: alterations in thinking, changes in sense of time and body image, loss of control, changes in emotional expression, perceptual distortions, changes in meaning and significance, sense of ineffability, feelings of rejuvenation, and hypersuggestivity (Ludwig, 1966).

Figure 7.1 illustrates the ritual healing theory in schematic form. This theory differs from many theories of religion in its openness to testing. Genotypes governing religiosity, selected as a result of ritual, are expected to be prevalent in modern people, a prediction associated with four general hypotheses: (1) The trauma/dissociation hypothesis: As humans gained the capacity to symbolize, the frequency of genes associated with dissociation

Figure 7.1 Ritual Healing Theory



increased due to survival advantages provided by this trait. Abused children use dissociation to compartmentalize memories of traumatic events. This aids them in maintaining mental health. As a result, the incidence and severity of childhood trauma should be correlated with propensity for dissociation. (2) The dissociation/anomalous experience hypothesis: Dissociation is correlated with hypnotizability, fantasy proneness, and the capacity for anomalous experience. The study of fantasy proneness began with Wilson and Barber's (1983) finding that a percentage of highly hypnotizable people fantasize much of the time and that this propensity is related to dissociation and anomalous experience. As genes related to dissociation increased, human propensities for anomalous, fantasy, and trance experience also increased. (3) The experiential source hypothesis: People who experience certain anomalous and trance experiences come to believe in spirits, souls, life after death, and magical abilities. Such people, if they gain performance skills, tend to engage in shamanic ritual, providing benefits for others. (4) The shamanic effectiveness hypothesis: Shamanism and other forms of spiritual healing are effective because of hypnotic and placebo processes. Dissociative people achieve greater benefit from shamanic healing than nondissociative people. The theory argues that this differential effect can be verified empirically (an assumption inherent within the hypnosis literature). The capacity to benefit from therapeutic ritual varies among people in all cultures.

As portrayed in Figure 7.1, hypotheses 2, 3, and 4 form a cycle leading to ever-increasing frequencies of dissociation/hypnosis genotypes. Dysfunctions associated with dissociation/hypnosis limit ultimate frequencies of these

genotypes. People who are highly hypnotizable can be damaged by negative suggestions. Costs associated with negative suggestions are hypothesized to be less than benefits derived from positive suggestions. Anthropologists, sociologists, and psychologists have found this to be the case—shamans tend to emphasize healing, and psychologically healthy people tend to focus on benefits. A huge body of literature derived from both clinical studies and anthropological observation supports the argument that placebo and suggestion contribute to therapeutic benefits far more often than negative outcomes (McClenon, 2002).

TRAUMA/DISSOCIATION HYPOTHESIS

The model argues that childhood trauma and encouragement of childhood fantasy lead to increased dissociative ability. The majority of hypnosis researchers conclude that dissociation is inherent within hypnotic functioning and that hypnotizability is biologically and socially shaped (Fromm & Nash, 1992).

Although researchers cannot define hypnosis precisely using physiological terms, various studies indicate that hypnotizability is associated with the functioning of specific brain areas governing focus of attention (Crawford, Brown, & Moon, 1993; Crawford & Gruzelier, 1992; Graffin, Ray, & Lundy, 1995; Spiegel & Vermutten, 1994). The genetic basis of hypnotizability has been established through twin studies (Morgan, 1973).

Evolutionary processes must have contributed to the development of dissociative capacities. Dissociation allows conscious minds to compartmentalize cognition and memory. Dissociative people are better able to ignore unhealthy thoughts and memories and have greater capacity to do multiple tasks simultaneously. Coordinating different tasks with each hand while speaking requires multitasking, a form of dissociation. Hominids developed increasingly bilateral brains, with modules that were “disassociated” from each other. As a result, consciousness became unaware of unconsciousness. Consciousness allows self-monitoring and modification of behavior following feedback. Because not all performance requires conscious self-regulation, awareness of well-learned behaviors tend to “retreat”: from consciousness. When a task is “well learned,” it may be performed unconsciously through “dissociation”—a tendency contributing to cognitive efficiency.

The existence of hypnotic-like process in animals implies that evolutionary shaping of dissociative states occurred during prehominid eras. Survival threats to some animals trigger automatic responses, such as the Totstell reflex, often labeled “animal hypnosis” since its appearance parallels that of hypnosis in humans (Hoskovec & Svorad, 1969). The Totstell reflex causes some animals to avoid predator attacks by “playing dead,” using a response involving rapid change in consciousness. Such startle responses can include

paralysis and the “sleepy” appearance often associated with human hypnotic response. Much observational evidence links human and animal hypnosis. Repetitive, nonverbal rituals function as hypnotic inductions for both primates and humans, creating similar behavioral responses (Völgyesi, 1966). Rhythmic waving of a hand before the eyes of a chimpanzee, for example, can induce the “glazed eye” behavioral responses associated with hypnosis in humans.

Dissociation in humans acts as a defense mechanism. Studies pertaining to therapy indicate that traumatic events cause some children to dissociate excessively (Albini & Pease, 1989; Fink, 1988; Putnam, 1985; Spiegel, 1986). Although excessive dissociation results in identity disorders (Ross, 1997), dissociation is not intrinsically pathological but is related to fantasy and imaginative ability (Putnam, 1991).

The trauma/dissociation hypothesis assumes that humans used dissociation as a coping strategy long enough for the frequency of related genes to increase. Evolutionists have long recognized that generational conflicts (and childhood trauma) have affected evolutionary processes. Childhood conflicts are inevitable since children’s interests do not always coincide with those of their parents (Daly & Wilson, 1998; Trivers, 1974). Much evidence supports the assumption that psychological traumas, treatable by psychological means, have shaped evolutionary processes. Ancient medical texts from many societies describe how hysterical symptoms can be treated through ritual suggestion (Veith, 1965, 1977). Cardeña (1994, p. 28) describes dissociative phenomena as including hysteria, conversion disorders, dissociative identity disorder, depersonalization, dissociative amnesia, hypnosis, OBE, trance possession, shamanic trance, and automatisms. Although reactions to childhood abuse are culturally shaped, people all over the world report similar psychological reactions as a result of exposure to severe stress—forms of posttraumatic stress disorder.

Genotypes linked to dissociation have both positive and negative effects. Highly dissociative people are prone to fantasy and tend to suffer from psychosomatic disorders. Not all recover when treated ritually. The ritual healing theory portrays a process where those with moderate levels of dissociative capacity have optimum survival advantages. This corresponds with modern observations; those with extremely high levels of religiosity/hypnotizability have less reproductive success—they focus excessively on religious practices. Although excessive dissociation reduces fertility, moderate levels protect against psychological trauma and allow benefits from ritual activities. The ritual healing theory predicts that, over time, the frequency of dissociative genotypes within a society attain a level related to the frequency of therapeutic ritual (a variable constrained by the demands of everyday life).

The relationship between high dissociative capacity and psychosomatic disorders generates the “wounded healer” syndrome observed by

anthropologists: Dissociative people tend to become shamans. They often suffer from cognitively based illness but can be healed (often incompletely) through shamanic ritual. As a result, they come to believe in magical processes. Those with sufficient performance skills (involving trance) are socialized into shamanic roles as part of their therapy. They assume valuable roles within their communities and, as part of the process, regain psychological and physical health.

The trauma/dissociation hypothesis can be tested using general populations. Standardized scales allow evaluation of childhood trauma and neglect (Kent & Waller, 1998; Sanders & Becker-Lausen, 1995). The ritual healing theory specifies that (1) childhood trauma and neglect should be positively correlated with dissociative/hypnotic capacity and frequency of anomalous experience, (2) groups claiming higher levels of anomalous experience should report higher rates of childhood trauma and neglect, (3) samples of psychic practitioners and spiritual healers should report more childhood trauma and neglect than general populations, and (4) anthropologists and sociologists who observe ritual healing will note that both spiritual practitioners and those benefiting from their treatments tend to report problems related to childhood stress and general anxiety.

DISSOCIATION/ANOMALOUS EXPERIENCE HYPOTHESIS

Research indicates that the propensity for anomalous experience, hypnosis, dissociation, fantasy proneness, temporal lobe lability, and thinness of cognitive boundaries are intercorrelated (McClenon, 1994, 2002; Targ, Schlitz, & Irwin, 2000). This literature supports the argument that a “shamanic syndrome” governs the nature and incidence of shamanism. A category of people, with propensity for anomalous experience, tend to suffer from psychologically based disorders, to benefit from ritual treatment, and to gain certainty regarding religious doctrines as a result of their anomalous experiences and cure.

Evidence pertaining to these arguments include studies regarding (1) dissociation and paranormal experience, (2) hypnotizability and paranormal experience, and (3) the shamanic syndrome.

1. *Dissociation and paranormal experience.* Various studies report significant positive correlations between dissociativity and frequency of paranormal and anomalous experience (Pekala, Kumar, & Marciano, 1995; Richards, 1991; Ross & Joshi, 1992; Ross, Ryan, Voight, & Eide, 1991). Researchers administer questionnaires measuring these variables and determine correlations between variables. Richards (1991) presents typical survey findings. He mailed questionnaires to

members of the Association for Research and Enlightenment (ARE), a group celebrating the messages provided by the Edgar Cayce (1877–1945), considered the best-documented psychic of the twentieth century. ARE members provide a population high in dissociative propensity. Richards found that, within this population, dissociation was highly correlated with waking clairvoyance, precognition, apparitions, PK, and volitional telepathy and that OBE, trance channeling, and spirit guides imply dissociative processes (as indicated by high significant correlations). His evidence links psychic and other anomalous experiences with dissociative capacities.

Other studies report similar results. A researcher who administers questionnaires to a sample of people can expect to find that scales measuring dissociation will provide values significantly correlated with scales measuring propensity for paranormal and anomalous experiences (estimated $r = 0.4$). In other words, people who are highly dissociative, tend to have anomalous experiences.

2. *Hypnotizability and paranormal experience.* Kumar and Pekala (2001) summarize the literature regarding hypnotizability and paranormal experience: “A total of 23 correlations were reported in 11 different studies . . . three were reported as nonsignificant ($-.20, p > .05$; $.13, p > .001$; [and one did not report an r value but reported that it was nonsignificant]; the rest varied between $.17$ and $.55$ (all at least $p < .05$). The median correlation (excluding the negative value) was $.31$. Studies . . . examining group differences in experiences also support a relationship [except for one study] in the sense that participants with high hypnotizability tend to report a greater number of experiences than those with low hypnotizability” (pp. 275–276). The research literature indicates that anyone who measures hypnotizability in a sample of respondents and also asks them about paranormal experiences is very likely to find that these two variables are significantly correlated—as hypnotizability increases, propensity for anomalous experience also increases.
3. *Shamanic syndrome.* Research indicates that hypnosis, dissociation, and propensity for anomalous experience are correlated with scales designed to measure underlying factors. Thalbourne and Delin (1994, 1999) conducted a principal-components analysis of variables such as belief in paranormal phenomena, magical ideation, manic and depressive experiences, and scores on a creative personality scale. They found that a single factor accounted for 52.5 percent of the variance in one study and 54.2 percent in a replication. They labeled this factor “transliminality,” or the degree to which there is a gap in the barrier or gating mechanism between the unconscious (subliminal) and conscious mind (Thalbourne, Bartemucci, Delin, Fox, & Nofi, 1997). Transliminality was highly correlated with mysticism, and people who are high in transliminality are more susceptible to incursions of ideational and affective input from subliminal regions (Thalbourne &

Delin, 1999). These findings indicate that there is a specific trait or propensity (transliminality) associated with the “flow” of information between consciousness and unconsciousness—and that some people have greater “flow” than others. Although it may be difficult to define transliminality precisely, the term is operationally specified by questionnaire items pertaining to mental focus, dissociation, absorption, and unusual experiences.

Hartmann (1991) conducted similar questionnaire studies, finding that certain cognitive propensities were linked to anomalous experience. He devised a “boundary questionnaire” designed to measure the degree that respondents construct cognitive borders within their minds. His studies found high correlation between “thinness” of cognitive boundaries and questionnaire items similar to those making up the transliminality scale. Hartmann defines cognitive boundaries as physiologically based and culturally socialized barriers to the spontaneous flow of images and information within the brain. People with thin boundaries have the sense of merging with their perceptions. They reveal greater fluidity of thought and feeling since they have fewer barriers separating them cognitively from the world. Thin cognitive boundaries allow hypnotic suggestions to affect unconscious processes, a characteristic associated with certain pathologies. Thinness facilitates the flow of anomalous perceptions into conscious awareness; as a result, those revealing thin boundaries on Hartmann’s scale tend to report more frequent anomalous experiences and to be more hypnotizable.

Hartmann does not discuss the evolutionary value of thinness of cognitive boundaries but notes that certain occupations (e.g., sea captains) tend to have thick boundaries while others occupations (e.g., painters, musicians, and writers) tend to have thin boundaries. The ritual healing theory would hypothesize that those with thin boundaries would gain greater benefits from shamanic rituals because of greater hypnotizability. Those with thick boundaries would have survival advantages in environments requiring cognitive rigidity, such as a storm at sea.

Persinger and his associates conducted a series of studies indicating that responses to questionnaire items related to temporal lobe epilepsy are related to specific electroencephalogram (EEG) patterns (the EEG is a device that reveals electrical activity in various parts of the brain). EEG patterns indicating variations in wave patterns in the temporal lobe region of the brain are correlated with the propensity to report anomalous and religious experiences (Kakarec & Persinger, 1990; Persinger, 1984a, 1984b; Persinger & Makarec, 1987, 1993; Persinger & Valliant, 1985). This body of evidence supports the argument that the propensity for anomalous experience has a physiological basis linked to brain mechanisms.

Anthropological observations coincide with findings regarding physiological basis. Anthropologists note recurring features linking anomalous experiences with physiological and mental health parameters—features that

imply physiological basis (McClenon, 1994, 2002). Ethnographers observe that people with a propensity for anomalous experience often suffer from psychologically based disorders and culturally specific pathologies; these problems are often attributed to spiritual forces (McClenon, 2002). Such people may be healed by spiritual practitioners and, as part of this process, become spiritual practitioners themselves (Lewis, 1971). In northern Sudan, for example, a woman in a stressful life situation found herself possessed by a spirit that affected her health. She described negative anomalous experiences. She regained wholeness through ritual healing ceremonies that provided a new, healthy identity for her as a cult member and healer (Broddy, 1988). This process requires the troubled person to be cognitively open, to have had anomalous experiences, to be responsive to ritual suggestion, to be capable of further anomalous experience, and to be suitable for becoming a healer. Sick people who are not cognitively open and responsive to suggestion are less likely to be healed within this system.

Anthropologists find that shamans differ on parameters related to transliminality compared to nonshamans within their community. For example, Katz (1976, p. 289) found that the spiritual healing masters among the Kalahari !Kung tended to come from certain families, to be more emotional, and to have richer fantasy lives than nonhealers. These practitioners used trance to demonstrate extrasensory ability. People all over the world believe that spiritual and magical propensities have a genetic component and that the capacity for spiritual healing runs in families. Folklorists note recurring motifs regarding spiritual healing and magical abilities in the anomalous stories of all societies—findings that imply physiological basis (McClenon, 1994). People in certain families, having specific propensities, tend to become magical practitioners—and others having the same propensities respond to their performances.

The dissociation/anomalous experience hypothesis provides specific predictions for future research. Studies should find significant correlations between frequency of anomalous experience, dissociative experience, temporal lobe signs (response to questionnaire items linked to temporal lobe disorders), transliminality, and cognitive openness. Anthropologists can observe universal features within spiritual healing related to these variables. Ethnographers can note that those who reveal elements related to the shamanic syndrome gain greater benefit from healing rituals and have greater potential to become spiritual healers themselves.

EXPERIENTIAL SOURCE HYPOTHESES

Hufford's (1982) *experiential source theory* states that certain forms of anomalous experience, such as sleep paralysis (waking from sleep and finding oneself unable to move—an experience often associated with apparitional perceptions), generate and shape folk religious beliefs. He devised this argument in opposition to what he refers to as the *cultural source theory*,

a set of ideas implying that anomalous experiences have no other source than culture. McClenon's (1994) analyses of apparitions, waking ESP, paranormal dreams, OBE, PK, synchronicity (anomalous coincidence between two events), and other unusual episodes extend the experiential source theory. Unusual experience accounts were collected from random samples of college students in China, Japan, and the United States. Their stories reveal recurring structural elements leading to parallel beliefs in spirits, souls, life after death, and magical abilities (McClenon, 1994, 2002). The narratives were compared to experiential accounts from medieval Europe, China, and Japan. People all over the world from all eras report equivalent anomalous experiences and reach generally similar conclusions regarding spirits, souls, life after death, and magical abilities.

Various research strategies allow testing of these arguments and have generated evidence supporting experiential source hypotheses. Analyses of survey responses from Japan, China, Europe, and the United States reveal that all groups report ESP and contacts with the dead (McClenon, 1994). Collections of narrative accounts from Finland, Germany, Great Britain, China, Japan, and the United States indicate that people from all these cultures report similar forms of apparitions, waking ESP, paranormal dreams, PK, OBE, and synchronicity (McClenon, 1994). Anomalous stories can be classified into clearly defined categories associated with reliable coding systems (McClenon, 1994, 1997b, 2000, 2002). This evidence implies that these forms of anomalous experience have physiological bases, just as do dreams and trance perceptions. Although experiential forms are culturally interpreted, similar experiences tend to produce similar beliefs.

The experiential source argument has been tested by talking with people reporting many unusual experiences in Thailand, Korea, Okinawa, the Philippines, India, Taiwan, China, and the United States (McClenon, 1994). Most of their anomalous stories are similar regarding form and theme and can be categorized as apparitions, paranormal dreams, ESP, OBE, and PK. Although each culture portrays unique elements, people reporting these perceptions describe general beliefs in spirits, souls, life after death, and magical abilities as a result.

Cross-cultural analysis of anomalous narratives reveal recurring patterns. Waking ESP, paranormal dreams, and apparitions have inherent structural features, consistent among cultures (McClenon, 2000). Analysis of respondents' accounts from Finland, Germany, China, and the United States reveal that (1) ESP tends to occur among family members; (2) death is often an important theme within ESP accounts; (3) paranormal dreams tend to pertain to future events, while waking ESP tends to pertain to present events; (4) waking ESP tends to generate greater conviction, indicated by the respondent taking action, than do paranormal dreams; (5) paranormal dreams tend to provide more information than do waking

ESP episodes; (6) there is a tendency for “quality of information” to be negatively correlated with “severity of event” within paranormal dreams, and paranormal dreams often fail to reveal the identity of a person who later dies while providing more complete information for events not associated with death; and (7) apparitions contain similar “abnormal features of perception” in all societies, including the disappearance of image, insubstantial image, glowing image, white or black clothes, sickly or deformed image, partial body, abnormal walking or floating, and abnormal sound (Emmons, 1982; McClenon, 1994). This body of evidence supports the argument that specific anomalous forms of experience are not totally produced by culture but have physiological bases generating universal structural elements.

Correlation survey research supports the argument that certain anomalous experiences are linked to specific beliefs (Pekala, Kumar, & Cummings, 1992; Targ et al., 2000). These types of studies, which involve respondents completing questionnaires, do not demonstrate that experiences *cause* belief but show correlations between these variables. In general, anomalous experiences are linked to beliefs involving spirits, souls, life after death, and magical abilities. Causal relationships are often uncovered when researchers interview people reporting frequent anomalous experience (Emmon, 1982; McClenon, 1994). For example, some people see apparitions on a daily basis. They claim to be able to communicate with the phantoms they see. They argue that their perceptions allow them insights into the nature of life after death. Although skeptics criticize their reasoning, they describe their beliefs as derived from their experiences. People who gain valid information from dreams, waking ESP, or OBE are likely to believe in spirits and magic.

Historical analysis coincides with the experiential source argument. Although features within anomalous experiences seemingly reflect experiencers’ cultures, elements within these stories seem universal (McClenon, 1994). People in medieval Europe and Asia described the same forms of apparition, haunting, and PK as do modern people. Perceptions of anomalous events (such as near-death experience) have shaped religious thinking in similar directions throughout history. Historical analysis reveals these patterns. For example, Swatos and Gissurarson (1997) found that spiritualism, the capacity for a person to go into trance and communicate with the spirit world, had powerful impacts on Icelandic people’s religious beliefs during the first half of the twentieth century. One medium, Indriði Indriðason (1883–1912) was investigated and tested extensively by member of the Experimental Society in Reykjavik beginning in 1905. The society constructed a special building including barriers between medium and audience as a means to prevent fraudulent production of mediumistic phenomena. Indriðason’s performances included ESP and PK and were so compelling that the huge number of people witnessing these phenomena came to believe in spiritualist explanations for spirits and life after death. People reported seeing anomalous lights, hearing

spirit voices, finding that objects moved about magically (PK), and a wide variety of other paranormal phenomena. Swatos and Gissurason describe the Experimental Society's astonishingly detailed precautions to preclude fraud: doors locked and sealed; the medium fastened and securely sewn using special tapes, strings, and other equipment; and many other precautions to preclude fraud. Even though such controls were in place, participants reported hearing unexplained knocking sounds, seeing the medium levitate, hearing spirit voices, seeing objects move about magically, and feeling unexplained "touching" by spirits. These anomalous perceptions were similar to spiritualist accounts from Great Britain, the European mainland, and the United States. Although most modern historians believe such phenomena were produced fraudulently, similar events are reported as part of shamanic performance all over the world. Magical practitioners, whether authentic or not, can affect audiences' religious beliefs. The propensity for such performers to shape belief coincides with the experiential source argument: magical performances have recurring elements that shape folk beliefs regarding spirits, souls, life after death, and magical abilities.

Social-psychological research indicates that attitudes formed by direct experience are stronger than those gained by other means. Experience-based attitudes have been found to be better predictors of later behavior than socially based attitudes (Millar & Millar, 1996). This propensity seems particularly powerful in the area of religious belief. All over the world, people reporting frequent anomalous experiences claim robust beliefs, having powerful influences on their behavior (McClenon, 1994). The majority of anomalous experiences are reported by a small segment of each population (Greeley, 1975, 1987; Palmer, 1979). This minority seems instrumental in shaping folk beliefs in spirits, souls, life after death, and magical abilities.

Critics of the ritual healing theory point out that only a small percentage of people have high propensity for anomalous experience. They ask, "If dissociative propensity provides survival benefits, why is it so rare?" As mentioned previously, dissociative capacity provides the most benefit only in specific environments—therapeutic rituals; it is less useful in other arenas. Sea captains, for example, find that rigidity of mind is valuable for commanding subordinates during storms. Artists and shamans, on the other hand, find dissociation to be linked with creativity and imagination—contributing to the success of therapeutic ritual. Although sea captains may benefit from religious beliefs, the ritual healing theory predicts that they are less likely to benefit from healing rituals than artists. The ritual healing theory argues that shamanic rituals have shaped the genetic basis for religion to a greater degree than have storms at sea.

Researchers can replicate findings regarding anomalous experience through testing a variety of hypotheses: (1) Collections of anomalous accounts from any society should include stories of apparitions, waking

ESP, paranormal dreams, PK, OBE, sleep paralysis, synchronicity, and spiritual healing. These experiential forms can be differentiated on the basis of universal elements, implying physiological basis. (2) Apparitions, waking ESP, and paranormal dreams have structural features related to recurring elements and states of consciousness associated with family, death, temporal factors, and conviction. (3) People reporting anomalous experiences tend to be prone to dissociation, hypnotizability, transliminality, cognitive openness, and temporal lobe lability. (4) Those who report one experience are more likely to report multiple experiences and to reveal particular beliefs and behaviors as a result.

Participant observation allows witnessing the creation of belief through experience. Some methods allow semicontrolled conditions. Researchers who participate in “sitter groups” meet regularly, often once a week, in semidarkness, with their hands on a table for an hour or more. These groups seek to investigate PK through inducing the table to move about magically (Batcheldor, 1966, 1979, 1984; Owen & Sparrow, 1976). Group séances often cause participants to think that spirits cause the table’s movements. The term “sitter group” refers to the patience required of people sitting around a table, waiting for the phenomena to occur. In similar fashion, spiritualist groups report table movements, spirit voices, and auditory “rapping” sounds thought to be generated by spirits. Many participants believe they communicated with spirits. Although parapsychological theories have not been fully verified by these studies, social scientists observing such groups could test social-psychological theories. They should find that small groups who gather regularly to practice rituals tend to report anomalous experiences (McClenon, 1994). Whether authentic or not, these experiences affect faith—a process hypothesized to have occurred during Paleolithic eras.

Observers find that psychic phenomena experienced by shamanic, spiritualist, and sitter groups have similar forms even though cultures vary (McClenon, 2004). Participants report seeing spirit lights, perceiving objects moving magically, hearing unexplained sounds and voices, and even feeling the whole room shake as during an earthquake (McClenon, 1994). Anthropologists have experienced similar anomalous phenomena: apparitions, paranormal dreams, and magical perceptions within the context of ritual activities (Young & Goulet, 1994). Such evidence tends to refute cultural source hypotheses and support experiential source hypotheses—anthropologists’ personal experiences transform their beliefs.

Social scientists tend to ignore the forms of anomalous experience that people report as the basis for their beliefs (McClenon, Roig, Smith, & Ferrier, 2003). The more robust experiential accounts, although stigmatized within the academic literature, are distributed through popular media. When apparitions and PK perceptions cluster around a particular location, these

reports are often labeled as “hauntings.” People tend to attribute such phenomena to the spirits of the deceased. People who conduct haunting and poltergeist investigations generate findings supporting the experiential source hypothesis. They find that haunting and poltergeist experiences occur more often among those reporting previous anomalous experiences, that frequent experiencers tend to reveal shamanic syndrome traits, and that haunting episodes result in oral accounts that contribute to and shape folk religious traditions (McClenon, 2001). The folklore of all societies contains similar forms of haunting accounts supporting belief in spirits, souls, life after death, and magical abilities.

SHAMANIC EFFECTIVENESS HYPOTHESIS

Anthropologists observe that psychological processes affect spiritual healing outcomes (Bergman, 1973; de Montellano, 1975; Finkler, 1985; Garrison, 1977; Harner, 1973; Kapferer, 1983; Kleinman, 1980; Kleinman & Sung, 1979; Laderman, 1987, 1991; Lambo, 1974; Moerman, 1979; Sharon, 1978; Vogel, 1970). This argument coincides with findings from the emerging fields of mind–body medicine and psychoneuroimmunology, the study of how psychological processes affect the immune system. Researchers note that suggestion affects psychological states, which in turn influence health (Benson & Stark, 1996; Friedman, Klein, & Friedman, 1996).

Much evidence suggests that rituals and mind–body processes shaped the development of shamanism. Paleolithic cave paintings portray shamanic rituals involving altered states of consciousness as early as 30,000 years ago (Lewis-Williams, 2001, 2002; Lewis-Williams & Dowson, 1988). Paleolithic people cared for their sick and engaged in symbolic actions for their benefit. They devised shamanic rituals associated with healing. Shamanism provided the foundation for all later religious forms, and much evidence indicates that the states of consciousness associated with shamanism have a physiological basis (Winkelman, 1992, 2000). With the invention of writing, humans left evidence connecting ritual healing and hypnosis. Ancient texts provide “abundant evidence which shows that hypnosis or a similar induced altered state of consciousness was used in ancient Greece, Egypt, India, China, Africa, and pre-Columbian America” (Mac Hovec, 1975, p. 215). The earliest medical texts of all societies link psychosomatic healing, religion, and magical ritual (McClenon, 2002).

Clinical studies indicate that hypnosis is particularly effective in alleviating pain, asthma, warts, headache, burns, bleeding, gastrointestinal disorders, skin disorders, insomnia, allergies, psychosomatic disorders, and minor psychological problems (Bowers & LeBaron, 1986; Brown, 1992). Folk healing methods also effectively deal with these problems, often through suggestion. Researchers note that hypnotic suggestion does not require trance induction

to be effective. People who are good hypnotic subjects respond to suggestions even when not in trance. Hypnosis can change the response of human skin to heat, probably through reducing edema and fluid retention following thermal injury (Margolis, Domangue, Ehleben, & Shrier, 1983). It can also accelerate healing—perhaps through mechanisms involving hypnotic control of blood flow (Barber, 1984; Chapman, Goodell, & Wolff, 1959; Moore & Kaplan, 1983; Ullman, 1947). This process may explain some of the extremely anomalous healing stories found in all societies (McClenon, 2002). For example, patients may cut off blood flow to cancerous tumors as a result of hypnotic suggestion, causing cancerous growths to wither away.

The magical abilities attributed to shamans contribute to their effectiveness as healers. Performances that induce belief have greater capacity to induce placebo effects. Ethnographers describe shamanic performances including ESP, PK, weather control, and fire walking (Long, 1977; McClenon, 1994). People swayed by these performances would have greater probability of being healed than those who remain skeptical.

The ritual healing theory allows many testable hypotheses: Among clients of spiritual healers, people who benefit should demonstrate more dissociativity, hypnotizability, frequency of anomalous experience, temporal lobe lability, and thinner cognitive boundaries than those not healed. People exposed to magical performances should show greater propensity for placebo and hypnotic response.

Previous research indicates relationships between dissociation and healing. Krippner (1994) portrays dissociative processes within spiritual healing and reviews studies of patients with dissociative identity disorders who benefited from ritual treatments. Goodwin, Hill, and Attias (1990) encourage psychotherapists to familiarize themselves with historical and folk techniques of exorcism since these techniques can be adapted to treat dissociative disorders.

Anthropologists often inadvertently describe processes within spiritual healing revealing hypnosis and dissociation (McClenon, 2002). Csordas (1997), for example, links successful spiritual healing among charismatic Christians with transformations of identity. The processes he describes coincide with the shamanic syndrome. A person suffering from psychosomatic symptoms may be healed by gaining a healthy identity. Researchers can contribute to this literature by specifying which individuals are more likely to respond to magical performances, achieving this transformation. Dissociation and hypnosis involve the types of role playing and acting that lead to transformations of identity and therapeutic social-psychological processes.

The ritual healing theory provides a paradigm for understanding how ritual healing works. Magical performances hold and focus people's attention, increasing the effectiveness of inferred suggestion. Ritual healing sometimes includes sleight-of-hand magic, pain defiance, heat immunity, and resistance

to the cutting action of blades (McClenon, 1994, 2002). Such performances stimulate belief, contributing to the impact of placebo and hypnotic-based healing.

CONCLUSIONS

Scholars have difficulty defining religion because of its wide variety of forms. Complex, hierarchical, multiethnic societies produce much variation within religious forms. Within the context of the ritual healing theory, religion can be defined as those behaviors (phenotypes) associated with genes selected over the millennia through ritual healing. Although variation of cultural forms causes variations in phenotypes, the ritual healing theory explains the fundamental nature of religion. Religion was a product of genetic selection due to the benefits of ritual.

The argument that there are no inherently religious “forms,” which some scholars feel refutes the ritual healing theory, runs counter to observation. The existence of underlying religious forms is apparent to any traveler. For example, the Spanish conquistadores, traveling through Montezuma’s empire in Mexico, easily identified certain practices as “religious,” even though these forms differed from their own. A westerner traveling through China would recognize Buddhist practices as religious even though these rituals do not involve worship of God or gods (assumed by some to be central to religious practice). The common elements inherent in all religious practice are derived from the genotypes selected through therapeutic ritual practiced by humans over many millennia.

The ritual healing theory explains a number of elements associated with religion: (1) the genetic basis for religiosity; (2) universal elements within the major forms of anomalous experience; (3) the prevalence of shamanic trance and healing, even in postindustrial societies; and (4) recurring elements within shamanic ideologies regarding spirits, souls, life after death, and magical abilities. The theory does not preclude group selection theories and other processes that may have shaped religious genotypes. Unlike other theories, it provides hypotheses subject to evaluation within the fields of anthropology, sociology, psychology, folklore, religious studies, physiology, genetics, and medicine.

The ritual healing theory has applied characteristics. It specifies that a segment of people in all societies have greater propensity for anomalous experience, dissociation/hypnotic capacity, and cognitive “openness” or “lability.” These individuals are more likely to benefit from therapeutic ritual. This knowledge could affect the practice of medicine. People with religious propensities, suffering from psychologically based disorders, are more likely to respond to appropriate ritual or faith-based treatments. The ritual healing theory provides a paradigm for the scientific exploration of treatment strategies in this area.

REFERENCES

- Albini, T. K., & Pease, T. E. (1989). Normal and pathological dissociations of early childhood. *Dissociation*, 2, 144–150.
- Barber, J. (1984). Changing “unchangeable” bodily processes by (hypnotic) suggestions: A new look at hypnosis, cognitions, imagining and the mind-body problem. In A. A. Sheikh (Ed.), *Imagery and healing* (pp. 69–128). Farmingdale, NY: Baywood Publishing.
- Batchelder, K. J. (1966). Report on the case of table levitation and associated phenomena. *Journal of the Society for Psychological Research*, 43, 339–356.
- Batchelder, K. J. (1979). PK in sitter groups. *Psychoenergetic Systems*, 3, 77–93.
- Batchelder, K. J. (1984). Contributions to the theory of PK induction from sitter-group work. *Journal of the American Society for Psychological Research*, 78, 105–132.
- Benson, H., & Stark, M. (1996). *Timeless healing: The power and biology of belief*. New York: Scribner.
- Bergman, R. L. (1973). A school for medicine men. *American Journal of Psychiatry*, 130, 663–666.
- Bowers, K. S., & LeBaron, S. (1986). Hypnosis and hypnotizability: Implications for clinical intervention. *Hospital and Community Psychiatry*, 37, 457–467.
- Broddy, J. (1988). Spirits and selves in northern Sudan: The cultural therapies of possession and trance. *American Ethnologist*, 15, 4–27.
- Brown, D. P. (1992). Clinical hypnosis research since 1986. In E. Fromm & M. R. Nash (Eds.), *Contemporary hypnosis research* (pp. 427–458). New York: Guilford Press.
- Cardeña, E. (1994). The domain of dissociation. In S. J. Lynn & J. W. Rhue (Eds.), *Dissociation: Clinical and theoretical perspectives* (pp. 15–31). New York: Guilford Press.
- Chapman L., Goodell, H., & Wolff, H. (1959). Increased inflammatory reaction induced by central nervous system activity. *Transactions of the Association of American Physicians*, 72, 84–110.
- Crawford, H. J., Brown, A. M., & Moon, C. E. (1993). Sustained attentional and disattentional abilities: Differences between low and highly hypnotizable persons. *Journal of Abnormal Psychology*, 102, 534–543.
- Crawford, H. J., & Gruzelier, J. H. (1992). A midstream view of the neuropsychophysiology of hypnosis: Recent research and future directions. In E. Fromm & M. R. Nash (Eds.), *Contemporary hypnosis research* (pp. 227–266). New York: Guilford Press.
- Csordas, T. J. (1997). *The sacred self: A cultural phenomenology of charismatic healing*. Berkeley: University of California Press.
- Daly, M., & Wilson, M. (1998). The evolutionary social psychology of family violence. In C. B. Crawford & D. L. Kribs (Eds.), *Handbook of evolutionary psychology: Ideas, issues, and applications*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Dawkins, R. (1999). *The selfish gene*. New York: Oxford University Press.
- de Montellano, B. O. (1975). Empirical Aztec medicine. *Science*, 188, 215–220.
- D’Onofrio, B. M., Eaves, L. J., Murrelle, L., Maes, H. H., & Spilka, B. (1999). Understanding biological and social influences on religious affiliation,

- attitudes, and behaviors: A behavior genetic perspective. *Journal of Personality*, 67, 953–984.
- Duke, J. D. (1969). Relatedness and waking suggestibility. *International Journal of Clinical Experimental Hypnosis*, 17, 242–250.
- Emmons, C. F. (1982). *Chinese ghosts and ESP: A study of paranormal beliefs and experiences*. Metuchen, NJ: Scarecrow Press.
- Fink, D. L. (1988). The core self: A developmental perspective on the dissociative disorders. *Dissociation*, 1, 43–47.
- Finkler, K. (1985). *Spiritualist healers in Mexico: Successes and failures of alternative therapeutics*. New York: Bergin and Garvey.
- Friedman, H., Klein, T. W., & Friedman, A. L. (Eds.). (1996). *Psychoneuroimmunology, stress, and infection*. Boca Raton, FL: CRC Press.
- Fromm, E., & Nash, M. R. (1992). *Contemporary hypnosis research*. New York: Guilford Press.
- Garrison, V. (1977). The “Puerto Rican Syndrome” in psychiatry and Expiritismo. In V. Crapanzano & V. Garrison (Eds.), *Case studies in spirit possession* (pp. 383–449). New York: John Wiley & Sons.
- Goodwin, J., Hill, S., & Attias, R. (1990). Historical and folk techniques of exorcism: Applications to the treatment of dissociative disorders. *Dissociation*, 3, 94–101.
- Graffin, N. F., Ray, W. J., & Lundy, R. (1995). EEG concomitants of hypnosis and hypnotic susceptibility. *Journal of Abnormal Psychology*, 104, 123–131.
- Greeley, A. M. (1975). *Sociology of the paranormal: A reconnaissance*. Beverly Hills, CA: Sage.
- Greeley, A. M. (1987). Mysticism goes mainstream. *American Health*, 6, 47–49.
- Harner, M. J. (1973). *Hallucinogens and shamanism*. London: Oxford University Press.
- Hartmann, E. (1991). *Boundaries in the mind: A new psychology of personality*. New York: Basic Books.
- Hilgard, E. R. (1992). Dissociation and theories of hypnosis. In E. Fromm & M. R. Nash (Eds.), *Contemporary hypnosis research* (pp. 69–101). New York: Guilford Press.
- Hobson, J. A. (1994). *The chemistry of conscious states: How the brain changes its mind*. Boston: Little, Brown.
- Hoskovec, J., & Svorad, D. (1969). The relationship between human and animal hypnosis. *American Journal of Clinical Hypnosis*, 11, 180–182.
- Hufford, D. J. (1982). *The terror that comes in the night: An experience-centered study of supernatural assault traditions*. Philadelphia: University of Pennsylvania Press.
- Kakarec, K., & Persinger, M. A. (1990). Electroencephalographic validation of a temporal lobe signs inventory in a normal population. *Journal of Research in Personality*, 24, 323–337.
- Kapferer, B. (1983). *A celebration of demons: Exorcism and the aesthetics of healing in Sri Lanka*. Bloomington: Indiana University Press.
- Katz, R. (1976). Education for transcendence: !Kia-healing with the Kalahari !Kung. In R. Lee & I. De Vore (Eds.), *Kalahari hunter-gatherers: Studies of the !Kung San and their neighbors* (pp. 282–301). Cambridge, MA: Harvard University Press.

- Kent, A., & Waller, G. (1998). The impact of emotional abuse: An extension of the Child Abuse and Trauma Scale. *Child Abuse and Neglect*, 22, 393–399.
- Kleinman, A. (1980). *Patients and healers in the context of culture: An exploration of the borderland between anthropology, medicine, and psychiatry*. Berkeley: University of California Press.
- Kleinman, A., & Sung, L. H. (1979). Why do indigenous practitioners successfully heal? A follow-up study of indigenous practice in Taiwan. *Social Science and Medicine*, 13B, 7–26.
- Koenig, L., McGue, M., Krueger, R. F., & Bouchard, T. J., Jr. (2005). Genetic and environmental influences on religiousness: Findings for retrospective and current religiousness ratings. *Journal of Personality*, 73, 471–488.
- Krippner, S. (1994). Cross-cultural treatment perspectives on dissociation disorders. In S. J. Lynn & J. W. Rhue (Eds.), *Dissociation: Clinical and theoretical perspectives* (pp. 338–361). New York: Guilford Press.
- Kumar, V. K., & Pekala, R. J. (2001). Relation of hypnosis-specific attitudes and behaviors to paranormal beliefs and experiences: A technical review. In J. Houran & R. Lange (Eds.), *Hauntings and poltergeists: Multidisciplinary perspectives* (pp. 260–279). Jefferson, NC: McFarland.
- Laderman, C. (1987). The ambiguity of symbols in the structure of healing. *Social Science and Medicine*, 24, 293–301.
- Laderman, C. (1991). *Taming the wind of desire: Psychology, medicine, and aesthetics in Malay shamanistic performance*. Berkeley: University of California Press.
- Lambo, T. A. (1974). Psychotherapy in Africa. *Psychotherapy and Psychosomatics*, 24, 311–326.
- Lewis, I. M. (1971). *Ecstatic religion: An anthropological study of spirit possession and shamanism*. Middlesex, England: Penguin Books.
- Lewis-Williams, J. D. (2001). Southern African shamanistic rock art in its social and cognitive contexts. In N. S. Price (Ed.), *The archaeology of shamanism* (pp. 17–42). London: Routledge.
- Lewis-Williams, J. D. (2002). *The mind in the cave: Consciousness and the origins of art*. London: Thames & Hudson.
- Lewis-Williams, J. D., & Dowson, T. A. (1988). The signs of all times: Entoptic phenomena in Upper Paleolithic art. *Current Anthropology*, 29, 201–245.
- Long, J. (Ed.). (1977). *Extrasensory ecology: Parapsychology and anthropology*. Metuchen, NJ: Scarecrow Press.
- Ludwig, A. (1966). Altered states of consciousness. *Achieves of General Psychiatry*, 15, 225–234.
- Mac Hovec, F. J. (1975). Hypnosis before Mesmer. *American Journal of Clinical Hypnosis*, 17, 215–220.
- Margolis, C. G., Domangue, B. B., Ehleben, C., & Shrier, L. (1983). Hypnosis in the early treatment of burns: A pilot study. *American Journal of Clinical Hypnosis*, 26, 9–15.
- McClenon, J. (1994). *Wondrous events: Foundations of religious belief*. Philadelphia: University of Pennsylvania Press.
- McClenon, J. (1997a). Shamanic healing, human evolution, and the origin of religion. *Journal for the Scientific Study of Religion*, 36, 345–354.

- McClenon, J. (1997b). Spiritual healing and folklore research: Evaluating the hypnosis/placebo theory. *Alternative Therapies in Health and Medicine*, 3, 61–66.
- McClenon, J. (2000). Content analysis of an anomalous memorate collection: Testing hypotheses regarding universal features. *Sociology of Religion*, 61, 155–169.
- McClenon, J. (2001). The sociological investigation of haunting cases. In J. Houran & R. Lange (Eds.), *Hauntings and poltergeists: Multidisciplinary perspectives* (pp. 62–81). Jefferson, NC: McFarland.
- McClenon, J. (2002). *Wondrous healing: Shamanism, human evolution and the origin of religion*. De Kalb: Northern Illinois University Press.
- McClenon, J. (2004). How shamanism began: Human evolution, dissociation, and anomalous experience. In J. Houran & R. Lange (Eds.), *From shamans to scientists: Humanity's search for spirits* (pp. 21–58). Lanham, MD: Scarecrow Press.
- McClenon, J., Roig, M., Smith, M. D., & Ferrier, G. (2003). The coverage of parapsychology in introductory psychology textbooks: 1990–2002. *Journal of Parapsychology*, 67, 167–179.
- Millar, M. G., & Millar, K. U. (1996). The effects of direct and indirect experience on affective and cognitive responses and the attitude-behavior relation. *Journal of Experimental Social Psychology*, 32, 561–579.
- Moerman, D. E. (1979). Anthropology of symbolic healing. *Current Anthropology*, 20, 59–80.
- Moore, L. E., & Kaplan, J. Z. (1983). Hypnotically accelerated wound healing. *American Journal of Clinical Hypnosis*, 26, 16–19.
- Morgan, A. H. (1973). The heritability of hypnotic susceptibility in twins. *Journal of Abnormal and Social Psychology*, 82, 55–61.
- Morgan, A. H., Hilgard, E. R., & Davert, E. C. (1970). The heritability of hypnotic susceptibility of twins: A preliminary report. *Behavioral Genetics*, 1, 213–224.
- Owen, I. M., & Sparrow, M. (1976). *Conjuring up Philip: An adventure in psychokinesis*. New York: Harper & Row.
- Palmer, J. A. (1979). A community mail survey of psychic experiences. *Journal of the American Society for Psychical Research*, 73, 221–251.
- Pekala, R. J., Kumar, V. K., & Cummings, J. (1992). Types of high hypnotically-susceptible individuals and reported attitudes and experiences of the paranormal and anomalous. *Journal of the American Society for Psychical Research*, 86, 135–150.
- Pekala, R. J., Kumar, V. K., & Marcano, G. (1995). Anomalous/paranormal experience, hypnotic susceptibility, and dissociation. *Journal of the American Society for Psychical Research*, 89, 313–332.
- Persinger, M. A. (1984a). People who report religious experiences may display enhanced temporal lobe signs. *Perceptual and Motor Skills*, 58, 963–975.
- Persinger, M. A. (1984b). Propensity to report paranormal experiences is correlated with temporal lobe signs. *Perceptual and Motor Skills*, 59, 583–586.
- Persinger, M. A., & Makarec, K. (1987). Temporal lobe epileptic signs and correlative behaviors displayed by normal populations. *Journal of General Psychology*, 114, 179–195.
- Persinger, M. A., & Makarec, K. (1993). Complex partial epileptic signs as a continuum from normals to epileptics: Normative data and clinical populations. *Journal of Clinical Psychology*, 49, 33–45.

- Persinger, M. A., & Valliant, P. M. (1985). Temporal lobe signs and reports of subjective paranormal experiences in normal population: A replication. *Perceptual and Motor Skills*, *60*, 903–909.
- Putnam, F. W. (1985). Dissociation as a response to extreme trauma. In R. Kluff (Ed.), *Childhood antecedents of multiple personality* (pp. 66–97). Washington, DC: American Psychiatric Press.
- Putnam, F. W. (1991). Dissociative disorders in children and adolescents: A developmental perspective. *Psychiatric Clinics of North America*, *14*, 519–531.
- Richards, D. (1991). A study of the correlations between subjective psychic experiences and dissociative experiences. *Dissociation*, *4*, 83–91.
- Ross, C. A. (1997). *Dissociative identity disorder: Diagnosis, clinical features, and treatment of multiple personality*. New York: John Wiley & Sons.
- Ross, C. A., & Joshi, S. (1992). Paranormal experiences in the general population. *Journal of Nervous and Mental Disease*, *180*, 357–361.
- Ross, C. A., Ryan, L., Voight, H., & Eide, L. (1991). High and low dissociators in a college student population. *Dissociation*, *4*, 147–151.
- Sanders, B., & Becker-Lausen, E. (1995). The measurement of psychological maltreatment: Early data on the Child Abuse and Trauma Scale. *Child Abuse and Neglect*, *19*, 315–323.
- Schmicker, M. (2000). *Best evidence: An investigative reporter's three-year quest to uncover the best scientific evidence for ESP, psychokinesis, mental healing, ghosts, and poltergeists, dowsing, mediums, near death experiences, reincarnation and other impossible phenomena that refuse to disappear*. Lincoln, NE: iUniverse.com.
- Sharon, D. (1978). *Wizard of the four winds: A shaman's story*. New York: Free Press.
- Spiegel, D. (1986). Dissociating damage. *American Journal of Clinical Hypnosis*, *29*, 123–131.
- Spiegel, D., & Vermutten, E. (1994). Physiological correlates of hypnosis and dissociation. In D. Spiegel (Ed.), *Dissociation: Culture, mind, and body* (pp. 185–209). Washington, DC: American Psychiatric Press.
- Swatos, W. H., Jr., & Gissurason, L. R. (1997). *Icelandic spiritualism: Mediumship and modernity in Iceland*. New Brunswick, NJ: Transaction.
- Targ, E., Schlitz, M., & Irwin, H. J. (2000). In E. Cardeña, S. J. Lynn, & S. Krippner (Eds.), *Varieties of anomalous experience: Examining the scientific evidence* (pp. 219–252). Washington, DC: American Psychological Association.
- Thalbourne, M. A., Bartemucci, L., Delin, P. S., Fox, B., & Nofi, O. (1997). Transliminality: Its nature and correlates. *Journal of the American Society for Psychical Research*, *91*, 305–331.
- Thalbourne, M. A., & Delin, P. S. (1994). A common thread underlying belief in the paranormal, creative personality, mystical experience and psychopathology. *Journal of Parapsychology*, *58*, 3–38.
- Thalbourne, M. A., & Delin, P. S. (1999). Transliminality: Its relation to dream life, religiosity, and mystical experience. *International Journal for the Psychology of Religion*, *9*, 35–43.
- Trivers, R. L. (1974). Parent-offspring conflict. *American Zoologist*, *14*, 249–264.
- Ullman, M. (1947). Herpes simplex and second degree burn induced under hypnosis. *American Journal of Psychiatry*, *103*, 823–830.

- Veith, I. (1965). *Hysteria: The history of a disease*. Chicago: University of Chicago Press.
- Veith, I. (1977). Four thousand years of hysteria. In M. J. Horowitz (Ed.), *Hysterical personality* (pp. 7–93). New York: Jason Aronson.
- Vogel, V. (1970). *American Indian medicine*. New York: Ballantine.
- Völgyesi, F. A. (1966). *Hypnosis on man and animals* (2nd ed., Rev. ed.). Baltimore: Williams & Wilkins.
- Waller, N. G., Kojetin, B. A. Bouchard, T. J., Jr., Lykken, D. T., & Tellegen, A. (1990). Genetic and environmental influence on religious interests, attitudes, and values: A study of twins reared apart and together. *Psychological Science, 1*, 138–142.
- Wickramasekera, I. E. (1987). Risk factors leading to chronic stress-related symptoms. *Advances: Journal of the Institute for the Advancement of Health, 4*, 9–35.
- Wilson, S. C., & Barber, T. X. (1983). The fantasy-prone personality: Implications for understanding imagery, hypnosis, and parapsychological phenomena. In A. A. Sheikh (Ed.), *Imagery, current theory, research, and application* (pp. 340–387). New York: John Wiley & Sons.
- Winkelman, M. (1992). *Shamans, priests and witches: A cross-cultural study of magico-religious practitioners* (Arizona State University Anthropological Research Papers No. 44). Tempe: Arizona State University Press.
- Winkelman, M. (2000). *Shamanism: The neural ecology of consciousness and healing*. Westport, CT: Bergin and Garvey.
- Young, D., & Goulet, J. (Eds.). (1994). *Being changed by cross-cultural experience: The anthropology of extraordinary experience*. Peterborough, Ontario, Canada: Broadview.

RELIGION IS NOT AN ADAPTATION

Lee A. Kirkpatrick

The notion that religion or religiosity is in one way or other inherent in human nature—that humankind is *Homo religiosus*—is probably as old as the question it aspires to answer about the apparent universality of religion across time and across cultures. The scientific literature contains countless suggestions, ranging from passing references to more detailed analyses, that religion is some kind of direct product of evolution by natural selection that has historically conferred one or another adaptive benefits. Such ideas have gained further in popularity in light of recent research in neuroscience and genetics suggesting the existence of “God modules” in our brains and “God genes” in our DNA. Whether the idea is stated in terms of religion “instincts,” specialized brain circuitry for generating spiritual experiences, or any number of other related forms, the claim is that one or more aspects of human psychology and/or physiology are “designed” to produce religious belief, behavior, and experience.

Putting aside the scientifically useless idea of “intelligent design,”¹ the only coherent explanation for the existence of complex “design” in living organisms is the theory of evolution by natural selection. In modern evolutionary terms, the *Homo religiosus* idea would be stated in terms of religion or some particular aspect(s) of it being an *adaptation*—that is, a species-universal trait or feature that owes its existence and design to its having been favored over eons by natural selection because it helped solve one or more *adaptive problems* in human ancestral environments. I will hence refer to the idea that religion is somehow inherent in human nature or part of the evolved design of the human being as the *religion-as-adaptation* hypothesis.

Evolutionary psychology, which has emerged from (but greatly improved on) its predecessor *sociobiology*, is the modern interdisciplinary field of research dedicated to understanding human behavior and experience from the perspective of evolutionary theory. Evolutionary psychologists have posited and presented empirical research in support of the existence of highly numerous, specialized psychological mechanisms or systems in our evolved psychological architecture. For example, Bowlby's (1969) *attachment theory* posits the existence of an evolved psychological system designed to maintain proximity between infants and their primary caregivers, with the ultimate function of protecting otherwise helpless infants from predation and other environmental dangers (for an extensive discussion of attachment theory and its application to the psychology of religion, see Granqvist, volume II, chapter 6; Kirkpatrick, 2004). More recently, evolutionary psychologists have identified psychological adaptations for sexual jealousy (Buss, Larsen, Westen, & Semmelroth, 1992; Daly, Wilson, & Weghorst, 1982), detecting cheating in social exchange (Cosmides & Tooby, 1992), and coalition maintenance (Kurzban, Tooby, & Cosmides, 2001), among many others (for overviews of the field, see Barkow, Cosmides, & Tooby, 1992; Buss, 2004, 2005). The question for this chapter can thus be stated in modern terms as whether religion or some aspect(s) of it represents such a psychological adaptation.

As I hope to make clear, an evolution-based understanding of any psychological phenomenon, including religion, involves far more than generating speculations about why that phenomenon is (or was in ancestral environments) useful or functional in some way. Postulated functions of religion have ranged from reducing anxiety (e.g., fear of death) to providing meaningful worldviews to promoting group solidarity. However, making a convincing scientific case for such a hypothesis is much more difficult than it might appear. Although such post hoc hypotheses often seem plausible on first blush, a more thorough examination of the problem based on a solid understanding of modern evolutionary theory reveals many problems that render them dubious.

ADAPTATIONS, GENES, AND BRAINS

I alluded previously to recent evidence from neuroscience and behavioral genetics that has fueled speculation about religion as an evolved adaptation. If we can locate particular brain regions that are reliably associated with spiritual experience, does it not follow that the brain is "designed" to produce such experiences? And if we identify particular genes that are reliably associated with religiosity, does it not follow that part of the human genome is dedicated to producing religion? In both cases, the answer is a resounding *no*.

I think there is a tendency, particularly among behavioral scientists and the lay public, to mentally lump together all things biological. Despite the

fact that evolutionary psychology, neuroscience, and behavioral genetics all involve genes, evolution, and other ideas biological, they are in many ways far more different from one another than they are similar. Even biologically trained researchers who should know better sometimes fall into the trap of equating one with the other. Two of the most egregious examples of such fallacious reasoning, I suggest, involve drawing improper inferences about the evolutionary psychology of religion—for example, with respect to its adaptive function, if any—from bits of evidence from the other two fields.

God Modules in the Brain?

A growing body of evidence suggests that certain patterns of brain activity are correlated with religiousness in one form or another, such as particular patterns of temporal lobe neural firing being associated with spiritual experiences (Persinger, 1987; Ramachandran & Blakeslee, 1998). These observations have led some researchers to ask what seems an obvious question: If there is a “God module” in the brain, what is it *for*? It seems that there must be some evolutionary story about the (presumably adaptive) function of this mechanism.

First, the idea of such a “God module” in the brain is dubious from the start. Although neuroscientists and evolutionary psychologists agree that the brain/mind is highly modularized—that is, made up of many, many functionally specific parts—there is no simple one-to-one mapping between the physical organization of brain structures and the functional organization of evolved mechanisms. Like computer hardware and software, the relationship is far more complex. You can take your computer apart and study the physical pieces, but you will never find the “word processing module” or “e-mail module.” Conversely, you will find many physical parts, such as wires, silicon chips, and circuit boards, none of which is associated with any particular word-processing or e-mail program. It should therefore not surprise us that, as Granqvist (volume II, chapter 6) explains, previous claims of empirical evidence for such an unlikely mapping have been cast into doubt by better-controlled experiments and other new evidence. At most, it appears that brain areas have been identified that are associated with a motley collection of vague feelings and experiences that are sometimes interpreted in spiritual terms—usually by already-religious research subjects.

Even if there are clearly identifiable neurophysiological correlates or causes of a particular pattern of thought, emotion, or behavior, however, it does not follow that the function of the module is to produce those effects. Observed effects may well represent one or another sort of *by-product* of a system designed to do something else. One kind of evolutionary by-product, known as a *spandrel*, refers to incidental, nonfunctional (or sometimes dysfunctional) effects of adaptations that result more or less inevitably but “unintentionally”

from the design of an adaptation, as with “side effects” of medicines. If you sit with one leg crossed over the other and tap your knee in the right spot, a reliable effect produced is that your lower leg will kick upward. It is doubtful that knees are designed by natural selection to produce this particular effect; instead, it is an odd little side effect of the particular combination of bones, ligaments, and tendons that we call knees (and that enable upright posture as well as crawling, sitting, and climbing). Another kind of by-product, often referred to as an *exaptation* (though there is some confusion regarding the use of this term), refers to the use of an adaptation for a purpose other than its original function. When Pangloss suggested in *Candide* that noses are for holding up one’s spectacles, the joke was that he was confusing an adaptation with an exaptation.

Data from these neuroscientific studies of religion might well be explained in terms of one or the other kind of by-product. For example, mystical experiences (and their underlying neurological correlates) might represent a kind of mis- or hyperactivation of an otherwise adaptive functional system designed for other (nonreligion) purposes. Averill (1998) offers the analogy of panic attacks, which surely are not adaptative but rather reflect the (hyper)activation of an otherwise adaptive fear system under inappropriate circumstances. He suggests that spiritual experiences might, in an analogous manner, reflect the mis- or hyperactivation of some other emotion/cognition system that is designed for other purposes, such as one designed to produce “aha!” experiences when one solves a puzzling problem. Temporal lobe epilepsy is not an adaptation but rather a (maladaptive) by-product of other aspects of brain design that sometimes go awry. That certain religious beliefs or experiences are associated with this condition (e.g., Ramachandran & Blakeslee, 1998) does not establish that these effects reflect an adaptation any more than that temporal lobe epilepsy itself is an adaptation.

Rapidly improving technology has allowed the field of neuroscience to explode in recent years, a trend that will undoubtedly continue for the foreseeable future. No matter how advanced these methodologies become, however, the fact will not change that understanding *what* happens in the brain or *how* it happens in the brain cannot in principle tell us *why* these effects occur rather than others. None of this is to say, of course, that neuroscience and evolutionary psychology are mutually irrelevant—indeed, they surely will someday be integrated—but only that the route from one to the other is not simple and direct.

God Genes?

It has been known for some time now that religiosity evinces fairly high *heritability*; that is, some people are more religious than others because of genetic differences (e.g., Waller, Kojetin, Bouchard, Lykken, & Tellegen, 1990).

The degree of heritability appears, in at least some studies, to rival that of major personality traits. More recently, at least one researcher has gone so far as to identify, on the basis of data from the Human Genome Project, some of the particular genes involved (Hamer, 2004). Just as evidence for a “God module” in the brain has misled scientists into shaky speculations about what that module “is for,” Hamer and others have been misled into speculating about why we have genes “for” religion. Although Hamer explicitly acknowledges that this is a fallacious line of reasoning, he inexplicably succumbs to temptation and offers wild speculations about the evolutionary function of religion and the genes alleged to produce it.

Evolutionary psychology’s relationship with behavioral genetics, like its relationship with neuroscience, is not at all straightforward. Perhaps the most stark difference is that whereas evolutionary psychology focuses primarily on *universality*, behavioral genetics focuses on *variability*. Evolutionary psychologists aim to identify those features of human psychology that are species universal, that make up “human nature.” Just as all humans (notwithstanding accidents) have a heart and two hands, we also presumably have an attachment system, a sexual jealousy system, and so forth. Behavioral genetics, in contrast, focuses precisely on what makes humans *different* from one another. Although intuitively it might seem that these questions and answers must be closely related, they in fact could hardly be more different.

From an evolutionary psychological perspective, all behavior must be the result of both nature and nurture: behavior results from the interaction of evolved psychological mechanisms and environmental stimuli. To borrow an often-cited metaphor from David Buss, consider the question of what causes calluses. When skin is subjected to repeated friction, a specialized mechanism in the skin causes a hardened buildup to appear in that area. No calluses are produced in the absence of the right kind of environmental stimulation. On the other hand, friction does not cause this response in materials that lack a callus-producing mechanism; indeed, friction has quite the opposite effect on most surfaces. It makes no sense to ascribe calluses to either nature or nurture alone or to speak in terms of X percent nature versus $(1 - X)$ percent nurture.

However, this latter conceptualization is perfectly sensible in answering questions about *individual differences* in calluses. But notice that although the phenomenon in this example is clearly a “biological” one, individual differences in calluses would generally be explained almost entirely in terms of environmental rather than genetic effects and thus display very low heritability. Although there may be subtle (heritable) differences between people with respect to the sensitivity of their callus-producing mechanisms, the lion’s share of the variance in calluses is attributable to playing guitar or walking barefoot. It would be wrong to assume that calluses are not produced by an adaptive, biological mechanism merely because they are not highly heritable.

Similarly, the fact that a particular trait (such as religiosity) evinces fairly high heritability in no way implies that the trait in question represents an adaptation. Height or stature is highly heritable—nearly all individual-difference variability is genetic—but it would be foolish to therefore try to concoct a story about the adaptive function of “height.” Height is not even a “thing” that could reasonably be construed as an adaptation; it is merely a measure on which people differ. It might be tempting to reframe the question to ask what might be the adaptive function of being *tall*, and it would be easy to generate hypotheses about enhanced abilities to reach fruits in trees, to see greater distances, or the like. However, note that we could just as easily ask about the adaptive function of being *short*, which would lead us in an entirely different direction. The decision to focus on tallness versus shortness is entirely arbitrary. By the same logic, individual differences in religiousness might just as well be interpreted as individual differences in irreligiousness; there is no a priori basis for determining which end of the continuum is the adaptive variant.

Ironically, the existence of highly heritable individual differences can be interpreted as evidence that the trait in question is *not* an adaptation. What is adaptive about height is actually an average or typical height. Humans have evolved in such a way as to have an average height with a certain amount of tolerable variability around that average. Most of us are between about four and seven feet tall because genes for shorter or taller heights were systematically eliminated by natural selection. Within this range, however, there must not have been any systematic advantages to being taller or shorter, or the species as a whole would likely have evolved toward a higher or lower average. Natural selection tends to eliminate variability while driving a species to an optimal norm, and the variability that remains typically reflects differences that specifically have *not* been adaptively significant. Although there are some exceptions, such as frequency-dependent selection in which multiple forms are retained in some proportional balance (male vs. female being a classic example), genetic variability tends to reflect adaptively *neutral* variation rather than adaptation per se (for discussion, see Tooby & Cosmides, 1990).

In sum, the moderate heritability of religion, like the identification of particular brain regions associated with religious experience, tells us virtually nothing about whether religion is the result of an adaptive, evolved mechanism designed to produce it. In particular, neither should be construed as evidence for the existence of an adaptive religion mechanism or system.

PROBLEMS WITH RELIGION-AS-ADAPTATION HYPOTHESES

In the preceding section, I showed that two commonly cited lines of evidence for religion-as-adaptation does not, in fact, support the hypothesis. In this section,

I discuss a variety of other reasons to call into question adaptationist theories of religion. As I noted earlier, it is all too common for researchers to speculate about the adaptive functions of religion without going further than a (post hoc) list of potential benefits ostensibly offered by religion, without considering numerous other difficult issues that, as I will argue, undermine the case. For convenience, I group these issues into three general categories.

Identifying the Phenomenon

The first problem to be confronted in establishing religion as an adaptation is that of identifying the phenomenon to be explained. What exactly is “religion”? Scholars have debated for centuries what features distinguish religion from nonreligion, and no two definitions are alike. Indeed, the problem seems intractable. A convincing argument for religion as an adaptation, however, requires precision: we need to know exactly what we are trying to explain in order to construct a convincing hypothesis about its evolutionary history, adaptive function, and design.

Religion poses a special definitional problem because few topics in psychology or related fields are as broad and multifaceted. One aspect of religion seems clearly to involve certain kinds of *beliefs*, such as belief in supernatural deities or an afterlife. Another involves certain kinds of *behavior*, such as prayer or participation in group rituals. A third involves certain kinds of *emotion* or phenomenological experience—that is, powerful “spiritual” or “religious” experiences. Finally, organized religions have a *social structure* and institutional forms within which there are specific roles and hierarchies of power and influence. The nature of an adaptationist explanation would likely take rather different forms, depending on which of these aspects one was trying to explain.

Most definitions and research approaches, therefore, have focused on one or another specific aspect of religion and ignored others. For example, some theories focus on group behavior such as ritual, arguing for an adaptive function related to benefits to the group accruing from increased cohesion or solidarity. There are many reasons to doubt such explanations from an evolutionary perspective, as I will argue in a subsequent section. However, even if we were to grant the validity of such an explanation for religious group rituals, questions about many other common religious phenomena would remain unanswered. Why do religious beliefs so often involve supernatural deities or powers? Conversely, an adaptationist explanation of supernatural belief begs questions about group rituals and why religions typically involve systems of morality and ethics. Although in many cultures and belief systems these various facets of religion are linked in the minds of believers, the nature of such links varies greatly, and, in any event, the links are surely not inevitable or logically necessary. In short, it is not at all clear

how an adaptationist explanation for any one aspect of religion could readily account for the many other aspects that may or may not co-occur with it. It is of course possible that multiple aspects of religion each have their own separate, functionally distinct explanations—religion might involve many different evolved psychological systems—but a separate theoretical and empirical case would need to be made for each one.

Relatedly, where we draw the line between religion and nonreligion seems destined to be a relatively arbitrary judgment. With respect to belief, for example, we probably all would agree that belief in anthropomorphized deities or the continued existence of a “soul” after death exemplifies “religion.” If so, then what about the many instances in day-to-day life in which we (if only momentarily) treat inanimate objects as if they were goal-directed agents? We do this every time we curse at a computer that seems to misbehave or a rock that seems to have jumped up to trip us. What about belief in ghosts of the haunted-house variety? Moreover, there are many kinds of supernatural belief that we would be reluctant to refer to as religion, such as beliefs in parapsychological phenomena such as extrasensory perception and clairvoyance. Spiritual experiences have much in common with emotional states that in other contexts would not typically be described as religion, as when we feel awestruck by natural beauty or deeply moved by a piece of music. Although certain kinds of rituals are readily identifiable as religious, it can be very difficult to separate the religious aspects of some rituals from nationalism or patriotism. If we have an adaptationist explanation for religious rituals, do we need a separate theory to account for secular rituals? If we have an adaptationist explanation for belief in deities, do we need separate theories about other mechanisms to account for beliefs in parapsychology?

Moreover, it is clear that individual and cross-cultural differences in the specific content of religion, within each of these components or categories, are immense. Some religions are monotheistic, others polytheistic, and some nontheistic. In some religions, deities are highly anthropomorphized, and in others they are more abstract and distant, and there is tremendous variability in what kinds of things these deities do and how people relate to them. With respect to behavior, we see a range of activities, from private, individual prayer to large and complex group rituals, from Bible reading to sacrificing virgins. Spiritual experiences are relatively rare, at least in modern societies; many if not most people never have one, and those who do interpret them in a vast array of ways. An adaptationist theory of religion needs to explain how such variability emerges from a species-universal psychological adaptation, a point to which I will return in a subsequent section. Given the enormous variability in religious beliefs and behaviors across cultures and time, it will be challenging at the least to explain all this in terms of a single, functionally specific psychological adaptation.

Identifying the Adaptive Function

The central focus of any religion-as-adaptation theory is of course the question of adaptive function. Assuming that the definitional and conceptual problems outlined in the previous section can be adequately addressed and we are clear on precisely what aspect(s) of religion is hypothesized to result from some evolved psychological system favored by natural selection to produce it, the critical question is why such a mechanism or system evolved. What exactly is it for? As noted earlier, a vast array of such adaptive functions have been suggested. In this section, I argue that answering this question is much more difficult than often assumed, and there are many traps and pitfalls to be avoided.

Psychological Benefits versus Reproductive Success

First, I believe that many religion-as-adaptation theories overestimate the degree to which ostensive benefits would be sufficient to permit natural selection to systematically favor “religious” variants over nonreligious ones. The criterion by which natural selection operates is quite strict: genetic recipes that, on average, get copied more widely in subsequent generations are those that are “adaptive”; those copied less widely are weeded out. Contrary to popular misconception, evolution by natural selection is not fundamentally about survival but rather about successful production of offspring who in turn are reproductively successful and so on. Survival is important only to the extent that it contributes to getting copies of genes into subsequent generations. In certain cases, for example, this may involve risking death rather than avoiding it, as when parents endanger their own welfare to ensure the survival and success of offspring. Saving an entire litter carrying (on average half of) your genes is on average a better strategy for promoting the welfare of genes than living longer oneself (for a brilliant and classic exposition of this “selfish-gene” model of natural selection, see Dawkins, 1989).

Proper understanding of this process of natural selection as a competition among genes rather than among individuals or groups is important in numerous ways because benefits to individuals or groups hypothesized to result from a religion adaptation must be shown to translate into adaptive benefits in this strict currency of genetic or reproductive success. For example, many scholars have argued (from both evolutionary and other perspectives) that religion confers various psychological benefits, such as providing comfort, allaying fears about death, making people more optimistic, or raising their self-esteem. It is not at all clear in these cases, however, how being happier leads on average to greater reproductive success. Natural selection is blind to purely psychological effects because being happy does not in itself cause more copies of happiness-promoting genes to dominate subsequent generations.

Indeed, there are good reasons to doubt that happiness or other positive emotional/mood states per se are adaptive in a strict biological sense. Emotions and mood states are designed specifically to be variable, so that we feel good in certain circumstances but not in others. Consider, for example, how our taste mechanisms operate. A gourmet meal tastes good and leaves us feeling wonderful, whereas rotting food or excrement tastes terrible. If everything we put in our mouths tasted good, there would be no point to having a sense of taste at all. Likewise, we feel fear when danger is imminent, we grieve when we lose an important person in our lives, and we feel angry and lash out when we are wronged. If religion or some other psychological mechanism were successful in preventing us from experiencing these negative states, it would have the effect of undermining the adaptive value of these other systems.

A specific example worth noting here regards self-esteem, which is widely cited by researchers as the goal or function of many psychological and social processes, including religion. An explicit or implicit assumption in much psychological research is that the maintenance of high self-esteem is a fundamental goal or motive of much human behavior. Mark Leary (e.g., Leary, Tambor, Terdal, & Downs, 1995; see also Kirkpatrick & Ellis, 2001) has argued persuasively that this conceptualization is entirely wrong and that self-esteem should be regarded not as a goal or motive in its own right but rather as a gauge (a *sociometer*) for assessing how successful one is in achieving one or more other goals. Leary likens self-esteem to the fuel gauge on your car's dashboard, noting that drivers visiting gas stations might seem to be motivated by the goal of keeping the needle pointed away toward "full." Drivers are of course not so motivated, however; their goal is to maintain enough fuel in the car to enable them, in turn, to meet other objectives. The fuel gauge merely provides important information about how to ensure this. That there is much more at stake in this analogy than mere semantics is evidenced by considering whether it would be a good idea to permanently glue the fuel-gauge needle so that it invariably points toward "full." This would be a splendid solution if one's primary goal concerns the status of the needle but not if the goal is to avoid running out of gas. Similarly, we should be very skeptical about any hypothesized adaptive function for religion that involves the production of positive feelings or other psychological states.

Perhaps the most common hypothesis about how psychological effects translate into differential reproductive success concerns the empirical relationships demonstrated between psychological and physical health. That is, it is argued that low anxiety or high self-esteem, for example, are correlated with longer life spans or lower vulnerability to various health problems, such as heart attacks. In addition to the potential costs of artificially inflated mood discussed previously, there are other difficulties with this argument. First, in many cases it is not clear that this relationship is a directional, causal one: people who are

happier may live lifestyles that are health promoting in other ways, in which case anything (including religion) that artificially inflated positive psychological states would not, in fact, cause improvements in physical health. Second, the vast majority of positive health effects known to correlate with psychological states such as anxiety are not observable until relatively late in the life span, in which case their effects on reproductive success are likely to be minimal. For women in particular, living to age 70 versus age 80 has no direct effect on reproductive potential because reproduction is limited by a biological deadline. And even though men are biologically capable of reproducing well into old age, they may not be (or would not have been in ancestral environments) able to compete for and defend quality mates late in life as successfully as when in their prime. It therefore is unlikely that the adaptive function of religion concerns lengthening the life span.

As an aside, it is perhaps worth mentioning here why organisms, including humans, grow old and die in the first place. Because natural selection is guided strictly by reproductive success and not survival of individual organisms per se, organisms are typically designed in such a way as to maximize success in mating and reproduction as early in the life span as is feasible given other limitations of the organism's design. The longer reproductive efforts are delayed, the more risk that one will not live long enough to engage in them. Humans are thus designed to devote maximal effort to mating—including competing for quality mates—soon after puberty. Unfortunately (for individual organisms), adaptations that promote successful mating early in life often have adverse, long-term side effects that show up later in life. For example, high levels of circulating testosterone are adaptive for young males competing with one another for quality mates, but chronically high levels of testosterone eventually produce negative health effects, such as increased risk of heart attacks, later in life. In a game in which genetic success is the only criterion, natural selection will trade high reproductive success early in the life span for decreased survival age later in life every time (Williams, 1957). It seems doubtful that religion or any other mechanism would have evolved in defiance of this logic.

Consideration of Adaptive Costs

A second general problem is that in their zeal to outline the potential adaptive benefits of religion, religion-as-adaptation theorists often fail to adequately consider the potential *costs* associated with the proposed mechanism. The degree to which any mechanism proves itself more adaptive than alternatives ultimately reflects the outcome of a cost-benefit analysis, as averaged across individuals and time. Both sides of the ledger need be considered equally. For example, a religion mechanism that functions to render individuals more open to persuasion or inculcation by other group members may

provide benefits to overall group functioning but inevitably would leave such individuals vulnerable to all kinds of exploitation. A mechanism that guides people toward supernatural attributions about the causes of natural events potentially distracts them from discovering more accurate explanations that potentially would confer practical benefits. It may be true that ignorance is bliss, but it isn't practical, and natural selection is driven by the latter rather than the former. Sacrifices to the gods are just that—sacrifices—meaning loss of valuable resources. Any religion-as-adaptation hypothesis needs to demonstrate that the postulated benefits of religion clearly outweigh these kinds of potential costs.

Similarly, researchers frequently cite examples of particular religious beliefs and behaviors that seem to support their hypotheses but ignore the equally numerous counterexamples. The biblical command to “go forth and multiply” certainly looks like a good prescription for spreading genes, but vows of chastity accomplish the opposite. There are countless beliefs in religious systems that provide comfort or feelings of security but at least as many are terrifying. Religion is a positive guiding force for many highly successful groups, but it leads others to child abuse, poverty and starvation, and mass suicides. Any theory of religion needs to explain these apparently maladaptive effects as well as its apparently adaptive effects.

Begging Questions

A third class of problems with many theories of religion as adaptation is that they often raise new theoretical problems in attempting to solve the problem at hand. For example, one function commonly ascribed to religion is the amelioration of fear of death, perhaps by resolving uncertainties about or painting a rosy picture about what happens after death or by providing a means for “life” in one form or another to continue after death. This explanation, however, raises the question as to why fear of death is such an incapacitating force in the first place. It might seem that the adaptive value of fearing death is self-evident from an evolutionary perspective, but it is not. Natural selection has fashioned adaptations in organisms such that, if all goes well, predictably lead to survival and reproduction; however, this does not mean that organisms possess a higher-order motive or system designed to “avoid death.” Indeed, such a mechanism would be entirely superfluous. A chess-playing computer program contains a variety of modules and sub-routines for evaluating the strength and weaknesses of positions, to ensure safety of the king, and so forth, and unless the opponent is a much stronger player, the program leads predictably to winning games. Nowhere in such a program, however, will you find an instruction or higher-order module for “making good moves” because such an instruction is of no value to the program in determining what constitutes a good move. Instead, we have

innate or readily learned fears of such things as large looming objects, loud unidentified noises, falling from great heights, and being bitten by poisonous snakes and spiders. The vast majority of living organisms live every day in a manner that appears *as if* intended to avoid death but without any awareness of this goal. This is not to deny that the (unique) ability of humans to think about death can cause anxiety but only that this fear is unlikely to have posed an adaptive problem for which religion is an adaptive, evolved solution.

Identifying the Design of the Purported Mechanism

A third class of problems that needs to be solved by an adaptationist theory of religion concerns the postulated design of the psychological mechanism(s) or system(s) that produce it. How does it work? What are its subsystems or components, and how are they interrelated? To what kinds of inputs does it respond? By what inferential rules does it operate to produce outputs such as religious thoughts, feelings, or behaviors?

The first crucial step in specifying the design of a religion (or any other) psychological adaptation is the distinction between behavior and the mechanism or mechanisms that give rise to it (Tooby & Cosmides, 1990). In an important sense, it is not even meaningful to speak in terms of religion *per se* being an adaptation. Genes are recipes for building (functionally organized) biological structures in the developing organism; they code not for behavior directly but rather for psychological mechanisms that, under certain conditions, reliably produce certain behaviors rather than others. Once this point is acknowledged, the task switches from developing hypotheses about the behavior of interest *per se* to that of developing hypotheses about how the mechanisms or systems in the brain/mind are designed.

Consider, for example, the various systems and mechanisms involved in the regulation of eating behavior that are presented in some detail in any introductory psychology textbook. Inputs to this system include internal gauges that assess, for example, the levels of glucose and other substances in the blood, stomach fullness, and perceptions of external stimuli, such as time of day and the smell or sight of tasty foods. Computations performed according to some specific algorithm give rise to internal states such as hunger, which in turn motivates eating. In addition, other higher-level motives, such as perceptions of one's own appearance—which is important, in turn, because of the importance of physical attractiveness in mate selection—contribute to the process at the next level of analysis. To illustrate with a more clearly “psychological” system, Bowlby's (1969) description of the *attachment system* includes identification of crucial system inputs (illness, injury, cues of danger in the environment, or unavailability of the primary caregiver or attachment figure) and outputs (behaviors designed to bring the attachment figure into

closer proximity, such as crying, calling, and clinging). Expression of such behaviors is regulated further on the basis of previous experience with the responsiveness and reliability of the attachment figure. If religion reflects an adaptation, then it should be possible to specify the details of the system's design in a similar manner. I am not aware of any extant adaptationist theories of religion that are sufficiently well specified to do this.

Going beyond hypotheses about adaptive function to specifying details of psychological architecture is important not only for the sake of theoretical completeness but also because it is necessary for applying the theory to understand cases in which the system does not operate "normally" or "properly." Correctly diagnosing why your car will not start requires more than an understanding of what cars are designed to do; rather, a mechanic needs a detailed understanding of the ways in which various subsystems interact functionally to make this happen. Knowing the adaptive function of an eating-regulation system will not alone help us understand obesity or anorexia: we need to understand precisely how the system is designed in order to specify clear hypotheses about what can go awry. An internal blood glucose sensor may consistently send low readings because the individual has been eating foods lacking adequate nutrition or because it is miscalibrated; an internal hunger state may be insufficient to motivate eating behavior because of higher-order cognitions about one's attractiveness to potential mates. A theory of religion as adaptation must be able to explain why a system postulated to be adaptive seems frequently to give rise to variants that appear maladaptive, as in the cases of individual or mass suicides or other problematic cases noted previously.

This issue of a system behaving in an unexpected manner is part of the much larger issue related to individual and cross-cultural differences, which need to be explained as part of any adaptationist account of religion. Recall that the existence of such variability does not preclude explanation in terms of a species-universal adaptation: Everyone can have the same (adaptive) callus-producing mechanism in the skin of their feet, but people who walk barefoot regularly have more calluses than those who typically wear shoes. Similarly, if barefootedness is the norm in one culture and shoes in another, systematic cultural differences will be observed. Understanding the design of the system—a mechanism in the skin that reliably responds to a certain kind of stimulation (friction) by hardening and building up the skin—is essential to these explanations. Thus, if a religion-as-adaptation theory included sufficient specification of design, it should be possible to explain the vast variability in religious expression. However, I doubt that this will be possible because, referring back to the problem of defining "religion" in the first place, it seems unlikely that any single adaptation could explain the enormous amount of variability in religion across time, individuals, and cultures (but more on this later).

Finally, perhaps the biggest problem with religion-as-adaptation theories is that, in virtually every example I have encountered, it seems clear that a much simpler design could solve the (presumed) adaptive problem at least as well as religion. Natural selection is a very conservative process that, starting from the existing design, fashions new adaptations by changing as little as necessary. Simpler designs are more evolvable designs. Consider, for example, suggestions that religious beliefs are adaptive because they provide relief from anxiety or other psychological benefits. In addition to other problems outlined previously as to how religion could represent an adaptation designed to produce such effects, it seems obvious that a much simpler way for natural selection to reduce anxiety would be to simply tweak a parameter of the anxiety system or mechanism to make it quantitatively less reactive in response to threats or to simply recalibrate it to produce consistently lower levels. Such a minor change in an existing anxiety system would be far easier—and thus more likely—for natural selection to produce than all the complex systems and mechanisms (not to mention group-level phenomena) required to produce anxiety-reducing religion. Moreover, simply modifying existing anxiety systems to produce lower anxiety levels would doubtlessly prove more reliable by circumventing all the complexities of religion that can cause it to increase rather than reduce anxiety for many people. George Williams (1966), one of the leading evolutionary biologists of the twentieth century, argued that adaptations are identifiable by the degree to which they exhibit characteristics of “special design.” That is, they should be at least fairly good at performing the adaptive task for which they are designed and in doing so should evince such features of reliability, economy, and precision. Given all its complexities and observed variability, it is difficult for me to see how religion, however defined, could possibly be regarded as a reliable, economical, precise solution to any adaptive problem. If religion-specific psychological mechanisms are designed to solve some particular adaptive problem, they do not seem to be very good at it. Indeed, the fact that it is not even clear to us what it is that religion is designed to do—or even what religion *is*—stands as testimony against any theory of religion as adaptation.

AN ALTERNATIVE: THE MULTIPLE- BY-PRODUCTS HYPOTHESIS

Williams (1966) argued for a theoretically conservative approach according to which high standards must be met to justify a conclusion that something represents an adaptation. It is easy to spin post hoc stories about the purported adaptive value of any particular behavior or class of behaviors; it is another to make a strong scientific case that convincingly supports the hypothesis. Following Williams’s reasoning, I suggest that given uncertainty about whether religion is an adaptation, our default position should be

that it is not. The onus of proof is on those who posit religion-as-adaptation hypotheses, and we should be skeptical until the weight of evidence and argument is overwhelming. In this chapter, I have outlined a variety of reasons to be skeptical about such hypotheses and pointed out some difficult obstacles that such theories must overcome to be convincing.

So what, then, is the alternative? My own position (Kirkpatrick, 1999, 2004) is that religion represents a collection of by-products of a variety of psychological mechanisms that evolved for other purposes (see also Atran, 2002, and Atran & Norenzayan, 2004, for a similar but independently derived view). Long before religion first appeared, our distant ancestors had evolved a diverse collection of specialized psychological systems—some shared with other species and others unique to *Homo sapiens*—from which the diverse assortment of what today we call “religion” is cobbled together. I maintain that no new adaptations have since evolved designed specifically to produce religion or any particular aspect of religion.

I hasten to add, however, that an evolutionary approach is every bit as necessary and valuable for understanding from this by-product perspective as from an adaptation perspective. The task merely shifts from identifying the function and design of a purported religion adaptation to identifying and explaining which other evolved mechanisms and systems are co-opted in the service of religion and explaining how and why this co-opting is accomplished (Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998). For example, Boyer (1994, 2001) has explained much about religious beliefs in terms of a set of evolved psychological systems designed for understanding various aspects of our physical, biological, and interpersonal worlds. Humans come into the world either “hardwired” or readily prepared to learn a variety of principles governing the behavior of inanimate objects (e.g., unsupported objects fall down, not up), living creatures (e.g., self-propulsion), and other human minds (e.g., in terms of motives, goals, and emotions). It turns out to be surprisingly easy to “fool” these system so that, for example, we misattribute agency to inanimate objects (animism) or human mental attributes to nonhuman agents (*anthropomorphism*) (see also Guthrie, 1993). Moreover, Boyer explains that religious beliefs tend to have unique features that render them particularly intriguing to us: they are *mostly* consistent with the expectations of our evolved psychology and thus plausible but also contain one or more elements that violate these usual principles and hence are attention grabbing. The gods and spirits of most religions are generally very much like humans in terms of their motives, goals, and so forth but with just one or a few supernatural characteristics, such as invisibility, omniscience, and so forth. In short, Boyer has identified several psychological mechanisms that evolved for purposes other than religion but that produce religious beliefs when combined in particular ways and supported by particular cultural contexts.

This line of thinking can be extended beyond the mechanisms identified by Boyer to a host of other specialized human psychological systems designed to regulate various functionally distinct kinds of interpersonal relationships. Once processes like those delineated by Boyer enable belief in supernatural, humanlike (in many ways) deities, numerous other specialized systems whir into action to specify the nature of our relationships with them, predict their behavior, and guide our own behavior toward them. The attachment system, for example, evolved to operate in infants and young children and to regulate their behavior toward their caregivers (usually parents), but much research literature suggests that many beliefs about God in most Judeo-Christian traditions appear to be the guided and processed by this system—that is, God is perceived as an attachment figure. In addition, other human psychological systems have evolved to regulate relationships with others in the functionally distinct contexts of social exchange (e.g., gods who provide benefits to humans in exchange for sacrifices or other obligations), coalitions (e.g., identifying and acting on distinctions between in-groups and out-groups and allies and enemies), intrasexual competition for resources and mates (e.g., use of religion in the service of attaining prestige, dominance, and power), and kin relationships (including “fictive” relationships, such as regarding fellow worshippers as “brothers and sisters”). As I demonstrate elsewhere in detail (Kirkpatrick, 1999, 2004), a wide variety of religious beliefs, behavior, and emotion can be understood as by-products of these various systems.

This multiple-by-products perspective resolves all the various problems that I have raised throughout this chapter. First and most obviously, the “by-products” aspect eliminates the numerous problems of religion-as-adaptation perspectives regarding identification of adaptive function and design. Of course, these questions do not go away but shift from religion to whichever other system—attachment, kinship, and so forth—are postulated to be co-opted by religion. This proves to be a good theoretical trade, however, because the theoretical problems posed by most of these other systems are much more tractable and pose fewer complex theoretical difficulties than does religion. Most are well studied and supported by considerable bodies of empirical evidence as well. For example, Bowlby’s (1969) introduction of the attachment system, including his reviews of multiple lines of evidence from both human and nonhuman research, has largely stood the test of time and been supported by hundreds of empirical studies; the basic theory remains highly influential but largely unchanged today.

Second, the “multiple” aspects of the multiple-by-products approach completely eliminates the intractable problem of defining religion or identifying any single central, fundamental characteristic that is shared by all things religious. Explaining religion is not like explaining calluses but more like explaining something like “irregularities of the skin.” Smooth, unblemished skin typically is populated not only by calluses but also by bruises, abrasions,

nicks and cuts, pimples, moles, rashes, burns, freckles, blisters, and other assorted blemishes. There can be no singular, coherent theory about the adaptive value of “skin irregularities” because this motley collection of phenomena do not in fact constitute a natural category of things sharing a single common cause or set of causes. Religion is many different things and can be explained collectively only in reference to multiple, functionally distinct mechanisms or systems. The multiple-by-products approach also is well positioned to deal with other phenomena that resemble religion in some ways but that are not usually classified as such, including beliefs about magic, psychic powers, and other forms of paranormal belief. Guthrie (1993) discusses in some detail that we are prone to animism and anthropomorphism in many contexts, many of which would not ordinarily be referred to as “religion.” These phenomena can be understood in terms of the same psychological systems, reducing arguments about whether they constitute “religion” as fruitless arguments about semantics.

Third, the enormous individual and cross-cultural differences in religion are readily explained by the multiple-by-products approach, which offers at least two levels of analysis for addressing the issue. Many important individual or cultural differences can be understood in terms of differences in the particular psychological systems or the relative weighting of these systems involved in different people’s processing of religious information. In some societies, beliefs about God might be rooted primarily in the attachment system, with God or gods perceived as nurturing, loving caregivers, whereas in other societies gods are perceived systems instead as social exchange partners who will be helpful only if we meet certain conditions or perform certain kinds of rituals or sacrifices. In addition, the respective designs of these various psychological systems each give rise to specific patterns of individual differences, as in attachment patterns or styles emerging from variability in experiences of caregiver reliability and responsiveness. This approach seems much better suited to explaining the enormous diversity of religion than any theory—evolutionary or otherwise—that attempts to explain all of religion in terms of a single process or function.

Fourth, the multiple-by-products approach seems far more consistent than any religion-as-adaptation theory with respect to its ability to explain why religion seems adaptive in some cases but maladaptive or adaptively neutral in so many others. If religion emerges as a by-product of other mechanisms, there is no reason to expect it to produce effects that are systematically adaptive. If, over the course of our evolutionary history, these religious by-products were in fact systematically maladaptive, natural selection would likely have modified the underlying mechanisms to reduce or eliminate these effects, much as drugs whose undesirable side effects outweigh their benefits soon disappear from the market. Conversely, if the religious by-products were systematically highly adaptive, it seems likely that natural selection would

have modified the underlying mechanisms in such a way that the religious effects were universal, and we would indeed have come to possess species-universal religion adaptations that would probably be readily identifiable. Instead, the notion that religious by-products have essentially proven to be adaptively neutral on average across time and cultures seems consistent with what we see when we look at religions around the world today.

CONCLUSION

The theory of evolution by natural selection is an astonishingly elegant and simple set of ideas that can be summarized neatly in a couple of sentences, but its implications are staggering in both number and diversity. Herein lies the beauty and power of the theory but also its many traps and pitfalls. One small misunderstanding can easily mislead one far down a wrong path. It is probably more true of this theory than any other that a little knowledge can be a dangerous thing. Anybody with a modicum of understanding of evolution can posit a plausible-sounding idea about why religion—or any other characteristic or trait displayed by people—evolved because of some hypothesized benefits it might have offered. However, many such ideas break down quickly on further scrutiny if the right questions are asked. In this chapter, I have tried to point out some of those key questions and issues and explain why most if not all religion-as-adaptation hypotheses, at least as presented to date, fail one or more of these tests. The multiple-by-products view resolves or eliminates all these problems while retaining and capitalizing on the many strengths of an evolutionary perspective.

The question of whether religion reflects one or more adaptations or instead is better understood as a collection of by-products of other adaptations is surely a difficult one, and researchers will no doubt continue to debate the relative merits of these alternative positions for years to come. The purpose of this chapter has been not to resolve the debate but merely to frame some of the central issues that need to be resolved. The psychology of religion poses many deep and fascinating questions, and we shouldn't be surprised that the answers do not come easily.

NOTE

1. As far as I can tell, the so-called theory of intelligent design amounts to nothing more than an intellectually lazy conclusion based on the reasoning that because organisms seem *as if* they were designed by an intelligent designer, like watches designed by a watchmaker, then they must be so. If we give proponents of this position the benefit of the doubt that this is not merely a statement of faith and grant the argument “scientific” status, the problem is that the theory of evolution by natural selection generally makes the same prediction. Interestingly, some of the

most convincing evidence differentiating the theories comes from the many cases of *imperfect* design, in which “better” designs are easily imaginable but natural selection, working blindly and constrained by history, has cobbled together a flawed but good-enough design (Gould, 1980).

REFERENCES

- Atran, S. (2002). *In gods we trust: The evolutionary landscape of religion*. Oxford, England: Oxford University Press.
- Atran, S., & Norenzayan, A. (2004). Religion’s evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences*, *27*, 713–770.
- Averill, J. (1998). Spirituality: From the mundane to the meaningful—and back. *Journal of Theoretical and Philosophical Psychology*, *18*, 101–126.
- Barkow, J. H., Cosmides, L., & Tooby, J. (Eds.). (1992). *The adapted mind: Evolutionary psychology and the generation of culture*. New York: Oxford University Press.
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. New York: Basic.
- Boyer, P. (1994). *The naturalness of religious ideas: A cognitive theory of religion*. Berkeley: University of California Press.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Buss, D. M. (2004). *Evolutionary psychology: The new science of the mind* (2nd ed.). Boston: Pearson.
- Buss, D. M. (Ed.). (2005). *The handbook of evolutionary psychology*. Hoboken, NJ: John Wiley & Sons.
- Buss, D. M., Haselton, M. G., Shackelford, T. K., Bleske, A. L., & Wakefield, J. C. (1998). Adaptations, exaptations, and spandrels. *American Psychologist*, *53*, 533–548.
- Buss, D. M., Larsen, R., Westen, D., & Semmelroth, J. (1992). Sex differences in jealousy: Evolution, physiology, and psychology. *Psychological Science*, *3*, 251–255.
- Cosmides, L., & Tooby, J. (1992). Cognitive adaptations for social exchange. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 163–228). Oxford, England: Oxford University Press.
- Daly, M., Wilson, M., & Weghorst, S. J. (1982). Male sexual jealousy. *Ethology and Sociobiology*, *3*, 11–27.
- Dawkins, R. (1989). *The selfish gene* (New ed.). New York: Oxford University Press.
- Gould, S. J. (1980). *The panda’s thumb*. New York: Norton.
- Guthrie, S. G. (1993). *Faces in the clouds: A new theory of religion*. New York: Oxford University Press.
- Hamer, D. H. (2004). *The God gene: How faith is hardwired into our genes*. New York: Doubleday.
- Kirkpatrick, L. A. (1999). Toward an evolutionary psychology of religion. *Journal of Personality*, *67*, 921–952.
- Kirkpatrick, L. A. (2004). *Attachment, evolution, and the psychology of religion*. New York: Guilford Press.

- Kirkpatrick, L. A., & Ellis, B. J. (2001). An evolutionary approach to self-esteem: Multiple domains and multiple functions. In G. J. O. Fletcher & M. S. Clark (Eds.), *The Blackwell handbook of social psychology: Vol. 2. Interpersonal processes* (pp. 411–436). Oxford, England: Blackwell.
- Kurzban, R., Tooby, J., & Cosmides, L. (2001). Can race be erased? Coalitional computation and social categorization. *Proceedings of the National Academy of Sciences*, *98* (26), 15387–15392.
- Leary, M. R., Tambor, E. S., Terdal, S. K., & Downs, D. L. (1995). Self-esteem as an interpersonal monitor: The sociometer hypothesis. *Journal of Personality and Social Psychology*, *68*, 518–530.
- Persinger, M. A. (1987). *The neuropsychological bases of God beliefs*. New York: Praeger.
- Ramachandran, V. S., & Blakeslee, S. (1998). *Phantoms in the brain*. New York: William Morrow.
- Tooby, J., & Cosmides, L. (1990). On the universality of human nature and the uniqueness of the individual: The role of genetics and adaptation. *Journal of Personality*, *58*, 17–67.
- Waller, N., Kojetin, B., Bouchard, T., Jr., Lykken, D., & Tellegen, A. (1990). Genetic and environmental influences on religious interests, attitudes, and values: A study of twins reared apart and together. *Psychological Science*, *1*, 138–142.
- Williams, G. C. (1957). Pleiotropy, natural selection and the evolution of senescence. *Evolution*, *11*, 398–411.
- Williams, G. C. (1966). *Adaptation and natural selection: A critique of some current evolutionary thought*. Princeton, NJ: Princeton University Press.

THE COGNITIVE AND EVOLUTIONARY ROOTS OF RELIGION

Scott Atran

Ever since Edward Gibbon's (1845) *Decline and Fall of the Roman Empire*, scientists and secularly minded scholars have been predicting the ultimate demise of religion (cf. Dawkins, 1998). But, if anything, religious fervor is increasing across the world, including in the United States, the world's most economically powerful and scientifically advanced society. An underlying reason is that science treats humans and intentions only as incidental elements in the universe (Russell, 1948), whereas for religion they are central. Science is not particularly well suited to deal with people's existential anxieties, including death, deception, sudden catastrophe, loneliness, or longing for love or justice. It cannot tell us what we *ought* to do, only what we can do (Sartre, 1948). Religion thrives because it addresses people's deepest emotional yearnings and society's foundational moral needs.

Science is not particularly well suited to deal with problems of human existence that have no enduring logical or factual solution, such as avoiding death, preventing deception, anticipating catastrophes, overcoming loneliness, finding love, or ensuring justice. Science cannot tell us what we ought to do or what should be, only what we can do and what is. Religion endures and thrives because it addresses people's deepest emotional yearnings and society's foundational moral needs. No society has ever endured more than a few generations without an unquestioningly true but rationally inscrutable moral foundation.

In the competition for moral allegiance, secular ideologies are at a disadvantage. For if some better ideology is likely to be available down the line, then, reasoning by backward induction, there is no more justified reason to

accept the current ideology than convenience. And if people come to believe that all apparent commitment is self-interested convenience or, worse, manipulation for the interest of others, then commitment withers and dies. Especially in times of vulnerability and stress, social deception and defection in pursuit of self-preservation is therefore more likely to occur, as the great Arab historian Ibn Khaldûn noted centuries ago. Religion passionately rouses hearts and minds to break out of this viciously rational cycle of self-interest and to adopt group interests that can benefit individuals in the long run. In the narrowest case, a couple bound in devotion more easily overcomes personal ups and downs. In the broadest case, mutual faith in an omniscient and omnipotent agent (the supreme deity of Abrahamic religions) mitigates cheating and the mentality of “every man for himself.”

Science, then, may never replace religion in the lives of most people and in any society that hopes to survive for very long. But science can help us understand *how religions are structured* in and across individual minds and societies—or, equivalently for our purposes, brains and cultures—and also, in a strictly material sense, *why religions endure*. Recent advances in cognitive science, a branch of psychology with roots also in evolutionary biology, focus on religion in general and awareness of the supernatural in particular as a converging by-product of several cognitive and emotional mechanisms that evolved under natural selection for mundane adaptive tasks (Atran, 2002).

As human beings routinely interact, they naturally tend to exploit these by-products to solve inescapable, existential problems that have no apparent worldly solution, such as the inevitability of death and the ever-present threat of deception by others. Religion involves costly and hard-to-fake commitment to a counterintuitive world of supernatural agents that master such existential anxieties (Atran & Norenzayan, 2004). The greater one’s display of costly commitment to that factually absurd world—as in Abraham’s willingness to sacrifice his beloved son for nothing palpable save faith in a “voice” demanding the killing—the greater society’s trust in that person’s ability and will to help out others with their inescapable problems (Kierkegaard, 1955).¹

Now, if (1) supernatural agents are cognitively salient and possess omniscient and omnipotent powers and (2) there is sufficient costly signaling from people within a community to convince others that commitment to the supernatural is genuine, then (3) the supernatural can be invoked to ease existential anxieties such as death and deception that forever threaten human life everywhere and from which no enduring rational escape is possible. However, conceptions of the supernatural invariably involve the interruption or violation of universal cognitive principles that govern ordinary human perception and understanding of the everyday world. Consequently, religious beliefs and experiences cannot be reliably validated (or disconfirmed as false) through consistent logical deduction or consistent empirical induction.

Validation occurs only by (4) collectively satisfying the emotions that motivate religion in the first place. Through a “collective effervescence” (Durkheim, 1995), communal rituals rhythmically coordinate emotional validation of and commitment to moral truths in worlds governed by supernatural agents. Through the sensory pageantry of movement, sound, smell, touch, and sight, religious rituals affectively coordinate actors’ minds and bodies into convergent expressions of public sentiment (cf. Tinbergen, 1951)—a sort of N-person bonding that communicates moral consensus as sacred, transcending all reason and doubt (Rappaport, 1999). But for those left outside the religious consensus, it may seem that “cruelty and intolerance to those who do not belong to it are natural to every religion” (Freud, 1955).

The rituals that accompany all religions almost always include music and other sorts of voluntary rhythmic stimulations. Even the Taliban, who banned nearly every sort of collective sensory stimulation, systematically used a capella chants to cement adherence to their religious fraternity.² Prayers in all religions employ the same gestures of submission: outstretched arms with chest exposed and throat bared, genuflection, prostration, and so on. These are pretty much the same bodily expressions that other social animals display to signal submission, including our simian cousins and canine friends. But for humans, such gestures are not merely symbolic: in embodying them, people actually provoke in themselves feelings of submission and humbleness before a greater power. Other common ritual acts that socially coordinate bodily movements among members of a congregation include sway and dance. The emotional unity created during these performances underscores the commitment to sacrifice a bit of oneself for others—not necessarily in the here and now but as an open-ended promise to help others in any number of ways when they may need it most.

To evoke a strong and intimate sense of community, members of a religious community often create families of fictive kin. For example, from Paris suburbs to Indonesian jungles, the mujahideen I have interviewed who profess commitment to martyrdom actions (suicide attacks) come from almost every walk of life and socioeconomic background (which is why global profiling across cells of suicide bombers is a waste of time); however, within each cell of typically 8 to 12 people, all tend to eat the same sort of food, sport the same clothing, chant the same slogans, and share the same daily rites and routines. Through incorporation of recruits into relatively small and closed cells—emotionally tight-knit brotherhoods—religiously inspired terror organizations create a family of cell mates who are just as willing to sacrifice for one another as a parent for a child. These culturally contrived cell loyalties mimic and (at least temporarily) override genetically based fidelities to kin while securing belief in sacrifice to a larger group cause. And this can even mutate over the Internet into a virtual family whose members may be physically remote from one another but who are as emotionally linked and

primed for mutual sacrifice as any real family or group of friends (Atran & Stern, 2005).³

In the final tally, eruptive emotions are often stronger and more convincing than careful reason—perhaps because evolution selected our emotions to wax when we believe ourselves inescapably faced with problems of survival. Failure to figure in the emotional costs and payoffs associated with those aspects of life that are not rationally controllable—including death and deception, heartbreak and loneliness, catastrophe and want—renders any purely cognitive theory of religion barely more than an account of how people assimilate cartoon fantasies. For without the emotion that underlies sincere commitment and sacrifice, there is nothing in cognitive theory to distinguish the Bible’s Moses from Disney’s Mickey Mouse or that of the Great Coyote of the Native American Cowlitz from Warner Bros.’ Wily Coyote.

RELIGION AS AN EVOLUTIONARY BY-PRODUCT

Explaining religion is a serious problem for any evolutionary account of human thought and society. All known human societies—past or present—bear the very substantial costs of religion’s material, emotional, and cognitive commitments to factually impossible, counterintuitive worlds. From an evolutionary standpoint, the reasons for why religion shouldn’t exist are patent: Religion is materially expensive, and it is unrelentingly counterfactual and even counterintuitive. Religious practice is costly in terms of material sacrifice (at least one’s prayer time), emotional expenditure (inciting fears and hopes), and cognitive effort (maintaining both factual and counterintuitive networks of beliefs).

Summing up the anthropological literature on religious offerings, Raymond Firth (1963) concludes that “sacrifice is giving something up at a cost. . . . ‘Afford it or not,’ the attitude seems to be” (pp. 13–16). That is why “sacrifice of wild animals which can be regarded as the free gift of nature is rarely allowable or efficient” (Smith, 1894, p. 466). As Bill Gates aptly surmised, “Just in terms of allocation of time resources, religion is not very efficient. There’s a lot more I could be doing on a Sunday morning” (cited in Keillor, 1999).⁴

Functionalist arguments, including adaptationist accounts, usually attempt to offset the apparent functional disadvantages of religion with even greater functional advantages. There are many different and even contrary explanations for why religion exists in terms of beneficial functions served. These include functions of social (bolstering group solidarity, group competition), economic (sustaining public goods, surplus production), political (mass opiate, rebellion’s stimulant), intellectual (explain mysteries, encourage credulity), health and well-being (increase life expectancy, accept death), and emotional (terrorizing, allaying anxiety) utility. Many of these functions

have obtained in one cultural context or another, yet all also have been true of cultural phenomena besides religion.

Such descriptions of religion often insightfully help to explain how and why given religious beliefs and practices help to provide competitive advantages over other sorts of ideologies and behaviors for cultural survival. Still, these accounts provide little explanatory insight into cognitive selection factors responsible for the ease of acquisition of religious concepts by children or for the facility with which religious practices and beliefs are transmitted across individuals. They have little to say about which beliefs and practices—all things being equal—are most likely to recur in different cultures and most disposed to cultural variation and elaboration. None predicts the cognitive peculiarities of religion, such as the following:

Why do *agent* concepts predominate in religion?

Why are *supernatural agent* concepts culturally universal?

Why are *some* supernatural agent concepts *inherently better* candidates for cultural selection than others?

Why is it necessary, and how is it possible, to *validate* belief in supernatural agent concepts that are logically and factually inscrutable?

How is it possible to prevent people from deciding that the existing moral order is simply wrong or *arbitrary* and from *defecting* from the social consensus through denial, dismissal or *deception*?

This argument does not entail that religious beliefs and practices cannot perform social functions or that the successful performance of such functions does not contribute to the survival and spread of religious traditions. Indeed, there is substantial evidence that religious beliefs and practices often alleviate potentially dysfunctional stress and anxiety (Ben-Amos, 1994; Worthington, Kurusu, McCullough, & Sandage, 1996) and maintain social cohesion in the face of real or perceived conflict (Allport, 1956; Pyszczynski, Greenberg, & Solomon, 1999). It does imply that social functions are not phylogenetically responsible for the cognitive structure and cultural recurrence of religion.

The claim is that religion is not an evolutionary adaptation per se but a recurring cultural by-product of the complex evolutionary landscape that sets cognitive, emotional, and material conditions for ordinary human interactions (Atran, 2002; Boyer, 2001; Kirkpatrick, 1999; Pinker, 2004). Religion exploits ordinary cognitive processes to passionately display costly devotion to counterintuitive worlds governed by supernatural agents. The conceptual foundations of religion are intuitively given by task-specific panhuman cognitive domains, including folk mechanics, folk biology, and folk psychology. Core religious beliefs minimally violate ordinary notions about how the world is, with all its inescapable problems, thus enabling people to imagine

minimally impossible supernatural worlds that solve existential problems, including death and deception.

Basic conceptual modules—naturally selected cognitive faculties—are activated by stimuli that fall into a few intuitive knowledge domains, including folk mechanics (inert object boundaries and movements), folk biology (species configurations and relationships), and folk psychology (interactive and goal-directed behavior). Ordinary ontological categories are generated when conceptual modules are activated. Among the universal categories of ordinary ontology are PERSON, ANIMAL, PLANT, SUBSTANCE.

The relationship between conceptual modules and ontological categories is represented as a matrix in Table 9.1. Changing the intuitive relationship expressed in any cell generates what Pascal Boyer (2000) calls a “minimal counterintuition.” For example, switching the cell (– folk psychology, SUBSTANCE) to (+ folk psychology, SUBSTANCE) yields a thinking talisman, whereas switching (+ folk psychology, PERSON) to (– folk psychology, PERSON) yields an unthinking zombie (cf. Barrett, 2000). These are general but not exclusive conditions on supernatural beings and events. Intervening perceptual, contextual or psycho-thematic factors, however, can change the odds. Thus, certain natural substances—mountains, seas, clouds, sun, moon, planets—are associated with perceptions of great size or distance and with conceptions of grandeur and continuous or recurring duration. They are, as Freud surmised, psychologically privileged objects for focusing the thoughts and emotions evoked by existential anxieties like death and eternity. Violation of fundamental social norms also readily lends itself to religious interpretation (e.g., ritual incest, fratricide, status reversal).

Table 9.1 Mundane Relations between Naturally Selected Conceptual Domains and Universal Categories of Ordinary Ontology

	Conceptual Domains (and associated properties)				
	Folk Mechanics	Folk Biology		Folk Psychology	
Ontological Categories	(Inert)	(Vegetative)	(Animate)	(Psychophysical, e.g., hunger, thirst, etc.)	(Epistemic, e.g., believe, know, etc.)
Person	+	+	+	+	+
Animal	+	+	+	+	–
Plant	+	+	–	–	–
Substance	+	–	–	–	–

Note: Changing the relation in any one cell [+ to – or – to +] yields a minimal, supernatural counterintuition.

Supernatural beliefs and behaviors obtain added coherence and further advantage when they focus on the management of people's existential anxieties. Religion has endured in nearly all cultures and most individuals because humans are faced with problems they can't solve. As people routinely interact, they naturally tend to exploit various mundane cognitive faculties in special ways to solve an array of inescapable, existential problems that have no apparent worldly solution. Consider death. Because we have cognitive abilities to travel in time and track memory, we are automatically aware of death everywhere. Physical death is something that organisms have evolved to avoid. People seek some kind of a long-term solution to this looming prospect, but there is none. That's the "tragedy of cognition." Lucretius and Epicurus thought they could solve this through reason. They said, "Look, what does it matter? We weren't alive for infinite generations before we were born. It doesn't bother us. Why should we be worried about the infinite generations that will come after us?" Nobody bought that line of reasoning because once you're alive, you've got something to lose (cf. Kahneman & Tversky, 1979).

Another existential problem is deception, which recent experiments in developmental psychology show children are aware of at least by age three (and perhaps as early as 15 months; Onishi & Baillargeon, 2005). If you have rocks and plants and bodies of water before you and say, "Oh, there's no piece of iron there," "That's not wet," or "That's not really a tree," someone can come along and say, "Look, you're nuts; I can touch it; I can show you it's a piece of iron." For commonsense physical events, we have ways of verifying what's real or not. For moral judgments, we have nothing comparable. If someone says, "Oh, he should be a beggar, and he should be a king" or "Murder is bad, and capital punishment is good," what is there in the world to prove this so? If there's nothing sure, how will people ever get on with one another, especially nonkin? How can they build societies and come to trust one another so they won't defect? One solution involves inventing a minimally counterintuitive world governed by deities who watch over to make sure that there will be no defectors or shirkers.

Finally, supernatural agent concepts tend to be emotionally powerful because they trigger evolutionary survival templates. This also makes them attention arresting and memorable. For example, an all-knowing blood-thirsty deity is a better candidate for cultural survival than a do-nothing deity, however omniscient. The next sections further address some of the cognitive processes that contribute to the cultural survival of supernatural beliefs.

All of this isn't to say that *the* function of religion and the supernatural is to promise resolution of all outstanding existential anxieties anymore than *the* function of religion and the supernatural is to neutralize moral relativity and establish social order, to give meaning to an otherwise arbitrary existence, to explain the unobservable origins of things, and so on. Religion

has no evolutionary functions per se. Rather, existential anxieties and moral sentiments constitute—by virtue of evolution—ineluctable elements of the human condition; and the cognitive invention, cultural selection, and historical survival of religious beliefs in the supernatural are, in part, due to success in accommodating these elements. Other factors in religion's persistence as humankind's provisional evolutionary destiny involve naturally selected elements of human cognition. These include the inherent susceptibility of religious beliefs to modularized (innate, universal, domain-specific) conceptual processing systems, such as folk psychology, that favor survival and recurrence of the supernatural within and across minds and societies.

THE SUPERNATURAL AGENT: HAIR-TRIGGERED FOLK PSYCHOLOGY

Religions invariably center on supernatural AGENT concepts, such as gods, goblins, angels, ancestor spirits, and jinns. Granted, nondeistic “theologies,” such as Buddhism and Taoism, doctrinally eschew personifying the supernatural or animating nature with supernatural causes. Nevertheless, common folk who espouse these faiths routinely entertain belief in an array of gods and spirits that behave counterintuitively in ways that are inscrutable to factual or logical reasoning.⁵ Even Buddhist monks ritually ward off malevolent deities by invoking benevolent ones and conceive altered states of nature as awesome.⁶

Mundane AGENT concepts are central players in what cognitive and developmental psychologists refer to as “folk psychology” and “theory of mind.” A reasonable speculation is that AGENCY evolved hair triggered in humans to respond “automatically” under conditions of uncertainty to potential threats (and opportunities) by intelligent predators (and protectors). From this evolutionary perspective, AGENCY is a sort of “innate releasing mechanism” (Tinbergen, 1951) whose original evolutionary domain encompasses animate objects but that inadvertently extends to moving dots on computer screens, voices in the wind, faces in clouds, and virtually any complex design or uncertain situation of unknown origin (Guthrie, 1993; Hume, 1956).⁷

Experiments show that children and adults spontaneously interpret the contingent movements of dots and geometrical forms on a screen as interacting agents with distinct goals and internal motivations for reaching those goals (Bloom & Veres, 1999; Csibra, Gergely, Bíró, Koós, & Brockbank, 1999; Heider & Simmel, 1944; Premack & Premack, 1995). Such a biologically prepared, or “modular,” processing program would provide a rapid and economical reaction to a wide—but not unlimited—range of stimuli that would have been statistically associated with the presence of agents in ancestral environments. Mistakes, or “false positives,” would usually carry little cost, whereas a true response could provide the margin of survival (Geary & Huffman, 2002; Seligman, 1971).

Our brains may be trip wired to spot lurkers (and to seek protectors) where conditions of uncertainty prevail (when startled, at night, in unfamiliar places, during sudden catastrophe, or in the face of solitude, illness, or prospects of death). Plausibly, the most dangerous and deceptive predator for the genus *Homo* since the late Pleistocene has been *Homo* itself, which may have engaged in a spiraling behavioral and cognitive arms race of individual and group conflicts (Alexander, 1989). Given the constant menace of enemies within and without, concealment, deception, and the ability to generate and recognize false beliefs in others would favor survival. In potentially dangerous or uncertain circumstances, it would be best to anticipate and fear the worst of all likely possibilities: presence of a deviously intelligent predator.

From an evolutionary perspective, it's better to be safe than sorry regarding the detection of agency under conditions of uncertainty. This cognitive proclivity would favor emergence of malevolent deities in all cultures, just as a countervailing Darwinian propensity to attach to protective caregivers would favor apparition of benevolent deities. Thus, for the Carajá Indians of central Brazil, intimidating or unsure regions of the local ecology are religiously avoided: "The earth and underworld are inhabited by supernaturals. . . . There are two kinds. Many are amiable and beautiful beings who have friendly relations with humans . . . others are ugly and dangerous monsters who cannot be placated. Their woods are avoided and nobody fishes in their pools" (Lipkind, 1940, p. 249). Similar descriptions of supernaturals appear in ethnographic reports throughout the Americas, Africa, Eurasia, and Oceania (Atran, 2002).

In addition, humans *conceptually create* information to mimic and manipulate conditions in ancestral environments that originally produced and triggered evolved cognitive and emotional dispositions (Sperber, 1996). Humans habitually "fool" their own innate releasing programs, as when people become sexually aroused by makeup (which artificially highlights sexually appealing attributes), fabricated perfumes, or undulating lines drawn on paper or dots arranged on a computer screen, that is, pornographic pictures.⁸ Indeed, much of human culture—for better or worse—can be arguably attributed to focused stimulations and manipulations of our species' innate proclivities. Such manipulations can serve cultural ends far removed from the ancestral adaptive tasks that originally gave rise to those cognitive and emotional faculties triggered, although manipulations for religion often centrally involve the collective engagement of existential desires (e.g., wanting security) and anxieties (e.g., fearing death).

Recently, numbers of devout American Catholics eyed the image of Mother Theresa in a cinnamon bun sold in a Tennessee shop. Latinos in Houston prayed before a vision of the Virgin of Guadalupe, whereas Anglos saw only the dried ice cream on a pavement. Cuban exiles in Miami spotted the Virgin in windows, curtains, and television afterimages as long as there was hope

of keeping young Elian Gonzalez from returning to godless Cuba. And on 9/11, newspapers showed photos of smoke billowing from one of the World Trade Center towers that “seems to bring into focus the face of the Evil One, with beard and horns and malignant expression, symbolizing to many the hideous nature of the deed that wreaked horror and terror upon an unsuspecting city” (“Bedeviling: Did Satan Rear His Ugly Face?,” *Philadelphia Daily News*, September 14, 2001). In such cases, there is culturally conditioned emotional priming in anticipation of agency. This priming, in turn, amplifies the information value of otherwise doubtful, poor, and fragmentary agency-relevant stimuli. This enables the stimuli (e.g., cloud formations, pastry, ice cream conformations) to achieve the minimal threshold for triggering hyperactive facial-recognition and body-movement recognition schemata that humans possess.

In sum, supernatural agents are readily conjured up perhaps because natural selection has trip wired cognitive schema for agency detection in the face of uncertainty. Uncertainty is omnipresent; so, too, is the hair triggering of an agency-detection mechanism that readily promotes supernatural interpretation and is susceptible to various forms of cultural manipulation. Cultural manipulation of this modular mechanism and priming facilitate and direct the process. Because the phenomena created readily activate intuitively given modular processes, they are more likely to survive transmission from mind to mind under a wide range of different environments and learning conditions than entities and information that are harder to process (Atran, 1990; Boyer, 1994). As a result, they are more likely to become enduring aspects of human cultures, such as belief in the supernatural.

“Minimally counterintuitive” worlds allow supernatural agents to resolve existential dilemmas. Supernatural agents, like ghosts and the Abrahamic deity and devil, are much like human agents psychologically (belief, desire, promise, inference, decision, emotion) and biologically (sight, hearing, feel, taste, smell, coordination) but lack material substance and some associated physical constraints. As we shall see in the next section, these imaginary worlds are close enough to factual, everyday worlds to be perceptually compelling and conceptually tractable but also surprising enough to capture attention, prime memory, and so “contagiously” spread from mind to mind.

CULTURAL SURVIVAL: MEMORY EXPERIMENTS WITH COUNTERINTUITIVE BELIEFS

Many factors are important in determining the extent to which ideas achieve a cultural level of distribution. Some are ecological, including the rate of prior exposure to an idea in a population, physical as well as social facilitators and barriers to communication and imitation, and institutional structures that reinforce or suppress an idea. Of all cognitive factors,

however, mnemonic power may be the single most important one at any age (Sperber, 1996). In oral traditions that characterize most of human cultures throughout history, an idea that is not memorable cannot be transmitted and cannot achieve cultural success (Rubin, 1995). Moreover, even if two ideas pass a minimal test of memorability, a *more* memorable idea has a transmission advantage over a less memorable one (all else being equal). This advantage, even if small at the start, accumulates from generation to generation of transmission, leading to massive differences in cultural success at the end.

One of the earliest accounts of memorability and the transmission of counterintuitive cultural narratives was Bartlett's (1932) classic study of "the war of the ghosts." Bartlett examined the ways by which British university students remembered and then transmitted a Native American folktale. Over successive retellings of the story, some culturally unfamiliar items or events were dropped. Perhaps Bartlett's most striking finding was that the very notion of the ghosts—so central to the story—was gradually eliminated from the retellings, suggesting that counterintuitive elements are at a cognitive disadvantage. Bartlett reasoned that items inconsistent with students' cultural expectations were harder to represent and to recall and hence less likely to be transmitted than items consistent with expectations.

In recent years, though, there has been growing theoretical and empirical work to suggest that minimally counterintuitive concepts are cognitively optimal; that is, they enjoy a cognitive advantage in memory and transmission in communication.

Religious beliefs are counterintuitive because they violate what studies in cognitive anthropology and developmental psychology indicate are universal expectations about the world's everyday structure, including such basic categories of "intuitive ontology" (i.e., the ordinary ontology of the everyday world that is built into the language learner's semantic system) as PERSON, ANIMAL, PLANT, and SUBSTANCE (Atran, 1989). They are generally inconsistent with fact-based knowledge though not randomly. Beliefs about invisible creatures who transform themselves at will or who perceive events that are distant in time or space flatly contradict factual assumptions about physical, biological, and psychological phenomena (Atran & Sperber, 1991). Consequently, these beliefs more likely will be retained and transmitted in a population than random departures from common sense and thus become part of the group's culture. Insofar as category violations shake basic notions of ontology, they are attention arresting and hence memorable. But only if the resultant impossible worlds remain bridged to the everyday world can information be stored, evoked, and transmitted. As a result, religious concepts need little in the way of overt cultural representation or instruction to be learned and transmitted. A few fragmentary narrative descriptions or episodes suffice to mobilize an enormously rich network of implicit background beliefs (Boyer, 1994, 2001).

In one series of experiments, Barrett and Nyhof (2001) asked participants to remember and retell Native American folktales containing natural as well as nonnatural events or objects. Content analysis showed that participants remembered 92 percent of minimally counterintuitive items but only 71 percent of intuitive items.⁹ These results, contrary to the findings in Bartlett's classic experiments, seem to indicate that minimally counterintuitive beliefs are better recalled and transmitted than intuitive ones.

Importantly, the effect of counterintuitiveness on recall is not linear. Too many ontological violations render a concept too counterintuitive to be comprehensible and memorable. Boyer and Ramble (2001) demonstrated that concepts with too many violations were recalled less well than those that were minimally counterintuitive. These results were observed immediately after exposure, as well as after a three-month delay, in cultural samples as diverse as the midwestern United States, France, Gabon, and Nepal. Consistent with the idea that this memory advantage is related to cultural success, a review of anthropological literature indicates that religious concepts with too many ontological violations are rather rare (Boyer, 1994).

Although suggestive, these studies leave several issues unresolved. For one, why don't minimally counterintuitive concepts occupy most of the narrative structure of religions, folktales, and myths? Even casual perusal of culturally successful materials, like the Bible, Hindu Veda, or Maya Popul Vuh, suggests that counterintuitive concepts and occurrences are a minority. The Bible is a succession of mundane events—walking, eating, sleeping, dreaming, copulating, dying, marrying, fighting, suffering storms and drought—interspersed with a few counterintuitive occurrences, such as miracles and appearances of supernatural agents like God, angels, and ghosts. One possible explanation for this is that counterintuitive ideas are transmitted in narrative structures. To the extent that narratives with too many counterintuitive elements are at a cognitive disadvantage, cognitive selection at the narrative level would favor minimally counterintuitive narrative structures.

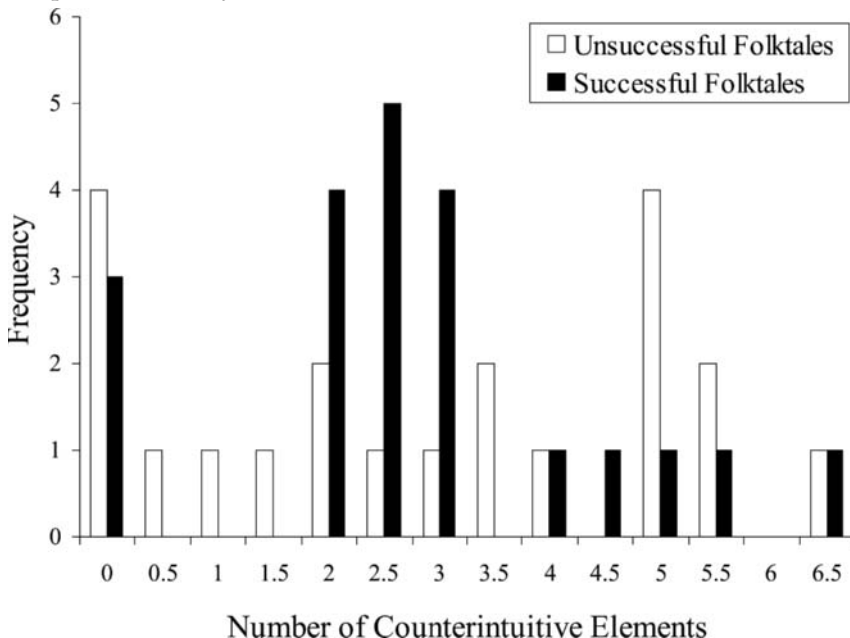
In one study that tested this hypothesis, Norenzayan, Atran, Faulkner, and Schaller, (2006; Atran & Norenzayan, 2004) analyzed folktales possessing many of the counterintuitive aspects of religious stories. They examined (1) the cognitive structure of the Grimm Brothers' folktales and (2) the relative cultural success of each tale. The hypothesized nonlinear relation between the frequency of counterintuitive elements and cultural success was confirmed (Figure 9.1). Minimally counterintuitive folktales (containing two or three supernatural events or objects) constituted 76.5 percent of culturally successful sample, whereas stories with fewer counterintuitive elements (scores < 2) and with excessive numbers of counterintuitive elements (scores > 3) constituted only 30 and 33 percent of the culturally successful sample, respectively. Overall, minimal counterintuitiveness predicted cultural success of folktales accurately 75 percent of the time. Perceived memorability

and ease of transmission but not other features of the folktale (e.g., whether the tale contains a moral lesson, interest value to children) partly mediated the relationship between minimal counterintuitiveness and cultural success. While results indicate that cultural success is a nonlinear (inverted U-shaped) function of the number of counterintuitive elements, success was not predicted by unusual narrative elements that are otherwise intuitive.

If memorability is the critical variable that mediates the effect of minimal counterintuitiveness on cultural success, then minimally counterintuitive knowledge structures should enjoy superior memory in the long run. To test this hypothesis more directly, in a related study Atran and Norenzayan (2004) examined the short- and long-term memorability of knowledge structures that systematically varied in the proportion of counterintuitive elements. Their methodology differed from prior studies by employing “basic level” concepts (e.g., thirsty door) that are cognitively privileged (Rosch, Mervis, Grey, Johnson, & Boyes-Braem, 1976) and are most commonly found in supernatural narratives. Participants were not cued to expect unusual events or transmit interesting stories to others. Instead, a standard memory paradigm was used to measure recall.

The study examined the memorability of intuitive (INT) and minimally counterintuitive (MCI) beliefs and belief sets over a period of a week. Two-word statements that represented INT and MCI items were generated. Each

Figure 9.1 Frequency Distribution of Counterintuitive Elements Contained in Samples of Culturally Successful and Unsuccessful Folktales



statement consisted of a concept and one property that modified it. INT statements were created by using a property that was appropriate to the ontological category (e.g., closing door). MCI statements were created by modifying the concept by a property that was transferred from *another* ontological category (e.g., thirsty door). This procedure explicitly operationalizes minimal counterintuitiveness as the transfer of a property associated with the core conceptual domains of folk physics, folk biology, and folk psychology from an appropriate ontological category of person, animal, plant, or substance to an inappropriate one. For example, a “thirsty door” transfers a folk-biological property (thirst) from its proper category (animal) to an improper category (inert object/substance).

American students rated these beliefs on degree of supernaturalness using a six-point Likert scale, with MCI beliefs significantly more likely to be associated with supernaturalness than INT beliefs. Although no differences were found in immediate recall, after one-week delay, minimally counterintuitive knowledge structures led to superior recall relative to all intuitive or maximally counterintuitive structures,¹⁰ replicating the curvilinear function found in the folktale analysis. With Yukatek Maya speakers, minimally counterintuitive beliefs were again more resilient than intuitive ones. A follow-up study revealed no reliable differences between the Yukatek recall pattern after one week and after three months (Atran & Norenzayan, 2004), indicating a cultural stabilization of the recall pattern.

In brief, minimally counterintuitive beliefs, as long as they come in small proportions, help people remember and presumably transmit the intuitive statements. A small proportion of minimally counterintuitive beliefs give the story a mnemonic advantage over stories with no counterintuitive beliefs or with far too many counterintuitive beliefs, just like moderately spiced-up dishes have a cultural advantage over bland or far too spicy dishes. This dual aspect of supernatural beliefs and belief sets—commonsensical and counterintuitive—renders them intuitively compelling yet fantastic, eminently recognizable but surprising. Such beliefs grab attention, activate intuition, and mobilize inference in ways that greatly facilitate their mnemonic retention, social transmission, cultural selection, and historical survival (cf. Atran, 2001).

METAREPRESENTING COUNTERINTUITIVE WORLDS: A THEORY-OF-MIND EXPERIMENT

If counterintuitive beliefs arise by violating innately given expectations about how the world is built, how can we possibly bypass our own hard wiring to form counterintuitive religious beliefs? The answer is that we don't entirely bypass commonsense understanding but conceptually parasitize it to transcend it. This occurs through the cognitive process of metarepresentation.

Humans have a metarepresentational ability to form representations of representations. This allows people to understand a drawing or picture of someone or something as a drawing or picture and not the real thing. It lets us imagine fiction and gives us an ability to think about being in different situations and deciding which are best for the purposes at hand *without our having to actually live through (or die in) the situations we imagine*. It affords us the capacity to *model the world in different ways and to conscientiously change the world by entertaining new models* that we invent, evaluate, and implement. It enables us to become aware of our experienced past and imagined future as past or future events that are distinct from the present that we represent to ourselves and so permits us to reflect on our own existence. It allows people to comprehend and interact with one another's minds.

Metarepresentation also lets people retain half-understood ideas, as when children come to terms with the world in similar ways when they hear a new word. By embedding half-baked (quasi-propositional) ideas in other factual and commonsense beliefs, these ideas can simmer through personal and cultural belief systems and change them (Atran & Sperber, 1991; Sperber, 1985). A half-understood word or idea is initially retained metarepresentationally, as standing in for other ideas we already have in mind. Supernatural ideas always remain metarepresentational.

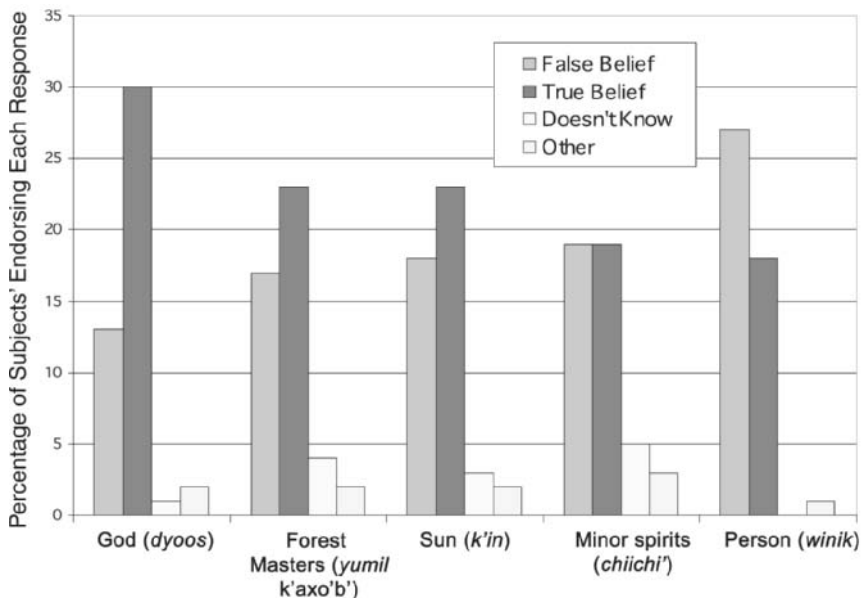
After Dennett (1978), most researchers in folk psychology, or "theory of mind," maintain that attribution of mental states, such as belief and desire, to other persons requires metarepresentational reasoning about false beliefs. Not before the child can understand that other people's beliefs are *only* representations—and not just recordings of the way things are—can the child entertain and assess other people's representations as veridical or fictional, truly informative or deceptive, exact or exaggerated, or worth changing one's own mind for or ignoring. Only then can the child appreciate that God thinks differently from most people in that only God's beliefs are always true.

In one of the few studies to replicate findings on theory of mind in a small-scale society (cf. Avis & Harris, 1991), Knight, Sousa, Barrett, and Atran (2004) showed 48 Yukatek-speaking children (26 boys, 22 girls) a tortilla container and told them, "Usually tortillas are inside this box, but I ate them and put these shorts inside." They asked each child in random order what a person, God, the sun (*k'in*), principal forest spirits (*yumil k'ax'ob*, "Masters of the Forest"), and other minor spirits (*chiichi*) would think was in the box. As with American children (Barrett & Nyhof, 2001), the youngest Yukatek (four years) overwhelmingly attribute true beliefs to both God and people in equal measure. After age five, the children attribute mostly false beliefs to people but continue to attribute mostly true beliefs to God. Thus, 33 percent of the four-year-olds said that people would think tortillas were in the container versus 77 percent of seven-year-olds. In contrast, no significant correlation was detected between answers for God and age.

Collapsing over ages, Yukatek children attribute true beliefs according to a hierarchy of human and divine minds, one in which humans and minor spirits are seen as easier to deceive and mental states of humans are perceived as different from those of God and those of Masters of the Forest and the sun god. God is seen as all-knowing, and local religious entities fall somewhere in the middle (Figure 9.2). Lowland Maya believe God and forest spirits to be powerful, knowledgeable agents that punish people who overexploit forest species. For adults, such beliefs have measurable behavioral consequences for biodiversity, forest sustainability, and so forth (Atran, Medin, & Ross, 2005; Atran et al., 2002). In brief, from an early age people may reliably attribute to supernaturals cognitive properties that are *different* from parents and other people.

In brief, human metarepresentational abilities, which are intimately bound to fully developed cognitions of agency and intention, also allow people to entertain, recognize and evaluate the differences between true and false beliefs. Given the ever-present menace of enemies within and without, concealment, deception, and the ability to both generate and recognize false beliefs in others would favor survival. But because human representations of agency and intention include representations of false belief and deception, human society is forever under threat of moral defection. If some better

Figure 9.2 What's in the Container? Yukatek Maya Children's Responses to False Belief Task



ideology is likely to be available somewhere down the line, then, reasoning by backward induction, there is no more justified reason to accept the current ideology than convenience.

As it happens, the very same metacognitive aptitude that initiates this problem also provides a resolution through metarepresentation of minimally counterintuitive worlds. Invoking supernatural agents who may have true beliefs that people ordinarily lack creates the irrational conditions for people to steadfastly commit to one another in a moral order that goes beyond apparent reason and self-conscious interest. In the limiting case, an omniscient and omnipotent agent (e.g., the supreme deity of the Abrahamic religions) can ultimately detect and punish cheaters, defectors, and free riders no matter how devious (Dennett, 1997; Frank, 1988).

EXISTENTIAL ANXIETY: AN EXPERIMENT ON WHAT MOTIVATES RELIGIOUS BELIEF

If supernatural agents are cognitively salient and possess hidden knowledge and powers, then they can be invoked to ease existential anxieties such as death and deception that forever threaten human life everywhere. To test this, Norenzayan, Hansen, and Atran (reported in Atran & Norenzayan, 2004) built on a study by Cahill, Prins, Weber, and McGaugh (1994) dealing with the effects of adrenaline (adrenergic activation) on memory.

The hypothesis was that existential anxieties (particularly death) deeply affect not only how people remember events but also their propensity to interpret events in terms of supernatural agency. Each of three groups of college students was primed with one of three different stories (Table 9.2): Cahill et al.'s (1994) uneventful story (neutral prime), Cahill et al.'s stressful story (death prime), and another uneventful story whose event structure matched the other two stories but that included a prayer scene (religious prime). Afterward, each group of subjects read a *New York Times* article (October 2, 2001) whose lead ran, "Researchers at Columbia University, expressing surprise at their own findings, are reporting that women at an in vitro fertilization clinic in Korea had a higher pregnancy rate when, unknown to the patients, total strangers were asked to pray for their success." The article was given under the guise of a story about "media portrayals of scientific studies." Finally, students rated strength of their belief in God and the power of supernatural intervention (prayer) on a nine-point scale.

Results show that strength of belief in God's existence and in the efficacy of supernatural intervention (Figure 9.3) are reliably stronger after exposure to the death prime than to either the neutral or the religious prime (no significant differences between either uneventful story). This effect held even after controlling for religious background and prior degree of religious identification. In a cross-cultural follow-up, 75 Yukatek-speaking Maya villagers were

Table 9.2 Three Stories with Matching Events Used to Prime Feelings of Religiosity (Neutral [Uneventful], Death [Stressful], Religious [Prayer Scene])

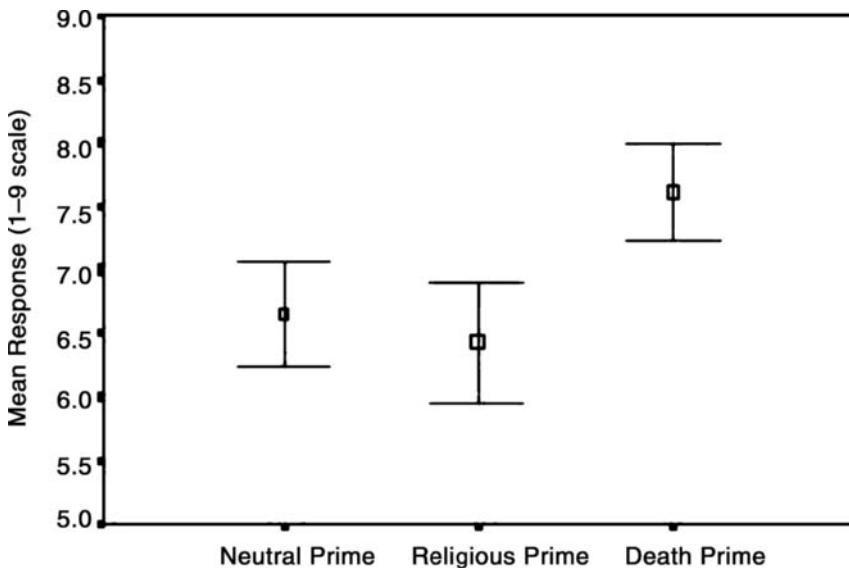
	Neutral	Death	Religious
1	A mother and her son are leaving home in the morning.	A mother and her son are leaving home in the morning.	A mother and her son are leaving home in the morning.
2	She is taking him to visit his father's workplace.	She is taking him to visit his father's workplace.	She is taking him to visit his father's workplace.
3	The father is a laboratory technician at Victory Memorial Hospital.	The father is a laboratory technician at Victory Memorial Hospital.	The father is a laboratory technician at Victory Memorial Hospital.
4	They check before crossing a busy road.	They check before crossing a busy road.	They check before crossing a busy road.
5	While walking along, the boy sees some wrecked cars in a junk yard, which he finds interesting.	While crossing the road, the boy is caught in a terrible accident, which critically injures him.	While walking along, the boy sees a well-dressed man stop by a homeless woman, falling on his knees before her, weeping.
6	At the hospital, the staff are preparing for a practice disaster drill, which the boy will watch.	At the hospital, the staff prepares the emergency room, to which the boy is rushed.	At the hospital, the boy's father shows him around his lab. The boy listens politely, but his thoughts are elsewhere.
7	An image from a brain scan machine used in the drill attracts the boy's interest.	An image from a brain scan machine used in a trauma situation shows severe bleeding in the boy's brain.	An image from a brain scan that he sees reminds him of something in the homeless woman's face.
8	All morning long, a surgical team practices the disaster drill procedures.	All morning long, a surgical team struggles to save the boy's life.	On his way around the hospital, the boy glances into the hospital's chapel, where he sees the well-dressed man sitting alone.
9	Makeup artists are able to create realistic-looking injuries on actors for the drill.	Specialized surgeons are able to reattach the boy's severed feet but cannot stop his internal hemorrhaging.	With elbows on his knees and his head in his hands, the man moves his lips silently. The boy wants to sit beside him, but his father leads him away.

(Continued)

Table 9.2 (Continued)

	Neutral	Death	Religious
10	After the drill, while the father watches the boy, the mother leaves to phone her other child's preschool.	After the surgery, while the father stays by the dead boy, the mother leaves to phone her other child's preschool.	After a brief tour of the hospital, while the father watches the boy, the mother leaves to phone her other child's preschool.
11	Running a little late, she phones the pre-school to tell them she will soon pick up her child.	Barely able to talk, she phones the preschool to tell them she will soon pick up her child.	Running a little late, she phones the preschool to tell them she will soon pick up her child.
12	Heading to pick up her child, she hails a taxi at the number 9 bus stop.	Heading to pick up her child, she hails a taxi at the number 9 bus stop.	Heading to pick up her child, she hails a taxi at the number 9 bus stop.

Figure 9.3 Strength of Belief in Supernatural Power after Priming (Neutral, Religious, or Death) and then Reading a Newspaper Article about Effects of Prayer on Pregnancy



Note: Vertical bars represent margin of error at $p = 0.05$.

tested, using stories matched for event structure but modified to fit Maya cultural circumstances. They were also asked to recall the priming events. We found no differences among primes for belief in the existence of God and spirits (near ceiling in this very religious society). However, subjects' belief in efficacy of prayer for invoking the deities was significantly greater with the death prime than with the religious or the neutral prime. Awareness of death more strongly motivates religiosity than mere exposure to emotionally nonstressful religious scenes, like praying. This supports the claim that emotionally eruptive existential anxieties motivate supernatural beliefs.¹¹

According to terror management theory (TMT), cultural worldview is a principal buffer against the terror of death. TMT experiments show that thoughts of death function to get people to reinforce their cultural (including religious) worldview and to derogate alien worldviews (Greenberg et al., 1990; Pyszczynski et al., 1999). On this view, then, awareness of death should enhance belief in a worldview-consistent deity but diminish belief in a worldview-threatening deity. An alternative view is that the need for belief in supernatural agency overrides worldview defense needs for death-aware subjects.

To test these competing views, Norenzayan, Hansen, and Atran told 73 American undergraduates that the prayer groups described in the first experiment described previously were Buddhists in Taiwan, Korea, and Japan. Supernatural belief was measured either shortly after the primes or after a significant delay between the primes and the belief measures. When the primes were recently activated, as expected there was a stronger belief in the power of Buddhist prayer in the death prime than in the control prime. Remarkably, death-primed subjects who previously self-identified as strong believers in Christianity were *more* likely to believe in the power of Buddhist prayer. In the neutral (control) condition, there was no correlation between Christian identification and belief in Buddhist prayer.¹² Given a choice between supernatural belief versus rejecting an alien worldview (Buddhism), Christians chose the former. This finding is difficult to explain in terms of bolstering a proprietary cultural worldview.

There was no evidence for differences in recall of priming events after subjects rated strength of belief in God and the efficacy of supernatural intervention. With this in mind, note that uncontrollable arousal mediated by adrenergic activation (e.g., subjects chronically exposed to death scenes) can lead to posttraumatic stress disorder if there is no lessening of terror and arousal within hours; however, adrenergic blockers (e.g., propranolol, guanfacine, possibly antidepressants) can interrupt neuronal imprinting for long-term symptoms, as can cognitive-behavioral therapy (work by Charles Marmar discussed in McReady, 1999, p. 9). A plausible hypothesis is that heightened expression of religiosity following exposure to death scenes that provoke existential anxieties may also serve this blocking function. It remains to test the further claim not only that existential anxieties spur supernatural

belief but also that these beliefs are in turn affectively validated by assuaging the very emotions that motivate belief in the supernatural.

CONCLUSION: THE EVOLUTIONARY LANDSCAPE OF RELIGION

Think metaphorically of humankind's evolutionary history as a landscape formed by different mountain ridges. This landscape functions everywhere to canalize but not determine individual and cultural development. It greatly reduces the possible sources of religious expression into structures that constantly reappear across history and societies.

This landscape is shaped by natural selection. It is ancestrally defined by specific sets of affective, social, and cognitive features—different mountain ridges. Each ridge has a distinct contour, with various peaks whose heights reflect evolutionary time. One such evolutionary ridge encompasses panhuman emotional faculties, or “affect programs.” Some of these affect programs, such as surprise and fear, date at least to the emergence of reptiles. Others, such as grief and guilt, may be unique to humans. Another ridge includes social interaction schema. Some schema may go far back in evolutionary time, such as those that are involved in detecting predators and seeking protectors or that govern direct “tit-for-tat” reciprocity (“you scratch my back, I’ll scratch yours”). Other social interaction schema seem unique to humans, such as committing to nonkin. Still another ridge encompasses panhuman mental faculties, or cognitive “modules,” like folk mechanics, folk biology, and folk psychology. Folk mechanics is this ridge’s oldest part, with links to amphibian brains. Folk psychology is the newest, foreshadowed among apes. Only humans appear to metarepresent multiple models of other minds and worlds, including the supernatural.

As humans randomly interact and “walk” through this landscape, they naturally tend toward certain forms of cultural life, including religious paths. All religions follow the same structural contours. They invoke supernatural agents to deal with emotionally eruptive existential anxieties, such as loneliness, calamity, and death. They have malevolent and predatory deities as well as more benevolent and protective ones. These systematically but minimally violate modularized expectations about folk mechanics, folk biology, and folk psychology. And religions communally validate counterintuitive beliefs through musical rituals and other rhythmic coordinations of affective body states. Finally, these landscape features are mutually constraining. They include evolved constraints on emotional feelings and displays, modularized conceptual and mnemonic processing, and social commitments that attend to information about cooperators, protectors, predators, and prey. Religious and cultural life is pervaded and largely constituted by the manipulation of these landscape features—for good or bad.

NOTES

1. The outlines of the factually preposterous world a person is committed to must be shared by a significant part of society, lest the person be considered a deviant psychopath or sociopath (e.g., lest Abraham's willingness to sacrifice his beloved son Isaac be considered attempted murder or child abuse).

2. In a survey of persons who reported a religious experience (Greeley, 1975), music emerges as the single most important elicitor of the experience. Listeners as young as three years old reliably associate basic or primary emotions to musical structures, such as happiness, sadness, fear, and anger (Panksepp, 1993; Trainor & Trehub, 1992)

3. According to the European Interactive Advertising Association, the Internet increasingly represents the essential media for the 15–24 age-group, which is “the holy grail” for most advertisers: “European Youth Ditching TV and Radio for Web,” *European Tech Wire*, June 24, 2005, <http://www.europeantechwire.com/etw/2005/06/24/>. Personal bonds formed online without physical contact appear to generate solid reputations for trustworthiness and all the deep commitment that physical intimacy does but often faster and over a wider set of personal relations (Resnick & Zeckhauser, 2002). A recent study of online dating by researchers at the University of Bath indicates that the Internet allows men to manifest emotions that cement durable relationships in ways easier than from face-to-face contact: “Internet Dating Much More Successful Than Thought,” online press release, University of Bath, February 2005, http://www.eurekalert.org/pub_releases/2005-02/uob-idm021305.php. The Web also lets women enter into chat rooms with men who would otherwise shun female contact, and it empowers a minority of two in dialogue with the sentiment that they can span the world.

4. In sum, religious sacrifice generally runs counter to calculations of immediate utility such that future promises are not discounted in favor of present rewards. In some cases, sacrifice is extreme. Although such cases tend to be rare, they are often held by society as religiously ideal, for example, sacrificing one's own life or nearest kin. Researchers sometimes take such cases as *prima facie* evidence of “true” (nonkin) social altruism (Kuper, 1996; Rappaport, 1999) or group selection wherein individual fitness decreases so that overall group fitness can increase (relative to the overall fitness of other, competing groups) (Sober & Wilson, 1998; Wilson, 2002). But this may be an illusion.

Consider suicide terrorism (Atran, 2003). The “Oath to Jihad,” taken by recruits to *Harkat al-Mujahedin*, a Pakistani-based ally of al-Qaeda, affirms that by their sacrifice they help secure the future of their “family” of fictive kin: “Each [martyr] has a special place—among them are brothers, just as there are sons and those even more dear.” In religiously inspired suicide terrorism, these sentiments are purposely manipulated by organizational leaders and trainers to the advantage of the manipulating elites rather than the individual (much as the fast-food or soft-drink industries manipulate innate desires for naturally scarce commodities like fatty foods and sugar to ends that reduce personal fitness but benefit the manipulating institution). No “group selection” is involved for the sake of the cultural “superorganism” (Wilson, 2002; cf. Kroeber, 1963)—like a bee for its hive—only cognitive and emotional manipulation of some individuals by others. In evolutionary terms, quest for status

and dignity may represent proximate means to the ultimate end of gaining resources but, as with other proximate means (e.g., passionate love), may become emotionally manipulated ends in themselves (Tooby & Cosmides, 1992).

5. Although the Buddha and the buddhas are not regarded as gods, Buddhists clearly conceive of them as “counterintuitive agents” (Pyysiäinen, 2001). In Sri Lanka, Sinhalese relics of the Buddha have miraculous powers. In India, China, Japan, Thailand, and Vietnam, there are magic mountains and forests associated with the Buddha, and the literature and folklore of every Buddhist tradition recount amazing events surrounding the Buddha and the buddhas.

6. Experiments with adults in the United States (Barrett & Keil, 1996) and India (Barrett, 1998) illustrate the gap between theological doctrine and actual psychological processing of religious concepts. When asked to describe their deities, subjects in both cultures produced abstract and consensual theological descriptions of gods as being able to do anything, to anticipate and react to everything at once, to always know the right thing to do, and to be able to dispense entirely with perceptual information and calculation. When asked to respond to narratives about these same gods, the same subjects described the deities as being in only one place at a time, puzzling over alternative courses of action, and looking for evidence in order to decide what to do (e.g., to first save Johnny, who’s praying for help because his foot is stuck in a river in the United States and the water is rapidly rising, or to first save little Mary, whom He has seen fall on railroad tracks in Australia where a train is fast approaching).

7. When triggered by a certain range of stimuli, an innate releasing mechanism “automatically” unleashes a sequence of behaviors that were naturally selected to accomplish some adaptive task in an ancestral environment. Consider food-catching behavior in frogs. When a flying insect moves across the frog’s field of vision, bug-detector cells are activated in the frog’s brain. Once activated, these cells in turn massively fire others in a chain reaction that usually results in the frog shooting out its tongue to catch the insect. The bug detector is primed to respond to any small dark object that suddenly enters the visual field. For each *natural domain*, there is a proper domain and (possibly empty) actual domain (Sperber, 1996). A *proper domain* is information that is the device’s naturally selected function to process. The *actual domain* is any information in the organism’s environment that satisfies the device’s input conditions, whether or not the information is functionally relevant to ancestral task demands—that is, whether or not it also belongs to its proper domain. If flying insects belong to the proper domain of frog’s food-catching device, then small wads of black paper dangling on a string belong to the actual domain.

8. An example from ethology offers a parallel. Many bird species have nests parasitized by other species. Thus, the cuckoo deposits eggs in passerine nests, tricking the foster parents into incubating and feeding the cuckoo’s young. Nestling European cuckoos often dwarf their host parents (Hamilton & Orians, 1965): “The young cuckoo, with its huge gape and loud begging call, has evidently evolved in exaggerated form the stimuli which elicit the feeding response of parent passerine birds. . . . This, like lipstick in the courtship of mankind, demonstrates successful exploitation by means of a ‘super-stimulus’” (Lack, 1968). Late nestling cuckoos have evolved perceptible signals to *manipulate* the passerine nervous system by initiating and then arresting or interrupting normal processing. In this way, cuckoos are able to subvert and co-opt the passerine’s modularized survival mechanisms.

9. Barrett and Nyhof (2001) list as common items “a being that can see or hear things that are not too far away” (p. 79), “a species that will die if it doesn’t get enough nourishment or if it is severely damaged,” and “an object that is easy to see under normal lighting conditions.” Such items fall so far below ordinary expectations that communication should carry some new or salient information, and Barrett and Nyhof (2001) report that “common items were remembered so poorly relative to other items. . . . In some instances of retelling these items, participants tried to make the common property sound exciting or unusual” (p. 82–83). In other words, some subjects tried to meet minimum conditions of relevance (Sperber & Wilson, 1995). For the most part, common items failed these minimum standards for successful communication.

10. Maximally counterintuitive statements (MXCI) were created by modifying a concept with two properties taken from another ontological category (e.g., squinting wilting brick). To control for memory differences on two- versus three-word items, for each MXCI statement, a matching statement was generated, only one of the properties being counterintuitive (e.g., chattering climbing pig).

11. In control conditions, equally anxiety-provoking scenarios (e.g., a visit to the dentist where dental pain is experienced) did not lead to stronger supernatural belief. Moreover, whenever stronger anxiety was found in the mortality salience condition, controlling for self-reported anxiety (measured on the PANAS scale) failed to eliminate the effect (Norenzayan & Hansen, 2006).

12. Under control conditions, the Christian subjects are unwilling to believe in Buddha or shamanic spirits, and they believe in God far more than they believe in Buddha or spirits.

REFERENCES

- Alexander, R. (1989). Evolution of the human psyche. In P. Mellars & C. Stringer (Eds.), *The human revolution* (pp. 455–513). Edinburgh, Scotland: University of Edinburgh Press.
- Allport, G. (1956). *The nature of prejudice*. Cambridge, MA: Harvard University Press.
- Atran, S. (1989). Basic conceptual domains. *Mind and Language*, 4, 7–16.
- Atran, S. (1990). *Cognitive foundations of natural history: Towards an anthropology of science*. Cambridge, England: Cambridge University Press.
- Atran, S. (2001). The trouble with memes: Inference versus imitation in cultural creation. *Human Nature*, 12, 351–381.
- Atran, S. (2002). *In gods we trust: The evolutionary landscape of religion*. New York: Oxford University Press.
- Atran, S. (2003). Genesis of suicide terrorism. *Science*, 299, 1534–1539.
- Atran, S., Medin, D., & Ross, N. (2005). The cultural mind: Environmental decision making and cultural modeling within and across populations. *Psychological Review*, 112, 744–776.
- Atran, S., Medin, D., Ross, N., Lynch, E., Vapnarsky, V., Ucan Ek’, et al. (2002). Folkecology, cultural epidemiology, and the spirit of the commons: A garden experiment in the Maya Lowlands, 1991–2001. *Current Anthropology*, 43, 421–450.

- Atran, S., & Norenzayan, A. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences*, 27, 713–770.
- Atran, S., & Sperber, D. (1991). Learning without teaching: Its place in culture. In L. Tolchinsky-Landsmann (Ed.), *Culture, schooling and psychological development* (pp. 39–55). Norwood, NJ: Ablex.
- Atran, S., & Stern, J. (2005). Small groups find fatal purpose through the web. *Nature*, 436, 620.
- Avis, J., & Harris, P. (1991). Belief-desire reasoning among Baka children. *Child Development*, 62, 460–467.
- Barrett, J. (1998). Cognitive constraints on Hindu concepts of the divine. *Journal for Scientific Study of Religion*, 37, 608–619.
- Barrett, J. (2000). Exploring the natural foundations of religion. *Trends in Cognitive Science*, 4, 29–34.
- Barrett, J., & Keil, F. (1996). Conceptualizing a non-natural entity. *Cognitive Psychology*, 31, 219–247.
- Barrett, J., & Nyhof, M. (2001). Spreading nonnatural concepts. *Journal of Cognition and Culture*, 1, 69–100.
- Bartlett, F. (1932). *Remembering*. Cambridge, England: Cambridge University Press.
- Ben-Amos, P. G. (1994). The promise of greatness: Women and power in an Edo spirit possession cult. In T. Blakely, W. van Beek, & D. Thomson (Eds.), *Religion in Africa* (pp. 118–134). Portsmouth, NH: Heinemann.
- Bloom, P., & Veres, C. (1999). The perceived intentionality of groups. *Cognition*, 71, B1–B9.
- Boyer, P. (1994). *The naturalness of religious ideas*. Berkeley: University of California Press.
- Boyer, P. (2000). Functional origins of religious concepts. *Journal of the Royal Anthropological Institute*, 6, 195–214.
- Boyer, P. (2001). *Religion explained*. New York: Basic Books.
- Boyer, P., & Ramble, C. (2001). Cognitive templates for religious concepts. *Cognitive Science*, 25, 535–564.
- Cahill, L., Prins, B., Weber, M., & McGaugh, J. (1994). Beta-adrenergic activation and memory for emotional events. *Nature*, 371, 702–704.
- Csibra, G., Gergely, G., Bíró, S., Koós, O., & Brockbank, M. (1999). Goal attribution without agency cues. *Cognition*, 72, 237–267.
- Dawkins, R. (1998). *Unweaving the rainbow*. Boston: Houghton Mifflin.
- Dennett, D. (1978). Response to Premack and Woodruff: Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences*, 4, 568–570.
- Dennett, D. (1997). Appraising grace: What evolutionary good is God? *The Sciences*, 37, 39–44.
- Durkheim, É. (1995). *The elementary forms of religious life*. New York: Free Press. (Original work published 1912)
- Firth, R. (1963). Offering and sacrifice. *Journal of the Royal Anthropological Institute*, 93, 12–24.
- Frank, R. (1988). *Passions within reason*. New York: Norton.
- Freud, S. (1955). Group psychology and the analysis of the Ego. In J. Strachey (Ed.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 18, pp. 67–143). London: Hogarth Press. (Original work published 1921)

- Geary, D., & Huffman, K. (2002). Brain and cognitive evolution. *Psychological Bulletin*, *128*, 667–698.
- Gibbon, E. (1845). *Decline and fall of the Roman empire*. London: International Book Company.
- Greeley, A. (1975). *The sociology of the paranormal*. London: Sage.
- Greenberg, J., Pyszczynski, T., Solomon, S., Rosenblatt, A., Veeder, M., Kirkland, S., et al. (1990). Evidence for terror management theory II. *Journal of Personality and Social Psychology*, *58*, 308–318.
- Guthrie, S. (1993). *Faces in the clouds: A new theory of religion*. New York: Oxford University Press.
- Hamilton, W., & Orians, G. (1965). Evolution of brood parasitism in altricial birds. *Condor*, *67*, 361–382.
- Heider, F., & Simmel, S. (1944). An experimental study of apparent behavior. *American Journal of Psychology*, *57*, 243–259.
- Hume, D. (1956). *The natural history of religion*. Stanford, CA: Stanford University Press. (Original work published 1757)
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263–291.
- Keillor, G. (1999, June 14). Faith at the speed of light. *Time*, *153*(23). Retrieved June 7, 2006, from <http://timeproxy.yaga.com/time/archive.preview/0,10987,991211,00.html>.
- Kierkegaard, S. (1955). *Fear and trembling and the sickness unto death*. New York: Doubleday. (Original work published 1843)
- Kirkpatrick, L. (1999). Toward an evolutionary psychology of religion and personality. *Journal of Personality*, *67*, 921–952.
- Knight, N., Sousa, P., Barrett, J., & Atran, S. (2004). Children's attributions of beliefs to humans and God: Cross-cultural evidence. *Cognitive Science*, *28*, 117–126.
- Kroeber, A. L. (1963). *Anthropology: Culture patterns and processes*. New York: Harcourt Brace and World. (Original work published 1923)
- Kuper, A. (1996). *The chosen primate*. Cambridge, MA: Harvard University Press.
- Lack, D. (1968). *Ecological adaptations for breeding in birds*. London: Methuen.
- Lipkind, W. (1940). Carajá cosmography. *The Journal of American Folk-Lore*, *53*, 248–251.
- McReady, N. (1999, February). Adrenergic blockers shortly after trauma can block PTSD. *Clinical Psychiatry News*, *30*(2), 9.
- Norenzayan, A., Atran, S., Faulkner, J., & Schaller, M. (2006). Memory and mystery: Cultural selection of minimally counterintuitive narratives. *Cognitive Science*, *30*, 531–553.
- Norenzayan, A., & Hansen, I. (2006). Belief in supernatural agents in the face of death. *Personality and Social Psychology Bulletin*, *32*(2), 174–187.
- Onishi, K., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science*, *308*(5719), 255–258.
- Panksepp, J. (1993). Emotional source of “chills” induced by music. *Music Perception*, *13*, 171–207.
- Pinker, S. (2004, October 29). The evolutionary psychology of religion. Paper presented at the annual meeting of the Freedom from Religion Foundation, Madison, WI. http://pinker.wjh.harvard.edu/articles/media/2004_10_29_religion.htm.

- Premack, D., & Premack, A. (1995). Origins of social competence. In M. Gazzaniga (Ed.), *The cognitive neurosciences* (pp. 205–218). Cambridge, MA: MIT Press.
- Pyszczynski, T., Greenberg, J., & Solomon, S. (1999). A dual process model of defense against conscious and unconscious death-related thoughts: An extension of terror management theory. *Psychological Review*, *106*, 835–845.
- Pyysiäinen, I. (2001). *How religion works*. Leiden, Netherlands: Brill.
- Rappaport, R. (1999). *Ritual and religion in the making of humanity*. New York: Cambridge University Press.
- Resnick, P., & Zeckhauser, R. (2002). Trust among strangers in internet interactions. In M. Baye (Ed.), *Advances in applied microeconomics* (Vol. 11, pp. 127–157). Amsterdam: Elsevier Science.
- Rosch, E., Mervis, C., Grey, W., Johnson, D., & Boyes-Braem, P. (1976). Basic objects in natural categories. *Cognitive Psychology*, *8*, 382–439.
- Rubin, D. (1995). *Memory in oral traditions*. New York: Oxford University Press.
- Russell, B. (1948). *Human knowledge: Its scope and limits*. New York: Simon & Schuster.
- Sartre, J. P. (1948). *Being and nothingness*. New York: Philosophical Library.
- Seligman, S. (1971). Phobias and preparedness. *Behavioral Therapy*, *2*, 307–320.
- Smith, W. R. (1894). *Lectures on the religion of the Semites*. London: A. & C. Black.
- Sober, E., & Wilson, D. S. (1998). *Unto others*. Cambridge, MA: Harvard University Press.
- Sperber, D. (1985). Anthropology and psychology. *Man*, *20*, 73–89.
- Sperber, D. (1996). *Explaining culture*. Oxford: Blackwell.
- Sperber, D., & Wilson, D. (1995). *Relevance: Communication and cognition* (2nd ed.). Oxford: Blackwell.
- Tinbergen, N. (1951). *The study of instinct*. London: Oxford University Press.
- Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19–136). New York: Oxford University Press.
- Trainor, L., & Trehub, S. (1992). The development of referential meaning in music. *Music Perception*, *9*, 455–470.
- Wilson, D. S. (2002). *Darwin's cathedral*. Chicago: University of Chicago Press.
- Worthington, E., Kurusu, T., McCullough, M., & Sandage, S. (1996). Empirical research on religion and psychotherapeutic processes of outcomes. *Psychological Bulletin*, *19*, 448–487.

CHAPTER 10

AMAZING GRACE: RELIGION AND THE EVOLUTION OF THE HUMAN MIND

Ilkka Pyysiäinen

Religious believers and atheists share at least one common assumption: they both believe that they know why religion exists. For the believer, religion exists because it is true; for the atheist, religion exists because it is not true. In the believer's case, religion is explained by some such thing as God's revelation. Thus, religion has an explanation only insofar that it really is true. In the atheist's case, religion is explained in terms of human ignorance. Religion exists because people are ignorant and credulous. For the atheist, religion thus has an explanation only insofar it is not true. In both cases, the explanation of religion starts from the contents of religious thinking and experience.

In the 1990s, a new scientific approach to religion was developed. It focuses not on religious mental contents but rather on the cognitive mechanisms that enable us to think about matters religious. Therefore, it has come to be known as the "cognitive science of religion." The basic starting point of this approach is that religious thought and behavior are based on quite mundane biological and psychological processes. Thus, while the truth of religious claims cannot be decided in the context of science, the ways we make these claims, as well as the reasons for making them, can be scientifically studied (Lawson, 2005). Such research can yield important knowledge of why we behave the way we do. Like moral philosophy, it can gradually enrich our self-understanding even though there is no direct bridge from scholarly findings to everyday life and moral values (Johnson, 1998).

Here, I present the basic hypotheses and findings of the cognitive science of religion for the general audience. I try to place the findings and hypotheses

in a more or less coherent frame of reference, viewing them against the background of the evolution of the human species. The basic idea is that religious cultural traditions are shaped by the human cognitive capacities that have a biological basis. These capacities can be scientifically studied by the believer and the atheist alike.

COGNITION AND MENTAL MECHANISMS

Cognitive scientists have mapped the various structures, processes, and mechanisms of the mind, trying to link them with such ontological domains in the external reality as solid objects, living things, personal agents, and various kinds of event structures. It is these natural structures and processes that also support religious thinking. The basic idea is that different mental mechanisms always correspond to some general domain, such as solid objects or personal agents. We do not, for example, have separate mental mechanisms for thinking about each person we know; instead, we have general mechanisms for thinking about personal agents in general. The many things that differentiate between all the persons we know are lower-level differences as compared to, for example, the distinction between personal agents and living things. "Personal agents" is a general category with corresponding dedicated processing mechanisms in the mind. Whenever we think about a personal agent, we rely on these mechanisms.

Mechanism here does not mean a concrete "device"; a mechanism rather is a system that consists of parts each of which is responsible for its own operation so that the general goal of that mechanism is attained. A mechanism is not only a sum of its parts but rather also an ensemble that manifests emergent, qualitatively new kinds of properties based on how the parts link together (Bechtel & Richardson, 1993).

A mental mechanism is a set of cognitive principles that makes a mental function possible. There is no easy way to explain the nature of these principles, however; if it helps to understand how the mind works, a mental mechanism can be likened to a computer program, although scholars disagree on whether the mind actually is a computer program (Edelman, 1992). Both a program and a mental mechanism enable us to do something: to write letters, to do mathematical operations, or to draw pictures, for example. Each task requires a specific algorithm that can be expressed in codes consisting of long chains of 1s and 0s. Whereas computer programs are run in various kinds of hardware, mental functions are supported by neural activity in the brain (Pinker, 1998). The word "cognition" thus refers to the mental functions by which we think, remember, imagine, perceive, and so forth.

Among the most important cognitive abilities underlying religion are those related to the mental representation of personal agents. While any individual entity that is a locus of causation or action can be called an "agent,"

a personal agent is an agent that is generally aware of its agency (Wilson, 2004, 2005). Human agency, for example, has been defined as consciousness of oneself as consciousness (Revonsuo, 2006; Sartre, 1943, 1960). However, while being an agent is normally defined by having a spatiotemporal boundary such that there are things that fall on either side of that boundary, people also postulate agents whose physical boundaries are much more difficult to establish in any unequivocal way (Wilson, 2005, pp. 6–7).

Beliefs about such agents, variously called “supernatural,” “counterintuitive,” and so forth, are at the heart of all religion (Barrett, 2004; Boyer, 1994, 2001; Lawson, 2001; Pyysiäinen, 2001, 2004b; Pyysiäinen, Lindeman, & Honkela, 2003). The ability to understand personal agency depends crucially on neuro-cognitive networks of the prefrontal cortex. The prefrontal cortex is responsible, among other things, for the so-called executive cognitive functions, that is, planning, initiation, maintenance, and adjustment of goal-directed behaviors, together with other areas, such as the amygdala in the temporal lobes (Gallagher & Frith, 2003; Heberlein & Adolphs, 2004; McNamara, 2001). The prefrontal cortex also inhibits the natural tendency to act on mere correlative stimulus relationships, guiding us to search for higher-order associations and recursive embeddings as well as directly helping us to process difficult syntactic constructs (Fuster, 2002; McNamara, 2001). Prefrontal activity thus outperforms other brain processes, and we rely on its functions whenever possible (Deacon, 1998, pp. 265–267).

The cognitive science of religion is characterized by the vision that the persistence of religious belief can be explained by such cognitive structures as the mechanisms for agent representation. Because of the nature of these mechanisms, religious concepts and beliefs are contagious and “sticky”: they are attention grabbing and easy to recall and process in mind. Therefore, they are here to stay. We cannot resist religion, except by a conscious and reflective effort for which we largely do not have the time or cognitive resources in everyday life (Barrett, 2004, pp. 107–118). The questions of how religion is actually used and how it relates to search for existential meaning have been by and large neglected in the cognitive science of religion (cf. Atran, 2002; Pyysiäinen 2001, pp. 77–139). Recently, however, psychologist Jesse Bering (2003) has begun to develop a model that integrates the cognitive and existential aspects; according to him, the capacity to attribute meaning to personal experiences may rest on a specialized cognitive system that, in turn, is anchored on systems for the attribution of intentions to agents.

GOD AND RELIGION

The ability to “read other minds,” that is, to see things from another’s point of view and to understand another’s intentions, seems to get better with age, unlike many other cognitive capacities (Happé, Winner, & Brownell, 1998).

Psychologist Justin L. Barrett (2004) therefore suggests that this capacity for mind reading may be a partial explanation for the fact that in the Western religious context, older persons tend to be more religious. This is because religion requires the ability to reason about an imagined agent's intentions and because older persons are simply better at this. Yet it is difficult to see why fluency in mind reading should make older persons *more* religious instead of merely modifying the nature of their religiousness. Moreover, as Barrett himself has argued that even small children readily use the concept of God in making inferences (Barrett, Richert, & Driesenga, 2001), it is not entirely clear how old age is supposed to change this reasoning.

Barrett argues that the developing child first acquires an idea of an omniscient and all-inclusive mind that very much reminds us of the theological idea of God's mind. Only later, around the age of four or five, children learn that there are different kinds of minds and that mom and dad, for example, are not omniscient. This is based on the so-called false-belief-task experiments in psychology in which the child has to say where a person (or an animal or God) would look for a hidden object.

When a three-year-old child herself knows where the object is located and also knows that the agent looking for it has not seen where it was hidden, she nevertheless thinks that the searching agent would look for the object in where it was hidden. An average three-year-old thinks that everybody else knows everything she herself knows because a three-year-old cannot understand that people may have false beliefs. For three-year-olds, the human mind is like a mirror that faithfully reflects everything that factually is the case. It is only in the fifth year of life that kids begin to understand that people, including themselves, may be mistaken in their beliefs (Frith, 2001; Leslie, Friedman, & German, 2004; Perner, 1991). This seems to be based on the fact that children gradually learn to use counterfactual reasoning, not on a "theory-of-mind module" beginning to work at this age (Bloom & German, 2000; Buller, 2005, pp. 190–195).

Barrett has found in similar kinds of experiments that Christian children between the ages of three and six all are equally likely to consider God infallible in his beliefs. Barrett takes this to mean that children do not simply proceed from anthropomorphism to a more abstract concept of God; they rather start with a very abstract idea of an omniscient mind and only later split it up into different kinds of minds (Barrett, 2004; Barrett & Johnson, 2003; Barrett, Newman, & Richert, 2003; Barrett et al., 2001). Another group of researchers has recently found that five-month-old infants regard human persons as free agents not bound by the constraints of physical form (Kuhlmeier, Bloom, & Wynn, 2004). Only later does the idea of agency as located in a material body replace an earlier idea of free agency.

I here use the concept of God as an example of religion in general without suggesting that religion should always be defined with reference to God.

God is only one example of religious thought and practice. The cognitive approach now entails that we think about God using the general mechanisms for generating inferences about personal agents (because God is a person). This entails that human personhood is the prototypical example of agency: God is a person in much the same manner as human agents. The only difference is that God has *some* nonstandard or *counterintuitive* properties (Boyer, 1996). A three-year-old child who apparently seems to consider God to be “omniscient” may, in fact, just be incapable of counterfactual reasoning. We do not need any special “religious” mechanisms for thinking about God, just as we do not need separate mechanisms for thinking about present and absent agents, for example. This is one possible way of explaining religious cognition. I shall call it “Boyer’s model” (Boyer, 1994, 2001).

Another option is that God is not mentally represented as an anomalous humanlike person but that he rather belongs to a *sui generis* category. This I call “Barrett’s model” (Barrett, 2004; cf. Franks, 2003). Here the word “God” names either an individual (God) and the category (gods) in which he is the only member or one individual (our God) in a wider category of gods (other gods). The difficult question is how such a cognitive category could have developed in the human mind because we do not interact with gods as unequivocally as we do with human persons. To understand this, we need to consider the cognitive evolution of our species.

RELIGION AND THE BALDWIN EFFECT

Our minds work the way they do partly because our species is a product of biological evolution. Evolution consists of natural selection operating on variation in genotypes (genetic compositions of individuals). In different kinds of environments, different kinds of morphology and behavior are required in order for organisms to survive and reproduce. When the environment changes, organisms living in it must change. This is called a selection pressure. The environment puts a pressure on organisms in the sense that it tends to favor organisms with a certain kind of genotype. Thus, what sorts of organisms (the phenotypes) survive in the long run is determined by the environment acting on the genotypes. The adjustment of an organism to its environment is called adaptation. The best-adapted organisms are fit in the sense that they reproduce effectively. This is referred to as their fitness (Mayr, 2001).

Now the question that emerges is how such phenomena as sterile insects or altruistic human persons are possible in the long run. How can natural selection favor such traits, as they obviously decrease the relative fitness of the organisms in question? One answer is that in kin groups, organisms may make sacrifices that benefit their relatives who are carrying partly the same genes. The real unit on which natural selection operates is the gene, not an individual

organism. What from an individual's point of view is a sacrifice may yet be a benefit from the gene's point of view, when the sacrifice benefits the individual's relatives. Thus, natural selection can favor altruistic individuals (Richerson & Boyd, 2005, pp. 198–203; Wilson, 2005, pp. 172–176).

Such “reciprocal altruism” works best among kin or in small groups where the same individuals constantly interact with each other. It is then possible to get to know who responds to cooperation and who tries to cheat (Axelrod, 1990). The so-called theory of group selection maintains that natural selection can (also) operate on groups as the unit of selection or that it may produce groups as the outcome of selection (Wilson & Sober, 1994). This, however, requires that migration between groups is almost nonexistent, which rarely happens. However, group selection may operate alongside gene selection in the sense that mathematically the models of gene selection and a multilevel selection yield the same result. Whether group selection actually happens in practice has been doubted by the majority of biologists, although currently the new multilevel model has gained some support (Richerson & Boyd, 2005, pp. 198–207; Wilson, 2005, pp. 184–189).

It might, however, be claimed that culture is a specifically human adaptation. The symbiosis between genes and culture has led to a major transition in the evolution of our species. Such phenomena as verbal language and technology, for example, have led to biological changes in the sense that language has modified our vocal tract and auditory system and technology has made physical robustness less important. This is called gene–culture coevolution (Richerson & Boyd, 2005, pp. 193–195).

This finally brings us back to religion. Whereas Boyer (1994, 2001) and Atran (2002), for instance, represent the view that religion is not a biological adaptation, scholars such as Wilson (2002) and Sosis (Sosis, 2003; Sosis & Alcorta, 2003) argue that religion, indeed, is an adaptation (Bulbulia, 2004).

Both parties have something important to say. Atran and Boyer, for example, correctly point out that the most likely candidates for biologically evolved mental mechanisms are the general mechanisms for agent representation and intuitive ontology. It is difficult to pinpoint any specifically religious cognitive mechanisms. Wilson, Sosis, and others are right in that religion yet has important social effects. The problem is that religion is a multifaceted set of behaviors, and for any behavioral trait to be a biological adaptation, it is necessary for it to be based on a genetically determined physical structure in the organism in question. To show that religion is an adaptation, it is necessary to link it with certain specified brain structures that, for their part, should be shown to have been selected for in evolution (Buller, 2005, p. 200; Panksepp & Panksepp, 2000; Woodward & Cowie, 2004, p. 318). This, however, comes close to being impossible because “religion” refers to a host of behaviors, beliefs, and experiences that are the *output* of certain cognitive mechanisms. Most evolutionary psychologists argue that

it is only the cognitive mechanisms that are adaptations, not their outputs; this is such a basic fact that philosopher David Buller even remarks that no evolutionary psychologist claims religion to be an adaptation (Buller, 2005, p. 85; Pinker, 1998, pp. 524–526, 554–560).

Religion as a competence might be indirectly “hardwired” in the human mind in the sense that we are predisposed to acquire beliefs and concepts that are often classified as “religious.” Religion is easy to learn because different kinds of religious beliefs and practices are automatically and spontaneously linked with such mechanisms of the mind as agent detection (Barrett, 2004; cf. Richerson & Boyd, 2005, pp. 42–57). Small children have various kinds of nonreflective beliefs, like the idea of mental states continuing after death; these are then enriched in maturation and thus may develop into reflective religious beliefs (Barrett, 2003; cf. Bering, 2004; Kelemen, 2004). As Barrett (2003) puts it, “Without agreeing with the claim that children are innately theists, I do believe that children rapidly develop conceptual tools that make belief in superhuman agency nearly inevitable given natural environmental (including social) conditions” (p. 230). Bering (2002, 2004) and Kelemen (2004), for their part, seem to support an even stronger form of religious nativism.

Another option, however, is that religion as an adaptive trait is “coded for” in the environment (Woodward & Cowie, 2004). Neither religion nor the cognitive mechanisms that support it need to be built into the genes; instead, we may have only dispositions to construct the kind of cultural environment in which religion is easily acquired (Laland, 2004; Sterelny, 2003; Woodward & Cowie, 2004). Such “niche construction” (Laland, Odling-Smee, & Feldman, 2001; Odling-Smee, 1988) may then have the effect of some genetically based traits being favored at the cost of others in a coevolutionary process.

In the 1890s, psychologist James Mark Baldwin argued that, under certain conditions, “learned behaviors can affect the direction and rate of evolutionary change by natural selection” (Depew, 2003). The point is that learning and behavioral flexibility can amplify and bias natural selection because they enable individuals to modify the context of natural selection that affects their offspring who thus face new kinds of selection pressures (Deacon, 1998, p. 322). Learning may thus have genetic consequences without Lamarckianism, that is, the idea that acquired traits are inherited by the offspring. The complex phenomena and theoretical perspectives related to this are often referred to as a “Baldwin effect,” although there is good reason to be skeptical about Baldwin’s observations reducing to a single effect (Weber & Depew, 2003). However, the idea was revived in the 1980s and became popular through Daniel Dennett’s version of it in his *Consciousness Explained* (Dennett, 1991, pp. 184–187).

Dennett invites the reader to imagine a population in which there is variation at birth in the way the brains are wired up. Only one type of wiring then

endows its owner with some advantageous behavioral talent that Dennett calls a “Good Trick.” The Good Trick is essential for survival, and everybody thus tries to learn it, with some doing it better than others. Those who have the special kind of neural wiring then get a head start in natural selection, and so do their progeny. Within each successive generation, the competition gets tougher and tougher until it is not enough to be close to the Good Trick; one needs to be born with it to survive and to have offspring. Thus, the Good Trick becomes internalized without any learned traits being genetically inherited. This happens through genetic assimilation in which the genes of those capable of the Good Trick replace those who could not learn it. At the same time, the initial flexibility is replaced by genetic determinism.

Neuroscientist Terrence Deacon (1998, 2003a, 2003b, 2003c), for his part, has employed the idea of a Baldwin effect to show how the capacity to understand symbolic reference has led to a coevolution of neuroanatomy and linguistic systems without genetic assimilation. Our enlarged prefrontal cortex, with its ample connections to the cerebellum, makes symbolic associations possible by forming the necessary neural basis for complex recursive structures (Fitch & Hauser, 2004). Words, for instance, can refer to objects because they are part of a linguistic system in which each word is defined by its relationships with other words. Linguistic systems impinge on experience only “along the edges,” as philosopher Willard Quine (1980) once put it.

Linguistic symbol systems are products of human activity that have introduced new kinds of selection pressures for humans through a special kind of Baldwin effect (Deacon, 1998, 2003a, 2003b, 2003c). Sexual selection in particular has driven the evolution of language in the sense that linguistic talent has given certain individuals an advantage in competition for mates: good command of language has been a sign of power and of good genes; therefore, those with it are favored in mate selection. As a consequence of this kind of selection pressure, the prefrontal cortex has gradually grown larger.

Deacon, however, points out that languages evolve much more rapidly than human biology; thus, only the most invariant and general features of language persist long enough to contribute to brain evolution (Laland et al., 2001; Richerson & Boyd, 2005). Instead of language shaping the human brain through biological evolution, languages themselves have evolved in the sense that forms of language too difficult for the learning child have soon disappeared. The structures of various languages thus reflect the learning strategies that typify the human child without being directly neurally implemented. Our brains may exhibit many adaptations for language, but grammatical knowledge is not one of them. Most important, the general idea of symbolic reference has shaped our prefrontal cortices. Linguistic environments are special kinds of niches in the sense that they evolve through self-organization (Deacon, 2003c, p. 112). We are talking about the coevolution of

language and the brain, not of learning becoming genetically assimilated or of preformed innate knowledge expressed in the phenotype (Deacon, 1998).

Religion might have an evolutionary history in some sense as similar to that of language. If this is so, then religion is neither a set of preformed concepts in mind nor merely parasitic on certain nonreligious mental mechanisms. As religious beliefs and practices obviously have changed the cultural niche of humans, religion also has set a new stage for our genetic evolution. It is an example of gene–culture coevolution, of culture shaping the biology that is its own basis.

EVOLUTION, COGNITION, AND RELIGION

The full-fledged ability of mind reading that typifies humans (Tomasello, Call, & Hare, 2003) has introduced a new kind of selection pressure. People have had to adapt to a changed cultural environment. Mind reading, in turn, may well be related to the capacity for symbolic communication (Deacon, 1998; Fitch & Hauser, 2004) and thus contributes to an organism's fitness; for example, it gives its possessor an advantage in sexual selection. Those who best adapted themselves to the new cultural niche, where mind reading was essential, got a head start in natural selection. Thus, the various cultural institutions involving reasoning about other minds (natural and supernatural) coevolved with the neural structures responsible for the representation of agency. In rapidly changed conditions, organisms that cannot imitate must start with whatever initial guess is provided by their genotype; humans, however, rely heavily on culture, which allows for the accumulation of learned improvements (Richerson & Boyd, 2005, pp. 114–115).

For humans, religion in the sense of beliefs about supernatural agents is one important cultural institution that has transformed the evolutionary process. Religion is a cultural practice that requires the capacity to represent others as agents and to “read” their minds even when they are not physically present (Barrett, 2004; Bering, 2004). Religious practices provide ample opportunities to exercise this capacity (cf. McNamara, 2002). Religion is not a unique domain but rather an extension of the general domain of social relationships between personal agents. However, those who regard religion as a biological adaptation think that it has enabled humans to form groups capable of coordinated action (MacIntyre, 2004; Sosis, 2003; Wilson, 2002). Religious moral teachings encourage persons to work for the common benefit; thus, it becomes possible to acquire resources that would otherwise be beyond reach.

The problem with this view is that the scant empirical evidence we have suggests that people do not actually behave in ways motivated by their explicit religious beliefs; rather, they follow their intuitions (Barrett 1998; Barrett & Keil 1996; Boyer, 2004). Here, intuitions are meant as automatic cogni-

tive processes and their results, as distinguished from controlled processes (Bargh, 1994, 1999). Intuition thus refers to spontaneous, tacit knowledge and fast cognitive processes that cannot be initiated or terminated at will but that are easy to execute (Pyysiäinen, 2004a). It is therefore important to have a plausible account of the relationship between general intuitions and their religious manifestations.

Barrett, for example, thinks that religion as such is not innate in the human mind despite the fact that the idea of God is more deeply rooted in human mental architecture than what Boyer allows for (Barrett, 2003). From Boyer's point of view, religion is something that follows from the nature of human cognition. The cognitive evolution of our species has not produced any specifically religious mental structures or mechanisms; it has produced only the more general mechanisms, which then have been adopted for new kinds of uses at some point in evolutionary history (Sperber & Hirschfeld, 2004). One of these specific uses is religion.

However, religion cannot be found simply in individual mental architectures because religion is a social construct. Just as we cannot locate science, politics, or football in the mind, we cannot locate religion simply in the mind. "Religion" refers to a host of beliefs, emotions, and practices that are classified under this concept. Although classification is a mental act, what is classified is a set of phenomena in the external reality. Classification as a mental act is also dependent on other persons' ways of classifying things and events (Bless, Fiedler, & Strack, 2004). "Religion" does not name a category with a fixed essence but rather refers to certain kinds of recurrent patterns, a specific overlap in beliefs, experiences, and behaviors across cultures (Anttonen, 1996; Day, 2005; Pyysiäinen, 2001, pp. 1–5; Saler, 2000).

In Boyer's and Barrett's models, the structures of the mind are like riverbeds, while religious traditions are like the water that flows in these beds (Atran, 2002). Although Boyer (1994, 2001, 2003) seems to think that we are dealing with religion only insofar as persons use counterintuitive agent concepts to make socially important inferences, he approaches religion "bottom up" as it were. He starts from the cognitive mechanisms, thus reducing the sociocultural variation in the world of religiosity to the mental mechanisms that constrain the cultural manifestations of religion. In explaining peoples' religious inferences, the cognitive constraints are far more important than the culturally varying conceptual contents. Barrett's model goes even deeper in its nativism: the human mind produces religion almost in a mechanical fashion.

In trying to understand the phenomenon of religion, we thus need to take into account both the microprocesses of cognition and sociocultural contexts (Sørensen, 2004). The classical account of religion in terms of the social was put forward by the French sociologist Émile Durkheim in 1912. He strongly emphasized that religion is the magic glue that ties people

together into a community. Religious behavior is a symbolic expression of the collective group consciousness, reverence toward the moral authority of the community. There are two circles in the individual consciousness: one consisting of representations arising from ordinary sensory experience and another consisting of representations arising from collective influences, the influence of the society (Durkheim, 1925, pp. 296–304, 322–323; see also Schmaus, 2003).

Although Durkheim clearly implies that “the social” emerges from the interaction between individual minds, he nevertheless regards it as a *sui generis* phenomenon, an independent level of reality. We might say that it is a new level of organization in mental activity based on recursive structures of the type “John knows that Mary wants that Tom believes that Helen is lying.” An ape never watches another ape watching a third ape watching a banana, for instance (Fitch & Hauser, 2004; Premack & Premack, 2002). In humans, this capacity for representing recursive structures is at the heart of symbolic reference and seems to be neurally based on the enlarged prefrontal cortex with its ample cerebellar connections (Deacon, 1998). In Durkheim’s times, it was not yet possible to explore individual cognitive processes, let alone their neural basis; Durkheim therefore speaks only of a “collective consciousness.” Religion is its symbolic expression, and anything that serves the function of uniting persons into a group is a religion (Durkheim, 1925, pp. 22, 605–607; Pyysiäinen, 2005).

Durkheim is partly correct. A solitary baby, marooned on a desolate island, cannot become religious with maturation, although he might be said to have the cognitive–emotional potential for religiosity. Religion is not a private matter but relates essentially to human sociality. In addition, Barrett and colleagues are partly correct. A community of “zombies”—automaton-like agents without conscious awareness—could not have religion, although they may be able to imitate outward religious talk and behavior in the finest detail. What is lacking in this case is the conscious experience of one’s own relatedness to others. We need both the social context and lived experience.

RELIGION AS LIVED EXPERIENCE

Philosopher John Searle (1980) once argued that such apparently intelligent behavior as that manifested in computer systems is no guarantee of a conscious mind driving the behavior. Such apparent intelligence is based on mere syntactical operations of computing strings of 0s and 1s. What is needed for a conscious mind to arise is semantics, intrinsically intentional reference to a world out there. For the time being, only biological brains have acquired an intrinsic capacity for such conscious reference; a computer manifests intentionality only as derived from the programmer’s intrinsic intentionality (Preston & Bishop, 2002).

However, it may be that the real dividing line here is in the difference between indexical and symbolic reference, that is, between reference based on a causal connection (fingerprint as an index of the person in question) and reference based on a symbolic convention shared by a number of people. Symbols only refer because of their relationships with other symbols (Deacon, 1998, pp. 70–10, 445). This difference does not derive from any difference between the brain and computer programs because neither of these can host a self-sufficient mental language. Symbolic language can exist only as a systemic relationship between a set of tokens and an environment (Deacon, 1998, pp. 443–447). Such a relationship also necessitates as its prerequisite a moving, self-propelled organism that spontaneously adapts itself to the environment, trying to maintain the self–other distinction. This latter aspect can be referred to as “sentience” (Deacon, 1998, p. 455). Sentient beings have emotions, physiological responses that guide their behavior. Thinking in their case always is thinking that feels like something (Azari & Birnbacher, 2004; Damasio, 1994).

As I see it, this idea enables us to distinguish between apparently religious behavior and genuinely religious behavior (Pyysiäinen, 2004b, pp. 195–196). A robot might be programmed to talk and behave in an outward religious manner and yet lack a phenomenal experience with an emotional component. In genuinely religious behavior, the outward behavior is accompanied by a conscious awareness of what one is doing as well as by emotions. By this distinction, I do not mean to differentiate between “true believers” and “hypocrites,” however. It is rather meant to give expression to the principal distinction between healthy humans and modern computers running a program. Humans are consciously aware of their own being in the world because a virtual reality emerges in human consciousness (Revonsuo, 2006). We thus have conscious experience and can consciously consult the contents of that experience and report it to others (Block, 1995, 2005). Therefore, we are capable of true religious experience as well as of faking it.

Emotions are an important part of conscious awareness: thinking normally feels like something. This feeling is a physiological, bodily reaction. Yet different kinds of basic feelings or emotions cannot be differentiated merely on the basis of physiological responses; such differentiation necessitates cognitive appraisal (Rolls, 2002). There is some evidence that certain types of religious experience also involve this kind of cognitive aspect (Azari et al., 2001a, 2001b). Such religious experiences thus do not mean an unmediated contact with some external object/person/power (Janz, 1995). Experiences attained in certain types of meditation may be different in this respect, though; some meditative practices focus more on doing than on thinking and thus need not activate cognitive processes to the same extent as reading the Bible, for example (Ketola, in press; Payne, 2002).

Thus, the conclusion can be drawn that religion in general is the cumulative product of brains and minds operating in a sociocultural environment with a history. It is not merely a question of specific experiences but rather of persons making inferences from their experiences and behaving accordingly (Barrett, 2004, p. 124), even if some rituals emphasize doing at the cost of thinking. Religion is a specific kind of human activity canalized by cognitive process with an evolutionary background. Although not an adaptation in itself, religion yet is a cultural institution that has transformed the evolutionary process. We have had to adapt to a cultural environment shaped by religion because our ancestors have imitated learned patterns of behavior that either have been simply “contagious” (Sperber, 1996) or have helped people solve problems of cooperation and competition by extending the amazing grace of altruism also to nonkin (MacIntyre, 2004). The spread of religion is due to gene–culture coevolution rather than to straightforward biological adaptation. The difference between religiosity and irreligiosity at the populational level is not a genetic one; it is a cultural difference not reducible to genetic differences between individuals.

Note: This article was written within a research project funded by the Academy of Finland (#200827). I want to thank Petri Ylikoski for comments on an earlier draft.

REFERENCES

- Anttonen, V. (1996). Rethinking the sacred: The notions of “human body” and “territory” in conceptualizing religion. In T. A. Idinopulos & E. A. Yonan (Eds.), *The sacred and its scholars* (pp. 36–64). Leiden: Brill.
- Atran, S. (2002). *In gods we trust: The evolutionary landscape of religion*. Oxford, England: Oxford University Press.
- Axelrod, R. (1990). *The evolution of cooperation*. New York: Penguin Books.
- Azari, N. P., & Birnbacher, D. (2004). The role of cognition and feeling in religious experience. *Zygon*, 39(4), 901–917.
- Azari, N. P., Nickel, J. P., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001a). Neural circuitry of religious experience. *Society for Neuroscience Abstracts*, 742(8), 382.
- Azari, N. P., Nickel, J. P., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001b). Neural correlates of religious experience. *European Journal of Neuroscience*, 13(8), 1649–1652.
- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (pp. 1–40). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bargh, J. A. (1999). The cognitive monster: The case against the controllability of automatic stereotypic effects. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 462–482). New York: Guilford Press.

- Barrett, J. L. (1998). Cognitive constraints on Hindu concepts of the divine. *Journal for the Scientific Study of Religion*, 37, 608–619.
- Barrett, J. L. (2003). Epidemiological and nativist accounts in the cognitive study of culture: A commentary on Pyysiäinen's innate fear of Bering's ghosts. *Journal of Cognition and Culture*, 3(3), 226–232.
- Barrett, J. L. (2004). *Why would anyone believe in God?* Walnut Creek, CA: AltaMira.
- Barrett, J. L., & Johnson, A. H. (2003). The role of control in attributing intentional agency to inanimate objects. *Journal of Cognition and Culture*, 3(3), 208–217.
- Barrett, J. L., & Keil, F. (1996). Conceptualizing a nonnatural entity: Anthropomorphism in God concepts. *Cognitive Psychology*, 31, 219–247.
- Barrett, J. L., Richert, R. A., & Driesenga, A. (2001). God's beliefs versus mothers: The development of nonhuman agent concepts. *Child Development*, 72(1), 50–65.
- Barrett, J. L., Newman, R. M., & Richert, R. A. (2003). When seeing is not believing: Children's understanding of humans' and non-humans' use of background knowledge in interpreting visual displays. *Journal of Cognition and Culture*, 3(1), 91–108.
- Bechtel, W., & Richardson, R. C. (1993). *Discovering complexity: Decomposition and localization as strategies in scientific research*. Princeton, NJ: Princeton University Press.
- Bering, J. (2002). Intuitive conceptions of dead agents' minds: The natural foundations of afterlife beliefs as phenomenological boundary. *Journal of Cognition and Culture*, 2(4), 263–308.
- Bering, J. (2003). Towards a cognitive theory of existential meaning. *New Ideas in Psychology*, 21, 101–120.
- Bering, J. (2004). The evolutionary history of an illusion: Religious causal beliefs in children and adults. In D. Ellis & D. F. Bjorklund (Eds.), *Origins of the social mind: Evolutionary psychology and child development* (pp. 411–437). New York: Guilford Press.
- Bless, H., Fiedler, K., & Strack, F. (2004). *Social cognition: How individuals construct social reality*. Hove, England: Psychology Press.
- Block, N. (1995). On a confusion about a function of consciousness. *Behavioral and Brain Sciences*, 18(2), 227–287.
- Block, N. (2005). Two neural correlates of consciousness. *Trends in Cognitive Sciences*, 9(2), 46–52.
- Bloom, P., & German, T. P. (2000). Two reasons to abandon the false belief task as a test of theory of mind. *Cognition*, 77, B25–B31.
- Boyer, P. (1994). *The naturalness of religious ideas: A cognitive theory of religion*. Berkeley: University of California Press.
- Boyer, P. (1996). What makes anthropomorphism natural: Intuitive ontology and cultural representations. *Journal of the Royal Anthropological Institute, n.s.*, 2, 83–97.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Boyer, P. (2003). Are ghost concepts “intuitive,” “endemic” and “innate”? *Journal of Cognition and Culture*, 3(3), 233–243.
- Boyer, P. (2004). Religion, evolution, and cognition. A review. *Current Anthropology*, 45(3), 430–433.
- Bulbulia, J. (2004). The cognitive and evolutionary psychology of religion. *Biology and Philosophy*, 19, 655–686.

- Buller, D. J. (2005). *Adapting minds: Evolutionary psychology and the persistent quest for human nature*. Cambridge, MA: MIT Press.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason and the human brain*. London: Papermac.
- Day, M. (2005). The undiscovered and undiscoverable essence: Species and religion after Darwin. *Journal of Religion*, 85(1), 58–82.
- Deacon, T. W. (1998). *The symbolic species: The co-evolution of language and the brain*. New York: Norton.
- Deacon, T. W. (2003a). The hierarchic logic of emergence: Untangling the interdependence of evolution and self-organization. In B. H. Weber & D. J. Depew (Eds.), *Evolution and learning: The Baldwin effect reconsidered* (pp. 273–308). Cambridge, MA: MIT Press.
- Deacon, T. W. (2003b). Multilevel selection in a complex adaptive system: The problem of language origins. In B. H. Weber & D. J. Depew (Eds.), *Evolution and learning: The Baldwin effect reconsidered* (pp. 81–106). Cambridge, MA: MIT Press.
- Deacon, T. W. (2003c). Postscript on the Baldwin effect and niche construction (with P. Godfrey-Smith & D. Dennett). In B. H. Weber & D. J. Depew (Eds.), *Evolution and learning: The Baldwin effect reconsidered* (pp. 107–112). Cambridge, MA: MIT Press.
- Dennett, D. C. (1991). *Consciousness explained*. Harmondsworth, England: Penguin Books.
- Depew, D. J. (2003). Baldwin and his many effects. In B. H. Weber & D. J. Depew (Eds.), *Evolution and learning: The Baldwin effect reconsidered* (pp. 3–30). Cambridge, MA: MIT Press.
- Durkheim, É. (1925). *Les formes élémentaires de la vie religieuse*. Paris: Félix Alcan.
- Edelman, G. M. (1992). *Bright air, brilliant fire: On the matter of consciousness*. New York: Basic Books.
- Fitch, W. T., & Hauser, M. D. (2004). Computational constraints on syntactic processing in a nonhuman primate. *Science*, 303, 377–380.
- Franks, B. (2003). The nature of unnaturalness in religious representations: Negation and concept combination. *Journal of Cognition and Culture*, 3(1), 41–68.
- Frith, U. (2001). Mind blindness and the brain in autism. *Neuron*, 32, 969–979.
- Fuster, J. (2002). Frontal lobe and cognitive development. *Journal of Neurocytology*, 31(3–5), 373–385.
- Gallagher, H. L., & Frith, C. D. (2003). Functional imaging of “theory of mind.” *Trends in Cognitive Sciences*, 7(2), 77–83.
- Happé, F. G. E., Winner, E., & Brownell, H. (1998). The getting of wisdom: Theory of mind in old age. *Developmental Psychology*, 34, 358–362.
- Heberlein, A. S., & Adolphs, R. (2004). Impaired spontaneous anthropomorphizing despite intact perception and social knowledge. *Proceedings of the National Academy of Sciences*, 101(19), 7487–7491.
- Janz, B. (1995). Mysticism and understanding: Steven Katz and his critics. *Studies in Religion/Sciences Religieuses*, 24, 77–94.
- Johnson M. (1998). How moral psychology changes moral theory. In L. May, M. Friedman, & A. Clark (Eds.), *Mind and morals: Essays on ethics and cognitive science* (pp. 44–68). Cambridge, MA: MIT Press.

- Kelemen, D. (2004). Are children “intuitive theists”? Reasoning about purpose and design in nature. *Psychological Science*, *15*(5), 295–301.
- Ketola, K. (in press). Can the modal theory of religiosity account for mystical traditions? An empirical study of practitioners of yoga and meditation.
- Kuhlmeier, V. A., Bloom, P., & Wynn, K. (2004). Do 5-month-old infants see humans as material objects? *Cognition*, *94*, 95–103.
- Laland, K. (2004). Extending the extended phenotype. *Biology and Philosophy*, *19*, 313–325.
- Laland, K. N., Odling-Smee, F. J., & Feldman, M. W. (2001). Cultural niche construction and human evolution. *Journal of Evolutionary Biology*, *14*, 22–33.
- Lawson, E. T. (2001). Psychological perspectives on agency. In J. Andresen (Ed.), *Religion in mind: Cognitive perspectives on religious belief, ritual and experience* (pp. 141–172). Cambridge, England: Cambridge University Press.
- Lawson, E. T. (2005). A new look at the science and religion dialogue. *Zygon*, *40*, 555–563.
- Leslie, A. M., Friedman, O., & German, T. (2004). Core mechanisms in “theory of mind.” *Trends in Cognitive Sciences*, *8*(12), 528–533.
- MacIntyre, F. (2004). Was religion a kinship surrogate? *Journal of the American Academy of Religion*, *72*(3), 653–694.
- McNamara, P. (2001). The frontal lobes and religion. In J. Andresen (Ed.), *Religion in mind: Cognitive perspectives on religious belief, ritual and experience* (pp. 237–256). Cambridge, England: Cambridge University Press.
- McNamara, P. (2002). The motivational origins of religious practices. *Zygon*, *37*(1), 143–160.
- Mayr, E. (2001). *What evolution is*. New York: Basic Books.
- Odling-Smee, F. J. (1988). Niche constructing phenotypes. In H. C. Plotkin (Ed.), *The role of behavior in evolution* (pp. 73–132). Cambridge, MA: MIT Press.
- Panksepp, J., & Panksepp, J. B. (2000). The seven sins of evolutionary psychology. *Evolution and Cognition*, *6*(2), 108–131.
- Payne, R. K. (2002). Cognitive theories of ritual and Buddhist practice: An examination of Ilkka Pyysiäinen’s theory. *Pacific World*, *3rd series*, *4*, 75–90.
- Perner, J. (1991). *Understanding the representational mind*. Cambridge, MA: MIT Press.
- Pinker, S. (1998). *How the mind works*. New York: Penguin Books.
- Premack, D., & Premack, A. (2002). *Original intelligence*. New York: McGraw-Hill.
- Preston, J., & Bishop, M. (Eds.). (2002). *Views into the Chinese Room: New essays on Searle and artificial intelligence*. Oxford, England: Oxford University Press.
- Pyysiäinen, I. (2001). *How religion works: Towards a new cognitive science of religion*. Leiden, Netherlands: Brill.
- Pyysiäinen, I. (2004a). Intuitive and explicit in religious thought. *Journal of Cognition and Culture*, *4*(1), 123–150.
- Pyysiäinen, I. (2004b). *Magic, miracles, and religion: A scientist’s perspective*. Walnut Creek, CA: AltaMira.
- Pyysiäinen, I. (2005). Religion, *déjà vu* and counterintuitiveness. *Durkheimian Studies/Études durkheimiennes*, in press.
- Pyysiäinen, I., Lindeman, M., & Honkela, T. (2003). Counterintuitiveness as the hallmark of religiosity. *Religion*, *33*(4), 341–355.

- Quine, W. V. O. (1980). Two dogmas of empiricism. In W. V. O. Quine (Ed.), *From a logical point of view* (pp. 20–46). Cambridge, MA: Harvard University Press.
- Revonsuo, A. (2006). *Inner presence: Consciousness as a biological phenomenon*. Cambridge, MA: MIT Press.
- Richerson, P., & Boyd, R. (2005). *Not by genes alone: How culture transformed human evolution*. Chicago: University of Chicago Press.
- Rolls, E. T. (2002). *The brain and emotion*. Oxford, England: Oxford University Press.
- Saler, B. (2000). *Conceptualizing religion: Immanent anthropologists, transcendent natives, and unbound categories*. New York: Berghahn Books.
- Sartre, J. P. (1943). *L'être et le néant*. Paris: Gallimard.
- Sartre, J. P. (1960). *The transcendence of the ego* (F. Williams & R. Kirkpatrick, Trans.). New York: Hill & Wang.
- Searle, J. R. (1980). Minds, brains, and programs. *Behavioral and Brain Sciences*, 3, 417–457.
- Schmaus, W. (2003). Is Durkheim the enemy of evolutionary psychology? *Philosophy of the Social Sciences*, 33(1), 25–52.
- Sørensen, J. (2004). Religion, evolution, and an immunology of cultural systems. *Evolution and Cognition*, 10(1), 61–73.
- Sosis, R. (2003). Why aren't we all Hutterites? Costly signaling theory and religious behavior. *Human Nature*, 14, 91–127.
- Sosis, R., & Alcorta, C. (2003). Signaling, solidarity, and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, 12, 264–274.
- Sperber, D. (1996). *Explaining culture: A naturalistic approach*. Oxford, England: Blackwell.
- Sperber, D., & Hirschfeld, L. A. (2004). The cognitive foundations of cultural stability and diversity. *Trends in Cognitive Sciences*, 8(1), 40–46.
- Sterelny, K. (2003). *Thought in a hostile world: The evolution of human cognition*. Malden, MA: Blackwell.
- Tomasello, M., Call, J., & Hare, B. (2003). Chimpanzees understand psychological states—The question is which ones and to what extent. *Trends in Cognitive Sciences*, 7(4), 153–156.
- Weber, B. H., & Depew, D. J. (Eds.). (2003). *Evolution and learning: The Baldwin effect reconsidered*. Cambridge, MA: MIT Press.
- Wilson, D. S. (2002). *Darwin's cathedral: Evolution, religion and the nature of society*. Chicago: University of Chicago Press.
- Wilson, D. S., & Sober, E. (1994). Reintroducing group selection to the human behavioral sciences. *Behavioral and Brain Sciences*, 17(4), 585–608.
- Wilson, R. A. (2004). *Boundaries of the mind: The individual in the fragile sciences: Cognition*. Cambridge, England: Cambridge University Press.
- Wilson, R. A. (2005). *Genes and the agents of life: The individual in the fragile sciences: Biology*. Cambridge, England: Cambridge University Press.
- Woodward, J., & Cowie, F. (2004). The mind is not (just) a system of modules shaped (just) by natural selection. In C. Hitchcock (Ed.), *Contemporary debates in philosophy of science* (pp. 312–334). Oxford, England: Blackwell.

THE SIGNIFICANCE OF THE EVOLUTION OF RELIGIOUS BELIEF AND BEHAVIOR FOR RELIGIOUS STUDIES AND THEOLOGY

Wesley J. Wildman

INTRODUCTION

The chapters in this volume report on traffic at the intersection of evolutionary theory and the *scientific study of religion*, by which I mean the interdisciplinary study of the cognitive, emotional, psychological, social, and communicative elements of religion using the methods of the natural and social sciences. (Note: I shall italicize key terms throughout this chapter at the place where each is defined to help readers formed in quite different intellectual contexts track what I mean.) The scientific study of religion has profound connections to the wider academic study of religion—that is, *religious studies*, pursued by *religionists*, to use a term that seems to be gaining currency. It is also deeply connected to scholarly reflection on religious beliefs and practices—that is, *theology*, pursued by *theologians*, who may belong to theistic and nontheistic religious traditions or may have religiously nonaffiliated or secular projects. If religionists are usually the outsiders who strive for neutrality in their study of religion, theologians tend to be the insiders, making a virtue of their existentially lively religious commitment to generate profound insights that outsiders cannot easily grasp or express. Of course, there are exceptions in both cases.

Cooperation between experts interested in religion from all specializations and perspectives should produce a deeper understanding of the evolution of religious beliefs and behaviors and thereby of the origins and functions of religion. I am one of a growing number of scientists, religionists, and theologians who acknowledge that as a worthy goal. Our motivations do

not always cohere. We probably all find religious phenomena intrinsically fascinating, and we can certainly all see that religion is often a crucial factor in geopolitics, economics, social change, and culture wars. We probably work in the hope that understanding will bring empathy and self-control, as it does so often in other facets of life. Some may go further and imagine that understanding religion may give us the power we need to eliminate it and to deliver its victims into humanistic enlightenment. Others might dream of a form of religion that can remain authentically spiritual while being fully aware of its evolutionary origins, social functions, psychological dynamics, and economic implications. Despite these discrepant motivations, cooperation seems feasible, and I think we can suspend our hidden or not-so-hidden social agendas for the sake of a quest for understanding.

Unfortunately, gaining an interdisciplinary understanding of religion is more difficult than it might seem. The scientific study of religion, religious studies, and theology are quite different discourses and sometimes shockingly disconnected. As one who bridges all three, I have concluded that they are not incommensurate, but they are very often so differently angled that fitting them together is challenging. This conceptual jigsaw is simplest when religionists and theologians allow the scientist to do his or her thing, as happens in this volume, and then see how that affects their projects. But many more complex interactions are possible.

Consider religious studies and the scientific study of religion. Religious studies as a field is deeply committed to registering the complexity and intricacy of religion in its phenomenological descriptions, historical reconstructions, and sociological models. It is profoundly interdisciplinary, much as political economy is. Because of its encompassing nature, religious studies have the ability to absorb and respond to scientific perspectives on religion without having to abandon its own fundamental methodological commitments. The scientific study of religion has a different set of commitments. Scientists work within methodological limitations that promote the simplification of endlessly complex religious phenomena to the few salient features that prove tractable for scientific investigation. Scientists can be interested in the whole complexity of religion and do well to know something about it for the sake of avoiding embarrassing caricatures. But their first commitment is to finding something they can chew on, so they must argue (or simply hope) that selecting certain limited strands from the interwoven fabric of religion does not invalidate their results.

This strikes religionists as appallingly reductionist. To them, the descriptions of religious phenomena that some scientists offer, without any trace of self-consciousness or hint of apology, are comically or, perhaps, dangerously oversimplified. Religionists feel certain that a high conceptual price is being paid for this reductionist strategy even when they do not immediately know how to advise the scientist who would gladly work with a more nuanced

interpretation of religion. At the very least, the price of casual reductionism is a social one. Most people in the large world cultures of the contemporary world listen to scientists no matter what they are saying. Their propagation of superficial understandings of religion can have potentially serious social and political consequences, from distorted understandings of religion and deep suspicion of science in the general religious public to the gradual loss of scientific prestige as reeducation painstakingly corrects careless scientific oversimplifications.

Nevertheless, science still achieves fascinating results in its study of religious beliefs and practices. Knowing that religious ideas take certain repeatable forms or that a tendency toward certain religious behaviors is heritable can be highly useful within the broader framework of religious studies. To make use of these benefits, religionists must get past their allergic reaction to the reductionist approach. Unfortunately, the field of religious studies has paid little attention to the scientific study of religion. That needs to change—and quickly. Scientists have been setting a challenging new agenda for religious studies over the past several decades, and it is time that more religionists engage it, if only to test it from their own perspectives.

The scientific study of religion affects theology, too. Theology typically ventures its own claims about the origins and functions of religion, perhaps through an intellectual interpretation of a founding narrative, through a doctrine that purportedly conveys a divinely revealed truth about the purpose of a religious ritual, or through a reflective interpretation of the astonishing experiences that can occur in meditation or corporate worship. Such theological claims typically concern only one part of a single religion, and few theologians ever attempt to coordinate such claims into a theoretical edifice that arches across religious traditions. In fact, most theologians generally seem uninterested in religion in the sense of the whole collection of phenomena that religious studies examines—not a good thing, in my view, but understandable given the way theologians often work on behalf of living religious communities. More important for our current concerns, theological claims frequently do not harmonize well with what the scientific study of religion has to say about the evolution of religious beliefs and behaviors and about the origins and functions of religion. Theologians have usually avoided this conflict problem, just as religionists have, by withdrawing into supportive communities with social identities strong enough to maintain local plausibility structures regardless of wider intellectual currents. From such local havens of acceptance and relevance, they need pay no social price for ignoring what scientists say about the evolutionary origins and functions of religion.

By contrast, there are intellectually compelling subtraditions within most theological traditions that seek to engage what other intellectuals have to say about matters of concern to theology. Such theologians—the ones likely to pick up a book of this sort—exert great effort to learn what religionists

and scientists have discovered about religion and seek to take account of those discoveries in their theological theories. Theological theories on some topics may operate conceptually independently of the scientific study of religion. But many theological theories have conceptual and logical traction with parts of the scientific study of religion; indeed, some scientists seem to presume this when they informally and sometimes publicly pronounce on the theological significance of the latest discovery pertinent to religion. Unfortunately, the discipline of theology is often identified with its most shrill and narrow-minded exponents, as much by cultural luminaries with an antireligious ax to grind as by conservative religious leaders. But the work of imaginative intellectuals seeking to integrate the scientific study of religion and religious studies into a specifically theological theory of religion persists quietly around the margins of religiously driven culture wars and in the interstices of the socially complex world of theological studies. Such theological theories seek to identify not only the origins and functions of religion but also the value of religious practices and the truth of religious claims, and they seek to do this coherently by uniting every relevant perspective into a consistent theory. This is why theology, in this very particular sense, is the most interdisciplinary of all intellectual ventures.

TWO LEVELS OF DIALOGUE

The dialogue between scientists, religionists, and theologians over the evolution of religious beliefs and behaviors unfolds—or can unfold—on two levels. First, at the level of conceptual content, there should be two-way traffic between scientific theories and the associated empirical research on the one hand and what religionists and theologians say about religious beliefs and practices on the other. Most obviously, religious studies and theology furnish basic data for the scientific study of religion. The most intellectually well-crafted statements about the beliefs of a religion are typically delivered by expert theologians, so scientists studying religion should ensure that they know about such statements rather than confining themselves to the knowledge base of popular religious self-understandings. Similarly, the most sophisticated descriptions of religious practices come from religionists specializing in ritual studies, so scientists ought to take account of them in deciding on the most salient aspects to study in detail. Doing this would have an immediate effect on the quality of scientific work. Scientists would be far more precise about what they are studying—not religious ritual but a particular religious practice and not a universal religious belief but an idea found in some parts of some religions and not others—and far more cautious about drawing obviously fallacious conclusions about religion as a whole from whatever part of religion they actually are studying.

In the other direction, religionists and theologians ought to have some response to emerging scientific theories of the origins of religion, to the dawning intelligibility of bizarre religious activities, and to theories of cognition that predict the recurrence of supernatural beliefs. Evolutionary psychology and cognitive neuroscience should influence theological claims about ultimate and proximate realities, salvation and liberation, the meaning and purpose of life, and how so many human beings come to believe in such things. How do theological assertions about sacred religious communities comport with the emerging evolutionary account of their origins? Can theologians continue to say everything they have formerly said about the theological meaning of church and synagogue, temple and sangha?

The second level of dialogue concerns method. On the one hand, the nature and function of theology demand evaluation in light of these results from the scientific study of religion. Is theology a socially embedded intellectual activity specializing in legitimating identity-nurturing deflective and projective responses to an uncertain natural environment? Is it a divinely given responsibility on behalf of a supernaturally established body of sacred revelation? Is it a religiously neutral form of philosophical inquiry? Can it be all of these at once? Scientific understandings of religion should impact the theologian's perception of what it means to assert and evaluate religious truth claims and to operate as the intellectual wing of a religious group and thus what it means to function as a theologian. Similarly, the scientific study of religion raises sharp questions for religionists about the adequacy of the generally humanistic, literary, and historical approaches to the study of religion. Does not the scientific study of religion show that these approaches need to be complemented—and possibly constrained—by the approaches of natural and social scientists?

On the other hand, the insights of religious studies and theology should chasten the scientific study of religion, inhibiting its tendency toward hasty and sometimes hostile reductionism in approaching religious phenomena. Religionists and theologians who accept an evolutionary theory of religion will inevitably assert that the evolution of human social tendencies and higher cognitive capacities provoked and promoted religious behavior. They will say that this particular product of the evolutionary process opened up a universe of religious depth that would have remained closed otherwise. They will picture the existential coloring and religious depth of reality gradually becoming a part of the environment of human life as human beings evolved the abilities to engage it. This viewpoint makes a virtue of the evolutionary account of the origins and functions of religious beliefs and behaviors. Religionists and theologians tend to agree on this much even if theologians then go further to speculate on the meaning of all this, whereas religionists typically remain content to analyze its functions and effects. The scientist studying evolution and religion may not be able to speak to the reality of

religious phenomena, but it is dangerous for that scientist simply to refuse to consider the role that religious realities may play in conditioning the evolutionary process itself.

This presents a serious methodological conundrum for the scientist. The scientist does not want to leave out factors relevant to an inquiry about the evolutionary origins of religious beliefs and behaviors, yet the scientific method appears unable to make use of the hypothesis of the reality of religious phenomena because scientific evidence appears incapable of settling such a question. Scientists may be tempted to rule out the reality of religious realities a priori rather than remaining neutral to them because they are intractable within the scientific framework of analysis. In that case, alert religionists and theologians, as well as other scientists, must be ready to call the wayward back to the straight-and-narrow path of scientific discipline. If science cannot settle metaphysical questions about the reality of religious objects positively, then neither can it settle such questions negatively. Scientists must *bracket* the questions—in the sense of suspending consideration of them—and also remain alert to the fact that such bracketing can limit the validity of their conclusions.

ORGANIZATION OF THIS CHAPTER

Evidently, the potential interactions among the scientific study of religion, religious studies, and theology are conceptually and methodologically complex, perhaps forbiddingly so. I have sketched these complexities with just enough detail to suggest how this volume fits into a wider intellectual venture, with a small but growing body of literature. In the remainder of this chapter, I shall comment at both the conceptual and the methodological level. I shall organize my thoughts into four major sections, reflecting the most important themes of the volume: CST, the evolutionary status of religion, the cognitive elements of religion, and the adaptive functions of religion. Sometimes I offer summary overviews or fill in background that is missing in the volume, thinking especially of what religionists and theologians might need to follow the scientific chapters. But my primary task is to say enough on each issue that I can briefly indicate its significance for religious studies and theology.

TERMINOLOGY AND BASIC CONCEPTS

Throughout this chapter, I take for granted the meaning of several key terms in evolutionary biology impinging on evolutionary psychology. Keeping these terms in mind is particularly important for religionists and theologians. Words such as “fitness” and “adaptiveness” may have misleading connotations in their worlds of thought, suggesting sound psychological adjustment,

empirically accurate interpretation of an environment, health-promoting lifestyles, or spiritually efficacious beliefs and practices. As important as these ideas are for understanding religion, they should not be conflated with the differential reproduction advantage associated with the concepts of fitness and adaptive function in evolutionary biology.

Fitness always refers to reproductive fitness, which means the ability of a biological entity (*organism*) to pass genetic information (*genes*) to future generations. This refers not to the number of offspring (which may be infertile or die before they reproduce, after all) but to the spread of genetic material in future generations. A simple (but not foolproof) test of fitness is whether one's offspring themselves are reproductively successful. Fitness is always relevant to an *environment*, within which a population has a *niche* where it is subject to particular *selection pressures* in the form of nutrition, disease, and predators. A key question in evolutionary biology is whether the environment relevant to fitness can include high-level social factors as well as low-level biological factors. Evolutionary psychology's core hypothesis is that social and psychological factors are relevant to evolutionary fitness.

A *trait* is a genetically based characteristic of an organism, such as eye color or a genetic propensity to cancer. I will use *characteristic* or *feature* to refer to aspects of an organism's behavior and function in general. The genetic basis of traits is an extremely complex matter because genes often influence more than one characteristic of an organism and traits usually depend on many interacting genes. Unresolved questions about the genetic basis of organism characteristics abound, particularly in the context of evolutionary psychology, where the concern is with emergent characteristics such as behaviors, emotions, and beliefs. Many behavioral characteristics can be cultivated independently of genetic makeup, so it is frequently unclear whether certain behavioral features of organisms are traits in the genetic sense at all. To say that a behavioral predisposition is a trait implies that the behavioral predisposition has a genetic basis that somehow persists through cultural and contextual factors and tends to express the associated behavior in widely varying circumstances. Twin studies and adoption studies can help to decide whether a behavior has a genetic component and thus whether the associated behavioral tendency is a trait. In human evolution, most key traits were developed in the very long Pleistocene environment of evolutionary adaptation, a hunter-gatherer lifestyle prior to settled agriculture to that I shall refer as the *ancestral environment*.

A *mutation* is a structural and molecular chemical change in genetic material. Many mutations are irrelevant to an organism's function, at least in the short term, though presumably many unexpected things can happen in gene evolution in the long term. The sorts of mutations we are interested in produce or affect traits. In evolutionary psychology, the focus is on mutations that affect cognitive and behavioral traits. An *adaptation* is

a mutation or a set of mutations that increases individual fitness. Genetic change is *adaptive for a population* when it produces traits that increase the population's average fitness.

Fitness is a relative term, expressing differential reproduction advantage of one organism relative to others of the same species in the same environment or average differential reproduction advantage of one population relative to a similar population at a different time or place or in a changed environment. There is no absolute measure of fitness. A *niche* is the ecological setting for a *species* of organisms and determines the part of the wider environment that is causally relevant to the species' fitness. A *niche resonance* is a self-reinforcing match between an adaptive trait and an environment that increases both the frequency of the trait in the population and the fitness of organisms possessing the trait. A niche resonance can link genetically distinct traits in such a way that the frequency of both traits increases in the population. This is especially important in sexual reproduction, where a male trait and a female trait can reinforce one another and increase in frequency within the population even though neither trait alone would increase fitness. Niche resonances can even occur between species, particularly in *communicative environments* that permit the sending and receiving of signals between predators and prey. Evolutionary psychology proposes that niche resonances might also sponsor *gene-culture coevolution*, a hypothetical relation between organisms and environment in which genetically linked cultural practices have a genetic influence.

Adaptive function refers to the biological or behavioral function of a genetic trait that causes it to be adaptive. A trait that decreases fitness has a *maladaptive function*; selection pressures may reduce the presence of such traits in the population. A genetic feature can be neither adaptive nor maladaptive if no selection pressure exists in a particular context to affect its presence in the population. The question of the context for assessing adaptive function and maladaptive function is a vexed one in evolutionary psychology. The *original selection context* is that in which a trait first becomes established in one or more organisms within the ancestral environment and then spreads widely through the species because of its adaptive function in that context. An established trait can also have effects other than the *primary adaptive function* for which it was selected. These effects, whether copresent already in the original selection context or appearing only much later as environmental conditions change and new traits are established, are called *side effects* or *by-products*. When by-product effects serve to increase fitness independently of the primary adaptive function, the underlying trait has a *secondary adaptive function*. As with primary adaptive function, there can be *secondary maladaptive functions* and secondary functions that are neither adaptive nor nonadaptive, or *nonfunctional by-products*.

Traits adaptive in one context can become maladaptive in a new context. By-products can be simultaneously adaptive, maladaptive, and nonfunctional

with respect to different selection mechanisms. There is great deal of dynamism here as varying sets of traits interact with diverse environments. Evolutionary psychology proposes that culturally conditioned behaviors can combine with genetic traits to have genetically relevant effects, as when health care policies and technologies create reproductive opportunities for those who would not have been able to reproduce in the ancestral environment. *Sexual selection*, the process of mate choice, is particularly important in giving genetic relevance to culturally conditioned aspects of organisms. *Communicative environments* vastly expand the range and likelihood of trait side effects. Some may be potentially maladaptive, as when communication allows human beings to wipe out malaria in some parts of the world, thereby reducing the presence of malaria resistant genes and exposing larger numbers of people to a future outbreak of deadly malaria under new environmental conditions. Most side effects are not directly exposed to selection pressures, as when human beings flip coins, cook waffles, and play cricket.

Different types of evolutionary theorists tend to focus on different contexts. Some focus on the original context for a trait's selection, some on the long-term persistence of traits through varied environments, and some on the current observable adaptive function of traits. This leads to quite different conceptual and terminological frameworks and sometimes to a great deal of confusion. Miscommunication can be mitigated by paying attention to the question of context for claims about the adaptiveness of traits. As it happens, diverse terminological frameworks are evident in the chapters of this volume, particularly around signaling theory and evolutionary by-products. When we come to those topics, therefore, I shall return to terminological and conceptual clarification in an attempt to promote mutual understanding.

COSTLY SIGNALING THEORY AND RELIGION

Most of the chapters in this volume accept the promise of costly signaling theory (CST) to offer an explanation of bizarre, seemingly fitness-reducing, and otherwise hard-to-explain behavioral characteristics, including certain religious phenomena. CST seems to apply only to some aspects of religion, and thus its usefulness as an explanation of religion's evolutionary origins is hard to assess with any confidence. Moreover, CST is controversial even in its native domain, as we shall see later in this chapter. Yet CST also suggests that costly religious behaviors can no longer serve as evidence that religion lacks an evolutionary origin. On the contrary, CST explains how such counterintuitive behaviors might actually increase fitness in communicative environments. Since there is no systematic accounting of the CST controversy in the current volume, a sketch of the main issues is in order here before turning to its application to religion.

A Sketch of the Development of Costly Signaling Theory

In a famous 1975 paper, biologist Amotz Zahavi introduced the *handicap principle* (Zahavi 1975, 1977a, 1977b). Inspired by his long observations of small Arabian Babbler birds, Zahavi was trying to explain how apparently fitness-reducing handicaps could evolve. In the realm of sexual selection, a standard example is the weighty and florid plumage of some male peafowls (peacocks). Such plumage might be sexually appealing to female peafowls (peahens), but it is metabolically expensive to produce, tiring to lift and spread, and increases the peacock's vulnerability to predators. The male trait thus seems to decrease fitness. The corresponding female trait also seems to decrease fitness by limiting the number of eligible mates. This doesn't make much sense on the premises of natural selection alone, so how could such an arrangement have evolved? In the interspecies realm, a standard example is gazelle stotting. When a gazelle notices a lion stalking in the savanna grass, the gazelle starts leaping in place, high in the air. Should not the gazelle save its valuable energy for running away and make the most of its time by starting immediately? For its part, the lion tends to avoid high-stotting gazelles and go after low-stotting or no-stotting gazelles instead.

Zahavi's key move in explaining such phenomena was to hypothesize a *communicative environment*, within which evolutionarily relevant *signals* can be sent from *signalers* to *receivers* so as to influence receiver behavior. The peacock's plumage is a trait that "sends a message" about genetic value (in the sense of likely reproductive fitness of offspring), while the peahen's instinctive attraction to florid plumage is a trait that permits her to "receive the message" about genetic value, which influences her mate-selection behavior. The two traits together in the right environment create a niche resonance that increases the frequency of exorbitant plumage in males and the frequency of attraction to such plumage in females. Males may die sooner, but they will find mates more quickly and more often (peacocks are polygynous in the wild and only monogamous in captivity), so their overall reproductive fitness may in fact increase, contrary to initial expectations. Females will have fewer potential mates, yet their overall fitness may increase because of increased fitness of their offspring.

Zahavi's intuitive (though not experimental) causal explanation of such behaviors promised an analytical framework for understanding their evolutionary origins and significance. At the time when Zahavi made his proposal, the most broadly accepted theory was Ronald Fisher's runaway sexual selection explanation (Fisher, 1930). Fisher proposed that there are no selection pressures (apart from peahen mate selection) on peacocks with large plumages, so the trait is amplified in the population without limit so long as peahens are attracted to such plumage. Surely runaway sexual selection applies in many cases, but the handicap principal is superior in

the case of peafowl because it accommodates the fact that plumage varies tremendously among peacocks. This variation presumably allows it to be used as a reliable fitness signal.

Gazelle stotting can also be explained on the premise of communication between gazelle and lion. The speculative reconstruction of this communication is as follows. The gazelle uses up valuable energy, but it shows the lion how strong and fast it must be through the height of its leaping. A lion smart enough to get that message but not smart enough to realize that gazelles with longest-lasting stotting displays may be more exhausted and easier to catch will chase down nonleaping or lower-leaping gazelles. This helps the lion because a failed chase is extremely exhausting, making a subsequent chase even less likely to succeed and risking starvation. It helps the individual gazelle by deflecting the predator's attention to weak or sick animals. At the gazelle population level, this deflection costs nothing in average fitness if the killed animal is old. It may actually improve average fitness if the unlucky prey is genetically prone to weakness. The resulting niche resonance increases the frequency of both the stotting trait in the gazelle population and the cognitive inference trait in the lion population. The careful scientist immediately wonders whether this story can ever really be confirmed or even experimentally tested because it depends on the cognitive contents of animal minds.

These explanations of seemingly fitness-reducing traits make evolutionary sense only if the signals in question are reliable indicators of reproductive fitness. Why? Suppose it turns out that low-leaping gazelles can actually run faster and dodge better than high-leaping gazelles. The lion that chases low-leaping gazelles, thinking they are more vulnerable, is less likely to eat. Its fitness is reduced by its possession of this mistaken cognitive structure, and the frequency of that trait will decrease in the lion population accordingly. Correspondingly, the high-stotting trait offers no survival advantage for gazelles to offset the disadvantage of exhaustion when lions do not treat stotting as a reliable signal of strength and speed. In this case, the stotting trait is not relevant to reproductive fitness, so it cannot function as an authentic signal and would not become an evolutionarily stable feature of the gazelle–lion–savanna environmental niche.

Zahavi's proposal was not received warmly at first. Evolutionary biologists from John Maynard Smith (1976) and Richard Dawkins (1976) to Robert Trivers (1985) and Mark Kirkpatrick (1986) criticized it because it flies in the face of the principle of natural selection, had no theoretical justification in the familiar terms of game theory, relied on very little data, and seemed to oversimplify animal signaling phenomena. Whereas natural selection eliminates fitness-reducing traits, the handicap principle can amplify them. Explanations of strange biological phenomena are welcome, of course, particularly when such phenomena make little sense on the principle of

natural selection alone, but the theoretical confusion induced by conflicting principles at the heart of biological evolution was not welcome. In fact, the problem of conflicting principles in evolutionary biology is long-standing. Darwin himself had distinguished the principle of sexual selection from the principle of natural selection and had produced no fully satisfying synthesis (see Darwin, 1859, 1872). This suggests that the difficulty accepting Zahavi's speculative interpretations of his observations may have been driven in some cases by a selection-oriented orthodoxy in biology that was not nearly as empirically minded as Darwin himself was.

The handicap principle is far more general than Darwin's sexual selection principle because it may help to explain surprising phenomena in sibling competition, predator-prey communication, and a variety of other contexts (see Zahavi & Zahavi, 1997). It is really about how the principle of natural selection needs to be modified to accommodate the fact of emergent communicative contexts. *Fitness remains the evolutionary yardstick, but in communicative environments natural selection is only one of many possible algorithms for optimizing fitness.*

Alan Grafen's landmark 1990 paper confirmed this interpretation of the handicap principle with game-theoretic formality that was alien to Zahavi's more intuitive observational work (see Grafen, 1990). Grafen's mathematical model showed how handicaps, understood as a kind of costly signaling, could optimize fitness in evolutionarily stable ways. The model also clearly exposed the assumptions of the handicap principle, allowing evolutionary biologists to see how it could complement the principle of natural selection. Grafen's work helped to win broad acceptance of the handicap principle among experts in the field. Some early critics reversed their early judgments (see Dawkins 1989), while others sought to generalize animal signaling theory to include the possibility of noncostly signals as well as the costly signals of the handicap principle (see Maynard Smith & Harper, 2003). With Grafen's contribution, the idea of handicap traits making sense in communicative environments had taken a huge step toward theoretical stability, and what we now know as CST was born.

Contemporary critics of CST have isolated weaknesses and oversimplifications in CST-based modeling. They point out that real-world relationships are multifaceted and cannot be reduced to the simple roles of CST game-theoretic models; that the actual genetic relevance of signals is often assumed rather than shown; that the models rarely accommodate dynamic complexities due to the social realities of cheating and deception, memory, and reputation; and that the game-theoretic criterion of evolutionarily stable scenarios oversimplifies the fluidity of evolutionary environments and the endlessly complex relationships that animals form within them. Yet because of the success of the handicap principle in solving some classic problems in evolutionary biology, scientists have tried to apply CST to other phenomena

that they find difficult to explain. In the biological sciences, it is an important factor in theories of sexual selection, kin relationships, and predator–prey behaviors. In the human sciences, it appears in theories of class distinctions, conspicuous consumption, fashion trends, adolescent peer-group dynamics, deception, language development, and ritual. Anthropologists and psychologists use CST to explain dangerous or bizarre human behaviors that reduce individual fitness, from needless risk taking to painful rituals and from altruistic acts of sacrifice to exorbitant acts of public generosity. Despite the ongoing challenges to CST, therefore, it appears to be here to stay. The core idea that communicative environments change the way environmental–species niches optimize evolutionary fitness corrects selection-focused biology by pointing out that complex emergent communicative environments permit many novel pathways to increasing fitness.

While experts now agree that costly signals are among the signaling phenomena that can be evolutionarily relevant, it is important to ask why costly signals turn out to be important in a given case when there are so many other potentially relevant dimensions of signaling, such as the communicative capacities involved in noncostly cooperation behaviors. In other words, if noncostly signals can enhance evolutionary fitness, why would costly signals ever arise? This is not a difficult question to answer, in principle: costly signals may be able to solve some problems that noncostly signals cannot, such as the freeloader (or free-rider) problem discussed in several places in this volume. But it is extremely important to keep this question in mind because game-theoretic models often suggest that non-CST equilibria persist alongside CST equilibria for biological signaling systems. In order to be credible, therefore, a CST-based analysis of a behavioral trait probably has to *show* that explanations based on noncostly signaling do not rule out a role for costly signals. But this level of rigorous argumentation is hard to achieve because evolutionary biology presumes communicative environments that we cannot inspect but only imaginatively reconstruct. The speculation that inevitably results makes it difficult to determine why, given that every imaginable kind and variation of signaling seems to have a role in evolution, one kind of signaling rather than another seems to have paid off in a particular evolutionary niche.

A similar frustration concerns the struggle for terminological consistency and conceptual clarity in this area. The chapters in this volume sometimes use different words for similar concepts and the same words for quite distinct concepts, thereby reproducing in microcosm the problem plaguing signaling theory as a whole. As just one example, Sosis uses the word “index” and its cognates such as “indicator” in multiple ways. Sometimes he uses it to describe a causal type of sign, as in his claim that behaviors, badges, and bans “indexically signal” (i.e., functionally signal because causally related to) acceptance of a community’s moral norms. In this usage, an index or indicator is a sign that

is causally related to that about which it communicates. Other times he uses it to mean a suggestion, as when he says that fakable signals can still be useful “indicators” of belief. In this usage, an index or indicator increases the probability that an observer’s assumption about sincerity will be correct. Sosis needs both ideas but has only one term.

Maynard Smith and Harper (2003) directly address the terminological and conceptual problems of signaling theory. They offer a conceptually well-organized survey of animal signaling and propose sharp definitions aimed at eliminating confusions and stabilizing language used to frame theories of signaling. They also situate CST-type explanations in the broader context of animal signaling, allowing us to see how CST can complement other lines of explanation for behavioral traits. Without a conceptually adequate and consistent lexicon of key terms, entering the world of thought of a particular author is a stiff challenge for outsiders and may lead to misunderstandings and conceptual muddles even among specialist readers.

Through all these complexities, several points emerge forcefully. First, communicative environments enhance the range of fitness-enhancing evolutionary strategies, permitting fitness-reducing behaviors to persist in particular species–environment niches. The natural selection filter in its simplest form seems to serve as an indispensable foundation for more elaborate strategies, such as animal signaling phenomena. Second, signaling theory helps to shift the focus in evolutionary biology from selection to fitness, which is to move attention from one strategy to the overarching end served by all strategies. It does this by linking the principle of natural selection with sexual selection, the handicap principle, cooperation, altruism, reputation, and other communication-based modes of analysis into a more comprehensive theoretical approach to evolutionary fitness. This promises to resolve the tension between apparently conflicting evolutionary principles that has persisted in biology since Darwin’s writings. Third, if we allow that a species can become genetically predisposed to certain behaviors within an evolutionary niche, then we also have to allow that those behavioral predispositions may persist in the population even when the niche disappears and the environment changes radically. This can lead to “fish out of water” behaviors that, while expected in the original selection environment, may seem bizarre in a new environment, perhaps because they continue to involve costly signaling when the conditions for overall increase in fitness of a costly signal no longer obtain. This in turn invites explanations of seemingly needlessly costly or otherwise bizarre human behaviors in terms of genetic conditioning.

A CST of Religion (Sosis)

With this quick survey in place, we come to religion. Several chapters in this volume assert that CST can help to make sense of a number of human

behaviors present in what we now call religion. Pinker mentions CST as an explanatory framework that might make sense of costly religious initiations and sacrifices. Emmons and McNamara use CST to interpret the pervasiveness of certain sacred emotions in religion. Koenig and Bouchard mention CST as one possible factor in the emergence of religiousness in the ancestral environment. Bulbulia accepts CST as the framework for understanding how religion facilitates group commitment and uses this to enhance and correct McClenon's ritual healing thesis that religion evolved because it promotes health-increasing placebo benefits. Atran uses CST to explain how religion, though not an adaptation itself, functions adaptively as a solution to ever-present existential problems of death and deception. Sosis devotes his entire chapter to explaining how CST illumines the evolution of religious beliefs and practices.

The general pattern of the reasoning seems to go something like this. As outsiders we can observe religious behaviors that strike us as strange because they seem to reduce fitness (e.g., Bulbulia's cognitive error associated with religious beliefs) or because they cause pain (e.g., Sosis's agonizing and terrifying religious rites)—of course, we also observe that these behaviors make perfect sense to insiders. We reason that the counterintuitive, excessively painful, or fitness-reducing character of these behaviors means that they would not arise spontaneously in a social group unless there were genetic predispositions to perform them. Consequently, we assume the presence of such genetic predispositions—and in some cases there is evidence, as some of the chapters recount, especially Emmons and McNamara, Koenig and Bouchard, and Bering. But we do not assume that there is a specific genetic tendency to penis laceration (as described by Sosis) because this is not widespread enough in the species to be an innate tendency expressing a trait. Rather, we assume that there is a genetic tendency to tolerate and seek such behaviors that expresses itself with wide variations in ways specific to culture and circumstance. Some of these behaviors may align strongly with religious rituals, while others may not. After this, we seek to understand precisely what these deeper genetic predispositions are, why they are religiously linked when they are, and how they were formed in the ancestral environment.

Sosis's chapter marshals an impressive array of evidence both that religion at least sometimes involves costly signaling and that costly signaling can help to explain the origins and persistence of some features of religion. His leading questions are excellent: Given the near ubiquity of costly behaviors, why do we spend so much time and energy on them? What is the evolutionarily point? And why do costly behaviors vary so dramatically in nature and intensity?

Sosis begins with an excruciating description of the torture of boys and young men among the Iahita Arapesh, galvanizing readers' attention by

challenging their moral norms in the way that only anthropologists can—they do this, one suspects, with secret self-congratulatory flourishes of pleasure as they picture their readers' discomfort. But such is life, apparently. Sosis intends his illustration to be a thought-provoking example of the problem he seeks to address. He then frames the problem in religious terms as if he had just been describing instances of religious rituals. But the connection between penis laceration and religion is nowhere established, as it is, for example, in a very different form in circumcision. This would be a minor point except that the fuzzy boundary between religious and nonreligious rituals—evident elsewhere in the chapter, too—endangers the heart of Sosis's argument. If we focus on costly religious rituals, we tend to ask about the evolution of religion. But if the relevant evolved traits underlie costly rituals in general and not specifically costly religious rituals, then we will not succeed in throwing much clear light on the evolutionary origins of religion by studying costly rituals. So when Sosis analyzes the communicative content of religious behaviors, badges, and bans, it is fair to ask what the evolutionary rationale is for limiting the scope of the question to religion and whether this way of framing the issue distorts the resulting accounts both of human nature and of religion.

It is not difficult to see how theoretical distortion might occur. Our theory of the communicative content of religious behaviors, badges, and bans may lead us to propose that religion evolved specifically to promote such signaling. Indeed, Sosis plausibly argues that religion promotes reliable signals better than simply announcing promises, but he merely assumes the superiority of religion to all other social mechanisms for establishing signal reliability without offering good reasons to think it is so. What if promise making was accompanied by some costly, nonreligious ritual, such as offering up one's children as a guarantee of sincerity? Indeed, this has happened, as when a slave makes such a suggestion to reassure a master that he or she will return from a journey. Less potentially deadly forms of collateral are common in financial transactions. The result would be a nonreligious cultural practice highly conducive to truth telling, promise keeping, and reliable signaling. The relevant trait is a cognitive one: we need to be able to count on a promise in spite of our ability to deceive and in spite of our *theory of other minds* that allows us to imagine being deceived. But those cognitive traits could promote many sorts of costly ritual practices, even if they were not religious in any recognizable sense. Therefore, we would err if we saw here a reason for the evolution of religion. We have only a reason for the evolution of behavioral traits supporting costly rituals that support reliable signaling. The question of the role of religion in such rituals—and the reasons for its absence in some—is not directly answered in such arguments.

Sosis addresses this difficulty later in his chapter. He wisely notes that religion is much more than costly rituals supporting reliable signaling that

can solve group-bonding problems. It also includes myths and mystical experiences, beliefs and emotions. He focuses on religious beliefs in supernatural agents, the effects of internalizing such beliefs, and their emotional significance. He argues that internalized beliefs in supernatural agents expose one's private intentions to a supernatural being capable of seeing and punishing deception. Such beliefs thus function as an internal goad to honest signaling. Religious practices, as Sosis points out, cause participants to internalize such beliefs through ritualized repetition and emotional priming. And most religious communities back up these mechanisms for internalizing group norms with an array of punishments, beginning with disapproval and fines and running through public shaming and physical beatings all the way to banishment, excommunication, torture, and execution.

In this way, Sosis argues that religion evolved as a means of maximizing the reliability of signals in socially complex communicative contexts. But he leaves open the question about whether the underlying traits are tightly tied to religion or rather promote quite general features of human behavior that influence the evolution of religion along with other loci of ritualized behavior and belief. He hints at part of the reason for this open-endedness at the end of his chapter. To Sosis—and I think this is commendable—the practical problems associated with religious beliefs and practices are much more important than reconstructing their evolutionary origins. Yet if we are to apply a CST-based theory (or indeed any other evolutionary theory of religion) to contemporary problems, it is best to have our theoretical ducks in a row. Knowing what sort of story our theory implies at the trait level serves as a check on theoretical adventurousness and may even help to avoid the covert operation of bias in our social and political analyses.

The Import of Costly Signaling for Religious Studies and Theology

The significance of CST for religious studies and theology is obvious: if CST is correct, then religious studies and theology have been overlooking something vital.

This hits home in religious studies, particularly within *ritual theory*, a fascinating and complex interdisciplinary area of study involving many lines of investigation. It involves historical investigation about the origins of rituals and their changes over time as well as description of the varied cultural expressions of similar rituals—themes less likely to be impacted by CST. But ritual theorists also try to explain the social and religious functions of rituals. The main resources here come from theoretically oriented sociologists and anthropologists who have proposed wide-ranging frameworks for understanding human behavior. Unfortunately, most of the theoretical frameworks in play within ritual theory do not discuss

evolutionary psychology and certainly not CST. As a result, many interpretations of costly religious rituals are currently leaving out a potentially field-transforming insight.

CST also deeply challenges theological readings of costly rituals. A theologian typically tries to make sense of the particular rituals that predominate in a single religious tradition as expressed in a particular place and time, being careful to take account of historical developments and the deliverances of sacred texts and traditional wisdom. Some theological interpretations of rituals ignore ritual theory altogether and work intensively within the plausibility structures and resources of a local religious tradition. Neither CST nor ritual studies are likely to induce such theologians to raise their eyes and consider “external” theoretical interpretations of ritual. By contrast, other theologians attempt to forge interpretations of the theological significance of ritual while absorbing the best theoretical understandings of ritual in general. Such theologians will be fascinated by CST, regardless of their tradition of focus or their religion of affiliation, if they have one. For them, CST raises the question of whether theological interpretations of ritual nurtured within religious communities are compatible with evolutionary psychology’s insights into the function of rituals in human groups. What happens to the theological interpretation of shamanic self-flagellation and the Hajj’s dangerous crowd-crushing stoning-the-devil ritual or of ancestor reverence and the pouring out of precious milk in Hindu puja when CST is drawn into the interpretation? Theologians inclined to say that Jewish circumcision expresses a covenant between God and God’s chosen people may look at the origins of the rite, which was among grown men, quite differently in the light of CST. CST may also help theologians used to thinking of the Christian Eucharist as a means of participating in the saving benefits of Jesus Christ’s sacrificial death to look on the historical origins and early social significance of the Eucharist in new and potentially revolutionary ways.

Finally, theologians interested in the theological meaning and social significance of religious groups need to scrutinize their working interpretative frameworks in the light of evolutionary psychology and CST in particular. The sorts of social functions that CST speaks of—such as solving the free-loader problem and increasing the reliability of commitment signals—are rarely mentioned in theological interpretations of religious groups, yet these kinds of dynamics may be among the most important factors influencing their origins and function.

THE EVOLUTIONARY STATUS OF RELIGION

A prominent theme in this volume is the evolutionary status of religion. Is religion an evolutionary adaptation, increasing fitness in and of itself and originating because of its adaptive function? Is it a side effect of a collection

of adapted traits, much as language and war and commerce seem to be? Is it a nonadapted by-product of the evolutionary process, like the redness of blood, or perhaps a maladaptive by-product, such as back problems that derive from erect posture? Is it possible that religion has no genetic component at all, either in its unfathomable origins or in its subsequent cultural expressions? These questions lie at the heart of the interpretation of religion within evolutionary psychology, and some of them are quite significant for religionists and theologians, as we shall see.

Religion as Nongenetic

We might be tempted to think there is no genetic component to religion, despite its near universality among human beings, because we can find no way to account for the diversity of religious practices and beliefs in terms of genetic traits. Rather, on this view, we should understand religion as a culture-level response to social needs for bonding and legitimation, to the problems of deception and freeloading, and to primal experiences of transcendence, revelation, love, and death. Religion is diverse because cultural practices are genetically underdetermined, leaving lots of room for chance factors to condition the particular practices of a given group. Religion recurs across cultures and eras for the same reason that fire does: it is an effective way to deal with the common challenges. We need presuppose no genetic tendency to either religion or fire. How credible is this nongenetic interpretation of religion?

The classic modern sources for the scientific study of religion include early philosophical and theological theorists such as Immanuel Kant and Georg Hegel, early sociologists such as Émile Durkheim and Max Weber, early psychologists such as Sigmund Freud and Carl Jung, and early crossover intellectuals such as William James. It is vital to note that these field-defining religionists worked by and large out of the nongenetic framework for understanding religion that I have just sketched. To a very large extent, the nongenetic framework for interpreting religion continues to dominate religious studies today. For example, few religious studies programs offer courses in the evolutionary psychology of religion.

In many ways, this does not matter much. To study the peculiar changes that crept into Buddhism when it migrated eastward from India into China, historians work closely with documentary sources. They can do that without paying any attention to evolutionary psychology if they confine themselves to description of the changes, surely a difficult enough challenge. Yet changes in religious beliefs on such migrations might well be affected by genetically based cognitive structures that constrain the options for how given beliefs are reframed in a new cultural context. If the historian is interested in explaining the changes rather than just describing them—and most historians do have

such interests—then the evolutionary psychology of religion claims a place in the discussion.

Such thought experiments challenge prevailing assumptions in religious studies that religion is a nongenetic, culture-level phenomenon or that its genetic linkages are irrelevant to understanding it. The chapters in this volume (especially Bering and Koenig and Bouchard) recount seemingly robust evidence that some aspects of religiosity have a genetic component. So religionists need to start paying attention to evolutionary theories of religion on pain of irrelevance. But irrelevance cuts both ways. From the point of view of even the most elementary religious studies, the lack of nuance in evolutionary theories of religion is appalling and makes the affected scientific work irrelevant for understanding religion as such, which in turn compromises its usefulness even for understanding a single dissociated feature of religion.

The disconnect between evolutionary theories of religion and mainstream religious studies is quite profound and must be overcome not only for the sake of theoretical adequacy but also to improve the quality of public discourse about religion. A scientist studying a single feature of religion may not have the broad-based knowledge needed to properly appreciate manifold levels of value in religious phenomena. To have such a person speak in public about a religious controversy can be disastrously insensitive and potentially insulting to adherents of a religion. In fact, we saw unsophisticated punditry from scientists repeatedly in the widespread controversy over the September 30, 2005, Danish publication—and subsequent republication in more than fifty other countries—of caricatures of the Prophet Muhammad. It is religious studies specialists who best understand religions and their internal and external battles. Yet the evolutionary study of religion casts many contemporary religious controversies into a fascinating and informative light that may eventually help to explain group identity struggles better than sociology alone. The quality of public discourse about religion demands that if hard scientists are not going to learn religious studies, then some religious studies specialists need to overcome their “genetics does not matter” mentality and seek to learn about the evolutionary interpretation of religion and the brain.

Religion as an Adaptation

On the spectrum of theories about the evolutionary status of religion, the view that religion is an evolutionary adaptation lies at the opposite end from the nongenetic view. The *adaptation explanation* says both that genetic predispositions to specifically religious beliefs and behaviors increased average fitness in the ancestral environment and that the primary adaptive functions of these beliefs and behaviors are precisely what caused the genetic predispositions

originally to become well established—and eventually virtually ubiquitous—in the human population.

This is a bold claim, considering that we cannot inspect the ancestral environment to check its accuracy. But perhaps we are not totally confined to speculative reconstructions of how things went down in the savanna. Adaptationists assume that the beliefs and behaviors associated with religion-inducing traits were expressed in ancestral environments in ways similar to today. This assumption is implausible if we think the challenges that originally provoked religious beliefs and behaviors no longer obtain. But it is plausible if we have reason to believe that those behaviors solved similar evolutionary challenges consistently across evolutionary contexts. In that case, we can indirectly inspect the original selection context by directly examining religious beliefs and behaviors in the contemporary world. Research on the evolutionary origins of religion as an adaptation can then be accomplished by studying how tightly connected religious beliefs and behaviors are to genetic traits in the current context. This involves twin and adoption studies to isolate genetic from environmental contributions to religious belief and behavior. It also increasingly involves neurological and biochemical studies. But it is crucial for the adaptationist's case that the relevant genetic traits induce specifically religious beliefs and underlie specifically religious practices—as against other, nonreligious beliefs and practices that might play a role in solving social problems among savanna hunter-gatherers.

In this way, we might try to construct the evidential foundations for a theory of the evolution of religion as an adaptation: religion rides on the back of specifically religious beliefs and behaviors that are tightly linked to genetic traits, with the traits selected for by virtue of the problem-solving usefulness of the associated beliefs and behaviors. Around this core of belief-inducing and behavior-promoting genetic traits, there may be a complex accretion of side-effect behaviors and cognitive tendencies that are not as tightly linked to genes and therefore can account for the massive variation in religious expression across cultures and eras. The adaptive functions of core religious beliefs and behaviors would produce structural similarities in all religious phenomena, however, and perhaps even specific religious beliefs and behaviors that are universal or nearly universal across the wealth of religious expressions. On this view, we could and should define religion in terms of these core genetically linked behaviors. (Startlingly, we have here the promise of a relatively objective solution to the religionist's unending problem of trying to define religion.)

The adaptation explanation is helpfully vulnerable to correction. Simply look for evidence of structural factors that persist through religious phenomena. Religionists have discovered few such universal factors, and most that have been discovered seem not to be distinctively tied to religion but rather seem to be generic features of human cultural activity. This weighs

against the adaptationist explanation of religion. But perhaps religionists have not been looking in the right places or for the right things. Cooperation between evolutionary theorists and specialists in the study of religion might turn up stronger evidence to support the adaptationist case.

I believe that relatively few theorists explicitly defend in print the idea that religion as a whole or in large part is a genetic adaptation. Yet many evolutionary psychologists attack adaptationism as if this view had a lot of supporters and they were causing a lot of trouble. Perhaps this is a vengeful expression of frustration that the adaptationist line is so easy for the general public to grasp that oversimplified adaptationist views, rather than their more complex competitors, typically make the front pages of newsmagazines and television documentaries. The title of Dean Hamer's (2004) book says everything we need to know about the popular cachet of adaptationist readings of religion: *The God Gene: How Faith Is Hardwired into Our Genes*. Even when books do not argue explicitly for religion as an adaptation, publishers often insist on oversimplified titles that suggest the eminently comprehensible adaptationist position, as in Matthew Alper's (2001) *The "God" Part of the Brain*, which comes complete with the neurological modularist's favorite sort of image on the cover: a brain scan with a small patch lit up (presumably with spiritual illumination). A similar adaptationist oversimplification happened in the press's reception of V. S. Ramachandran's work on a temporal lobe brain area that seems connected to religious experiences, reportedly to Ramachandran's great dismay (see Ramachandran, 2004; Ramachandran & Blakeslee, 1998).

Hamer is more cautious than his many critics often allow, but he does seem to want to argue for religion as an adaptation, so it is worth noting the weakness of his argument (Hamer is aware of the difficulty but risks it for the sake of speculatively articulating a bold hypothesis). He claims to find a correlation between a point mutation on a single gene (VMAT2) and small differences on surveys about self-transcendence experiences (for details, see Hamer, 2004). But this is not the same as providing an argument for religion as an adaptation. Most obviously, the mutated gene may have evolved for reasons having nothing to do with religion, whereafter its religious significance (such as it is) kicks in as a side effect, and nothing is gained for the adaptation case. Unfortunately, Hamer does not investigate this alternative, so his argument for religion as an adaptation is weaker than he would like. Not holding anything back, Carl Zimmer, in his *Scientific American* review of the book, suggests an alternative title for *The God Gene*: "A Gene That Accounts for Less Than One Percent of the Variance Found in Scores on Psychological Questionnaires Designed to Measure a Factor Called Self-Transcendence, Which Can Signify Everything from Belonging to the Green Party to Believing in ESP, According to One Unpublished, Unreplicated Study." Evidently, we need clear criteria for establishing that something is an adaptation, which brings us to Pinker's contribution to this volume.

Criteria for Adaptation (Pinker)

Pinker helpfully lists four adaptationist explanations for the pervasiveness of religious belief: religious beliefs are adaptive because (a) they truly describe the environment of human life, (b) they bring comfort, (c) they forge unified communities, or (d) they answer our need for moral values. His discussion of these four explanations is extremely brief and serves mainly to indicate that he is more interested in explaining religion as a by-product of a host of behaviorally linked genetic traits. I agree with Pinker's preferred approach, so I am ready to appreciate his arguments against these four adaptationist perspectives.

In relation to (a), Pinker rightly treats as an empirically testable hypothesis religion's claim that its beliefs describe reality. But he considers only the theistic type of religion and only one type of theism, the one most vulnerable to falsification because it is strongly oriented to moral confidence and hope for a better world (i.e., a personal, caring, judging God). And then he dismisses all religious beliefs because of the empirical inadequacy of this particular worldview. While I happen to agree with Pinker about the empirical implausibility of "a personal, attentive, invisible, miracle-working, reward-giving, retributive deity," I also think it is tendentious to choose this as the only representative of religious belief worth mentioning in the quest to test the empirical claims of religion. I would be glad to see a patient evaluation of the more theoretically persuasive, if less popular, forms of religious belief, the ones historically adopted by intellectuals because of their empirical adequacy, among other reasons. Some of these are broadly theistic, as in Aristotle's and Plato's worldviews and the philosophical theisms of Neoplatonism and South Asian religion. Others are nontheistic, as in philosophically refined versions of Buddhism, Daoism, and Confucianism. These belief systems are intellectually and existentially profound.

In relation to (b) and (c), Pinker allows that religion may bring comfort to some people and may unite communities but rejects these as adaptationist explanations of religion because they do not establish why the characteristics in question are adaptive or, if they are, why their adaptive functions were the cause for the fixing of genetic predispositions to the associated beliefs and behaviors. In other words, the comforting and bonding elements of religion are available to all approaches to explaining religion, including the nongenetic approaches, and all will make use of them to explain why religion persists, so the adaptationist can make special claim on them only if he or she also shows that these features of religion are adaptive in the original selection context in their specifically religious forms. This involves showing that other, nonreligious ways of getting access to the same comforting and group-bonding benefits are either impossible or less adaptive than the religious ways. Unfortunately, Pinker's criticisms of these two adaptationist

explanations of religion merely ask for more detail and do not acknowledge that a lot more detail already exists in the literature on the subject. For example, Pinker asserts that we have no reason to think that religious beliefs could induce people to cooperate. But he does not say what is wrong with one of the core assertions of the “religion is adaptive because it facilitates cooperation” position, namely, that religion causes people to believe that their private thoughts are transparent to a supernatural power with an interest in preventing deception and promoting group loyalty. In the right social context, a person demonstrating such beliefs will be trusted by potential mates and the wider community alike and thus is more likely to have an opportunity to reproduce, passing along whatever genetic component plays into his or her predisposition to this sort of religious belief. These and related themes recur in the chapters of this volume, and it is unfortunate that Pinker does not address them but merely assumes that they carry no argumentative weight.

In relation to (d), Pinker argues that the idea of a retributive, humanlike deity plays no role in our best explanations of the logic of morality. But this depends on which logic of morality we accept. I think the sociology of knowledge’s interpretation of the role of morality in the social construction of reality is highly persuasive, particularly as elaborated in Peter Berger’s interpretation of religion as in part a means of legitimation and social control (see Berger, 1967). Sociologist Émile Durkheim anticipates and inspires many of the insights of the sociology of knowledge (see Durkheim, 1915), including its recognition of religion as the means by which groups codify their core moral commitments. Similarly, Immanuel Kant’s accounting of the natural logic of human moral reasoning demands a religious framework for moral reasoning to be rational and practical: our moral reasoning presumes (but cannot prove) standards of right and wrong vested in an ultimate moral judge who has the power to reward and punish. Kant and Durkheim and Berger cannot easily be swept aside. I consider religion’s role in moral reasoning and practical moral activity to be one of the strongest arguments for religion as an adaptation, but its strength derives essentially from group-bonding and cooperation considerations and from comfort considerations having to do with moral orientation and the management of cognitive dissonance—the second and third points on Pinker’s list.

Despite these difficulties, the main point of Pinker’s argument is well taken. The fact that claims of adaptiveness are challenging to support in any domain makes the idea of religion as an adaptation difficult to establish. He mentions three criteria for a trait to be an adaptation. The first two are more or less obvious: the trait has to be innate, and it must increase a population’s average fitness in the ancestral environment. Pinker’s third criterion is more complex because it concerns the epistemology of evidence as much as biology: arguments for the supposed increase in average fitness due to the putatively adaptive trait do not count if they take the form of

suspiciously convenient explanations (“just-so” stories). Rather, the arguments must justify the usefulness of the trait with independently convergent evidence from several perspectives. That is, arguments that some aspect of religion increases average fitness in a population have to be based not only on our ability to imagine their practical usefulness in an ancestral environment but also on evidence from some independent field, such as cognitive science or biomechanical engineering. The criterion functions as a burden-shifting principle, defining what counts as a satisfactory argument for average fitness increase due to a trait and therefore setting the bar high for claims that religion is an adaptation.

Evolutionary Side Effects

There are many examples of side effects of adaptive traits that solve problems in ancestral environments (and perhaps also in contemporary cultural settings) and thus turn out to have a secondary adaptive function even though this is not the reason that the underlying traits were originally selected. Language and commerce are standard examples in the literature. In fact, even if side effects have no subsequent adaptive function or prove to be maladaptive, they may still be culturally important. For example, war is probably a side effect of genetic predispositions to violence, combined with the challenges of resource scarcity and possibly our inability to control powerful emotions, and it seems mostly maladaptive as a form of behavior, being extremely costly with questionable benefits at the best of times.

Such side effects are very common in evolution, indeed far more numerous than direct adaptations. This only makes sense: as biological systems get more complex and carry more information, the number of potential trait interactions increases exponentially, well beyond the prodigiously high information limits of DNA. It is in this fuzzy world of trait interactions that most of culture comes to life. Cultures are diverse because they explore the vast space of human behavioral tendencies made possible by trait interactions in different ways. They take advantage of the opportunities presented by random events and the human learning capacity to determine quite different beliefs and behaviors, moral norms and social conventions, languages, and life patterns. Most evolutionary psychologists seem to believe that it is in this space of possibilities that religion finds its origins. There are many theoretical frameworks for articulating precisely how this occurs, however, and there is considerable controversy within evolutionary psychology over which theoretical framework is correct.

Some of the questions that recur in disputes over the evolutionary origins of religion as a side effect are as follows. (1) Given the complexity of religion, which features of religion are we all talking about in any given claim about its evolutionary origins? (2) How can we design experiments to

yield unambiguous determination of genetic traits having religious beliefs and behaviors as their side effects? (3) Given that the ancestral environment is no longer with us, how can we discern adaptive function in the original selection context of traits having religious beliefs and behaviors as their side effects in the contemporary world? (4) Were secondary adaptive functions of traits having religious beliefs and behaviors as their side effects evident from the beginning, even in the original selection context, or did those secondary adaptive functions only appear later, in changed environments? (5) Did religious beliefs and behaviors ever have a secondary adaptive function or have they always been nonadapted or maladaptive? (6) Is it possible that some features of religion directly increased fitness in the original selection context and thus were adaptive, while other features were side effects with secondary adaptive functions? (7) Can we place the entire research enterprise of the evolutionary origins of religion on firmer evidential foundations?

These are enormously complicated questions, and evolutionary psychology is in some disarray partly because of their complexity. Terminological inconsistency plagues the literature, sometimes reflecting unclear concepts. A number of theorists have attempted to come to the rescue, offering key definitions in an attempt to furnish a solid foundation for evolutionary psychology and to tame the zoo of crazy concepts and tangled terms. Stephen Jay Gould has been a particularly important figure because of his coining of the two terms “spandrel” (Gould & Lewontin, 1979) and “exaptation” (Gould & Vrba, 1982). His pluralistic approach to evolution was aimed at overthrowing what he saw as a selection-and-adaptationist-oriented orthodoxy and instilling an awareness of the prodigiously complex space of possibilities opened up by emergent complexity in the evolutionary process. Thus, Gould championed the idea of evolutionary side effects and pluralism of evolutionary mechanisms, along with evolutionary theorists such as Richard Lewontin, as far back as the 1970s. Since then, tidying-up efforts have improved the conceptual clarity of key terms, but some terminological confusion persists.

Buss, Haselton, Shackelford, Bleske, and Wakefield (1998) explain this persistence by pointing out that sociologists, psychologists, anthropologists, and biologists working in evolutionary psychology—and I add religionists—with little or no training in evolutionary biology can get caught in the terminological difficulties because it is virtually impossible for an outsider to penetrate very far into the extremely technical literature on the subject, with its vast array of evidence and intricate argumentation. As Kirkpatrick points out in his chapter for this volume, it is nowhere truer than in evolutionary theory that a little knowledge can be a dangerous thing. But terminological differences having potentially serious conceptual implications are common even among specialists. Indeed, authors in this volume use terminology about the evolutionary status of religious beliefs and behaviors differently. I pointed this out earlier in relation to signaling, and I note now that it is the case also with

terms such as “exaptation,” “spandrel,” and “functionless by-product.” I am sure there are good reasons for any lexicon of terms. For the sake of consistency and to honor the one who coined key terms, here I follow Gould (1991), as enhanced and corrected by Buss et al. (1998)—though I note the objections to Buss et al. (1998) advanced by Kennair (2002) and others.

The key terms for describing evolutionary side effects are “exaptation,” “spandrel,” and “functionless by-product.” Table 11.1 distinguishes these three concepts from one other and from adaptation and indicates how common each is in the real world, reflecting the previous argument that complexity exponentially increases in the space of possibilities for trait interaction.

Brief discussions of exaptation, spandrel, and functionless by-product will illumine these distinctions. Gould’s definition of exaptation has become the standard for both use and abuse, and I present it here using terms already discussed. An *exaptation* is a feature of an organism that originated not as an adaptation but as a side effect of an adaptation that proved (often much later)

Table 11.1 Definitions of Evolutionary Adaptions Versus Evolutionary By-Products

	Adaptation	Exaptation	Spandrel	Functionless By-Product
Corresponds to a trait with an adaptive function that caused the trait to become fixed in the original selection context	Yes	No	No	No
Corresponds to a trait with a secondary adaptive function in the original selection context or in some subsequent evolutionary context	Possibly	Yes	No	No
Does not correspond to a trait but has a secondary adaptive function in the current context of study	Possibly	Possibly	Yes	No
Relative frequency in human life within the current context of study as postulated by theorists	Rare	Common	Very common	Virtually ubiquitous

to have a secondary adaptive function (see Gould, 1991; Gould & Vrba, 1982). Gould spoke of *cooption* to describe the way evolution makes use of a secondary adaptive function.

Named for the more or less unprogrammed parts of an architectural design, Gould defined a *spandrel* as a side effect of biological features that were never selected for their usefulness even in the original selection context and yet subsequently prove to possess an adaptive function in a new evolutionary context (see Gould & Lewontin, 1979). One of his examples is a bridge that was not designed with shelter in mind but subsequently provides shelter to homeless people.

Spandrels and exaptations collectively do not account for side effects with no adaptive functions in any later environment. Buss et al. (1998), in refining Gould's distinctions, call these *functionless by-products*. Of course, there are also a host of *random effects* in evolutionary biology, and these play a role in all these concepts, including functionless by-products. Similarly, biology and context jointly present *constraints* that profoundly affect evolutionary design (there seem to be only two basic ways of connecting optic nerves to eyes, for example), and constraints figure in all of these concepts too.

This lexicon of terms and associated concepts situates spandrels in a middle space between exaptations and functionless by-products. On the one side, spandrels share with exaptations the functional characteristic of increasing fitness in some evolutionary environment, but spandrels differ from exaptations in being side effects of nonadapted characteristics, whereas exaptations are side effects of adapted traits. On the other side, spandrels share with functionless by-products the same evolutionary origins as side effects of nonadapted traits, but spandrels proved to be useful in the sense of increasing fitness in some evolutionary context, whereas functionless by-products never did or at least do not in the context assumed in a given study.

Religion: Exaptation, Spandrel, or Functionless By-Product?

The *by-product explanation* for religious beliefs and behaviors has proved important because it is so difficult to show that religion is an adaptation. Adaptation arguments fail typically because genetic predispositions to religious beliefs and behaviors are not uniquely tied to those beliefs and behaviors. Genetic predispositions to violence are not uniquely connected with war, genetic predispositions to appreciate beauty are not uniquely connected with art, and genetic predispositions to inquire are not uniquely connected with science. Yet war, art, and science can affect and obviously have affected fitness in a variety ways.

The same applies to religion. One much-talked-about feature of some religious beliefs concerns supernatural agents. It is extremely difficult to show that the cognitive predisposition to believe in supernatural causes is an

adaptation. Rather, this tendency probably derives from more basic cognitive strategies that are demonstrably adaptive but not uniquely tied to religious beliefs, such as overactive pattern recognition skills and the readiness to impute intentionality to hard-to-interpret natural events. These abilities had an adaptive function in the ancestral environment because they enabled us to interpret movements in bushes as potentially dangerous and thereby helped us to escape predators. Overactive pattern recognition skills routinely led and still lead to cognitive error, to be sure, including running away from bushes when the wind rather than a tiger caused the rustling, but they can still be adaptive. In his chapter for this volume, Bulbulia illustrates another way that religious-cognitive error can sometimes increase fitness, namely, by gaining access to health-promoting placebo benefits. It follows that religious beliefs and behaviors grounded in these cognitive capacities can be understood as sometimes adaptive side effects of traits originally adapted for nonreligious functions—that is, as exaptations.

An evolutionary psychologist might conclude that religion is a spandrel rather than an exaptation. In that case, the argument concerns the original selection context for the features whose side effects underlie the religious behavior in question. If those features were based in traits that were originally selected for some other adaptive function and now have a secondary adaptive function in religion, then we have an exaptation. If those features were not based in traits that were selected for some other adaptive function but rather were combinations of side effects of evolutionary design, springing from chance events and merely expressing certain design constraints, then we have a spandrel. Of course, if you trace a spandrel back through its chain of dependencies far enough, you do find traits adapted for something somewhere, just as most family trees contain an aristocrat and a criminal. In this sense, the line between spandrels and exaptations is unclear. In his chapter for this volume, Pyysiäinen illustrates this difficulty by describing the possibility of gene–culture evolution in relation to religion. This further obscures the conceptual boundary between spandrels and exaptations. But it is still important to recognize that features of religion can be more and less remote from adapted traits. Adaptations just are adapted traits. Exaptations are side effects tightly linked to genes, with the side effect possibly co-occurring in the original selection context though never the cause of the fixing of the trait. Spandrels are more remote side effects with secondary adaptive functions.

The distinction between exaptations and spandrels seems to have little bearing on the way religionists understand of religion, as fascinating and important as this distinction may be in evolutionary biology generally. Much more important for religious studies is the distinction between both of these ideas and functionless by-products. The functionless by-product explanation of religion is a relatively rare viewpoint because most theorists

readily grant that religion helps to catalyze group cohesion and to solve social problems ranging from deception to freeloading. The eventual adaptiveness of religion seems obvious at the social level, therefore, even when we cannot agree on whether religion is an adaptation or an exaptation or a spandrel and even when we can't generate consensus around what are the relevant genetic traits and how closely they are tied to religious beliefs and behaviors. The functionless by-product viewpoint is most common among those who believe the moral downside of religious beliefs and behaviors outweighs its strategic social benefits. This passionate antireligious position has an opposing twin in the equally passionate proreligious view that denies any genetic component in religion at all on the grounds (quite mistaken, I think) that a genetic link would evacuate religion of its spiritual value and sacred character.

The contemporary value of religious beliefs and behaviors is a point of great moment for religionists and theologians alike, and it has enormous political and social significance. Detractors of religion have argued for centuries that we should eliminate religion (or many parts of religion) because it is bad for people. One way this is done these days is to argue that the badness of religion is due to its being maladaptive or a functionless by-product of the evolutionary process. In such cases, the assumption is that adaptive function is valuable and good, whereas we can dispose of evolutionary by-products with no adaptive function without any loss of value. None of the contributors to this volume explicitly makes this case, but a number of chapters certainly lean in that direction. For example, Pinker asks how a powerful taste for apparently irrational beliefs could evolve, and Bulbulia's argument depends on understanding religious beliefs in the framework of cognitive error.

Religionists and theologians—including scholars with no religious affiliation—tend to find these sorts of characterizations of religious belief outrageous and inexcusable. I have heard terrible things said about such characterizations—shoddy scholarship! lazy interpretation! ideological naïveté! To be completely direct about this, I think these criticisms are well earned in a few cases. Certainly the logical problems with such patterns of valuation are obvious. If adapted function really is good and maladaptation or no adaptation really is bad, then moral consistency demands a eugenics program to optimize adapted function, understood in some (no doubt ridiculous) way. If value accrues through adaptive function but not through functionless by-products, then most cultural artifacts are relegated to the low-value bargain-basement bin because they have not been around long enough to have much effect on human genes. So much for glorious cooking, fabulous new-year fireworks, and awe-inspiring architecture!

I think religionists and theologians should go to war over these issues with the few ideologically extreme scientists guilty of such sins. That is certainly preferable to bending over backward trying to be tolerant, perhaps

because religionists condescendingly think that scientists can't be expected to understand the multidimensionality of value or because religionists are cowed by science's current cultural prestige—which, I note with concern, is capable of being squandered if a few shrill scientists do not learn to speak in public with greater depth of awareness. It is important to remember at this point that this sharp criticism is being leveled by a religionist and theologian already inclined to see human religion in many respects as a kind of agonized striving against the difficulties and uncertainties of life, full of cognitive self-deception, and unaware of the social forces that drive it. Despite this religious and moral critique of religious beliefs and behavior, I am deeply moved by the empirical fact that religion has enormous and genuine value for vast numbers of people. Moreover, this value is assessable independently of any considerations of evolutionary fitness. In other words, my criticism is not religious special pleading but a demand for more intellectual sophistication across the board.

Spleen vented, I note that religionists and theologians still stand to learn a great deal from scientists about the origins of religion by studying its adaptive functions, both in the original selection context and in subsequent evolutionary environments. But little is gained for the religionist or the theologian by mastering the intricate debates over adaptations versus exaptations versus spandrels since little depends on the details of how religion evolved once it is granted that religion is in fact partly the product of evolutionary processes.

No contributor to this volume argues either that religion is a functionless by-product or that religious beliefs and behaviors have no genetic component at all. The strongest argument for religion as an adaptation is probably that of Bulbulia, whose chapter's subtitle describes religiosity as "an adaptation for health and cooperation." There is no representative of any of the supposedly classic views of religion as an adaptation, either based on specific genes or based on specific brain modules that increase reproductive fitness. The most explicit argument against religion as an adaptation is that of Kirkpatrick, who titles his chapter simply "Religion Is Not an Adaptation." The other contributors, while possibly allowing that some features of religion may be adaptations or functionless by-products, stand firmly in the exaptation–spandrel region of the explanatory spectrum with regard to most features of religion. Here I focus on Kirkpatrick's argument that religion is a complex combination of side effects that have a variety of adaptive functions.

Religion as a Collection of Multiple By-Products (Kirkpatrick)

In his chapter, Kirkpatrick articulates a multiple-side-effects hypothesis about the origins of religion. He does this in lovely prose, clearly, and with a focus on saying why adaptationist explanations of religion fail. This should

be particularly helpful for readers of this volume. If they want a detailed explanation of attachment theory, which is the heart of Kirkpatrick's positive viewpoint, they can consult his 2004 book on the evolutionary psychology of religion.

Kirkpatrick's attack on adaptationist explanations of religion is entertaining and insightful. He begins by showing how slender the evidence is for the adaptationist view, especially God modules and God genes. He then points out that the adaptationist view faces serious theoretical problems. For instance, he shows that adaptationists by the nature of the case have to explain religion through one or maybe two adaptive traits so that they inevitably end up focusing on certain bits of religion and leaving other pieces out. They might focus on religious experience but leave out group bonding and morality, or else they emphasize cognitive susceptibility to supernatural beliefs but neglect ritual. Kirkpatrick further argues that adaptationists tend to conflate the psychological benefits of religion with reproductive fitness, they often underestimate the fitness costs of alleged religious adaptations, and they remain tantalizingly vague on the key question of the mechanisms by which religious traits get selected for their specifically religious adaptive function—all big no-nos in evolutionary theory. He concludes by stating his own view, that “religion represents a collection of byproducts of a variety of mechanisms that evolved for other (nonreligious) purposes” (Kirkpatrick, pp. 272–273).

As I noted earlier, it is more difficult to locate bona fide defenders of the religion-as-adaptation view than one might suspect, given the frequency with which they are attacked. Unfortunately, Kirkpatrick does not cite many—or any—bona fide defenders of the religion-as-adaptation view, despite saying often enough that God modules and God genes are “commonly cited” as reasons to think that religion is an adaptation. He mentions Hamer (2004), but even Hamer acknowledges that the case for religion as adaptation is difficult to make out, and Kirkpatrick himself notes this. I suspect that this lack of cited opponents is evidence of a difference between what gets published in evolutionary psychology and the way evolutionary psychologists talk—a distinction needed to make sense of many disciplines. Or perhaps Kirkpatrick is indirectly attacking the media frenzy around the religion-as-adaptation view, which reflects the public's fondness for oversimplified pictures of complex phenomena.

Be that as it may, the case against adaptation is well made here. Kirkpatrick's argument definitely shifts the burden of proof to his opponents, showering them with challenges to meet in order to justify any claim that religion is an adaptation.

Religion as a Baldwin Phenomenon (Pyysiäinen)

Pyysiäinen's chapter for this volume might well be treated in the next section, on the cognitive dimensions of religion. I mention it here because he

argues that religion has an evolutionary history similar to that of language; both are products of gene–culture coevolution. Like Kirkpatrick, Pyysiäinen thinks that religion is not an adaptation or a collection of adaptations in itself, but he emphasizes more strongly than Kirkpatrick does the role of gene–culture coevolution in the origins of religion.

To make this point, Pyysiäinen refers to the late nineteenth-century writings of James Baldwin, after whom the Baldwin effect is named. The Baldwin effect as it is used today (Pyysiäinen cites Deacon, 1997; Dennett, 1991) is actually a variety of mechanisms whereby learned behavior leads to genetic changes. The most obvious examples, which Pyysiäinen does not mention, are learned social stigmas against people with genetic disorders, which limit the spread of the genes in question. A more interesting example is language, which Pyysiäinen does discuss. According to Terrence Deacon (1997), human language is an instance of the Baldwin effect: it is a three-way coevolution of vocal-tract physiology, the cognitive capacity for symbolic reference, and communicative social environments. Language was not directly selected for in the evolutionary process, but it comes to have an adaptive function anyway once it arrives on the scene. Pyysiäinen thinks that much the same is true of religion. If that is the case, he argues, then religion derives neither from cognitive adaptations specific to religious beliefs nor from simple side effects of traits that were selected for their nonreligious adaptive functions. Rather, religion is a collection of side effects that changes culture and thereby alters what gets selected in the evolutionary process. I would have appreciated more detail at this point so as to grasp more clearly how Pyysiäinen believes religion changes the terms of natural selection. I presume he has in mind sexual selection effects, as when mate selection is guided in part by a preference for partners who use religious beliefs and practices to signal their reliability.

The consequences for religion of this gene–culture resonance are interesting, too, and again akin to the evolution of language. Brains evolve much more slowly than both languages and religions. Just as languages that children cannot learn do not become important, so religions that fail to make cognitive sense to children do not get much play. To apply Pyysiäinen's framework to a religious example that is important to me, I suspect his analogy with language leads to the correct analysis of liberal religion: if a great deal of education is required to make sense of a religious outlook, which is the case for liberal and naturalist forms of religion, then its influence is likely to be confined to an intellectual elite and its numbers small.

COGNITIVE DIMENSIONS OF RELIGION

Religion is not only about beliefs. But there is no question that beliefs are a big part of religion. And there is also no question that beliefs in supernatural agents are quite common in religion. The prevalence of supernatural beliefs

inspires us to ask what it is about human evolution that leaves us, as a rule, so willing to entertain supernatural causes and agents. This has been the focus of intense research in recent decades, and a number of the authors in this volume present their perspectives on what has been discovered.

Before setting out in this new direction, however, I wish to point out that there have always been religious people who reject supernatural beliefs as superstitious and will have nothing to do with them. They are common in our time, too. Judging from this volume, which in this respect faithfully reflects the wider literature in cognitive psychology of religion, these nonsupernaturalist, antisuperstitious religious folk are not taken seriously or treated with respect. They are not even mentioned as exceptions to a rule, and the resulting cognitive theories of religion strike religionists and theologians as exceedingly fragile. This is an obvious instance where deeper knowledge of religion might help scientists studying religion to deal with powerful contraindicating evidence.

Religion and Supernatural Beliefs (Bering)

Bering's chapter is a well-written survey of research on the cognitive psychology of belief in the supernatural. The awareness of the complexity of religion that he demonstrates at the end of his chapter is particularly commendable. His research focuses on children, on the grounds that we can use their rapid cognitive development to assess what level of cognitive complexity would have been needed to entertain the idea of supernatural agents in the evolutionary process. This makes sense as a research strategy because there are so few avenues of approach to questions about levels of cognitive development in evolution, but it is a dubious assumption just the same.

Bering reports on experiments designed to test whether the human tendency to believe in supernatural agents and states is innate or acquired through cultural exposure. His results suggest that even the youngest children are inclined to impute mental states to a dead mouse eaten by an alligator in a puppet play. Yet these youngest of children rarely mentioned beliefs about afterlife prevalent in their culture, which older children tended to do. Bering concludes that belief in an afterlife cannot be entirely a matter of cultural conditioning and that we have here evidence for an innate tendency to treat mental states as fundamental and persistent regardless of bodily state.

There are several problems here. First, Bering's research question about innateness versus social acquisition presumes that the two options jointly exhaust the possibilities. But this omits the possibility that children are born with another innate tendency, namely, to develop a theory of other minds, which initially applies to everything and so often misfires. With the greater cognitive sophistication of later childhood, however, children can detect

inferential mistakes and thus implicitly feel their need for a more plausible intellectual framework for mental states beyond death, whereon they adopt whatever sophisticated framework their environment offers. This interpretation is quite opposed to Bering's yet consistent with the data he presents. Second, Bering's method of approach is flawed in that, as least as he describes the experiment, he does not conduct the experiment on a broadly cross-cultural basis so as to control for the effect of cultural exposure. This ought to be an important check on his interpretation of these preliminary results. Third, a subtler methodological difficulty is that such experiments are notorious for not successfully controlling for extraneous factors, such as the experimenter's interview technique (tone of voice, facial expressions) and contextual factors (subjects may enter an "as if" mode of explanation as dictated by the experimental context). This can result in answers that do not reflect authentic metaphysical opinions but rather merely the sorts of answers that ought to be given in the context of such a language game. Despite these difficulties, this sort of research is just getting started, and Bering's results are fascinating and useful within limits.

Bering acknowledges that belief in supernatural entities depends on more fundamental cognitive traits and so rejects the idea that it is an adaptation. He presents experimental evidence to support his claim that such beliefs cause a *Santa Claus effect* wherein human beings believe they are being watched, with attendant improvements in behavior and conceivably an increase in average fitness. It follows that the cognitive traits underlying the tendency to believe in the supernatural have a secondary adaptive function even though they were probably selected originally for a more cognitively basic adaptive function. That makes them exaptations rather than spandrels, in Bering's terminology, but in the lexicon introduced here, this shows only that they are exaptations or spandrels but not functionless by-products. The question of whether belief in the supernatural is an exaptation or a spandrel has to be settled by analyzing whether it is a side effect of a trait. Bering argues for the former, so belief in the supernatural is an exaptation rather than a spandrel, but for different reasons than he gives.

Religion, Cognition, and Emotion (Atran)

Atran perceives the importance and value of religion in a multileveled way. This is enormously helpful when communicating with religionists and theologians and also a prerequisite for responsibly carrying out public commentary duties. I note, moreover, that this does not interfere even a tiny bit with a fair-minded and rational scientific approach to analyzing the cognitive and evolutionary roots of religion, which is Atran's goal in his chapter for this volume. He does oversimplify religion, unfortunately, but not as egregiously as some others.

As the subtitle of his 2001 book *In Gods We Trust: The Evolutionary Landscape of Religion* suggests, Atran sees the human evolutionary heritage as a landscape that constrains, without determining, the development and function of individuals, cultures, and religions. This leads to an interpretation of religion as a recurring by-product of more basic evolutionary traits, of course, but the interesting point in Atran's theory is that he claims to account for variations in religious beliefs and behavior as different journeys within the constraining landscape. Is there really this much freedom to structure religion differently in different cultural settings? Atran gives the impression that the freedom is rather limited when he claims that many fundamental structures recur in all religions, such as supernatural agents, rhythmic coordination of affective bodily states, and social devices to promote cooperation and deal with deception. Empirically, he is mistaken on this point in the sense that there are numerous unexplained exceptions of which religionists are sharply aware, and his argument would be much stronger if he acknowledged the exceptions and explained them instead of speaking of religion as if these exceptions did not exist. But the nonsupernaturalist subtraditions within the world's religions are in the minority, as are those that shun rhythmic coordination of affective bodily states and those that have no important social component, so his general point about landscape-based constraints on religious beliefs and behaviors probably survives.

Atran stresses that the cognitive functions associated with supernatural beliefs are present in many domains of human life, including our appreciation for fictional cartoon characters. It is the emotional freight associated with religion that makes all the difference in bonding communities together, solving social challenges of cooperation and deception, and inspiring the willingness to sacrifice that he sees in the Islamic jihadists he studies. His question, therefore, is how the conceptual foundations of religion manage to work in such a way that they ramify religious beliefs so powerfully that people are willing to die for them. His answer is similar to that of Pascal Boyer (2001), and I quote a key passage from Atran's chapter that compactly express it: "The conceptual foundations of religion are intuitively given by task-specific panhuman cognitive domains, including folk mechanics, folk biology, and folk psychology. Core religious beliefs minimally violate ordinary intuitions about how the world is, with all its inescapable problems, thus enabling people to imagine minimally impossible supernatural worlds that solve existential problems, including death and deception."

A useful feature of Atran's chapter is the experimental evidence he presents in support of the memorable quality of minimally counterintuitive beliefs. This helps to explain why supernatural religious beliefs persist and thus fits the theory of religion as a cultural product passed from generation to generation because it makes sense to children and solves social and existential problems. What is less clear, here as well as in Boyer (2001), is precisely how minimal

counterintuitiveness is adaptive, which is crucial to understanding the evolutionary origins of religion, as against its persistence. In any event, perhaps the most impressive aspects of Atran's contribution are his appreciation for the passionate intensity of much religion, which helps him stay empirically true to some of its complexity, and his ability to harmonize the cognitive elements of religion with the emotional, ritual, social, and moral dimensions.

Consequences for Religious Studies and Theology

Just as CST has the potential to transform the branches of religious studies that focus on ritual, so cognitive science of the sort that Bering and Atran present has the potential to transform the way religious studies approaches phenomena related to religious belief. The field of comparative religious ideas within religious studies and theology is quite young, but already it has become dominated by the view that religious ideas are usually too full of richly layered existential and contextual meanings to be significantly compared to one another. While anyone who knows anything about religion finds it easy to appreciate this view, it also seems somewhat defeatist, cutting off a valid line of inquiry before it gets started. I suspect that the landscape constraints that Atran describes, backed by the sorts of experiments that both he and Bering summarize, could provoke a more balanced approach in comparative religious ideas, opening religionists and theologians to the possibility that religious beliefs might be a mix of constraints that produce recurring similarities and cultural or chance determinations that produce differences. By the same token, the cognitive science of religion would do well to notice the staggering wealth of detailed information that religious studies specialists have collected about the world's religious beliefs and practices. Unfortunately, cognitive scientists sometimes speak as if their wisdom on similarities and differences in world religious beliefs should be taken seriously even though they know less than a rank novice in religious studies about the vast associated literatures.

The cognitive science of religion has particularly challenging implications for some forms of theology. Theology rarely investigates the truth claims of religion in respect of the evolutionary function of the corresponding beliefs or the cognitive appeal of minimal counterintuitiveness. Were theologians to address such issues frankly, they would necessarily make manifest the social and psychological dynamics of religion, which seem to work more smoothly when religious people remain unaware of them. The theologian is not alone in this. The social scientist who is also a member of a religious community likewise knows firsthand the stressful experience of being a participant-observer. But the first-order intellectual tasks of psychologists and sociologists of religion do not involve nurturing the religious faith of believers, so their role is more easily accepted and understood in religious communities.

Theologians who take it as part of their moral obligation to support the spiritual well-being of religious believers and who begin publicly discussing the cognitive science of religion may find themselves in an especially difficult situation. They can be understood as betraying their calling, and they may be—indeed, they often have been—resisted both by other theologians and by the very religious groups they seek to serve. This led Van Harvey to describe such an impossibly doubly committed intellectual as an “alienated theologian.” It follows that there are powerful incentives for such theologians not to take up the social sciences, evolutionary psychology, or the cognitive psychology of religion with the seriousness these lines of research deserve. Of course, at this point it is important to recall that there are many kinds of theologians, some of whom have secular and nonreligiously affiliated intellectual projects, and they are not so constrained.

RELIGION AND ADAPTIVE FUNCTION

We first considered the costly signaling argument that bizarre religious behaviors can have adaptive functions in communicative environments, removing an objection to the thesis that religion is in part a product of the evolutionary process. Then we saw that, while religious studies and theology may have little at stake in the technical debates over the evolutionary status of religious beliefs and behaviors, they have a great deal to learn from the fact that religion becomes intelligible when understood at least in part as a product of evolutionary processes. Subsequently, we noticed how religion makes still more evolutionary sense when its entanglements with human cognitive evolution are taken into account. These three themes arc through the chapters of this volume—most authors mention all of them, at least in passing—and jointly they constitute an extremely persuasive case that religion is best understood in close connection with evolutionary biology and evolutionary psychology. This volume also contains other arguments about the adaptive functions of religion, all of which contribute to strengthening the case for religion as at least in part a product of the evolutionary process. I take those up briefly in the following section.

Religion and Sacred Emotions (Emmons and McNamara)

Emmons and McNamara use a costly signaling framework to explain how character strengths can increase cooperation and thereby average fitness. Strengths of character include honesty, trustworthiness, integrity, and emotions such as gratitude. They contend that religion is a universal feature of human life and a crucial promoter of such emotions, behaviors, and character strengths. It follows that scientists studying the evolution of emotion and the neuropsychology of character should take into account the role of

religion. The authors kindly provide a usefully compact survey of the scientific study of religion and emotion that points interested readers more deeply into the relevant literatures. They then launch into their case, showing that CST helps to make evolutionary sense of sacred emotions such as gratitude. In particular—and this takes us a step beyond Sosis—they argue that religion inculcates in people genuine virtues to the degree that their consistent integrity and generosity are virtually impossible to fake. In this light, religion appears to be an indispensable component in the “gene–culture arms race” to solve social cooperation problems through unfakable signals of reliability. The unfakable signals in this case are actually genuine virtues.

It is a pleasing change of pace to read a chapter that takes ordinary virtues seriously and does not allow their evolutionary role to leave them somehow questionable. In fact, it is quite unusual to find scientists who take value seriously at a number of levels at once rather than just at the level that science can most easily handle through quantification. This kind of humane and humanistic perspective does not interfere with the precision of the argument from a scientific perspective. And from a religionist’s perspective, the argument is more compelling and realistic because it resists the sorts of “nothing-but” reductionism that indirectly suggests (while rarely directly claiming) that the things reduced have only the value of that to which they are reduced. This kind of sensitivity will increase the influence of the scientific study of religion as well as its intellectual quality, and I think more authors should follow Emmons and McNamara’s example.

Religion and Traditional Moral Values (Koenig and Bouchard)

Koenig and Bouchard are concerned with the sorts of evidence that scientists must seek in order to establish heritability of characteristics (for the sake of clarity, note that they use “trait” both in the generic sense, here translated to “characteristics,” and in the specific sense of “genetic trait”). Their chapter is important in this volume because it illustrates how complicated arguments about genetic linkage typically are and also because it indirectly highlights the lack of sophistication in some science writing about genetic linkage. It is a lot easier to claim that a religious belief or a behavior is genetically linked than it is actually to demonstrate this. Unfortunately, the shortcut to genetic linkage—that is, just stating it rather than showing it—is taken rather often in evolutionary psychology literature, without due notice. Yet Koenig and Bouchard are motivated to do this for another reason entirely, namely, to refute what they say is a common claim, namely, that moral values and religiousness are formed by family socialization independently of any genetic component. Koenig and Bouchard’s specific interest is in the heritability of certain moral values that correlate significantly with one another on standard measures. They call the

moral values authoritarianism, conservatism, and religiousness—jointly, the *traditional moral values triad* (TMVT).

The authors do not immediately reject the idea that religiousness is a biological adaptation, acknowledging that the universality of the religious tendency and the structural similarities of its various manifestations do indeed suggest that it may be an adaptation. They even go so far as to mention the counterargument that religion often involves avoidable suicide and martyrdom, answering it with the standard CST reply that highly demanding groups produce highly committed members, citing military basic training and hazing as illustrations. With admirable caution, however, Koenig and Bouchard do not buy in to the adaptationist line. In fact, they rightly insist that heritability does not imply adaptation, a point we have seen many times in this volume in the form of “religion is a by-product not an adaptation” theses. This sort of balanced caution and precision is characteristic of the entire chapter and a most welcome virtue.

The bulk of the chapter concerns evidence for the heritability of the TMVT from twin and adoption studies, and what a fabulous array of evidence it is. I would have to check my amateur impression with experts, but the data appear to support their conclusion that the three components of the TMVT are significantly heritable. I assume that this is equivalent to tossing a cat into the pigeon cage of researchers studying socialization and that this is precisely the effect that Koenig and Bouchard intend. Among religious studies specialists, researchers routinely proceed as if socialization were the only significant factor in interpreting decisions to stay affiliated with religious groups. Religious educators rarely entertain the idea of a genetic component to religiousness, let alone address the significance of this for their strategic proposals. Anyone involved in socialization research needs to keep an eye on this research.

Likewise, theologians speculating about universal religious instincts, universal quests for salvation or liberation, and universal longings for ultimate meaning may need to pause and consider how the heritability of authoritarianism, conservatism, and religiousness fit into their speculations. Religious doctrines that propose a universal religious state of humanity may have been formed by people inclined to believe and seek such theories and reinforced by others with the same inclinations. This selection bias may not mean that the beliefs are false, but it does suggest that serious challenges to them are probably going to be encountered far less often than would seem appropriate if empirical adequacy is part of the goal.

Religion and Ritual Healing (McClenon)

McClenon’s chapter for this volume recapitulates part of the argument from his 2001 book on shamanic healing practices. His strategy is sensible: if

current-day shamanism gives us the best insight into early hominid life, then we should study shamanism in order to understand the origins of religion. When we do that, dissociation and ritual suggestion come to the fore as the means by which shamans mediate therapeutic benefits to those with whom they work. Thus, McClenon concludes that ritual healing lies at the origins of religion: “ritual healing practices shaped genotypes governing the human capacity for dissociation and hypnosis, allowing modern forms of religiosity.” McClenon, unlike many other defenders of religion as a by-product of some trait or traits, actually states what the underlying trait is: a capacity for dissociation and hypnosis. This trait gets established in the human population because its therapeutic benefits give a fitness advantage to those who have it. And its aftereffects include social codification of the procedures that maximize those fitness benefits, which is ritual healing, leading in due course to religion. This is the ritual healing theory of the origins of religion.

McClenon’s case is carefully argued and well written. I contend, however, that it tells a plausible story about only one of the evolutionary by-products that are assembled in contemporary religions beliefs and practices. To adapt Kirkpatrick’s criticism, which he made more narrowly in the context of battling adaptationist arguments, it is insufficient to theorize about one component of religious beliefs and practices as if this could lead to a theory of the origins of religion. Strangely, despite the flow of McClenon’s rhetoric toward explaining the origins of religion (e.g., as in the previous quote), in the conclusion of his chapter he straightforwardly acknowledges that his ritual healing theory “does not preclude group selection theories and other processes that may have shaped religious genotypes.” And this admission follows right on the heels of a list of distinctive advantages of the ritual healing theory as an explanation of religion, including its genetic basis, which cannot hold true if his theory does not preclude other theories purporting to explain the genetic basis of religiosity. I conclude that McClenon has overstated his case slightly but that the overstatement affects only the comprehensiveness of his account of the evolutionary origins of religion.

Other scientists inquiring into the origins of religion would do well to follow McClenon’s example of specificity and clarity about underlying traits and selection mechanisms. And their theories will have to take account of McClenon’s.

Religion and Placebo Benefits (Bulbulia)

I mentioned Bulbulia’s chapter in passing several times already, but here I focus on it in connection with the alleged adaptiveness of religion by means of its placebo benefits. Bulbulia’s entertaining chapter is the only one in this volume explicitly to acknowledge the problematic effects of his scientific methodological naturalism on his treatment of the subject matter and explicitly to

argue in favor of it anyway. This shows an impressive degree of methodological self-awareness. But it also leads him to describe religious beliefs as cognitive errors, based, as far as I can see, only on the assumption that supernatural beings, whether or not they exist, do not do anything in the world, so if you think they do, you must be wrong. I happen to agree with Bulbulia's (stated) assumption that supernatural beings do not interfere in natural processes. In my case, this is because I believe that supernatural beings do not exist (i.e., I am a religious naturalist). Even so, I think impressive methodological self-awareness does not excuse preemptive settling of metaphysical claims, which is what the phrase "cognitive error" does. Nevertheless, as Bulbulia himself requests, we should give him the benefit of the doubt and see how far he can get with his "as if not" assumptions about supernatural beings.

Bulbulia is the closest this volume has to a living, breathing adaptationist. He accepts the argument that religion is universal feature of human life because it is a biological endowment. And he suspects that McClenon (discussed previously) puts his finger on the reason why: that religiosity evolved to foster placebo health benefits. But McClenon's case in his chapter is more cautious than Bulbulia's. McClenon argues that the capacity for dissociation and suggestion were what evolved, not religion. These traits evolved in a long-term gene-culture evolution nexus (ritual healing) driven by the fitness advantages that dissociation and suggestion confer. Religion is a by-product. I have not consulted McClenon's other writings, and perhaps Bulbulia interprets them correctly, but it is important to note that McClenon is not making an adaptation case for the origins of religion in this volume. Despite this quibble over interpreting McClenon, Bulbulia offers a fascinating defense and extension of McClenon's case, one that is far more closely geared to the evolutionary biology literature than McClenon's own way of arguing.

At the heart of Bulbulia's case is the claim that healing and religiosity use the same kind of cognitive structures, including especially supernatural beliefs. That is, supernatural entities both heal and perform religiously relevant functions, such as saving, protecting, and enlightening. Given the way healing mechanisms work through dissociation and suggestion, only those that truly believe with unshakable confidence will be healed. To be healed, correspondingly, is an unfakable sign of religious commitment. This kind of CST argument welds ritual healing theory, religious cognition, and the social elements of religion into a flexible and multifaceted theoretical edifice. Even so, I doubt that all these features of human behavior can be so tightly correlated with a few genes so that religion is rightly described as an adaptation.

CONCLUSION

The chapters in this volume contain a wealth of information about evolution and religion. While I certainly have scratched the surface in this chapter,

I was obliged to leave many ideas and arguments untouched. This testifies to the collective complexity and value of the chapters. In this conclusion, I confine myself to three brief points.

First, concerning reductionism, I think it is extremely unlikely that we will ever comprehend the evolved diversity and complexity of religious beliefs and practices using only one of the existing theoretical frameworks for explaining the origins of religion. Nor is it likely that we can cleanly prioritize these theories, ranking the most fundamental ahead of the derivative and gaining a clear impression of what came first and why. In certain corners of the evolutionary-origins-of-religion marketplace, there are enthusiastic groups hawking their favorite viewpoint as the key to understanding religion. A few chapters in this volume show traces of such enthusiastic conviction. Yet a fair-minded reader of a variety of serious theories must allow that many have the beginnings of a robust empirical basis and impressive theoretical integrity. The problem with one-sided enthusiasm among scientists is reductionism of the varied and complex phenomena of religion merely to what falls within the ambit of the theoretical framework for explaining its origins and functions. At this point, the religious studies specialist insists on urging their scientist colleagues to honor the complexity of the phenomena they seek to analyze and to take more seriously properly rich descriptions of religion. Many theoretical frameworks will have to play a role in explaining the origins and functions of religions (notice the plurals) because religions are too diverse, complex, paradoxical, existentially vibrant, and socially potent for any one theory to express the very heart of religion, if there even is such a thing, without massive oversimplification.

Religionists rightly resist theories that seek to give a substantially comprehensive account of the origins and functions of religions yet do not register this mass of contradictory details and exception-filled patterns that is religion in actual practice. In this way, religionists claim the role of data gatherers and data parsers for scientists aiming to present evolution-based and cognition-based hypotheses about these data. The interpretation of “religion as a whole,” whatever that contested concept finally means, is a shared endeavor that requires contributions from religionists and scientists alike. Interested theologians need to be fully aware of developments in this joint investigation so as to avoid their own version of reductionism as they seek to interpret religious phenomena.

I have drawn attention to a few of the many places where the chapters in this volume oversimplify the complexity of religion or speak as if its value were confined to the aspects that science could grasp. While I defended an appropriate reductionism as a feasible strategy for studying religion, I also want to challenge specialists in the scientific study of religion to strive for intelligent selection of salient features of religion and to shun damaging forms of reductionism. I have tried in a few places to suggest how deeper and

broader knowledge of religious phenomena might help scientists to be more accurate and to avoid proposing causal theories of religion that presume data against which religionists effortlessly point out numerous unexplained exceptions. Realizing how infuriating their simplistic characterizations seem to specialists in religious studies and theology may be enough to trigger better scholarship. Otherwise, perhaps they will be inspired to greater care by the awesome responsibility of speaking in public about religion with authentic respect and genuine learning at a time when a great deal depends on such skillful public speech.

Second, not one of the scientific contributors to this book gives any evidence of realizing that there are such things as naturalistic religious outlooks and naturalistic theologies. The emphasis on supernaturalism is overbearing strong, which leaves the reader floundering when trying to make sense of philosophers such as Plato and Aristotle, Sankara and Lao-tzu, on whose thought vast traditions of religious philosophy have been built. Many theologians have held—and many living theologians insist—that supernaturalism is the antithesis of authentic religion because (so they say) it embraces cognitive self-deception for the sake of undeniable communal benefits and immediate but uncertain comfort. There are plenty of theologians who will reject this naturalist theological outlook as a faithless betrayal of one or another home tradition, but it is not a perverse or destructive challenge to conventional religion. Rather, it is a theological articulation of a vision of human spiritual and moral maturity. It has a great deal in common with secular humanism and a great fondness for learning in all forms. It functions within all religious traditions, often on the underside or in the interstices of religious sociality, as a challenging goal for serious religious people of a particular type. To have seen this intellectually and socially important religious perspective discussed, even as an exception to the rule, would have been gratifying to me and many other religionists and theologians who are likely to pick up this volume and take seriously its topic. To ignore it altogether, without any explanation, is bizarre. Be that as it may, it is especially important to note that naturalistic theological viewpoints accommodate scientific insights into the origins and functions of religion easily and constructively. And that should be as interesting to thoughtful scientists studying religion as their scientific work is to such religionists and theologians.

Finally, and most important, religionists and theologians must accommodate insights from the scientific study of religion. I pointed out many areas where the theories emerging from evolutionary psychology not only would influence but also could potentially utterly transform religious studies and theology. Many religionists and theologians will go their own way in the specialized language games of their discourse communities, of course, but their work will be the poorer for neglecting this emerging literature. Those theologians and religionists who do engage the scientific study of religion

have a daunting task ahead of them. They will seek to make sense of the way that religion engages human beings with ultimate realities. And they will do this with a view of religion as, in part, an ad hoc, complex, and variable assemblage of adapted and exapted genetic traits constraining culturally colored exploration of a landscape of social and existential possibilities. That is a difficult task. It is also a culturally and intellectually valuable one. And the scientific study of religion can help religionists and theologians do it better.

NOTE

I am grateful to Olga Naidenko and Catherine Harris for their insightful comments on an early draft of this chapter.

REFERENCES

- Alper, M. (2001). *The "God" part of the brain: A scientific interpretation of human spirituality and God*. New York: Rogue Press.
- Atran, S. (2002). *In Gods we trust: The evolutionary landscape of religion*. New York: Oxford University Press.
- Berger, P. L. (1967). *The sacred canopy*. New York: Doubleday.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Buss, D. M., Haselton, M. G., Shackelford, T. K., Bleske, A. L., Wakefield, J. C. (1998). Adaptations, exaptations, and spandrels. *American Psychologist*, 53(5), 533–548.
- Darwin, C. (1859). *The origin of species*. London: Penguin Books.
- Darwin, C. (1872). *The descent of man, and selection in relation to sex*. London: Murray.
- Dawkins, R. (1976). *The selfish gene*. Oxford, England: Oxford University Press.
- Dawkins, R. (1989). *The selfish gene* (2nd ed.). Oxford, England: Oxford University Press.
- Deacon, T. W. (1997). *The symbolic species: The co-evolution of language and the brain*. New York: Norton.
- Dennett, D. C. (1991). *Consciousness explained*. Boston: Little, Brown.
- Durkheim, É. (1915). *The elementary forms of the religious life: A study in religious sociology*. New York: Macmillan.
- Fisher, R. A. (1930). *The genetical theory of natural selection*. Oxford, England: Clarendon Press.
- Gould, S. J. (1991). Exaptation: A crucial tool for evolutionary psychology. *Journal of Social Issues*, 47, 43–65.
- Gould, S. J., & Lewontin, R. C. (1979). The spandrels of San Marco and the Panglossian paradigm: A critique of the adaptationist programme. *Proceedings of the Royal Society of London, Series B*, 205, 581–598.
- Gould, S. J., & Vrba, E. S. (1982). Exaptation—A missing term in the science of form. *Paleobiology*, 8(1), 4–15.
- Grafen, A. (1990). Biological signals as handicaps. *Journal of Theoretical Biology*, 144, 517–546.

- Hamer, D. H. (2004). *The God gene: How faith is hardwired into our genes*. New York: Doubleday.
- Harvey, Van. (1971). The alienated theologian. In R. Evans (Ed.), *The future of philosophical theology*. Philadelphia: Westminster Press.
- Kennair, L. E. O. (2002). Evolutionary psychology: An emerging integrative perspective within the science and practice of psychology. *Human Nature Review*, 2, 17–61.
- Kirkpatrick, L. A. (2004). *Attachment, evolution, and the psychology of religion*. New York: Guilford Press.
- Kirkpatrick, M. (1986). The handicap mechanism of sexual selection does not work. *American Naturalist*, 127, 222–240.
- Maynard Smith, J. (1976). Sexual selection and the handicap principle. *Journal of Theoretical Biology*, 57, 239–242.
- Maynard Smith, J., & Harper, D. (2003). *Animal signals*. Oxford, England: Oxford University Press.
- McClenon, J. (2001). *Wondrous healing: Shamanism, human evolution, and the origin of religion*. De Kalb: Northern Illinois University Press.
- Ramachandran, V. S. (2004). *A brief tour of human consciousness: From imposter poodles to purple numbers*. New York: Pearson Education.
- Ramachandran, V. S., & Blakeslee, S. (1998). *Phantoms in the brain: Probing the mysteries of the human mind*. New York: Praeger.
- Trivers, R. L. (1985). *Social evolution*. Menlo Park, CA: Benjamin-Cummings.
- Zahavi, A. (1975). Mate selection: A selection for a handicap. *Journal of Theoretical Biology*, 53, 205–214.
- Zahavi, A. (1977a). The cost of honesty (further remarks on the handicap principle). *Journal of Theoretical Biology*, 67, 603–605.
- Zahavi, A. (1977b). Reliability in communication systems and the evolution of altruism. In B. Stonehouse & C. M. Perrins (Eds.), *Evolutionary ecology* (pp. 253–259). London: Macmillan.
- Zahavi, A., & Zahavi, A. (1997). *The handicap principle: A missing piece of Darwin's puzzle*. New York: Oxford University Press.

INDEX

- Absorption scale, MPQ, 36
- Acceptance, *vs.* religious belief, 71–72
- Adaptation, 213; *vs.* by-product of adaptation, 3–5; culture as, 214; definition of, 233–34, 252, 253; environment of, 32; examples of, 4–5; in life history, 39–40; in religious healing, 93–94, 107, 114
- Adaptation, religion as, 2–5, 31–32, 93–94, 107, 125, 246–48; Atran on, 184–85; basis of theories of, 160–61; by-product of, 3–7, 94, 161–62, 184–88; criteria for adaptation in, 2–5, 249–51
- Adaptation, religion as not, 159–78, 214–15, 254, 257–58; background on, 159–60; behavior *vs.* mechanism giving rise to, 171–72; cross-cultural differences in, 172, 176; god genes and, 162–64; god modules and, 161–62; identifying adaptive function in, 167–71 (*see also* Adaptive function, of religion); identifying design of purported mechanism in, 171–73; identifying phenomenon in, 164–66; maladaptive variants and, 172; multiple-by-products hypothesis *vs.*, 172–77 (*see also* Multiple-by-products hypothesis); simpler designs in, 172
- Adaptive, for a population, 233–34
- Adaptive costs, of religion, 169–70
- Adaptive error, 95–97
- Adaptive function, 234, 251–54; primary, 234; secondary, 234, 251
- Adaptive function, of religion, 167–71; adaptive costs in, 169–70; new theoretical problems with, 170–71; psychological benefits *vs.* reproductive success in, 167–69
- Adaptive traits, side effects of, 234–35
- Adoption, on authoritarianism, 46
- Affective neuroscience, 21
- Afterlife: children on, 126–27; intuitiveness of, 127–28; societal advantages of belief in, 128–30
- Age, on traditional moral values triad, 46–47, 54
- Agents, personal, mental representation of, 210–11
- Agents, supernatural, 254–55; children's views of, 212; cognitive and evolutionary value of, 188–90; mental representation of, 210–11; religious

- beliefs about, 211–13. *See also* Supernatural, cognitive psychology of belief in
- Aging, natural selection and, 169
- Alertness, from gratitude, 21
- Altemeyer adoption study, on authoritarianism, 46
- Altered states of consciousness, 138
- Alternate form, 36
- Altruism, reciprocal, 213–14; gratitude in, 15
- Ancestor worship, 5
- Ancestral environment, 233
- Angels, belief in, 1, 8
- Animal hypnosis, 140–41
- Anomalous experience: beliefs and, 147; classification of, 146; cross-cultural narratives of, 146–47; culture as source of, 146; dissociation and, 139, 142–45; historical analysis of, 147–48; psychological disorders and, 145; replication of findings on, 148–49
- Anxiety, existential: experiment on, 197–201; religion in management of, 187–88
- Appreciation: behavioral technique for induction of, 20; physiological effects of, 20
- Assessment confidence, 95–96, 112; in religious healing error, 99–100
- Assortative mating, 42; attitudes and, 42–43
- Attachment system, 171–72, 175
- Attachment theory, 160, 171–72
- Attendance, at religious ceremonies, 49; genetics and, 52; marriage on, 41; signals from, 74
- Attitudes: assortative mating and, 42–43; experience-based, 148; genetics on, 33–34, 40; malleability of, 40; from parenting, 32; religiousness and structure of, 34–35; social, 34–35
- Authoritarianism: adoption on, 46; right-wing (*see* Right-wing authoritarianism (RWA)); social class rearing on, 42
- Authoritarianism, genetics and environment on, 41–46; Altemeyer adoption study of, 46; Finkel and McGue study of, 44–46; IQ and, 41–42; McCourt, Bouchard et al. study of, 42–44; Scarr and Weinberg study of, 41–42
- Autism, intuitive psychology and, 7–8
- Awe, 12
- Badges, religious, 63, 70–71
- Baldwin effect, 213–17, 258–59
- Bans, religious, 63, 69–71
- Beer, Arnold, and Loehlin adoption study, on religiousness, 51
- Behavior: genes and, 171; learned, on natural selection, 215–17; *vs.* mechanisms giving rise to, 171; natural selection in, 124–25
- Behavior, religious, 165; communication in, 62–64; cooperation and trust in, 63–64; in costly signaling theory, 16–17; costs in, 64–65; cross-cultural differences in, 166; expected, 67; fundamentals of, 63; *vs.* theory of natural selection, 62. *See also* Rituals, religious
- Behavior, religious, signaling theory of, 62–84; badges and bans in, 63, 69–71; belief in, 72–77 (*see also* Beliefs, religious); communication in, 62–64; costly signaling theory in, 78–83 (*see also* Costly signaling theory); handicaps in, honest, 64–65; hard-to-fake handicaps *vs.* impossible-to-fake indices in, 71–72; ingenious indices in, 66; private practice in, 77–78; reputation and punishment mechanisms in, 83; solidarity in, 66–68; stable signals in, 68–69
- Behavior genetics, 163; quantitative methods in, 36–39
- Belief, experience and, 136–37
- Beliefs, religious, 72–77, 165; *vs.* acceptance, 71–72; church attendance as signal of, 74; cross-cultural differences in, 166; cult success and, 75; death and, 197–200; emotions in, 76; motivation for, 73–74; ritual performance on, 74–76; in supernatural, 73–76, 211–13; in supernatural, cognitive psychology of, 123–33, 260–61 (*see also* Supernatural, cognitive psychology of belief in); in supernatural, cognitive psychology of belief in, 123–33,

- 260–61 (*see also* Cognitive psychology, of belief in supernatural); supernatural rewards and punishments in, 73–74, 77, 83; validation of, 182–83
- Book of Genesis, belief in literal truth of, 1
- Boundary questionnaire, 144
- Brain development, modular, 137
- By-product, 234; adaptive and maladaptive, 234–35; evolutionary, religion as, 184–88; of psychological mechanisms, religion as, 174
- By-product, functionless, 234, 253–56; religion as, 254
- By-product of adaptation, 3–7; *vs.* adaptation, 3–5; religion as, 161–62; religious error and, 94
- Calmness, from gratitude and meditation, 20
- Ceremonies, religious. *See* Rituals, religious
- Character, 18
- Characteristic, 233
- Charismatic movement, emotion in, 12
- Cheaters (free riders), in costly signaling theory, 17–18, 82
- Church attendance, 49; heritability of, 52; marriage on, 41; as signal of belief, 74
- Cognition, 210–11; religion as nature of, 218
- Cognitive and evolutionary roots, of religion, 181–201, 261–63; basic conceptual modules in, 186; as by-products, evolutionary, 184–88; community and family groups in, 183–84; counterintuitive beliefs in, memory experiments with, 190–94, 262–63; counterintuitive beliefs in, metarepresenting, 194–97; emotions in, 184; evolutionary landscape of, 201; existential anxieties in, experiment on, 197–201; existential anxieties in, management of, 187–88; function of religion and, 181–82; music and movement in, 183; supernatural agent in, 188–90; validation of religious beliefs in, 182–83
- Cognitive boundaries, thin *vs.* thick, 144
- Cognitive dissonance, 75
- Cognitive predispositions, to religious belief, 7
- Cognitive psychology, of belief in supernatural, 123–33, 260–61. *See also* Supernatural, cognitive psychology of belief in
- Cognitive science of religion, 209–21; Baldwin effect in, 213–17, 258–59; cognition and mental mechanisms in, 210–11; cognitive evolution in, 217–18; fundamentals of, 209; God in, 211–13; intuition in, 217–18; lived experience in, 219–21; social construct in, 218–19; starting point of, 209; theological challenges with, 263–64
- Comfort, from religion, 2, 249
- Coming of age rituals, 62
- Commitment, religious, 182; cooperation and, 79–81, 87, 105–8, 112, 114; costly behaviors on, 82–83; health as costly signal of, 112–15 (*see also* Health, religion and); membership demands and, 78–79
- Communes, religious, 79–80
- Communication, religion as, 62–64
- Communicative environments, 234, 235; in costly signaling theory, 236
- Community groups, in religion, 183–84
- Community togetherness, religion in, 2–3, 218–19, 249
- Competence, religion as, 215
- Conformity, 101
- Conservatism: personal, and heritability of religiousness, 51–52; views on social policy and organization with, 34–35
- Conservatism, genetics and environment on, 46–49; age in, 46–47, 54; Eaves et al. Virginia Twin Registry study of, 46–47; MISTRA study on, 48–49; Virginia 30,000 study on, 47–48
- Constraints, 254
- Contemplative tradition, emotional calming and quietude in, 12
- Convergent judgments, 101
- Cooperation: character strengths in, 11; commitment and, 79–81, 87, 105–8, 112, 114; in costly signaling theory, 17–18, 87; in kibbutzim, 80–81; in

- prisoners' dilemma, 105; promotion of, 17–18, 63–64, 250
- Cooperative relationship: free riders in, 17–18; successful, 17–18
- Cooption, 254
- Costly signaling theory, 78–83, 235–44; cognitive neuroscience of, 22; commitment in, cooperative interactions and, 79–81, 87, 105–8, 112, 114; commitment in, health as costly signal of, 112–15; commitment in, membership demands and, 78–79; communes and, 79–80; costs of religion in, 88–89; critiques of, 238–39; development of, 236–40; free riders in, 17–18, 82; fundamentals of, 16–17; gratitude in, 16–19, 22–24; kibbutzim and, 80–81; perceived outcomes and, 107; placebo health as reproductively beneficial in, 111–13; of religion, 240–43; religious ritual and, 32; religious studies, theology, and, 243–44; reputation and punishment mechanisms in, 83; strategic costs in, 16–18; terminology problems in, 239–40; warfare in, 82–83
- Costs: of religion, 88–89; of religion, adaptive, 169–70; strategic, 16–18, 65
- Counterintuitive beliefs: God as, 213; memory experiments with, 190–94, 262–63; metarepresentations of, 194–97; in successful religions, folk tales, and myths, 192–94
- Cults, religious practices on belief in, 75
- Cultural differences: adaptation and, 172, 176; in anomalous experience, 146–47; in religion and health, 110–11; in religious behavior, 166; in religious beliefs, 166; in spiritual experiences, 166
- Cultural survival, religion and, 190–94
- Culture: as adaptation, 214; anomalous experience from, 146; paranormal experience and, 149
- Dance, healing, 90–91
- Death, 187; belief in God and supernatural after exposure to, 197–200; existence of soul and, 8
- Deception, 187
- Depression, gratitude on, 19–20
- Detractors of religion, 256
- Devil, belief in, 1, 8
- Devotion, personal, in heritability of religiousness, 51
- Dissociation and dissociative processes: as coping strategy, 141; definitions of, 135–36; evolutionary processes in, 140; experiences of, 137–38; genotypes linked to, 141; healing and, 151; hypnosis and, 136, 138, 151; paranormal experience and, 142–43; rarity of experience of, 148; rituals and, 135–36, 138; in shamanism, 136; trauma and, 138–39, 140–42
- Dissociation/anomalous experience hypothesis, 139, 142–45
- Dissociation/hypnosis genotypes, 139–40
- Dissociative genes, 137
- Dizygotic twins reared apart, 38; authoritarianism and, 42–43
- D'Onofrio et al. adult twin study, on religiousness, 49–51
- Eaves et al. Virginia Twin Registry study, on conservatism, 46–47
- Efficacy costs, 65
- Elephants, musth in, 65, 68
- Emotional experience: religion in regulation of, 11; spiritual and religious, 12, 166, 184; validation and, 183
- Emotional expression, religion in regulation of, 11, 12
- Emotional predispositions, to religious belief, 7
- Emotions, 220; religion on generation and regulation of, 11, 12; in religious experience, 12–13, 165
- Emotions, positive: as adaptive, 168; cognitive neuroscience of, 21–24; religious, 12–13. *See also specific emotions*
- Emotions, religious, 12–13, 76; in charismatic movement, 12; free riders *vs.* genuine cooperators and, 18; trustworthiness in, 17, 18, 64. *See also Gratitude*
- Emotions, sacred, 11–28, 264–65; characteristics of, 13; examples of, 12–13; gratitude as, 13–28 (*see also Gratitude*); overview of, 12–13

- Emotion theory, 12–13
- Encapsulation constraints, 96; in religious healing error, 102–3, 115
- Environment, 233
- Environment, on authoritarianism, 41–46; Altemeyer adoption study of, 46; Finkel and McGue study of, 44–46; McCourt, Bouchard et al. study of, 42–44; Scarr and Weinberg study of, 41–42
- Environment, on conservatism, 46–49; age in, 46–47, 54; Eaves et al. Virginia Twin Registry study of, 46–47; MISTRA study on, 48–49; Virginia 30,000 study on, 47–48
- Environment, on religiousness: Beer, Arnold, and Loehlin adoption study of, 51; child-rearing practices/parenting *vs.* genetics and, 32–33; D'Onofrio et al. adult twin study on, 49–51; heritability *vs.*, 33–34; Kendler, Gardner, and Prescott female twin study on, 51–52; Koenig et al. study of, 52–53; life history on, 39–41; rationale for study of, 31–34
- Environment, on traditionalism, 44–46
- Environment of evolutionary adaptation, 32
- Equivalent form, 36
- Error: adaptive, 95–97; *vs.* fact, 97; religious, 93–97, 113; religious healing, 98–99; reproductive advantages of, 94; specialization of, to strategic problem domain, 96
- Ethical yearnings, higher, 3
- Evolutionary biology: basic concepts of, 232–35; terminology of, 232–35, 239–40, 252–53
- Evolutionary psychology, 160, 163, 213; in ritual healing theory, 137; on supernatural, 124–25. *See also specific topics*
- Evolutionary roots, of religion, 201, 244–45; religion as evolutionary by-product in, 184–88. *See also* Cognitive and evolutionary roots, of religion
- Exaptations, 3, 125, 162, 252–55
- Existential anxieties: experiment on, 197–201; religion in management of, 187–88
- Experience: belief and, 136–37; religious, 76
- Experience-based attitudes, 148
- Experiential source hypothesis, 139, 145–50
- Extinctivists, 127
- Extrinsic religiousness, 51, 74
- Fact, *vs.* error, 97
- Faith, of religious believers, 7
- False-belief-task experiment, 212; Yukatek Maya children's responses to, 195–96
- Family Environment Scale (RES), in studies of genetics on authoritarianism, 43–44
- Family groups, in religion, 183–84
- Feature, 233
- F (fascism)-scale, 41–42
- Finkel and McGue study, of authoritarianism, 44–46
- Fitness, 11, 233, 234; in communicative environments, 238. *See also* Adaptation, religion as
- Food taboos, 5–6
- Free riders, in costly signaling theory, 17–18, 82
- Functionalist arguments, 184–85
- Functionless by-product, 253–56; religion as, 254
- Garments, religious, 63
- Gazelles, stotting behavior of, 66, 237
- Gene, God, 1, 54, 159, 162–64, 248
- Gene–culture coevolution, 234; religion as, 214–17
- Genes, 233; behavior and, 171; dissociative, 137; in natural selection, 162–64, 213–14
- Genetic drift, 4
- Genetics, behavioral, 163; quantitative methods in, 36–39
- Genetics, of attitudes, 33–34; objection to, 40
- Genetics, of authoritarianism, 41–46, 266; Altemeyer adoption study of, 46; Finkel and McGue study of, 44–46; McCourt, Bouchard et al. study of, 42–44; Scarr and Weinberg study of, 41–42

- Genetics, of conservatism, 46–49, 266;
 age in, 46–47, 54; Eaves et al. Virginia
 Twin Registry study of, 46–47;
 MISTRA study on, 48–49; Virginia
 30,000 study on, 47–48
- Genetics, of religion and religiousness,
 31–41; adaptation and, 31–32, 164;
 Beer, Arnold, and Loehlin adoption
 study of, 51; behavior *vs.* molecular
 genetics in, 54; *vs.* child-rearing prac-
 tices/parenting, 32–33; D’Onofrio et
 al. adult twin study of, 49–51; factors
 in, 33–34; heritability and, 33–34; on
 internal and external subscales, 52–53;
 Kendler, Gardner, and Prescott female
 twin study on, 51–52; Kirkpatrick on,
 163–64; Koenig and Bouchard on, 49–
 53; Koenig et al. study of, 52–53; life
 history in, 39–41; measures of, 49–53;
 quantitative behavior genetic methods
 in, 36–39 (*see also* Quantitative behav-
 ior genetic methods); rationale for
 study of, 31–34; Wildman on, 245–46,
 265–66
- Genetics, of traditionalism, 44–46
- Genotypes, 137, 213
- Ghosts: belief in, 1, 8; hunter-gather
 beliefs on, 129
- God: belief in, 1, 8; definition of, 87; reli-
 gion and, 211–13
- God gene, 1, 54, 159, 162–64, 248
- God module, 1, 159, 161–62, 248
- GQ, 16
- Grafen, Alan, 238
- GRAT, 16
- Gratitude, 11, 13–28, 264–65; alertness
 from, 21; benefits of, 16, 18–19; calm-
 ness from, 20–21; cognitive neurosci-
 ence of, 21–24; cognitive neuroscience
 of, applications of, 21–22; cognitive
 neuroscience of, costly signaling
 model of, 22–24; cognitive neurosci-
 ence of, detection in, 24; cognitive
 neuroscience of, process approach to,
 22; cognitive neuroscience of, rationale
 for, 21; cognitive neuroscience of,
 reciprocity in, 21–22; costly signaling
 theory and, 16–19, 22–23; counterfac-
 tual thinking and, 24–25; definitions
 of, 13–14; detection of, 24; disposi-
 tional, 16; evolutionary perspective of,
 14–16; future neurologic research on,
 24–26; in group governance, 14–15;
 on happiness and depression, 19–20;
 limbic-prefrontal networks in, 24–25;
 material meaning of, 13–14; measures
 of, 16; mechanisms of, 20–21; from
 meditation, 21; on mood and health,
 19, 20; as moral affect, 15; neurologic
 correlates of, 24–26; with neurologic
 deficits, 24–26; in Parkinson’s disease
 patients, 24–25; as personality trait,
 16; in reciprocal altruism, 15; reli-
 gious aspects and expressions of, 23;
 research on benefits of, 19–21; on
 social position, 16; strategic value of,
 23; transcendent meaning of, 14; uni-
 versality of, 14; on well-being, 16
- Group governance, gratitude in, 14–15
- Group selection, theory of, 214
- Handicap principle, 236–39; in religious
 rituals, 32
- Handicaps: hard-to-fake, 71–72; honest,
 64–65
- Happiness, 12–13; as adaptive, 168; grati-
 tude on, 19–20
- Haredim*, signals of solidarity in, 66–67
- Harmann’s scale, 144
- Hauntings, 149–50
- Healers, religious, 99
- Healing: as evidence for moral supernat-
 ure, 109; !Kung dance for, 90–91, 102.
See also Health, religion and
- Healing placebo hypothesis. *See* Health,
 religion and; Placebo health
- Health, psychology and, 168–69
- Health, religion and, 87–118, 267–68;
 adaptation in, 93–94, 107, 114; assess-
 ment confidence in, 95–96, 99–100,
 112; cognitive complexity in, 98–99;
 as costly signal of commitment, 112–15;
 cultural variation on, 110–11; evidence
 for healing supernatural world in,
 101; gratitude in, 19, 20; healing
 power of supernatural in, evidence for,
 101; history of, 90–92; informational
 encapsulation in, 102–3, 115; moral

- functions and religious nocebos in, 104–6, 108; overview of, 90–93; perceived outcomes in, 106–8; prisoners' dilemma in, 104–6; prisoners' dilemma in, supernature, 106–8; psychological design for, optimal, 97–104; religious consciousness in, 92–93; religious error in, 93–97; religious healing error in, 98–99; as reproductively beneficial, 111–13; research on, 89–90; self-deception in, 113; self-deception in, moralist, 94–95; self-deception in, strategic, 94–96; shared information and motivation flow for, 108–10; social influence on, 101–2; stressful fact *vs.* religious error in, 98–99; stressors and stress mitigation in, 97–98; western health care practices and, 116. *See also* Ritual healing theory
- Heart rhythm patterns, appreciation on, 20
- Heritability. *See* Genetics
- Homo religiosus*, 159
- Hood mysticism scale, 36
- Hoyt Parallel Form Reliability, 36–37
- Hypervigilance mechanisms, 132
- Hypnosis: animal, 140–41; as defense mechanism, 141; dissociation and, 136, 151; medical use of, 150–51; in ritual healing theory, 136, 138
- Hypnotizability: genetic basis of, 140; paranormal experience and, 143
- Ilahita Arapesh rituals, 62
- Immortalists, 124
- Index, varying definitions of, 239–40
- Indexical signals, 65, 220; rituals, badges, and bans as, 71–72; varying definitions of, 239–40
- Indicator, varying definitions of, 239–40
- Indices, impossible-to-fake, 71–72
- Informational encapsulation, in religious healing error, 102–3, 115
- Initiations, costly, 6
- Integrity, of genuine cooperators *vs.* free riders, 18
- Intrinsic religiousness, 51, 74; religious practices in, 74–77
- Intrinsic religiousness scale, 36, 51
- Intuition and intuitive beliefs, 7–8; on afterlife, 127–28; in autism, 7–8; in cognitive science of religion, 217–18; memory experiments with beliefs confirming and defying, 190–94, 262–63
- Intuitive ontology, 191
- IQ, on authoritarianism, 41–42
- Irrational beliefs, 1–2
- Joy, 12–13
- Kaiko* ceremony, 72
- Kendler, Gardner, and Prescott female twin study, on religiousness, 51–52
- Kibbutzim, 80–81
- Kin groups, 213. *See also* Community groups; Family groups
- Koenig et al. study, on religiousness, 52–53
- !Kung, 102, 145
- !Kung healing dance, 90–91
- Learned behaviors, on natural selection, 215–17
- Life history, behavior genetic data and, 39–41
- Linguistic symbol systems, 216
- Lived experience, religion as, 219–21
- Love, 12–13
- MacDonald's five robust factors, 35–36
- Maladaptive function, 234, 256; secondary, 234
- Maladaptive traits, 234–35
- Marriage, 6; on church attendance, 41; as indexical signal, 72
- Materialist, 123
- Mating, assortative, 42; attitudes and, 42–43
- McCourt, Bouchard et al. study, of authoritarianism, 42–44
- Meditation: autonomic nervous system activity in, 20; gratitude from, 21; thankfulness from, 21
- Membership demands, devotion, commitment and, 78–79

- Memory experiments, with counterintuitive beliefs, 190–94, 262–63
- Mental mechanisms, 210–11
- Metarepresentation, 194–95
- Mind: theory of, 130; types of, 125–27
- Mind–body dualism, 127
- Mind module, theory of, 7–8
- Mind reading, 211–12
- MISTRA study, on conservatism, 48–49
- Modular brain development, 137
- Module, God, 1, 159, 161–62, 248
- Monozygotic twins reared apart, 38; authoritarianism and, 42–43
- Monozygotic twins reared together, 38; authoritarianism and, 42–43
- Mood, gratitude on, 19
- Moral functions, religious nocebos and, 104–6, 108
- Moralist self-deception, 94–95
- Moral religiosity, 106–8; shared information and motivation flow for, 108–10
- Moral values, 3; gratitude in, 15; religion as source of, 3, 250; as universal sentiment, 3
- Moral Values Triad, 34–35, 265–66; genetics and environment on, 31–55. *See also* Authoritarianism; Beliefs, religious; Conservatism; Religiosity
- Movement, in religion, 183
- MPQ Absorption scale, 36
- Multiple-by-products hypothesis, 172–77, 257–58; adaptive function and design in, 175; consistency of, 176; diversity of religion and religious experiences in, 175–76; individual and cross-cultural differences in religion in, 176; religion as by-products of psychological mechanisms in, 174
- Music, in religion, 183
- Musth, 65, 68
- Mutation, 233
- Mysticism scale, Hood, 36
- Native American coming of age rituals, 62
- Natural selection, 213; aging and, 169; on behavior, 124–25; behavior on, learned, 215–17; genes in, 162–64, 213–14; for religion, 167–69; *vs.* religious behavior, 62; 167–69. *See also* Adaptation
- New Guinea Maring, *kaiko* ceremony of, 72
- Niche, 233, 234
- Niche resonance, 234
- Nocebos, religious, moral functions and, 104–6, 108
- Nonfunctional by-products, 234
- Occult knowledge, expertise in, 6
- Organism, 233
- Original selection context, 234
- Origin of religion, in ritual healing theory, 135–52. *See also* Ritual healing theory
- Outcomes, perceived, 106–8
- Paranormal experience: cross-culture similarity of, 149; dissociation and, 142–43; hypnotizability and, 143
- Parapsychology, 137
- Parenting: attitudes from, 32; religious belief and, 32–33
- Parkinson's disease: counterfactual thinking deficits in, 24–25; gratitude with, 24–25
- Phenotype, 137, 213; variance in, 36–37
- Placebo, religion as, 88
- Placebo health, 87–118; cognitive complexity in, 98–99; evolution of, 97; fundamentals of, 88; history of religion as, 90–92; religion as, 88, 267–68; religious error and, 93–97; religious healing errors in, 98–99; shaman induction of religious consciousness in, 92–93. *See also* Health, religion and
- Positive emotions: as adaptive, 168; cognitive neuroscience of, 21–24; religious, 12–13. *See also* Gratitude; *specific emotions*
- Practice, religious, 74–76; internalizing supernatural beliefs through, 74–77; private, 77–78; promises of rewards for, 73–74. *See also* Rituals, religious
- Praise, 17
- Prefrontal cortex, 211
- Primary adaptive function, 234

- Prisoners' dilemma, 104–6; supernature, 106–8
- Private practice, religious, 77–78
- Prohibitions, religious, 70
- Proselytizing religions, success in, 75
- Proximate explanations, 73
- Psychic phenomenon, cross-culture similarity of, 149
- Psychological benefits, of religion, 167–69
- Punishments: costly signaling theory on, 83; by religious communities, 77; supernatural, 73–74
- Quantitative behavior genetic methods, 36–39; dizygotic twins reared apart in, 38; Hoyt Parallel Form Reliability in, 36–37; monozygotic twins reared apart in, 38; monozygotic twins reared together in, 38; unrelated individuals reared apart in correlated environments in, 38–39; unrelated individuals reared together in, 38–39
- Random effects, 254
- Reasoning, second-order, 131
- Receivers, 236
- Reciprocal altruism, 213–14; gratitude in, 15
- Recognition constraint, 107
- Reductionism, 127
- Relationships, gratitude in, 14–15
- Religion and religiousness, 72–77; *vs.* acceptance, 71–72; as adaptation (*see* Adaptation, religion as; Adaptation, religion as not); behaviors in (*see* Behavior, religious); benefits of, to producers *vs.* consumers, 5; as by-product of adaptation (*see* Adaptation, religion as); child-rearing/parenting and, 32–33; cognitive predispositions to, 7; cognitive science of (*see* Cognitive science of religion; Supernatural, cognitive psychology of belief in); costs of, 16–18, 65, 88–89, 169–70 (*see also* Costly signaling theory); definition of, 87; emotional predispositions to, 7; evolution on, 88; factors influencing, 32–33; functionalist arguments for, 184–85; heritability of (*see* Genetics, of religion and religiousness); inculcation of, 6–7; intensity of, variation in, 68–69; interdisciplinary understanding of, 228; as lived experience, 219–21; as nongenetic, 245–46; *vs.* nonreligion, 166; pervasiveness of, 88; as placebo, 88; prevalence of, 1–2, 8; rituals in (*see* Rituals, religious); science and, 181–82; scientific study of, 227–29; social attitudes in, 34–35; as social construct, 218–19; social value of, 181–82; success of, 181–82; as trait, 33–34; universal factors in, 247–48; universality of, 1, 8. *See also* Beliefs, religious; Genetics, of religion and religiousness; Supernatural; *specific aspects*
- Religionists, 227; in dialogue with scientists and theologians, 230–32; on scientific study of religion, 228–29
- Religiosity: definition of, 87; history of, 88
- Religious error, 93–97, 113
- Religious experience, 76
- Religious healing error, 98–99; assessment confidence in, 99–100, 112
- Religiousness. *See* Religion and religiousness
- Religiousness scale, intrinsic, 36, 51
- Religious studies, 227, 228; costly signaling theory and, 243–44; on scientific study of religion, 228–29
- Reproductive success, 167–69
- Reputations, 83
- Reverence, 12–13
- Rewards, supernatural, 73–74
- Right-wing authoritarianism (RWA): adoption and, 46; college career and, 40; genetics of, 42–44; IQ and, 42; parenting and, 34; religiousness and, 34, 40–41; in spouses, 42–43; views on family organization and, 34
- Rites of passage, 6
- Ritual healing theory, 135–52, 266–67; on biological basis of religion, 136; dissociation/anomalous experience hypothesis in, 139, 142–45; dissociation/hypnosis genotypes in, 139–40; dissociative processes in, 135–36, 138;

- evolutionary psychology in, 137; experience and belief in, 136–37; experiential source hypothesis in, 139, 145–50; fundamentals of, 135; hypnosis and, 136, 138; modular brain development and, 137; parapsychology and, 137; predictions of, 136; schematic of, 138; shamanic effectiveness hypothesis in, 139, 150–52; shamanic ritual in, 138; summary of, 136; trauma/dissociation hypothesis in, 138–39, 140–42
- Rituals, religious, 67, 165; in adherence to beliefs, 67; attendance at, 41, 49, 52, 74; as badges, 71; on belief, 74–75; compliance with, public expression of, 17; in costly signaling theory, 16–17, 32; dissociative processes with, 135; elements of, 138; function of, 183; of Ilahita Arapesh, 62. *See also* Behavior, religious
- Sacredness, 13. *See also* Emotions, sacred; Gratitude
- Sacrifices: costly, 6; evolutionary cost of, 184
- Santa Claus effect, 129, 261
- Scarr and Weinberg study, of authoritarianism, 41–42
- Scars, ritual, 71
- Scientific study of religion, 227–29; classic modern sources for, 245; religionists on, 228–29; religious studies and, 228–29; theology and, 229–30. *See also specific topics*
- Scientists, in dialogue with religionists and theologians, 230–32
- Secondary adaptive function, 234, 251
- Secondary maladaptive function, 234
- Second-order reasoning, 131
- Selection pressure, 213, 233
- Self-deception, 113; moralist, 94–95; strategic, 94–96
- Self-esteem, 168–69
- Self-healing, religion as, 87. *See also* Health, religion and
- Sentience, 220
- Sexual selection, 235
- Shamanic effectiveness hypothesis, 139, 150–52
- Shamanic ritual, 138
- Shamanic syndrome, 142–44, 151
- Shamans and shamanism: cognitive states in, 138; dissociative people as, 142; as expert in occult, 6; healing work of, 90–91; history of, 150; rituals and mind–body processes in, 150; transliminality in, 145
- Side effects, 234; of adaptive traits, 234–35; evolutionary, 251–54. *See also* By-product
- Signalers, 236
- Signaling theory, of religious behavior, 62–84. *See also* Behavior, religious, signaling theory of
- Signals, 236; from attendance at religious ceremonies, 74; fake (handicaps), 64–65; indexical, 65, 71–72, 220, 239–40; of solidarity, 66–68; stable, 68–69
- Signals, costly: conditions for evolutionary stability of, 68–69; religious commitment as, 112–15 (*see also* Health, religion and). *See also* Costly signaling theory
- Sikh, turban wearing by, 70–71
- Snakes, fear of, 4
- Social attitudes, in religious belief, 34–35
- Social construct, religion as, 218–19
- Social psychological effects, 53
- Social structure, of religion, 165
- Solidarity, signals of, 66–68
- Soul, empirical support for existence of, 8
- Spandrels, 3, 125, 161–62, 252–55; religious error and, 94
- Species, 234
- Spiritual experiences: cross-cultural differences in, 166; as emotions, 166; as mis- or hyperactivation of functional system, 162
- Spiritualism, 147
- Spirituality, MacDonald's five robust factors in, 35–36
- Stable signals, 68–69
- Stotting, of gazelles, 66, 237
- Strategic costs, 16–18, 65
- Strategic self-deception, 94–96
- Strengths of character, 18
- Stress mitigation, 97, 114
- Stressors, 97

- Success: of religion, 181–82; from religious belief, 7
- Supernatural, 87; belief in, 73, 76, 211–13; healing power of (*see* Health, religion and)
- Supernatural, cognitive psychology of belief in, 123–33, 260–61; adaptation in, 125; evolutionary psychology and, 124–25; gorillas and children on, 125–27; increasing impact of, 132–33; intuitiveness of afterlife and, 127–28; rationale for study of, 123–24; signs from beyond in, 130–32; societal advantages of, 128–30
- Supernatural agents, 254–55; children's views of, 212; cognitive and evolutionary value of, 188–90; mental representation of, 210–11; religious beliefs about, 211–13
- Supernature, healing, policing as evidence for, 109
- Supernature, moral, healing as evidence for, 109. *See also* Health, religion and Supernature prisoners' dilemma, 106–8
- Symbol systems, 220; linguistic, 216
- Taboos, religious, 63, 69–71
- Tattoos, religious, 63, 71
- Terminology, of evolutionary biology, 232–35; inconsistencies in, 239–40, 252–53
- Terror management theory, 200
- Thankfulness: from meditation, 21. *See also* Gratitude
- Thanksgiving, 17
- Theologians, 227; in dialogue with religionists and scientists, 230–32
- Theological theories, 229–30
- Theology, 227; cognitive science of religion and, 263–64; costly signaling theory and, 243–44; scientific study of religion and, 229–30
- Theory of group selection, 214
- Theory of mind, 130
- Theory-of-mind experiment, 194–97
- Theory of other minds, 242
- Totstell reflex, 140–41
- Traditionalism: genetics *vs.* environment on, 44–46; heritability of, 44–46. *See also* Conservatism; Right-wing authoritarianism (RWA)
- Traditional Moral Values Triad (TMVT), 34–35, 265–66; genetics and environment on, 31–55. *See also* Authoritarianism; Beliefs, religious; Conservatism; Religiousness
- Trait, 233; adaptive and maladaptive, 234–35; gratitude as, 16; religion and religiousness as, 33–34
- Trance states, 135
- Transliminality, 143–45
- Trauma/dissociation hypothesis, 138–39, 140–42
- Trust, in cooperation, 64
- Trustworthiness: costly signaling theory on, 17, 18; of genuine cooperators *vs.* free riders, 18
- Turbans, Sikh wearing of, 70–71
- Twin research, 38–39
- Ultimate explanations, 73
- Universal factors, in different religions, 247–48
- Universal spirit, belief in, 1, 8
- Unrelated individuals: reared apart in correlated environments, 38–39; reared together, 38–39
- Variance, in phenotype, 36–37
- Virginia 30,000 study, on conservatism, 47–48
- Virtues, 18
- Warfare, religious commitment and, 82–83
- Witch doctor, 6. *See also* Shamans and shamanism
- Witches, belief in, 1, 8
- Wounded healer syndrome, 141–42
- Zahavi, Amotz, 236–38

ABOUT THE EDITOR AND CONTRIBUTORS

EDITOR

Patrick McNamara, Ph.D., is director of the Evolutionary Neurobehavior Laboratory in the Department of Neurology at the Boston University School of Medicine and the Veterans Administration New England Health Care System. On graduating from the Behavioral Neuroscience Program at Boston University in 1991, he trained at the Aphasia Research Center at the Boston Veterans Administration Medical Center in neurolinguistics and brain–cognitive correlation techniques. He then began developing an evolutionary approach to problems of brain and behavior and currently is studying the evolution of the frontal lobes, the evolution of the two mammalian sleep states (REM and NREM), and the evolution of religion in human cultures. He has published numerous articles and chapters on these topics pioneering the investigation of the role of the frontal lobes in mediation of religious experience.

CONTRIBUTORS

Scott Atran is director de recherche (CNRS) at the Institut Jean Nicod in Paris and adjunct professor of psychology at the University of Michigan. He received his Ph.D. in anthropology from Columbia University. His research in Mesoamerica concerns universal and culture-specific aspects of biological categorization and reasoning and environmental decision making. He is currently interviewing jihadists in the Middle East, exploring the limits of rational choice and the role of sacred values among suicide terrorists.

Jesse M. Bering is a reader in psychology and director of the Institute of Cognition and Culture at the Queen's University, Belfast. His research interests in this area include intuitive perceptions of the afterlife, folk psychologies of souls, and the concepts of meaning and destiny. He applies an empirical cognitive science perspective to these traditional philosophical questions and places them within the framework of evolutionary theory.

Thomas J. Bouchard Jr., Ph.D., is professor of psychology at the University of Minnesota. His research program encompasses the entire range of normal adult individual differences (personality, mental ability, psychological interests, psychomotor skills, work-related behaviors, and social attitudes). His study populations include twins reared together and apart as well as ordinary adoptees and spouses. He has served as president of the Behavior Genetics Association and vice president of the International Society for Twin Studies. He served as the Distinguished Scientific Speaker for the American Psychological Association (1995) and has received the Galton Award (1995), the Dobzhansky Memorial Award for a Lifetime of Outstanding Scholarship in Behavior Genetics (2001), and the Kistler Prize (2005) for his work on the genetics of behavior.

Joseph Bulbulia (Ph.D., Princeton University, 2001) is a senior lecturer at Victoria University of Wellington, New Zealand, where he teaches in the Religious Studies program. His current research centers on biofunctional aspects of religious cognition, evolutionary game theory, and the evolutionary biology of costly signaling. His articles have appeared in such journals as *Biology and Philosophy*, *Evolution and Cognition*, and *Method and Theory in the Study of Religion*. He is revising his dissertation "Before Eden: Religion and the Evolved Mind" for publication. Joseph currently serves on the executive committee of the International Association for the Cognitive Science of Religion.

Robert A. Emmons, Ph.D., is professor of psychology at the University of California, Davis, where he has taught since 1988. He received his Ph.D. in personality and social ecology from the University of Illinois at Urbana-Champaign and his bachelor degree from the University of Southern Maine. He is the author of nearly 100 original publications in peer-reviewed journals or chapters in edited volumes, including the books *The Psychology of Ultimate Concerns: Motivation and Spirituality in Personality*, *Words of Gratitude for Body, Mind, and Soul*, and *The Psychology of Gratitude*. He is past president of the American Psychological Association's Division 36 (Psychology of Religion). He is founding editor and editor in chief of the *Journal of Positive Psychology*. He was formerly an associate editor for the *Journal of Personality and Social*

Psychology and is currently on the editorial board of the *International Journal for the Psychology of Religion*. In 1999, he coedited a special issue of the *Journal of Personality* on religion and personality, and he is coauthor of a 2003 *Annual Review of Psychology* chapter on the psychology of religion. His research focuses on personal goals, spirituality, the psychology of gratitude and thankfulness, and subjective well-being.

Lee A. Kirkpatrick is currently associate professor and director of graduate studies in psychology at the College of William and Mary in Virginia. He received his Ph.D. in social/personality psychology from the University of Denver in 1988. He has published numerous scholarly articles and chapters on a variety of topics in social psychology, the psychology of religion, and evolutionary psychology. He is author of *Attachment, Evolution, and the Psychology of Religion* and, with Brooke Feeney, *A Simple Guide to SPSS for Windows*.

Laura B. Koenig, M.A., is an advanced graduate student at the University of Minnesota in the area of behavior genetics and individual differences. Her current research interests include religiousness and its development. She has studied change and stability in religiousness in early adulthood as well as the genetic and environmental influences on religiousness over time.

James McClenon is a professor of sociology at Elizabeth City State University, North Carolina. He is author of *Deviant Science: The Case of Parapsychology* (1984), *Wondrous Events: Foundations of Religious Belief* (1994), and *Wondrous Healing: Shamanism, Human Evolution, and the Origin of Religion* (2002) and is assistant editor of the *Encyclopedia of Religion and Society* (1998).

Steven Pinker, a native of Montreal, received his B.A. from McGill University in 1976 and his Ph.D. in psychology from Harvard in 1979. After serving on the faculties of Harvard and Stanford universities for a year each, he moved to the Massachusetts Institute of Technology in 1982, where he spent 21 years before returning to Harvard in 2003 as the Johnstone Family Professor of Psychology. His research has focused on visual cognition and the psychology of language. The research has been reported in two technical books and many journal articles and won the Troland Award from the National Academy of Sciences, the Henry Dale Prize from the Royal Institution of Great Britain, and the Early Career Award and McCandless Prize from the American Psychological Association. He has also received awards for graduate and undergraduate teaching, two prizes for general achievement, three honorary doctorates, and eight awards for his critically acclaimed popular science books *The Language Instinct*, *How the Mind Works*, and *The Blank*

Slate, the latter two of which were also finalists for the Pulitzer Prize in Nonfiction. He is an elected fellow of several scholarly societies, including the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the Neuroscience Research Program. He is an associate editor of *Cognition* and serves on many professional panels, such as the Usage Panel of the *American Heritage Dictionary*, the Scientific Advisory Panel of the *Evolution* series on NOVA, and the Endangered Language Fund. He also writes in the popular press, including for the *New York Times*, *Time*, *The New Yorker*, and *Technology Review*.

Ilkka Pyysiäinen was educated in theology and comparative religion at the University of Helsinki, Finland. He earned his Ph.D. in 1993 with a thesis on Buddhist mysticism. Since then, he has dedicated himself to the exploration of religious cognition. He has published numerous articles and books. Among his monographs are *How Religion Works* (2001) and *Magic, Miracles, and Religion*. He currently works as an academy research fellow at the Helsinki Collegium for Advanced Studies.

Richard Sosis began his graduate career at the University of Michigan in the Department of Anthropology and the interdisciplinary Evolution and Human Behavior program. He continued his education in the Human Evolutionary Ecology program at the University of New Mexico and received his doctorate in anthropology there in 1997. He is currently an associate professor of anthropology at the University of Connecticut and a senior lecturer in the Department of Sociology and Anthropology at The Hebrew University of Jerusalem. His research has focused on the evolution of cooperation and the adaptive significance of religious behavior. Over the past five years, he has contributed theoretical, empirical, and popular pieces to the emerging literature on the evolution of religion. Under the umbrella of human behavioral ecology, this work has been interdisciplinary, including perspectives from psychology, neuroscience, evolutionary biology, economics, sociology, and his primary area of training, anthropology. He has conducted fieldwork with remote cooperative fishers in the Federated States of Micronesia and with various communities throughout Israel, including Ultra-Orthodox Jews and members of secular and religious communes. He has also pursued ethnohistorical research on nineteenth-century utopian communal societies and conducted economic experiments with nonstudent populations in Israel and the United States.

Wesley J. Wildman, Associate Professor of Theology and Ethics, is Chair of the Philosophy, Theology, and Ethics Department at Boston University's

School of Theology. He is Convener of the Graduate School's doctoral program in Science, Philosophy, and Religion. He has been a member of the Boston-based Comparative Religious Ideas Research Project; the Divine Action Project, which is jointly sponsored by the Center for Theology and the Natural Sciences and the Vatican Observatory; the Religion and Brain Project, based at the Boston University School of Medicine's Evolutionary Neurobehavior Laboratory; and the Relational Ontology Project within the Templeton Humble Approach Initiative. He is the author of *Fidelity with Plausibility: Modest Christologies in the Twentieth Century* (SUNY, 1997) and coeditor of *Religion and Science: History, Method, Dialogue* (Routledge, 1996) and *Encyclopedia of Science and Religion* (Macmillan Reference, 2003). The author of more than fifty scholarly articles and book chapters, Professor Wildman invites inquiry into theological and ethical topics using resources from multiple disciplines, including the natural and human sciences.

His research and publications have embraced topics such as religious experience, religious language, religious knowledge, religion and ethics, religion and the human condition, theories of ultimate realities, theories of divine action, theories of religious genius, theories of comparison in relation to religious ideas, and theories of rational inquiry.

ABOUT THE ADVISORY BOARD

Scott Atran, Ph.D., conducts research and is centered in the following areas: cognitive and linguistic anthropology, ethnobiology, environmental decision making, categorization and reasoning, evolutionary psychology, anthropology of science (history and philosophy of natural history and natural philosophy), Middle East ethnography and political economy, natural history of Lowland Maya, cognitive and commitment theories of religion, terrorism, and foreign affairs.

The evolution of religion is a topic he explores in his book *In Gods We Trust* (2002). He is based both at the National Center for Scientific Research in Paris and at the University of Michigan. His recent work has focused on suicide terrorism. He has marshaled evidence that indicates that suicide bombers are not poor and crazed as depicted in the press but well-educated and often economically stable individuals with no significant psychological pathology.

Donald Capps, Ph.D., is Princeton's William Harte Felmeth Professor of Pastoral Psychology. He draws on his training as a psychologist of religion in both his teaching and his writing. In 1989, he was awarded an honorary doctorate in sacred theology from the University of Uppsala, Sweden, in recognition of his publications in the psychology of religion and pastoral care and of his leadership role in the Society for the Scientific Study of Religion, for which he served as editor of its professional journal from 1983 to 1988 and as president from 1990 to 1992.

J. Harold Ellens, Ph.D., is series editor for Praeger's Psychology, Religion and Spirituality series. He is a research scholar at the University of Michigan, Department of Near Eastern Studies. He is a retired Presbyterian theologian and ordained minister, a retired U.S. Army colonel, and a retired professor of philosophy, theology, and psychology. He has authored, coauthored, and/or edited 111 books and 165 professional journal articles. He served 15 years as executive director of the Christian Association for Psychological Studies and as founding editor and editor in chief of the *Journal of Psychology and Christianity*. He holds a Ph.D. from Wayne State University in the psychology of human communication, a Ph.D. from the University of Michigan in biblical and Near Eastern studies, and master degrees from Calvin Theological Seminary, Princeton Theological Seminary, and the University of Michigan. He was born in Michigan, grew up in a Dutch-German immigrant community, and determined at age seven to enter the Christian ministry as a means to help his people with the great amount of suffering he perceived all around him. His life's work has focused on the interface of psychology and religion.

Harold Koenig, M.D., M.H.Sc., is an associate professor of psychiatry and medicine at Duke University. He is director and founder of the Center for the Study of Religion/Spirituality and Health at Duke University; editor of the *International Journal of Psychiatry in Medicine*, and founder and editor in chief of *Research News in Science and Theology*, the monthly international newspaper of the John Templeton Foundation. His latest books include the *Handbook of Religion and Mental Health*, *The Healing Power of Faith: Science Explores Medicine's Last Great Frontier*, and *Religion and Health: A Century of Research Reviewed*.

Koenig completed his undergraduate education at Stanford University, his medical school training at the University of California at San Francisco, and his geriatric medicine, psychiatry, and biostatistics training at Duke University Medical Center. He is board certified in general psychiatry, geriatric psychiatry, and geriatric medicine and is on the faculty at Duke as professor of psychiatry and behavioral sciences and associate professor of medicine. He is also a registered nurse.

Koenig has published extensively in the fields of mental health, geriatrics, and religion, with nearly 250 scientific peer-reviewed articles and book chapters and 26 books in print or in preparation. His research on religion, health, and ethical issues in medicine has been featured on approximately 50 national and international television news programs (including all major U.S. news networks), 80 national or international radio programs (including multiple NPR, BBC, and CBC interviews), and close to 200 national or international newspapers or magazines (including cover stories for *Reader's Digest*, *Parade* magazine, and *Newsweek*). Koenig has been nominated twice

for the Templeton Prize for Progress in Religion. His latest books include *The Healing Power of Faith* (2001), *The Handbook of Religion and Health* (2001), *Spirituality in Patient Care* (2002), and his autobiography *The Healing Connection* (2004).

Andrew B. Newberg, M.D., is director of clinical nuclear medicine, director of neuroPET research, and assistant professor in the Department of Radiology at the Hospital of the University of Pennsylvania. On graduating from the University of Pennsylvania School of Medicine in 1993, Newberg trained in internal medicine at the Graduate Hospital in Philadelphia—serving as chief resident in his final year—and subsequently completed a fellowship in nuclear medicine in the Division of Nuclear Medicine, Department of Radiology, at the University of Pennsylvania. He is board certified in internal medicine, nuclear medicine, and nuclear cardiology.

In collaboration with the Departments of Neurology and Psychiatry, Newberg has actively pursued neuroimaging research projects, including the study of aging and dementia, epilepsy, and other neurological and psychiatric disorders. Additionally, he has researched the neurophysiological correlates of acupuncture, meditation, and other types of complementary therapies.

Newberg has presented his research at national and international scientific and religious meetings; his numerous published articles and chapters cover the topics of brain function, brain imaging, and the study of religious and mystical experiences. In addition to the extensive press he has received, he has appeared on ABC's *World News Tonight* and is coauthor, with Eugene G. d'Aquili, M.D., of *The Mystical Mind: Probing the Biology of Belief*.

Recently, Newberg received a Science and Religion Course Award from the Center for Theology and the Natural Sciences to teach the course titled "The Biology of Spirituality" in the Department of Religious Studies, University of Pennsylvania (spring 2000).

Raymond F. Paloutzian, Ph.D., is a national and international expert in the psychology of religion and spirituality. He received his doctoral degree in 1972 from Claremont Graduate School and has been a professor of experimental and social psychology at Westmont College, Santa Barbara, California, since 1981. He has been a visiting professor teaching psychology of religion at Stanford University and guest professor at Katholieke Universiteit Leuven, Belgium. He is a fellow of the American Psychological Association (divisions of general, teaching, social issues, psychology of religion, and international), the American Psychological Society, and the Western Psychological Association and has served as president of the American Psychological Association's Division 36 (Psychology of Religion

and Spirituality). The division honored him with the 2005 Virginia Sexton Mentoring Award for contributing to the development of other scholars in the field. He wrote *Invitation to the Psychology of Religion* (2nd ed.1996; 3rd ed. forthcoming) and, with Crystal Park, edited the *Handbook of the Psychology of Religion and Spirituality* (2005). He is currently writing chapters on religion and spirituality for handbooks by Oxford University Press and Blackwell Publishers. His current research focuses on religiously motivated child abuse and medical neglect and on a systematic review of the literature on spiritual well-being. Paloutzian is editor of the *International Journal for the Psychology of Religion*.

Kenneth Pargament, Ph.D., has conducted nationally and internationally known research that addresses religion as a resource for coping with major life stressors. His research has also examined how religion can be a source of struggle for people facing major medical illnesses. He has studied the process by which people create perceptions about the sanctity of aspects of their life activities and the various effects of “sanctification” for individual and interpersonal well-being. Most recently, he has been developing and evaluating spiritually integrated approaches to psychotherapy. Pargament won the William James Award for Excellence in Research from Division 36 of the American Psychological Association. He also won the 2000 Virginia Staudt Sexton Mentoring Award from the American Psychological Association for his generous work in encouraging both faculty, undergraduate, and graduate research in the psychology of religion. He has published extensively and his work has received national and international media attention.

WHERE GOD AND
SCIENCE MEET

**Recent Titles in
Psychology, Religion, and Spirituality**

J. Harold Ellens, Series Editor

Married to an Opposite: Making Personality Differences Work for You
Ron Shackelford

Sin against the Innocents: Sexual Abuse by Priests and the Role of the
Catholic Church
Thomas G. Plante, editor

Seeking the Compassionate Life: The Moral Crisis for Psychotherapy and
Society
Carl Goldberg and Virginia Crespo

Psychology and the Bible: A New Way to Read the Scriptures, 4 Volumes
J. Harold Ellens and Wayne E. Rollins, editors

Sex in the Bible: A New Consideration
J. Harold Ellens

WHERE GOD AND SCIENCE MEET

How Brain and Evolutionary Studies
Alter Our Understanding of Religion

VOLUME 2

The Neurology of Religious Experience

Edited by Patrick McNamara

PRAEGER PERSPECTIVES

Psychology, Religion, and Spirituality

J. Harold Ellens, Series Editor

PRAEGER

Westport, Connecticut
London

Library of Congress Cataloging-in-Publication Data

Where God and science meet : how brain and evolutionary studies alter our understanding of religion / edited by Patrick McNamara.

p. cm. — (Psychology, religion, and spirituality, ISSN 1546-8070)

Includes index.

ISBN 0-275-98788-4 (set) — ISBN 0-275-98789-2 (v. 1) — ISBN 0-275-98790-6 (v. 2) — ISBN 0-275-98791-4 (v. 3)

1. Psychology, Religious. 2. Genetic psychology. 3. Evolutionary psychology. 4. Experience (Religion) 5. Neurology. I. McNamara, Patrick H.

BL53.W511 2006

200.1'9—dc22 2006021770

British Library Cataloguing in Publication Data is available.

Copyright © 2006 by Patrick McNamara

All rights reserved. No portion of this book may be reproduced, by any process or technique, without the express written consent of the publisher.

Library of Congress Catalog Card Number: 2006021770

ISBN: 0-275-98788-4 (set)

0-275-98789-2 (vol. 1)

0-275-98790-6 (vol. 2)

0-275-98791-4 (vol. 3)

ISSN: 1546-8070

First published in 2006

Praeger Publishers, 88 Post Road West, Westport, CT 06881

An imprint of Greenwood Publishing Group, Inc.

www.praeger.com

Printed in the United States of America



The paper used in this book complies with the Permanent Paper Standard issued by the National Information Standards Organization (Z39.48-1984).

10 9 8 7 6 5 4 3 2 1

CONTENTS

VOLUME 2 THE NEUROLOGY OF RELIGIOUS EXPERIENCE

<i>Series Foreword</i> by J. Harold Ellens	vii
<i>Acknowledgments</i>	xi
<i>Preface</i> by Patrick McNamara	xiii
CHAPTER 1 The Chemistry of Religiosity: Evidence from Patients with Parkinson's Disease <i>Patrick McNamara, Raymon Durso, Ariel Brown, and Erica Harris</i>	1
CHAPTER 2 Religious and Spiritual Practices: A Neurochemical Perspective <i>Andrew B. Newberg</i>	15
CHAPTER 3 Neuroimaging Studies of Religious Experience: A Critical Review <i>Nina P. Azari</i>	33
CHAPTER 4 Religion and the Life Course: Is Adolescence an "Experience Expectant" Period for Religious Transmission? <i>Candace S. Alcorta</i>	55

CHAPTER 5	Neurotheology: A Science of What? <i>Matthew Ratcliffe</i>	81
CHAPTER 6	Religion as a By-Product of Evolved Psychology: The Case of Attachment and Implications for Brain and Religion Research <i>Pehr Granqvist</i>	105
CHAPTER 7	Religious Conversion, Spiritual Transformation, and the Neurocognition of Meaning Making <i>Raymond F. Paloutzian, Erica L. Swenson, and Patrick McNamara</i>	151
CHAPTER 8	Religion and the Brain: Evidence from Temporal Lobe Epilepsy <i>Steven C. Schachter</i>	171
CHAPTER 9	The Frontal Lobes and the Evolution of Cooperation and Religion <i>Patrick McNamara</i>	189
CHAPTER 10	Mind Design and the Capacity for Ritual Performance <i>Carl Seaquist</i>	205
CHAPTER 11	The Brain, Religion, and Baseball: Comments on the Potential for a Neurology of Religion and Religious Experience <i>Warren S. Brown</i>	229
	<i>Index</i>	245
	<i>About the Editor and Contributors</i>	255
	<i>About the Advisory Board</i>	261

SERIES FOREWORD

The interface between psychology, religion, and spirituality has been of great interest to scholars for a century. In the last three decades a broad popular appetite has developed for books which make practical sense out of the sophisticated research on these three subjects. Freud expressed an essentially deconstructive perspective on this matter and indicated that he saw the relationship between human psychology and religion to be a destructive interaction. Jung, on the other hand, was quite sure that these three aspects of the human spirit, psychology, religion, and spirituality, were constructively and inextricably linked.

Anton Boisen and Seward Hiltner derived much insight from both Freud and Jung, as well as from Adler and Reik, while pressing the matter forward with ingenious skill and illumination. Boisen and Hiltner fashioned a framework within which the quest for a sound and sensible definition of the interface between psychology, religion, and spirituality might best be described or expressed.¹ We are in their debt.

This series of General Interest Books, so wisely urged by Greenwood Press, and particularly by its editors, Deborah Carvalko and Suzanne I. Staszak-Silva, intends to define the terms and explore the interface of psychology, religion, and spirituality at the operational level of daily human experience. Each volume of the series identifies, analyzes, describes, and evaluates the full range of issues, of both popular and professional interest, that deal with the psychological factors at play (1) in the way religion takes shape and is expressed, (2) in the way spirituality functions within human persons and shapes both religious formation and expression, and (3) in the ways that

spirituality is shaped and expressed by religion. The interest is psycho-spiritual. In terms of the rubrics of the disciplines and the science of psychology and spirituality this series of volumes investigates the *operational dynamics* of religion and spirituality.

The verbs “shape” and “express” in the above paragraph refer to the forces which prompt and form religion in persons and communities, as well as to the manifestations of religious behavior (1) in personal forms of spirituality, (2) in acts of spiritually motivated care for society, and (3) in ritual behaviors such as liturgies of worship. In these various aspects of human function the psychological and/or spiritual drivers are identified, isolated, and described in terms of the way in which they unconsciously and consciously operate in religion, thought, and behavior.

The books in this series are written for the general reader, the local library, and the undergraduate university student. They are also of significant interest to the informed professional, particularly in fields corollary to his or her primary interest. The volumes in this series have great value for clinical settings and treatment models, as well.

This series editor has spent an entire professional lifetime focused specifically upon research into the interface of psychology in religion and spirituality. These matters are of the highest urgency in human affairs today when religious motivation seems to be playing an increasing role, constructively and destructively, in the arena of social ethics, national politics, and world affairs. It is imperative that we find out immediately what the psychopathological factors are which shape a religion that can launch deadly assaults upon the World Trade Center in New York and murder 3,500 people, or a religion that motivates suicide bombers to kill themselves and murder dozens of their neighbors weekly, and a religion which prompts such unjust national policies as pre-emptive defense; all of which are wreaking havoc upon the social fabric, the democratic processes, the domestic tranquility, the economic stability and productivity, and the legitimate right to freedom from fear, in every nation in the world today.

This present set of three volumes, the project on religion and the brain, is an urgently needed and timely work, the motivation for which is surely endorsed enthusiastically by the entire world today, as the international community searches for strategies that will afford us better and deeper religious self-understanding as individuals and communities. This project addresses the deep genetic and biological sources of human nature which shape and drive our psychology and spirituality. Careful strategies of empirical, heuristic, and phenomenological research have been employed to give this work a solid scientific foundation and formation. Never before has so much wisdom and intelligence been brought to bear upon the dynamic linkage between human physiology, psychology, and spirituality. Each of these three aspects

has been examined from every imaginable direction through the illuminating lenses of the other two.

For fifty years such organizations as the Christian Association for Psychological Studies and such Graduate Departments of Psychology as those at Boston University, Fuller, Rosemead, Harvard, George Fox, Princeton, and the like, have been publishing significant building blocks of empirical, heuristic, and phenomenological research on issues dealing with religious behavior and psycho-spirituality. In this present project the insights generated by such patient and careful research are synthesized and integrated into a holistic psycho-spiritual world view, which takes the phenomenology of religion seriously.

Some of the influences of religion upon persons and society, now and throughout history, have been negative. However, most of the impact of the great religions upon human life and culture has been profoundly redemptive and generative of great good. It is urgent, therefore, that we discover and understand better what the psychological and spiritual forces are which empower people of faith and genuine spirituality to give themselves to all the creative and constructive enterprises that, throughout the centuries, have made of human life the humane, ordered, prosperous, and aesthetic experience it can be at its best. Surely the forces for good in both psychology and spirituality far exceed the powers and proclivities toward the evil that we see so prominently perpetrated in the name of religion in our world today.

This series of Greenwood Press volumes is dedicated to the greater understanding of *Psychology, Religion and Spirituality*, and thus to the profound understanding and empowerment of those psycho-spiritual drivers which can help us transcend the malignancy of our earthly pilgrimage and enormously enhance the humaneness and majesty of the human spirit, indeed, the potential for magnificence in human life.

J. Harold Ellens

NOTE

1. Aden, L., & Ellens, J. H. (1990). *Turning points in pastoral care: The legacy of Anton Boisen and Seward Hiltner*. Grand Rapids, MI: Baker.

ACKNOWLEDGMENTS

I would like to thank Debbie Carvalko from Greenwood Press for her advocacy of this project, for her help at every step of the way, and for her advice and encouragement at critical junctures of the project. I would also like to thank J. Harold Ellens for his belief in the importance of this project and for his sage advice throughout. Our advisory board members—Ray Paloutzian, Kenneth Pargament, Harold Koenig, Andrew Newberg, Scott Atran, and Donald Capps—in addition to their help in identifying topics to be covered also helped us to find the best authors to cover them! Advisors also kept the editor from making mistakes that could have cost the project dearly. In short, these advisors have immeasurably increased the quality of these volumes. I would also like to thank Lena Giang, Pattie Johnson, Anna Kookoolis, Jocelyn Sarmiento, and Sarah Varghese for their help with editing and formatting the references for all the chapters in the series—a thankless task at best, but these assistants did it both conscientiously and carefully. Finally, I would like to thank Ms. Erica Harris, my head research assistant, who helped out on all aspects of this project. Her organizational help has meant all the difference throughout. She did yeoman's work on the project Web site, kept track of correspondence with authors, and generally kept the project running smoothly and on schedule.

PREFACE

In recent years, several lines of evidence have converged on the conclusion that religiousness is associated with a specific and consistent set of biological processes. Religion appears to be a cultural universal. There may be a critical period (adolescence) during the life cycle of normally developing persons when religiousness is best transmitted from an older to a younger generation (see volume II, chapter 4). Individual differences in religiosity are associated with consistent health benefits (see volume I, chapter 7; volume III, chapter 2) as well as unique health risks (see volume III, chapters 4 and 8). Twin studies have shown that religiousness is moderately to highly heritable (see volume I, chapter 3). Genetic studies have implicated specific genes in religiousness (mostly genes that code for regulatory products of monoamine transmission in limbic-prefrontal networks; for reviews, see Comings, Gonzales, Saucier, Johnson, & MacMurray, 2000; D'Onofrio, Eaves, Murrelle, Maes, & Spilka, 1999; Hamer, 2004; see also volume I, chapter 3). Consistent with these preliminary genetic studies, neurochemical and neuropharmacologic studies have implicated limbic-prefrontal serotonergic and dopaminergic mechanisms in mediation of religious experiences (see volume II, chapters 1 and 2; volume III, chapters 1 and 10). Neuroimaging and neuropsychologic studies have implicated a consistent set of neurocognitive systems and brain activation patterns in religious activity (mostly limbic-prefrontal networks (see volume II, chapters 2, 3, 8, and 9; volume III, chapter 7). A cognitive psychology of religious belief has revealed both the unique aspects of religious cognition as well as its commonalities with other basic cognitive processing routines (see volume I, chapters 6, 9, and 10; volume II, chapter 10). Finally, changes in self-reported

religious experience by individuals suffering from obsessive-compulsive disorder; schizophrenia, Parkinson's disease, and temporal lobe epilepsy are in the expected direction if the previously mentioned neurocognitive networks (limbic-prefrontal) do in fact mediate core aspects of religiousness (see volume II, chapters 1 and 8; volume III, chapter 1).

Although the array of previously mentioned findings suggests to some investigators that it is reasonable to speak about potential neurocognitive specializations around religiosity, caution is in order when attempting to interpret the findings (see volume II, chapters 3, 5, 6, and 8; and all three commentaries). As in every other scientific enterprise, what is investigated in any given study is not the whole phenomenon of interest but rather only a small constituent part of the whole. The previously cited studies could not investigate "religion" *per se*. That is too vast a phenomenon to be studied in a single project. Instead, they tried to operationalize religiousness in various ways—with everything from a score on an inventory about religious practices to measurements on those practices themselves. Thus, we are reduced to making inferences about the nature of religiousness from data we collect via these questionnaire and observational/experimental methods. Making inferences about the nature of religion as a whole from neurobiologic correlations of one aspect of religiosity is, of course, fraught with danger (as all three commentators and several of our authors point out), but there is simply no other way to proceed. Inference and extrapolation from observations you collect on operationalized measures of the phenomenon you are interested in is necessary if you want to make progress. What is all-important, however, is to extrapolate, infer, and proceed with caution and humility. Constraints on incautious claims and inferences can often be obtained if you have a good theoretical framework from which to generate inferences about data meanings and from which you can develop falsifiable hypotheses. When it comes to biologic correlates of religiousness, the best available theory is evolution. Thus, several of the essays in these volumes discuss potential evolutionary and adaptive functions of religion.

Claims, however, about potential adaptive functions of religiousness also need to be treated with great caution and tested against the evidence. Several authors in these volumes address the question of whether religiousness can be considered an evolutionary adaptation (see volume I, chapters 1, 4, 5, 7, 8, and 10; volume II, chapter 4; volume III, chapter 6; and all three commentaries). For those scientists who think the evidence supports some variant of an adaptationist position (see volume I, chapters 4, 5, 7, and 10; volume II, chapter 4; volume III, chapter 6), the questions shift to what part of religiousness is actually adaptive and what functions might religiousness enact? Some theorists suggest that it is reasonable to speak about a "common core" religious experience fundamental to all forms of religiosity (see volume I, chapter 7; volume III, chapters 5 and 6). Some investigators suggest that the aspect of religiousness that was "selected" over evolutionary history was the

capacity for trance, placebo responding, or altered states of consciousness, or ASC (see volume I, chapters 5 and 7; volume III, chapter 6). The capacity for trance, placebo responding, and ASC, of course, would yield both health benefits and arational or even irrational belief states over time. Other theorists (see volume I, chapters 4 and 5; volume II, chapter 4) suggest that the aspect of religiousness that was selected over evolutionary history was its ability, primarily via ritual displays and other “costly signals” (see volume I, chapters 2, 4, and 5; volume II, chapter 10), to solve the free-rider problem (where unscrupulous individuals exploit the benefits of group cooperation without paying any of the costs of that cooperation) and thereby promote cooperation among individuals within early human groups. Other theorists who tilt toward some kind of adaptationist position emphasize both costly signaling theory as well as gene–culture interactions to explain particular associations of religiosity, such as its ability to promote character strengths (volume I, chapter 2), its ability to protect against death-related fears (volume I, chapter 9; volume III, chapter 8), its ability to generate life meanings (volume III, chapter 3), its ability to address attachment needs (volume I, chapter 8; volume II, chapter 6), its links with the sources and phenomenology of dreams (volume III, chapter 9), and its similarities with special perceptual capacities of the aesthetic sense (volume II, chapter 7).

Although it has to be admitted that all these investigators have marshaled an impressive array of evidence to support their claims concerning religion’s potential adaptive functions, all the authors of these theories realize that it is nearly impossible to demonstrate conclusively that some biopsychologic process is an adaptation, in the classical sense of that term. Several authors in these volumes have pointed out just how easy it is to get muddled when attempting to think through evolutionary approaches to a phenomenon as complex as religiousness (see volume I, chapters 1, 8 and 10; volume II, chapter 6; and all three commentaries). It is all too easy to overlook the harmful (and presumably nonadaptive) aspects of religiousness (see volume I, chapters 1 and 6; volume III, chapters 4 and 8). Ignorance of the complexity of religious phenomena, an underappreciation of the pervasive effects of social learning and cultural transmission on cognitive functions, and confusion around technical terms in evolutionary biology (such as adaptation, exaptation, and so forth) all militate against progress in this new science of the biology of religion.

To help think through problems of evolutionary change and adaptations in animals, the evolutionary biologist has often utilized the principles and methods of cladistics and phylogenetic analysis. Debates on potential adaptive functions of religion may benefit by taking a look at these methods. Cladistic methodology is used to analyze phylogenetic relationships in lineages that are recognized by the presence of shared and derived (advanced) characteristics. When cladistic methodology is supplemented with the advanced

statistical tools of “phylogenetic analysis,” you get precise and powerful techniques for reconstructing evolutionary history. These techniques have now been successfully used in the cultural arena, as in analyzing biocultural changes (e.g., language evolution). Scholars of ritual and religious practices have now amassed a huge amount of data on the historical development of ritual practices and on ritual practices in premodern human groups. There may therefore be enough data to reconstruct the evolutionary history of ritual practices in certain human lineages. If there is also enough data available on the history of various forms of healing practices of cooperative enterprises (e.g., farming or herding), it may be possible to assess change in ritual practices against change in these other forms of human activity. By superimposing phenotypic features (e.g., ritual practices) over accepted language phylogenies, one can reconstruct the history of evolutionary change in ritual practices as well as potential correlated change in health or in cooperative practices. Thus, hypotheses about potential adaptive functions of key aspects of religiousness may be tested quantitatively using these sorts of methods. With these sorts of methods, one could also potentially assess whether some aspect of religiousness (e.g., ritual practices) fit criteria for an adaptation or an exaptation. An adaptation involves the modification of a phenotypic feature (e.g., a particular ritual practice) that accompanies or parallels an evolutionary acquisition of a function (new healing practices or new forms of cooperation). However, in exaptation, the feature originates first rather than in parallel and only later is co-opted for the function in question. In short, because phylogenetic analysis involves quantitative reconstruction and analysis of histories of shared and derived traits, it provides powerful methods for identification of potential adaptive functions of religion. I draw attention to these techniques only to point out their potential. They have significant limitations, and they have not yet been applied to many problems in biocultural evolution. In particular, phylogenetic techniques have not yet been brought to bear on questions of the evolutionary history of religious practices. Nevertheless, they may be one way to shed some light on the problem of potential adaptive functions of religion.

The fact that reasonable speculations about potential adaptive functions of religion can be advanced at all is partly due to the startling consistency of the evidence summarized in these volumes on the neurobiologic correlates of religiousness. While tremendous progress has been made in identifying neurobiologic correlates of religiousness, it will be a challenge to place these findings in new theoretical frameworks that can do justice to the richness and complexity of the religious spirit. The essays in these volumes provide the necessary first tools to do just that.

Patrick McNamara

REFERENCES

- Comings, D. E., Gonzales, N., Saucier, G., Johnson, J. P., & MacMurray J. P. (2000). The DRD4 gene and the spiritual transcendence scale of the character temperament index. *Psychiatric Genetics, 10*, 185–189.
- D’Onofrio, B. M., Eaves, L. J., Murrelle, L., Maes, H. H., & Spilka, B. (1999). Understanding biological and social influences on religious attitudes and behaviors: A behavior genetic perspective. *Journal of Personality, 67*, 953–984.
- Hamer, D. (2004). *The God gene: How faith is hardwired into our genes*. New York: Doubleday.

CHAPTER 1

THE CHEMISTRY OF RELIGIOSITY: EVIDENCE FROM PATIENTS WITH PARKINSON'S DISEASE

*Patrick McNamara, Raymon Durso, Ariel Brown,
and Erica Harris*

INTRODUCTION

While the scientific study of religion has gained momentum in recent years (see reviews Albright & Ashbrook, 2001; Andresen, 2001; Boyer, 2001; d'Aquilli & Newberg, 1999; Newberg, d'Aquilli, et al., 2001; Wilson, 2002), experimental neuropsychologic studies of religiosity have remained exceedingly rare. The time is ripe for development of an experimental approach to the study of the neurology of religion as a fairly large amount of preliminary and theoretical work on neurobiologic correlates of religious experience has been published (Albright & Ashbrook, 2001; d'Aquilli & Newberg, 1999; Newberg, Alavi, et al., 2001; Schroeder, 2001). d'Aquilli and Newberg's (1999) and Newberg et al.'s models of the neurobiology of religious experience are discussed below. Albright and Ashbrook (2001) and Ashbrook and Albright (1997) provide a reconceptualization of brain functions as shaped by religious impulses, emphasizing links of the frontal lobes with functions basic to religiosity such as the human capacity for empathy, agency, intentionality and purpose (Albright & Ashbrook, 2001; Ashbrook & Albright, 1997). We focus in this chapter on the potential role that both the mesocortical dopaminergic system and the frontal lobes play in support of religious cognition and behavior. The mesocortical dopaminergic system is simply a set of nerve fibers that specialize in use of dopamine as their neurotransmitter and that project from lower sites in the mid-brain to higher sites in the frontal cortex. They are important because they activate or turn on functions of the frontal lobes. The frontal

lobes, in turn, handle very high-level executive functions of the brain such as activating other brain areas and orchestrating complex mental and motor functions. Because the meso-cortical dopaminergic systems project to the frontal lobes, we can expect correlated effects of dopamine and frontal system dysfunction on religiosity.

Investigation of potential dopaminergic contributions to religious behavior is vitally important because it might help to explain two religion-related phenomena of enormous significance to public health: (a) religion's association with improved health outcomes for some individuals and (b) religion's association with the adoption of a dangerous fanaticism and intolerance in other individuals. Dopaminergic circuits are known to exert a regulatory influence on hypothalamic, autonomic and neuro-hormonal systems that impact the ability to respond to stress (Buijs & Van Eden, 2000) and thus might indirectly contribute to health. Similarly, negative effects of religious belief might be at least partially clarified by comparison to neuropsychiatric symptoms typically associated with dysfunction in striatal-frontal dopaminergic circuits (Fiske & Haslam, 1997). For example, such dysfunction may give rise to symptoms of obsessive-compulsive spectrum disorder or a rigid adherence to maladaptive beliefs and behavioral routines (Fiske & Haslam, 1997; Jenike, Baeri, & Minichiello, 1998), as well as threats of violence when those routines are threatened (Pincus, 1999).

Evidence is accumulating from both neuroimaging and clinical work that points to a significant link between dopamine, frontal function and religiosity.

RELIGION AND THE FRONTAL LOBES

Religiosity has traditionally been linked to the temporal lobes (e.g., Bear & Fedio, 1977; d'Aquilli & Newberg, 1993; Persinger, 1987; Ramachandran, Hirstein, Armel, Tecome, & Iragul, 1997). But most of the evidence for a role of the temporal lobes in religious experience was based on observations of the behaviors of a small subset of temporal lobe epileptics who exhibited the inter-ictal behavioral syndrome (Dewhurst & Beard, 1970; Geschwind, 1983; Ramachandran et al., 1997). The "syndrome" included hyper-religiosity as one of its signs. d'Aquilli and Newberg (1993) very sensibly assume that all the major areas of the brain generate some aspect of the total religious experience. In their models of religion and brain, the job of the temporal lobes is to attach meaning and significance to events while posterior parietal sites participate in construction of both the sense of self and the accompanying sense of the dissolution of the self during mystical states. With respect to the frontal lobes, d'Aquilli and Newberg (1993) reviewed a number of studies that apparently established a link between sustained attention associated with the practice of meditation and EEG theta waves above the pre-frontal cortex. The EEG data therefore suggests that sustained meditation

results in activation of prefrontal networks. Newberg, Alavi, Baime, Mozley, and d'Aquilli (1997) later confirmed these EEG data using SPECT imaging techniques. Regional cerebral blood flow changes were studied in six highly experienced meditators while they meditated. Results demonstrated significantly increased blood flow to the inferior frontal and dorsolateral prefrontal cortical regions while subjects engaged in intense meditation. More recently, Azari et al., (2001) reported greater dorsolateral frontal, dorsomedial frontal and medial parietal cortex activation during religious recitation in self-described religious subjects.

THE FRONTAL LOBES AND DOPAMINE

The frontal lobes comprise the large expanse of cortex in the anterior portions of the brain and increase in size and connectivity with both phylogenetic (evolutionary) and ontogenetic (individual) development (Banyas, 1999; Fuster, 1989; Goldman-Rakic, 1987; Passingham, 1995). They are not fully myelinated (functional) until the adolescent or adult years. They receive projections from the mediodorsal nucleus and give rise to primary motor cortex, as well as premotor, supplementary motor, and prefrontal areas. All of these areas send inhibitory efferents onto their sites of termination. The motor-premotor areas comprise Brodmann areas 4, 6, parts of Area 44 (Broca's area) and the frontal eye fields. The prefrontal areas are further subdivided into two large functional regions. The first prefrontal region includes paralimbic cortex of the anterior cingulate region and orbitofrontal cortex. The second prefrontal region is generally referred to as the dorsolateral prefrontal region and includes Brodmann areas 9, 10, 11, 12, 45, 46 and 47. Both frontal regions are densely innervated by dopaminergic (DA) fibers originating in the Ventral Tegmental Area (VTA) and the substantia nigra (SN) (Arnsten, Matthew, Ubriani, Taylor, & Li, 1999; Goldman-Rakic, 1987; Randolph-Scwartz, 1999). Most addicting substances (e.g., drugs, alcohol, food, etc.) exert their rewarding effects via stimulation of these meso-limbic, dopaminergic fibers projecting to the frontal lobes (Schultz et al., 1995). If dopaminergic tracts innervate frontal sites, then dopaminergic drugs might influence frontal functions. We will see below that this is in fact the case.

DOPAMINE AND RELIGIOSITY

Evidence is accumulating for a significant role of dopamine in supporting high levels of religiosity:

1. A polymorphism on the dopamine receptor gene, DRD4, has been found to be significantly associated with measures of spirituality and

- self-transcendence on a personality scale (Comings, Gonzales, Saucier, Johnson, & MacMurray, 2000).
2. Disorders of excessive dopaminergic functioning, such as schizophrenia and obsessive compulsive disorder, are often associated with increases in religiosity (Abramowitz, Huppert, Cohen, Tolin, & Cahill, 2002; Brewerton, 1994; Saver & Rabin, 1997; Siddle, Haddock, Tarrier, & Faragher, 2002; Tek & Ulug, 2001; Wilson, 1998). Anti-psychotic agents that block dopaminergic actions at the level of the limbic system result in changes (typically diminishment) in religious behaviors and religious delusions in these patients.
 3. Hallucinatory agents that purportedly enhance religious or mystical experiences may also enhance dopamine transmission. LSD and DMT, for example, block serotonin (5-HT) receptors (Cooper, Bloom, & Roth, 2003), and thus 5-HT activity cannot be the etiologic agent in these religious experiences. 5-HT, however, is known to exert tonic inhibitory effects on dopaminergic neurons (Cools, Stefanova, Barker, Robbins, & Owens, 2002; Daw, Kakade, & Dayan, 2002; Giacomelli, Palmery, Romanelli, Cheng, & Silvestrini, 1998; Millan, Lejeune, & Gobert, 2000; Vollenweider, 1998), particularly in the limbic system, and thus removal of the inhibitory 5-HT influence enhances DA activity resulting in religious and hallucinatory experiences (Carlsson, Waters, & Carlsson, 1999; Giacomelli et al., 1998; Iqbal & van Praag, 1995; Tomic & Joksimovic, 2000; Vollenweider, 1998).
 4. Many religious behaviors and basic religious cognitive processes depend on the prefrontal lobes (see McNamara, 2002 for review), and prefrontal system functioning, in turn, is strongly influenced by dopaminergic activity (Goldman-Rakic, 1987).
 5. Dopaminergic activity, particularly limbic-prefrontal activity, functions to signal significant or salient stimuli (Schultz et al., 1995), thus if DA activity is increased due to pharmacologic treatment, incoming information will more likely be tagged as overly significant and a greater number of experiences will be experienced as highly significant.
 6. Changes in prefrontal function can be associated with changes in religious behaviors (McNamara, 2002).

RELIGION AND HEALTH

One of the reasons to study dopaminergic effects on religiosity is because religiosity has significant effects on health. Religion's effects on health may partially involve dopaminergic modulation of the hormonal and autonomic nervous systems. Measures of religiosity such as frequent prayer, frequent attendance at religious services, and intrinsic forms of religiosity appear to have beneficial effects on some aspects of physical

and mental health (Beit-Hallahmi & Argyle, 1997; Comstock & Partridge, 1972; Ellison, Gay, & Glass, 1989; Idler, 1987; Koenig et al., 1998; Kune, Kune, & Watson, 1993; Levin & Vanderpool, 1989), particularly in the elderly (Koenig, 2001; Musick, Traphagan, Koenig, & Larson, 2000), yet this beneficial effect of religiosity remains unexplained. These positive effects range from improved subjective reports of enhanced well-being to objective reductions in somatic complaints and rates of hypertension, pain, cancer, and mortality. In their review of effects of religiosity on mental health, Levin and colleagues have summarized possible mediators of religions' effects on health. Levin, Taylor, and Chatters (1995) found that religiosity is usually associated with better mental health. Levin and Vanderpool (1989) in a meta-analysis of 28 studies of the relation between religiosity and subjective well-being and health found that religiosity correlates positively with subjective sense of well-being and other measures of health. Koenig et al. (1998) recently reported that respondents who both attended religious services and frequently prayed or studied the bible had 40 percent lower odds of having high blood pressure than controls who engaged in those religious activities less frequently. Similarly, a number of research teams (e.g., Koenig, 2001; Musick et al., 2000; Strawbridge, Cohen, Shema, & Kaplan, 1997) have replicated Comstock and Partridge's (1972) original findings of lower mortality rates for frequent religious attenders as compared with infrequent attenders.

Since Allport and Ross' pioneering work in the 1960s on intrinsic religiosity, a number of investigators (reviewed in Beit-Hallahmi & Argyle, 1997) have more recently reported strong associations between intrinsic religiosity and measures of mental and physical health. This link between intrinsic religiosity and the practice of private religious acts such as prayer and meditation suggests that adoption of a particular neuropsychologic mental state is an important mediator of religion's effects on mental and physical health. The intrinsic religious person practices a more interior form of religious observance than the extrinsic type. He or she frequently engages in private devotional practices and sees religion as an ultimate value rather than as a mere means to obtain other more utilitarian ends (such as social contacts). Persons with an extrinsic form of religiosity, on the other hand, tend to use religion instrumentally and opportunistically for their own ends. They are more comfortable with congregational forms of worship than are the intrinsics and find religion useful for various utilitarian reasons such as to provide social connections and opportunities. Batson, Shoenrade, and Ventis (1993) found that persons who scored high on measures of intrinsic as opposed to extrinsic religiosity tended to score better on measures of overall mental health than their nonreligious counterparts. Watson, Hood, Morris, and Hall (1984) found

significant and positive correlations between measures of intrinsic religiosity and empathy. In their review of effects of religiosity on individuals who rate themselves as religious or who engage in private religious practices, Beit-Hallahmi and Argyle (1997) found that religiosity (particularly intrinsic religiosity) was associated with increases in subjective happiness, health, mental health, and altruism and decreases in some forms of sexual behaviors as well as rates of suicide, relative to nonreligious controls. Worthington, Kurusu, McCullough, and Sandage (1996) summarized a number of studies relevant to the issue of effects of private religious practices on mental function. Use of prayer, for example, was correlated with indices of hope and with subjective well-being, at least in religiously committed subjects. Prayer appeared to be a very common coping method for persons in distress whether they described themselves as religious or not. We (McNamara, Andresen, & Gellard 2003) recently found that optimal self-report health outcomes were associated with high prayer AND high frontal lobe scores. Neither, high prayer alone or high frontal scores were enough to yield optimal self-reported health, thus indicating a possible role for frontal function in mediating religion's effects on health.

RELIGIOSITY IN PARKINSON'S DISEASE: A LOW DOPAMINE DISORDER

If, as our review above seems to indicate, high levels of dopamine promote high levels of religiosity, then low levels of dopamine should be associated with lower than average levels of religiosity. We can test this idea by studying religiosity in patients with Parkinson's Disease (PD). Religiosity-related symptomology is relatively common in disorders that are associated with neo-striatal and limbic-prefrontal alterations such as schizophrenia (Cooper, Bloom, & Roth, 2003), obsessive-compulsive disorder (Vollenweider, 1998), and certain forms of temporal lobe epilepsy (Giacomelli et al., 1998; Millan, Lejeune, & Gobert, 2000). To our knowledge, however, there are no published reports of similar religiosity-related symptomology in PD—another prominent disorder of neo-striatal and prefrontal dysfunction (Daw, Kakade, & Dayan, 2002; Cools, Stefanova, Barker, Robbins, & Owens, 2002).

PARKINSON'S DISEASE

Parkinson's Disease is characterized by rigidity, bradykinesia, gait disorders, and sometimes tremors. The primary pathology involves loss of dopaminergic cells in the substantia nigra (SN) and in the ventral tegmental area (VTA) (Agid, Javoy-Agid, & Ruberg, 1987). As mentioned above, these two subcortical dopaminergic sites give rise to two projection systems important for motor, affective, and cognitive functioning. The nigrostriatal system, pri-

marily implicated in motor functions, originates in the pars compacta of the SN and terminates in the striatum. The meso-limbic-cortical system contributes to cognitive and affective functioning. It originates in the VTA and terminates in the ventral striatum, amygdala, frontal lobes, and some other basal forebrain areas. In PD dopamine levels in the ventral striatum, frontal lobes, and hippocampus are approximately 40 percent of normal (Agid et al., 1987; Javoy-Agid & Agid, 1980; Scatton, Javoy-Agid, Rouquier, Dubois, & Agid, 1983; Shinotoh & Calne, 1995), but as mentioned above, chronic stimulation with levodopa results in transient above normal increases during the on-state in dopamine activity in limbic and prefrontal sites (Brooks, 2000; Carlsson, Waters, & Carlsson, 1999; Haslinger et al., 2001; Mattay et al., 2002; Piccini et al., 1997; Rascol et al., 1998; Sabatini, Boulanouar, & Fabre, 2000; Samuel et al., 1997). The degree of nigro-striatal impairment correlates with degree of motor impairment while VTA-mesocortical dopaminergic impairment correlates positively with the degree of affective and intellectual impairment (German, Manaye, Smith, Woodward, & Saper, 1989; Rinne, Rummukainen, Palijarvi, & Rinne, 1989; Torack & Morris, 1988) in affected individuals. As many as 40 percent to 60 percent of the cells in the SN are lost before clinical signs of disease become evident. Remaining neurons of the SN may also evidence the hallmark pathologic feature of Lewy bodies (cytoplasmic eosinophilic insolvent protein inclusions).

To study religiosity in patients with PD, we asked 22 male patients with moderately severe PD; and 20 healthy age-matched control subjects to complete a series of religiosity questionnaires, neuropsychologic tests, and mood function tests.

A wide range of religious preferences were represented by patients and controls who participated in these pilot studies. While Roman Catholics made up the bulk of the Parkinsonian sample (45%), several other faiths were represented in both the PD and control samples.

We used the Brief Multidimensional Measure of Religiousness/Spirituality (BMMRS, Fetzer Foundation) to measure religious attitudes and practices. The BMMRS contains 38 statements with Likert scale formats that cover 11 religious domains. These are: daily spiritual experiences, values/beliefs, forgiveness, private religious practices, religious and spiritual coping, religious support, religious/spiritual history, commitment, organizational religiousness, religious preference, and overall self-ranking (e.g., "To what extent do you consider yourself a religious person?"). The BMMRS was developed by a panel of experts on religion and health convened by the Fetzer Institute and the National Institutes of Health and Aging. It has excellent psychometric properties as well as publicly available norms for healthy older individuals.

We used the Rivermead Life Goals inventory (Schultz et al., 1995) to measure participants' subjective estimations of their major life goals. These included nine areas of personal concern from residential domestic arrangements and

ability to personally care for oneself to financial status and work-related goals. Participants were asked to rate each life goal domain in importance from 0 (no importance) to 3 (extreme importance). After subjects rated the importance of these life goals, we then asked them to go back and rate each domain as to whether they felt it was on track or off track (0 = totally off track to 3 = totally on track). We used the question “My religion or life philosophy is . . .” to assess the subjective importance of religion to PD patients.

Our cognitive test battery was chosen with an emphasis on examining prefrontal neuropsychological function. The tests included the Stroop color-word interference procedure, the Tower of London mental planning task; and the Raven’s test of visual intelligence. All of these tests have previously been shown to be altered in patients with PD (McNamara, 2002).

We assessed depression, stress, and anxiety with the Depression Anxiety and Stress Scale (DASS) developed by Lovibond and Lovibond (1995). The test includes 21 questions, seven in each of the depression, anxiety, and stress subscales.

We found that both controls and patients with PD reported that their residential domestic arrangements, personal care, work, relationship with primary partner, family life, contact with friends and financial affairs were on track and important to them. Patients with PD, however, rated their leisure activities/hobbies and their religion as less important than their age-matched counterparts—despite rating these same activities as being on track.

Patients with PD were significantly less religious than controls (Overall Index mean PDs = 7.1 (0.9); controls = 5.3 (1.4); $p < .04$), higher scores indicate less religiosity). Although patients with PD reported less religiosity on every scale compared to age-matched controls, the difference was significant only for the overall index and for the scale on private practices (i.e., prayer and meditation, private devotional reading; PD mean = 33.3 (7.2); controls 26.3 (7.9), $p = .050$).

As expected, the two groups differed significantly on Mini Mental State (MMSE), logical memory recall, mood tests, and Stroop interference/switching score. They did not differ significantly on the Tower of London and the Ravens Progressive Matrices Task.

Within the PD group, overall religiousness correlated with the Stroop interference/switching score (indicating the greater the frontal dysfunction the *lesser* the religiosity). Overall religiousness correlated negatively with the Ravens score, indicating that the better the performance on the Raven visual intelligence test, the *more* the religiousness. Within the healthy control group, religiosity was correlated with a measure of stress and inversely correlated with logical memory recall scores.

In summary, we found that patients with PD reported significantly lower levels of religiousness than did age-matched controls, and that this low level of religiosity was related primarily to a measure of prefrontal

neuropsychological function rather than to age, education, mood, or to medication-related factors.

Why should patients with PD report less religiousness than age-matched healthy controls? We found that they were more depressed than age-matched controls, but religiousness scores were not significantly related to depression scores. One argument that has been presented is that religiousness may be inversely related to intelligence or education levels, in that people with higher intelligence or more education would be less likely to be religious. Our sample of patients with PD performed marginally better than controls on a measure of visual intelligence (Raven, 1965), and this measure was in turn significantly and inversely correlated with religiousness scores in patients with PD but not with controls. The latter finding suggests that in our sample the higher the visual intelligence, the greater the religiousness, indicating a possible relationship between intelligence and religiosity in this sample.

We did not find a significant correlation between the overall religiousness index and years of education in either the patients or the controls. The relationship between educational level and religiosity in healthy samples is, in any case, complex: high educational levels generally are positively correlated with frequent church attendance but negatively correlated with the occurrence of mystical or religious experiences (Comings, Gonzales, Saucier, Johnson, & MacMurray, 2000, p. 40). The correlation of religiosity with Stroop interference/switching scores (a measure of orbitofrontal inhibitory capacities), furthermore, argues against the “too intelligent” explanation for the lack of religiosity in patients with PD. It therefore appears that intelligence level is not a likely explanation of religiosity in these patients.

An alternative explanation for our major finding follows from the findings of our review of the relation between dopamine levels, the frontal lobes, and religiosity presented above. It may be that long-term forms of religiosity require participation of the motivational support normally supplied by the dopaminergic drive centers housed in neo-striatal and limbic-prefrontal circuits. The previously cited neuroimaging and neuropsychologic studies linking religious practices with prefrontal network activation is consistent with this hypothesis. Recent reports (Brown, 2002; Goberman & Coelho, 2002) linking scores on religiosity and measures of self-transcendence with genetic markers for the dopamine transport molecule and the DRD4 dopaminergic receptor gene (which is densely represented in prefrontal cortex) supports this hypothesis as well. Patients with PD experience relatively global reduction in central and forebrain dopamine activity as the disease progresses. If dopaminergic activity supports key aspects of religiosity, then it would not be surprising to find patients with PD lacking in overt signs of religiosity.

In summary, we found that patients with PD reported less religiosity than age-matched controls and that their scores on a battery of religiosity scales

were consistently related to their performance on tests that measure frontal dysfunction. In short, patients with PD express less interest in religion and report consistently lower scores on measures of religiosity than age-matched controls. Given the correlation between prefrontal performance and religiosity scores, the profile of low interest and relatively low levels of religiosity among patients with PD may be related to dopaminergic and frontal dysfunction. Given these new findings, as well as our literature review above, we conclude that dopaminergic activity in the frontal lobes very likely significantly influences levels of religiousness.

REFERENCES

- Abramowitz, J. S., Huppert, J. D., Cohen, A. B., Tolin, D. F., & Cahill, S. P. (2002). Religious obsessions and compulsions in a non-clinical sample: The Penn Inventory of Scrupulosity (PIOS). *Behaviour Research and Therapy*, *40*(7), 825–838.
- Agid, Y., Javoy-Agid, M., & Ruberg, M. (1987). Biochemistry of neurotransmitters in Parkinson's disease. In C. D. M. S. Fahn (Ed.), *Movement disorders 2* (pp. 166–230). New York: Butterworths and Co.
- Albright, C., & Ashbrook, J. (2001). *Where God lives in the human brain*. Naperville: Sourcebooks, Inc.
- Andresen, J. (2001). *Religion in mind: Cognitive perspectives on religious belief, ritual, and experience*. Cambridge: Cambridge University Press.
- Arnsten, A., Matthew, R., Ubriani, R., Taylor, R.J., & Li, B. M. (1999). Alpha-1 noradrenergic receptor stimulation impairs prefrontal cortical cognitive function. *Biological Psychiatry*, *45*, 26–31.
- Ashbrook, J., & Albright, C. (1997). *The humanizing brain: Where religion and neuroscience meet*. Cleveland: Pilgrim Press.
- Azari, N. P., Nickel, J., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001). Neural correlates of religious experience. *European Journal of Neuroscience*, *13*(8), 1649–1652.
- Banyas, C.A. (1999). Evolution and phylogenetic history of the frontal lobes. In B. Miller & J. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 83–106). New York: The Guilford Press.
- Batson, C.D., Shoenrade, P., & Ventis, W.L. (1993). *Religion and the individual: A social-psychological perspective*. New York: Oxford University Press.
- Bear, D. M., & Fedio, P. (1977). Quantitative analysis of interictal behavior in temporal lobe epilepsy. *Archives of Neurology*, *34*, 454–467.
- Beit-Hallahmi, B., & Argyle, M. (1997). *The psychology of religious behavior, belief, and experience*. New York: Rutledge.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Brewerton, T. (1994). Hyperreligiosity in psychotic disorders. *Journal of Nervous and Mental Disease*, *182*(5), 302–304.
- Brooks, D. (2000). PET studies and motor complications in Parkinson's disease. *Trends in Neurosciences*, *23*(Suppl. 1), S101–S108.

- Brown, D. (2002). Sleep in Parkinson's disease and the parkinsonian syndromes. In T. Lee-Chiong, M. Sateia, & M. Carskadon (Eds.), *Sleep medicine* (pp. 509–520). London: Lippincott, Williams & Wilkins.
- Buijs, R. M., & Van Eden, C.G. (2000). The integration of stress by the hypothalamus, amygdala and prefrontal cortex: Balance between the autonomic nervous system and the neuroendocrine system. *Progress in Brain Research*, 126, 117–132.
- Carlsson, A., Waters, N., & Carlsson, M. L. (1999). Neurotransmitter interactions in schizophrenia—therapeutic implications. *European Archives of Psychiatry and Clinical Neuroscience*, 249(Suppl 4), 37–43.
- Comings, D. E., Gonzales, N., Saucier, G., Johnson, J. P., MacMurray, J. P. (2000). The DRD4 gene and the spiritual transcendence scale of the character temperament index. *Psychiatric Genetics*, 10(4), 185–189.
- Comstock, G. W., & Partridge, K. B. (1972). Church attendance and health. *Journal of Chronic Disease*, 25(12), 665–672.
- Cools, R., Stefanova, E., Barker, R. A., Robbins, T. W., & Owen, A. M. (2002). Dopaminergic modulation of high-level cognition in Parkinson's disease: The role of the prefrontal cortex revealed by PET. *Brain*, 125(Pt 3), 584–594.
- Cooper, J., Bloom, F., & Roth, R. (2003). *The biochemical basis of neuropharmacology* (8th ed.). Oxford: Oxford University Press.
- d'Aquilli, E., & Newberg, A. B. (1993). Religious and mystical states: A neuropsychological model. *Zygon*, 28(2), 177–200.
- d'Aquilli, E., & Newberg, A. (1999). *The mystical mind: Probing the biology of religious experience*. Minneapolis: Fortress Press.
- Daw, N., Kakade, S., & Dayan, P. (2002). Opponent interactions between serotonin and dopamine. *Neural Network*, 15(4–6), 603–616.
- Dewhurst, K., & Beard, A. W. (1970). Sudden religious conversions in temporal lobe epilepsy. *British Journal of Psychiatry*, 117, 497–507.
- Ellison, C. G., Gay, D. A., & Glass T. A. (1989). Does religious commitment contribute to individual life satisfaction? *Social Forces*, 68, 100–123.
- Fetzer Foundation. (1999). Multidimensional measurement of religiousness/spirituality for use in health research (pp. 1–95). Bethesda, MD: Fetzer Institute/National Institute on Aging Working Group.
- Fiske, A. P., & Haslam, N. (1997). Is obsessive-compulsive disorder a pathology of the human disposition to perform socially meaningful rituals? Evidence of similar content. *Journal of Nervous and Mental Disease*, 185(4), 211–222.
- Fuster, J. M. (1989). *The prefrontal cortex*. Anatomy, physiology and neuropsychology of the frontal lobe (2nd ed.). New York: Raven Press.
- German, D., Manaye, K., Smith, W., Woodward, D., & Saper, C. (1989). Mid-Brain dopaminergic cell loss in Parkinson's disease: Computer visualization. *Annals of Neurology*, 26, 507–514.
- Geschwind, N. (1983). Interictal behavioral changes in epilepsy. *Epilepsia*, 24(Suppl 1), 523–530.
- Giacomelli, S., Palmery, M., Romanelli, L., Cheng, C. Y., & Silvestrini, B. (1998). Lysergic acid diethylamide (LSD) is a partial agonist of D2 dopaminergic receptors and it potentiates dopamine-mediated prolactin secretion in lactotrophs in vitro. *Life Sciences*, 63(3), 215–222.

- Goberman, A., & Coelho, C. (2002). Acoustic analysis of Parkinsonian speech I: Speech characteristics and L-Dopa therapy. *Neurorehabilitation, 17*, 237–246.
- Goldman-Rakic, P. (1987). Circuitry of primate prefrontal cortex and regulation of behavior by representational memory. In V. Plum (Ed.), *Higher cortical function, Handbook of Physiology* (pp. 373–417). New York: American Physiological Society.
- Haslinger, B., Erhard, P., Kampfe, N., Boecker, H., Rummeny, E., & Schwaiger, M. (2001). Event-related functional magnetic resonance imaging in Parkinson's disease before and after levodopa. *Brain, 124*, 558–570.
- Idler, E. L. (1987). Religious involvement and the health of the elderly: Some hypotheses and an initial test. *Social Forces, 66*, 226–238.
- Iqbal, N., & van Praag, H. (1995). The role of serotonin in schizophrenia. *European Neuropsychopharmacology, 5*(Suppl 1), 11–23.
- Javoy-Agid, F., & Agid, Y. (1980). Is the mesocortical dopaminergic system involved in Parkinson's disease? *Neurology, 30*, 1326–1330.
- Jenike, M. A., Baer, L., & Minichiello. (1998). *WE: Obsessive-compulsive disorders: Practical management* (3rd ed.). St. Louis: Mosby.
- Koenig, H. G. (2001). *The healing power of faith: How belief and prayer can help you triumph over disease*. New York: Simon and Schuster.
- Koenig, H. G., George, L. K., Hays, J. C., Larson, D. B., Cohen, H. J., & Blazer, D. G. (1998). The relationship between religious activities and blood pressure in older adults. *International Journal of Psychiatry in Medicine, 28*, 189–213.
- Kune, G. A., Kune, S., & Watson, L. F. (1993). Perceived religiousness is protective for colorectal cancer: Data from the Melbourne colorectal cancer study. *Journal of the Royal Society of Medicine, 86*, 645–647.
- Levin, J. S., Taylor, R. J., & Chatters, L. M. (1995). A multidimensional measure of religious involvement for African Americans. *Sociology Quarterly, 36*, 157–173.
- Levin, J. S., & Vanderpool, H. Y. (1989). Is religion therapeutically significant for hypertension? *Social Science and Medicine, 29*(1), 69–78.
- Lovibond, S., & Lovibond, P. (1995). *Manual for the Depression Anxiety Stress Scales*. Sydney: The Psychology Foundation of Australia, Inc.
- Mattay, V. S., Tessitore, A., Callicott, J. H., Bertolino, A., Goldberg, T. E., Chase, T. N., et al. (2002). Dopaminergic modulation of cortical function in patients with Parkinson's disease. *Annals of Neurology, 51*, 156–164.
- McNamara, P. (2002). The motivational origins of religious practices. *Zygon, 37*(1), 143–160.
- McNamara, P., Andresen, J., & Gellard, J. (2003). Relation of religiosity and scores on verbal and non-verbal fluency to subjective reports of health in the elderly. *International Journal for the Psychology of Religion, 13*(4), 259–271.
- Millan, M. J., Lejeune, F., & Gobert, A. (2000). Reciprocal autoreceptor and heteroreceptor control of serotonergic, dopaminergic and noradrenergic transmission in the frontal cortex: Relevance to the actions of antidepressant agents. *Journal of Psychopharmacology, 14*(2), 114–138.
- Musick, M. A., Traphagan, J. W., Koenig, H. G., & Larson, D. B. (2000). Spirituality in physical health and aging. *Journal of Adult Development, 7*(2), 73–86.

- Newberg, A., Alavi, A., Baime, M., Mozley, P. D., & d'Aquilli, E. (1997). The measurement of cerebral blood flow during the complex cognitive task of meditation using HMPAO-SPECT imaging. *Journal of Nuclear Medicine*, *38*, 95.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquilli, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research*, *106*(2), 113–122.
- Newberg, A., d'Aquilli, E., & Rause V. (2001). *Why God won't go away*. New York: Ballantine.
- Passingham, R. E. (1995). *The frontal lobes and voluntary action*. New York: Oxford University Press.
- Persinger, M. A. (1987). *Neuropsychological bases of God beliefs*. New York: Praeger.
- Piccini, P., Morrish, P. K., Turjanski, N., Sawle, G. V., Burn, D. J., Weeks, R. A., et al. (1997). Dopaminergic function in familial Parkinson's disease: A clinical and 18F-dopa positron emission tomography study. *Annals of Neurology*, *41*(2), 222–229.
- Pincus, J. H. (1999). Aggression, criminality and the frontal lobes. In B. Miller & J. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 547–556). New York: The Guilford Press.
- Ramachandran, V. S., Hirstein, W. S., Armel, K. C., Tecoma, E., & Iragul, V. (1997). *The Neural Basis of Religious Experience*. Poster session presented at the 27th Annual Meeting for Society for Neuroscience, New Orleans, LA, October.
- Randolph-Schwartz, J. (1999). Dopamine projections and frontal systems function. In B. Miller & J. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 159–173). New York: The Guilford Press.
- Rascol, O., Sabatini, U., Brefel, C., Fabre, N., Rai, S., Senard, J. M., et al. (1998). Cortical motor overactivation in parkinsonian patients with L-dopa-induced peak-dose dyskinesia. *Brain*, *121*(3), 527–533.
- Raven, J. C. (1965). *Guide to using the colored progressive matrices*. London: H.K. Lewis.
- Rinne, J. O., Rummukainen, J., Paljarvi, L., & Rinne U. K. (1989). Dementia in Parkinson's disease is related to neuronal loss in the medial substantia nigra. *Annals of Neurology*, *26*(1), 47–50.
- Sabatini, U., Boulanouar, K., & Fabre, N. (2000). Cortical motor reorganization in akinetic patients with Parkinson's disease: A functional MRI study. *Brain*, *123*, 394–403.
- Samuel, M., Ceballos-Baumann, A. O., Turjanski, N., Boecker, H., Gorospe, A., & Linazasoro, G. (1997). Pallidotomy in Parkinson's disease increases supplementary motor area and prefrontal activation during performance of volitional movements an H₂(15)O PET study. *Brain*, *120*, 1301–1313.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *Journal of Neuropsychiatry and Clinical Neurosciences*, *9*(3), 498–510.
- Scatton, B., Javoy-Agid, F., Rouquier, L., Dubois, B., & Agid, Y. (1983). Reduction of cortical dopamine, neuroadrenaline, serotonin, and their metabolites in Parkinson's disease. *Brain Research*, *275*, 321–328.

- Schroeder, G. L. (2001). *The hidden face of God: How science reveals the ultimate truth*. New York: The Free Press.
- Schultz, W., Romo, R., Ljungberg, J., Mirenowicz, J., Hollerman, J., & Dickinson, A. (1995). Reward-related signals carried by dopamine neurons. In J. Houk, J. Davis, & D. Beiser (Eds.), *Models of information processing in the basal ganglia* (pp. 233–248). Cambridge: MIT Press.
- Shinotoh, H., & Calne, D. (1995). The use of PET in Parkinson's disease. *Brain and Cognition*, 28, 297–310.
- Siddle, R., Haddock, G., Tarrier, N., & Faragher, E. B. (2002). Religious delusions in patients admitted to hospital with schizophrenia. *Social Psychiatry and Psychiatric Epidemiology*, 37(3), 130–138.
- Strawbridge, W. J., Cohen, R. D., Shema, S. J., & Kaplan, G. A. (1997). Frequent attendance at religious services and mortality over 28 years. *American Journal of Public Health*, 87, 957–961.
- Tek, C., & Ulug, B. (2001). Religiosity and religious obsessions in obsessive-compulsive disorder. *Psychiatry Research*, 104(2), 99–108.
- Tomic, M., & Joksimovic, J. (2000). Psychomimetics moderately affect dopamine receptor binding in the rat brain. *Neurochemistry International*, 36(2), 137–142.
- Torack, R. M., & Morris, J. C. (1988). The association of ventral tegmental area histopathology with adult dementia. *Archives of Neurology*, 45(5), 497–501.
- Vollenweider, F. X. (1998). Advances and pathophysiological models of hallucinogenic drug actions in humans: A preamble to schizophrenia research. *Pharmacopsychiatry*, 31(Suppl 2), 92–103.
- Watson, P. J., Hood, R. W., Morris, R. J., & Hall, J. R. (1984). Empathy, religious orientation, and social desirability. *Journal of Psychology*, 117, 211–216.
- Wilson, D. S. (2002). *Darwin's cathedral: Evolution, religion and the nature of society*. Chicago: University of Chicago Press.
- Wilson, W. P. (1998). Religion and psychoses. In H. Koenig (Ed.), *Handbook of religion and mental health* (pp. 161–174). San Diego: Academic Press.
- Worthington, E. L., Kurusu, T. A., McCullough, M. E., & Sandage, S. J. (1996). Empirical research on religion and psychotherapeutic processes and outcomes: A 10-year review and research prospectus. *Psychological Bulletin*, 119(3), 448–487.

RELIGIOUS AND SPIRITUAL PRACTICES: A NEUROCHEMICAL PERSPECTIVE

Andrew B. Newberg

INTRODUCTION

Spiritual practices such as meditation are complex neurocognitive tasks that have been utilized in almost every culture and tradition over the past several millennia. In the past 30 years, science has been able to explore the biological effects and mechanism of such practices in great detail. Initial studies focused more specifically on meditation practices. These studies measured changes in autonomic activity such as heart rate and blood pressure as well as electroencephalographic changes. More recent studies have explored changes in hormonal and immunological function associated with meditation. Studies have also explored the clinical effects of spiritual practices in relation to both physical and psychological disorders. Functional neuroimaging has opened a new window into the investigation of spiritual states with the ability to find neurological correlates of these experiences. In previous works, we have outlined a basic neurophysiological model for the mechanism underlying such practices. As this basic model has evolved, and as the results of more studies have been added, a more detailed synthesis of the neurochemical basis of such states can be elaborated. Such a model not only helps to further elucidate the mechanism underlying spiritual practices and experiences, but provides important information regarding the effects of these experiences on body physiology and creates a springboard for future research, particularly with regard to functional brain imaging.

CURRENT NEUROIMAGING TECHNIQUES

Functional and anatomical neuroimaging techniques have contributed dramatically to our understanding of the causes of various neurological disorders and in their diagnosis and management. Anatomical imaging techniques such as magnetic resonance imaging (MRI) and x-ray computed tomography (CT) are useful for determining structural changes in the brain. Functional imaging methods such as single photon emission computed tomography (SPECT) and positron emission tomography (PET) have been useful for measuring changes in blood flow, metabolism, and neurotransmitter activity in neuropsychiatric processes as well as activation states of the brain (see tables 2.1 and 2.2).

Brain activation studies have utilized neuroimaging techniques to explore cerebral function during various behavioral, motor, and cognitive tasks. These studies, usually utilizing SPECT, PET, and functional MRI, have helped to determine which parts of the brain are responsible for a variety of neurocognitive processes. Functional MRI, which has been extensively developed in the past several years, has been shown to have high spatial and temporal resolution in measuring changes in cerebral activity during various cognitive, sensory, and motor activation tasks (Binder et al., 1994; Hammeke et al., 1994; McCarthy et al., 1994; Rao et al., 1995; Sergent, 1994). Thus, activation studies with the functional imaging techniques have been employed to determine the areas in the brain that are involved in the production and understanding of language, visual processing, and pain reception and sensation (Friston,

Table 2.1 A Partial Listing of Radioligands Used in Neurological SPECT Imaging

Compound	Application
HMPAO, IMP, ECD	Cerebral blood flow
3-quinuclidinyl benzilate (IQNB)	Muscarinic cholinergic receptor
Iodopride, IBZM, iodospiperone	Dopamine receptor activity
AMIK, DOI	Serotonin receptor activity
Iomazenil	Benzodiazepine activity
2-iodomorphine	Opioid receptor activity
I-d(CH ₂) ₅ [Tyr(Me) ₂ , Tyr(NH ₂) ₉]AV	Vasopressin activity

AMIK = 7-amino-8-iodo-ketanserin

DOI = 1-(2,5-dimethoxy-4-iodophenyl)-2-aminopropane

ECD = Ethylene Cystinate Dimer

HMPAO = Technetium 99m hexamethyl propylene amine oxime

IBZM = 3-iodo-N-[(1-ethyl-2-pyrrolidinyl)] methyl-2-hydroxy-6-methoxybenzamide

IMP = Iodine-123-N-N', N, N-trimethyl-N'-[2-hydroxyl-3-methyl-5-iodo-benzyl]-1, 3 propane diamine

Frith, Passingham, Liddle, & Frackowiak, 1992; Phelps, Huhl, & Mazziotta, 1981; Phelps & Mazziotta, 1985).

With regard to the functional imaging techniques of PET and SPECT, it is important to note that a large number of radiopharmaceuticals have been developed over the past 30 years that may be of use for studying the effects of meditative and related experiences. Tracers have now been developed that are specific for glucose and oxygen metabolism as well as cerebral blood flow. One of the most important strengths of PET and SPECT imaging is in the evaluation of neurotransmitter systems. Radioactive analogues of almost every neurotransmitter have been developed including those related to the dopamine, benzodiazepine, opiate, and cholinergic receptor systems (Diksic & Reba, 1991; Frost, 1992; Gatley, DeGrado, Kornguth, & Holden, 1990; Kung, 1991; Maziere & Maziere, 1991). As more and more tracers are developed, we will continue to expand our understanding of what each system does and how they interact during various mental states. This has important implications for the study of spiritual practices and experiences.

Each of the functional imaging techniques provides different logistical advantages and disadvantages in the study of meditation and other spiritually related experiences. Functional MRI, while having improved resolution over SPECT and the ability of immediate anatomic correlation, would be very difficult to utilize for the study of meditation because of the noise from the machine and the problem of having to lie prone in the machine. In fact, we attempted the use of fMRI with our initial subject to determine feasibility, but the subject found it extremely difficult to carry out the meditation

Table 2.2 A Partial Listing of Radioligands Used in Neurological PET Imaging

Compound	Application
[¹⁵ O] H ₂ O	Blood flow
[¹⁸ F] fluorodeoxyglucose	Glucose metabolism
¹⁵ O ₂	Oxygen metabolism
[¹¹ C] l-methionine	Amino acid metabolism
[¹¹ C] raclopride, [¹¹ C] methylspiperone, 6-[¹⁸ F] fluorodopamine, [¹⁸ F] spiperone,	Dopamine receptor activity
[¹¹ C] carfentanil, [¹¹ C] etorphine	Opiate receptor activity
[¹¹ C] flunitrazepam	Benzodiazepine receptor activity
[¹¹ C] scopolamine, [¹¹ C] quinuclidinyl benzilate	Muscarinic cholinergic receptors
6-[¹⁸ F] fluoro-L-DOPA, 4-[¹⁸ F] fluoro-m-tyrosine	Presynaptic dopaminergic system
[¹¹ C] ephedrine, [¹⁸ F] fluorometaraminol	Adrenergic terminals

practice. Other investigators have attempted to acclimate patients prior to performing the fMRI scan with varying degrees of success. While PET imaging also provides better spatial resolution than SPECT, if one strives to make the environment relatively distraction free to maximize the chances of having as strong a meditative experience as possible, it is sometimes beneficial to perform these studies off hours (especially if there is a busy clinical service). This may complicate the use of PET because the radiopharmaceuticals often require preparation close to the time of use. The SPECT tracers have longer half lives and thus can be prepared in advance and then used when needed. Thus, while PET and fMRI offer certain technical advantages, SPECT appeared to provide the best option for our initial study of Tibetan Buddhist meditation (Newberg et al., 2001). In this study, patients had an intravenous line placed and were injected with a cerebral blood flow tracer while at rest to acquire a baseline image. They then meditated for approximately one hour until they experienced a peak in their meditation that was indicated by a signal from the subject during the meditation. The patients were again injected with the tracer while they continued to meditate. The tracer is fixed in the brain at the time of injection so that when the images were acquired approximately 20 minutes later, they reflected the cerebral blood flow during the peak meditation. The baseline and meditation images were then compared to determine changes in cerebral blood flow.

The findings of this study showed marked increases in the bilateral frontal cortices, cingulate gyrus, and thalami. A decrease in blood flow was noted in the superior parietal lobes bilaterally with the left more affected than the right. Interestingly, the decreases in the superior parietal lobes correlated with the increases in the thalami, suggesting a complex network that affects multiple brain areas.

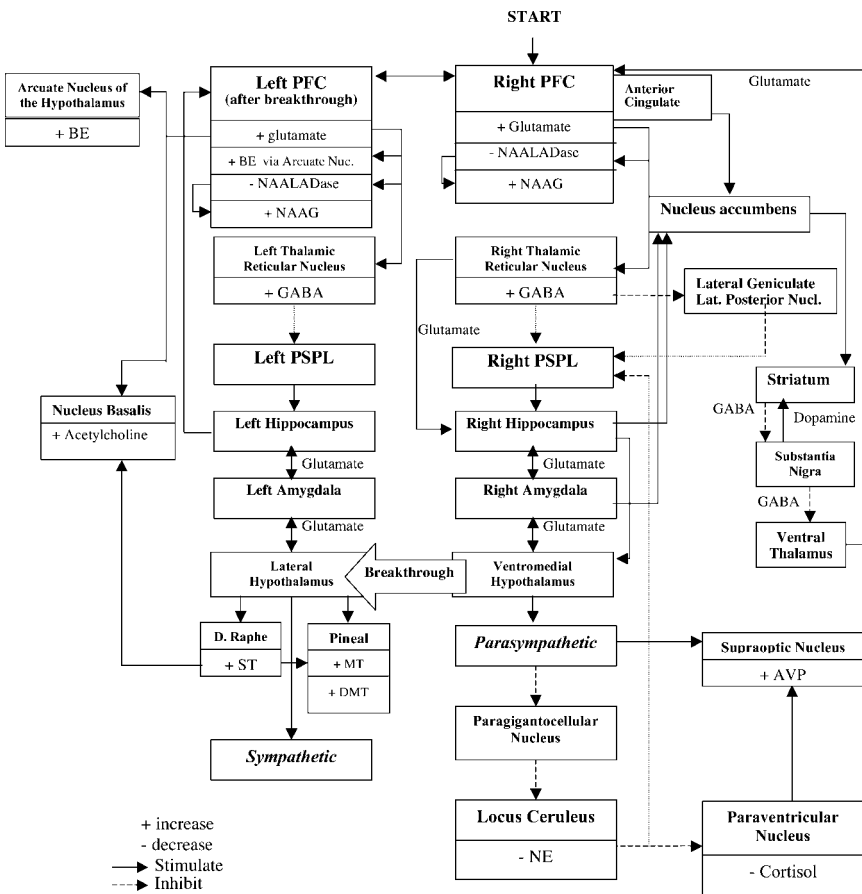
The other brain imaging studies of spiritual practices have utilized the different functional imaging modalities of fMRI and PET. The fMRI study by Lazar et al. and the PET study by Herzog et al. both demonstrated increased activity in the frontal areas, particularly the prefrontal cortex (Herzog et al., 1990–1991; Lazar et al., 2000). They also demonstrated some decreases in the parietal regions. The study by Lazar took an interesting approach to avoiding the distraction of the MRI noise by having patients practice ahead of time with a tape of the MRI machine. However, the results from both of these studies are not inconsistent with our results. One PET study by Lou et al. did not demonstrate increased prefrontal activity (Lou et al., 1999). However, this may have been due to the fact that patients were following a tape guiding them through the meditation, which is different from our study during which the meditation was self-initiated and maintained. In a similar manner, internally generated words activate the prefrontal cortex while guided word generation does not, so whether or not the PFC is

activated during meditation may have to do with the type of approach used by the practitioner.

PHYSIOLOGICAL STUDIES OF SPIRITUAL PRACTICES

In studies of the physiological correlates of practices such as meditation, investigators have examined both specific neurophysiological function as well as the relation of that function to various aspects of body physiology (please see Figure 2.1 for an overall diagram of the potential neurophysiological

Figure 2.1 Schematic Overview of the Neurophysiological Network Possibly Associated with Meditative States



Note: The circuits generally apply to both hemispheres, however, much of the initial activity is on the right.

effects related to meditation practices; Newberg & Iversen, 2003). The autonomic nervous system's responses to meditation include decreases in blood pressure, heart rate, respiratory rate, and galvanic skin responses (Jevning, Wallace, & Beidebach, 1992; Wallace, 1970). Investigators have also performed a number of studies that measured changes in the body's neurochemistry as a result of meditation. The vast majority of these studies were performed on patients practicing transcendental meditation. In this type of practice, originally derived from Hindu practice, the individual focuses on a particular word or phrase (the mantra) that has significant meaning to the individual. The result is a feeling of calmness, a loss of the sense of self, and the diminishment of the perception of external stimuli.

Several studies have demonstrated an increase in gamma aminobutyric acid (GABA) in the blood serum of individuals during meditation (Elias, Guich, & Wilson, 2000; Elias & Wilson, 1995). Interestingly, GABA is the principal inhibitory neurotransmitter in the brain. Serotonin (ST) is a neuromodulator that densely supplies the visual centers of the temporal lobe, where it strongly influences the flow of visual associations generated by this area (Foote, 1987). The cells of the dorsal raphe produce and distribute ST when innervated by the lateral hypothalamus (Aghajanian, Sprouse, & Rasmussen, 1987). Moderately increased levels of ST appear to correlate with positive affect, while low ST often signifies depression (Van Praag & De Haan, 1980). This has clearly been demonstrated with regard to the effects of the selective serotonin reuptake inhibitor medications such as Prozac or Zoloft, which have been widely used for the treatment of depression. When cortical ST₂ receptors (especially in the temporal lobes) are activated, however, the stimulation can result in a hallucinogenic effect. Tryptamine psychedelics such as psilocybin and LSD seem to take advantage of this mechanism to produce their extraordinary visual experiences (Aghajanian & Marek, 1999). Interestingly, after practices such as meditation, breakdown products of ST in urine have been found to significantly increase, suggesting an overall elevation in ST during meditation (Bujatti & Riederer, 1976; Walton, Pugh, Gelderloos, & Macrae 1995). The neurohormone melatonin (MT) is produced by the pineal gland, which can convert ST into MT when innervated by the lateral hypothalamus (Moller, 1992). MT has been shown to depress the central nervous system and reduce pain sensitivity (Shaji & Kulkarni, 1998). During meditation, blood plasma MT has been found to increase sharply, but it is not clear whether this is directly related to the experiences that arise during such practices (Coker, 1999; Tooley, Armstrong, Norman, & Sali, 2000)

The neurochemical arginine vasopressin (AVP), produced in the supraoptic nucleus of the hypothalamus, serves many functions in the brain and body. It is a vasoconstrictor that tightens blood vessels, but also it

decreases self-perceived fatigue and arousal and appears to contribute to the general maintenance of positive affect (Pietrowsky, Braun, Fehm, Pauschinger, & Born, 1991). Increases in AVP have also been found to significantly improve the consolidation of new memories and learning (Reghunandanan, Reghunandanan, & Mahajan, 1998; Weingartner et al., 1981). In meditators, blood plasma AVP has been found in exponentially higher levels (O'Halloran et al., 1985). Of course, whether this translates into central effects of AVP remains to be seen.

Norepinephrine (NE) is a neuromodulator produced by the locus ceruleus of the pons (Foote, 1987). NE increases the susceptibility of brain regions to sensory input by amplifying strong stimuli, while simultaneously gating out weaker activations and cellular "noise" that fall below the activation threshold (Waterhouse, Moises, & Woodward, 1998). The breakdown products of catecholamines such as NE and epinephrine have generally been found to be reduced in the urine and plasma during meditation (Bujatti M. & Riederer, 1976; Infante et al., 2001; Walton, Pugh, Gelderloos, & Macrae, 1995). Cortisol is a hormone associated with the stress responses. Cortisol is produced when the paraventricular nucleus of the hypothalamus secretes corticotropin-releasing hormone (CRH) in response to innervation by NE from the locus ceruleus (Ziegler, Cass, & Herman, 1999). This CRH stimulates the anterior pituitary to release adrenocorticotrophic hormone (ACTH; Livesey, Evans, Mulligan, & Donald, 2000). ACTH, in turn, stimulates the adrenal cortex to produce cortisol (Davies, Keyon, & Fraser, 1985). Thus, cortisol is released during stress states, but most studies have found that urine and blood plasma cortisol levels are decreased during meditation (Jevning, Wilson, & Davidson, 1978; Sudsuang, Chentanez, & Veluvan, 1991; Walton, Pugh, Gelderloos, & Macrae, 1995). In fact, this has led a number of investigators to examine the ability of practices such as meditation to attenuate the effects of stress.

Beta-endorphin (BE) is an endogenous opioid produced primarily by the arcuate nucleus of the medial hypothalamus and distributed to the brain's sub-cortical areas (Yadid, Zangen, Hezberg, Nakash, & Sagen, 2000). The arcuate nucleus releases BE in response to the excitatory neurotransmitter glutamate, to which it is extremely sensitive (Kiss, Kocsis, Csaki, Gorcs, & Halasz, 1997). BE depresses respiration, reduces fear, reduces pain, and produces sensations of joy and euphoria (Amano et al., 1982; Campbell, Weinger, & Quinn, 1995; Janal, Colt, Clark, & Glusman, 1984; Kalin, Shelton, & Barksdale, 1988). Meditation has been found to disrupt diurnal rhythms of BE and ACTH, while not affecting diurnal cortisol rhythms (Infante et al., 1998). Thus, the opiate system may play some role in spiritual states, but it is unlikely to be the primary neurotransmitter involved.

NEUROCHEMICAL CORRELATES OF SPIRITUAL PRACTICES

Activation of the Prefrontal Cortex and Cingulate Gyrus

Brain imaging studies suggest that willful acts are initiated via activity in the prefrontal cortex along with the anterior cingulate gyrus and are mediated by the excitatory neurotransmitter glutamate (Ingvar, 1994). Since the prefrontal cortex (PFC) in particular appears to mediate intense concentration, it thus should be essential for all meditative practices. Using PET imaging, investigators have shown that when patients performed purposely willed tasks or tasks that required sustained attention, there was activation of the PFC (Frith, Friston, Liddle, & Frackowiak, 1991; Pardo, Fox, & Raichle, 1991). Activation of the PFC and cingulate gyrus has been further validated by the increased activity observed in this region on several of the brain imaging studies of meditation (Herzog et al., 1990–1991; Lazar et al., 2000; Newberg et al., 2001). Therefore, meditation appears to start with activating the prefrontal cortex and possibly the cingulate gyrus associated with the will or intent to clear the mind of thoughts.

Thalamic Activation

The thalamus governs the flow of sensory information to cortical processing areas via the inhibitory effects of the neurotransmitter GABA on structures such as the lateral geniculate and lateral posterior nuclei. The lateral geniculate nucleus receives raw visual data from the optic tract and routes it to the striate cortex for processing (Andrews, Halpern, & Purves, 1997). The lateral posterior nucleus of the thalamus provides the posterior superior parietal lobule (PSPL) with the sensory information it needs to determine the body's spatial orientation (Bucci, Conley, & Gallagher, 1999). During meditation, if the activation of the right PFC causes increased activity in the reticular nucleus, the result may be decreased sensory input entering into the PSPL and visual center. While brain imaging studies of meditation have not had the resolution to distinguish the reticular nuclei, our recent SPECT study did demonstrate a general increase in thalamic activity that was proportional to the activity levels in the PFC (Newburg et al., 2001). However, further studies will be necessary to clarify the role of the thalamus in spiritual practices.

PSPL Deafferentation

The PSPL (Brodmann's area 7) is heavily involved in the analysis and integration of higher-order visual, auditory, and somesthetic information.

Through the reception of auditory and visual input from the thalamus, the PSPL is able to generate a three-dimensional image of the body in space and may actually be crucial in distinguishing self from other (Joseph, 1990; Lynch, 1980). It should be noted that a recent study has suggested that the superior temporal lobe may play a more important role in body spatial representation, although this has not been confirmed by other reports. However, it remains to be seen what is the actual relationship between the parietal and temporal lobes in terms of spatial representation. Regardless, deafferentation of these orienting areas of the brain, we propose, is an important concept in the physiology of spiritual practices ranging from ritual to intense meditative states. If, for example, deafferentation of the PSPL by the reticular nucleus's effect on the posterior thalamic nucleus occurs to a significant degree, the person may begin to lose their usual ability to spatially define the self and help to orient that self. Deafferentation of the PSPL has been corroborated by several functional imaging studies of meditation that have demonstrated decreased activity in this area during intense meditation.

Limbic Activation

The hippocampus acts to modulate and moderate cortical arousal and responsiveness, via rich and extensive interconnections with the prefrontal cortex, other neocortical areas, the amygdala, and the hypothalamus (Joseph, 1990). Hippocampal stimulation has been shown to diminish cortical responsiveness and arousal; however, if cortical arousal is initially at a low level, then hippocampal stimulation tends to augment cortical activity (Redding, 1967). Thus, the hippocampus functions in conjunction with the thalamus, hypothalamus, and septal nuclei to prevent extremes of arousal, thereby maintaining a state of quiet alertness (Joseph, 1990).

The hippocampus greatly influences the amygdala, such that they complement and interact in the generation of attention, emotion, and certain types of imagery (Joseph, 1990). It seems that much of the prefrontal modulation of emotion is via the hippocampus and its connections with the amygdala (Poletti & Sujatanond, 1980). Because of this reciprocal interaction between the amygdala and hippocampus, the activation of the right hippocampus likely stimulates the right lateral amygdala as well.

Parasympathetic Activation and Resulting Effects

Stimulation of the right amygdala can cause a stimulation of the ventromedial portion of the hypothalamus with a subsequent activation of the peripheral parasympathetic system (Joseph, 1990). This activation may result in the subjective sensation first of relaxation, and eventually, of a more profound quiescence. Activation of the parasympathetic system would cause

a reduction in heart rate and respiratory rate, an involuntary decrease combined with the voluntary attempt of the meditator to steady and slow breathing and movement. The locus ceruleus, which produces and distributes NE, receives most of its excitatory input from the medulla's lateral paragigantocellular nucleus, which monitors breathing and heart rate (Van Bockstaele & Aston-Jones, 1995). During a meditative practice, decreased heart rate and breathing associated with parasympathetic activation, then, should theoretically reduce the firing of the paragigantocellular nucleus of the medulla and cut back its innervation of the locus ceruleus, which densely and specifically supplies the PSPL and the lateral posterior nucleus with NE (Foote, 1987). Less innervation would mean a decrease in the quantity of NE delivered to these regions, where it normally serves to increase their susceptibility to sensory input by amplifying strong stimuli and gating out noise that falls below the activation threshold (Waterhouse, Moises, & Woodward, 1998). Thus, a reduction in NE decreases the impact of sensory input on the PSPL, contributing to its deafferentation.

The parasympathetic activity should also result in the hypothalamic paraventricular nucleus, decreasing its production of CRH, ultimately lowering the adrenal cortex's production of cortisol, a finding observed in the majority of meditation studies. The drop in blood pressure associated with meditation should induce the hypothalamic supraoptic nucleus to release the vasoconstrictor AVP, which has been shown to increase during meditation (Renaud, 1996).

Positive-Feedback Circuit Formation

As the meditation practice continues, there should theoretically be increasing activity in the PFC associated with the ever persistent will to focus attention. Most of the neurons of the PFC are glutamatergic, meaning that they produce and employ the excitatory neurotransmitter glutamate to communicate among themselves and to innervate other brain structures (Cheramy, Romo, & Glowinski, 1987). In general, as PFC activity increases, it produces ever-increasing levels of free synaptic glutamate in the brain. This glutamate can stimulate the hypothalamic arcuate nucleus to release BE, depressing respiration, reducing fear and pain, and producing sensations of joy and euphoria, feelings that have been described during meditation. However, it is unlikely that BE is the sole mediator in such experiences because simply taking morphine-related substances does not produce equivalent experiences, and one very limited study demonstrated that blocking the opiate receptors with naloxone did not effect the experience or EEG pattern associated with meditation (Sim & Tsoi, 1992).

Glutamate activates NMDA receptors (NMDAr), but excess glutamate can kill these neurons through excitotoxic processes (Albin & Greenamyre,

1992). We propose that, as glutamate levels approach excitotoxic concentrations, the brain might limit its production of NAALADase, which converts the endogenous NMDAR antagonist NAAG into glutamate (Thomas, Vornov, Olkowski, Merion & Slusher, 2000). The resultant increase in NAAG would protect cells from excitotoxic damage. There is an important side effect, however, since the NMDAR inhibitor NAAG is functionally analogous to the dissociative hallucinogens ketamine, phencyclidine (PCP), and nitrous oxide. These NMDAR antagonists produce a variety of states that may be characterized as either schizophrenomimetic or mystical, such as out-of-body and near-death experiences (Ellison, 1995; Jansen, 1995).

Complex Autonomic Activity

Our original model was based to some extent on the work of Gellhorn and Kiely, who suggested that intense stimulation of either the sympathetic or parasympathetic system, if continued, could ultimately result in simultaneous discharge of both systems (Gellhorn & Kiely, 1972). A recent study corroborated the notion of mutual activation of parasympathetic and sympathetic systems by demonstrating an increase in the variability of heart rate during meditation (Peng et al., 1999). The increased variation in heart rate was hypothesized to reflect activation of both arms of the autonomic nervous system. This notion also fits the description people have of these experiences in that they feel both a sense of overwhelming calmness as well as significant alertness.

It is interesting to note that stimulation of both systems can result in intense stimulation of structures in the lateral hypothalamus and median forebrain bundle, which are known to produce both ecstatic and blissful feelings when stimulated (Olds & Forbes, 1981). This may be associated with the lateral hypothalamus stimulation of the dorsal raphe to deliver more ST to the temporal lobe visual association areas. When ST is produced by the dorsal raphe, it also inhibits the lateral geniculate nucleus, greatly reducing the amount of visual information that can pass through (Funke & Eysel, 1995; Yoshida, Sasa, & Takaori, 1984). Combined with reticular and ST inhibition of the lateral geniculate nucleus of the thalamus, ST would increase the fluidity of temporal visual association in the absence of sensory input. The result would likely be the generation of internally derived imagery that has also been utilized during certain meditative states. Greatly increased ST levels might also act as agonists on ST₂ receptors, provoking hallucinations in the manner of the tryptamine psychedelics.

These increased ST levels, combined with lateral hypothalamic innervation, may lead the pineal gland to increase MT production, decreasing pain sensitivity and producing a sensation of tranquility. Under circumstances of heightened activation, pineal enzymes can also endogenously synthesize the powerful hallucinogen 5-methoxy-dimethyltryptamine (DMT) (Guchhait,

1976). Strassman has extensively linked DMT to a variety of mystical states, including out-of-body experiences, distortion of time and space, and interaction with supernatural entities (Strassman, 2001).

FUTURE DIRECTIONS IN THE STUDY OF SPIRITUAL PRACTICES AND EXPERIENCES

The future study of meditative practices, other religious experiences, and experiences of distant intentionality may offer a number of fascinating possibilities. The focus of initial studies will need to be on the specific neuroscientific techniques that will be most useful in the study of such phenomena. Imaging techniques, including PET, SPECT, and MRI, can be evaluated for their capacity to study the neurobiological correlates of meditative practices and spiritual phenomena. Specifically, such neurobiological correlates as cerebral metabolism, blood flow, and neurotransmitter receptor levels can be analyzed. Logistical issues and problems of the various techniques need to be considered to assess which techniques may offer the most appropriate methodology for the study of such experiences. Care should be taken so that confounding variables can be minimized and the possibility of identifying an effect is maximized. Experimental interventions should be simple, well-defined, and distinct from other types of interventions to exclude possible extraneous effects. Interventions that use only one form of activity such as meditation or prayer might be the most appropriate. Interventions requiring a combination of techniques (i.e., combining praying, dancing, and singing) might be too complicated for studying individual components of the intervention and may complicate careful analysis of the effects. Thus, interventions that allow for the simplified study of specific aspects of spiritual experience will have the highest yield in initial experiments. Homogeneity of spiritual interventions also will improve the results obtained from small, preliminary studies. Other variables such as electroencephalography, autonomic activity, and neuroendocrine and immunological markers may also help elucidate the overall interaction between the brain and the body during such states.

Ultimately, scientific methods such as functional brain imaging techniques may offer the best window into exploring how the human brain works during spiritual experiences and how it may be able to interact with the world in complex and remarkable ways.

REFERENCES

- Aghajanian, G. K., & Marek, G. J. (1999). Serotonin and hallucinogens. *Neuropsychopharmacology*, 21(2 Suppl), 16S–23S.
- Aghajanian, G. K., Sprouse, J., & Rasmussen, K. (1987). Physiology of the midbrain serotonin system. In H. Meltzer (Ed.), *Psychopharmacology: The third generation of progress* (pp. 141–149). New York: Raven Press.

- Albin, R., & Greenamyre, J. (1992). Alternative excitotoxic hypotheses. *Neurology*, *42*, 733–738.
- Amano, K., Tanikawa, H., Kawamura, H., Iseki, H., Notani, M., Kawabatake, H., et al. (1982). Endorphins and pain relief. *Applied Neurophysiology*, *45*, 123–135.
- Andrews, T. J., Halpern, S. D., & Purves, D. (1997). Correlated size variations in human visual cortex, lateral geniculate nucleus, and optic tract. *Journal of Neuroscience*, *17*(8), 2859–2868.
- Binder, J. R., Rao, S. M., Hammeke, T. A., Yetkin, F. Z., Jesmanowicz, A., Bandettini, P. A., et al. (1994). Functional magnetic resonance imaging of human auditory cortex. *Annals of Neurology*, *35*, 662–672.
- Bucci, D. J., Conley, M., & Gallagher, M. (1999). Thalamic and basal forebrain cholinergic connections of the rat posterior parietal cortex. *Neuroreporting*, *10*(5), 941–945.
- Bujatti, M., & Riederer, P. (1976). Serotonin, noradrenaline, dopamine metabolites in transcendental meditation-technique. *Journal of Neural Transmission*, *39*(3), 257–267.
- Campbell, C., Weinger, M. B., & Quinn, M. (1995). Alterations in diaphragm EMG activity during opiate-induced respiratory depression. *Respiratory Physiology*, *100*(2), 107–117.
- Cheramy, A., Romo, R., & Glowinski. (1987). Role of corticostriatal glutamatergic neurons in the presynaptic control of dopamine release. In M. Sandler, C. Feuerstein, & B. Scatton, (Eds.), *Neurotransmitter Interactions in the Basal Ganglia* (pp. 131–133). New York: Raven Press.
- Coker, K. H. (1999). Meditation and prostate cancer: integrating a mind/body intervention with traditional therapies. *Seminars in Urological Oncology*, *17*(2), 111–118.
- Davies, E., Keyon, C. J., & Fraser, R. (1985). The role of calcium ions in the mechanism of ACTH stimulation of cortisol synthesis. *Steroids*, *45*, 557.
- Diksic, M., & Reba, R. C. (Eds.). (1991). *Radiopharmaceuticals and brain pathology studied with PET and SPECT*. Boca Raton, FL: CRC Press.
- Ellison, G. (1995) The N-methyl-D-aspartate antagonists phencyclidine, ketamine and dizocilpine as both behavioral and anatomical models of the dementias. *Brain Research Reviews*, *20*(2), 250–267.
- Elias, A. N., Guich, S., & Wilson, A. F. (2000). Ketosis with enhanced GABAergic tone promotes physiological changes in transcendental meditation. *Medical Hypotheses*, *54*(4), 660–662.
- Elias, A. N., & Wilson, A. F. (1995). Serum hormonal concentrations following transcendental meditation—potential role of gamma aminobutyric acid. *Medical Hypotheses*, *44*(4), 287–291.
- Foote, S. (1987). Extrathalamic modulation of cortical function. *Annual Review of Neuroscience*, *10*, 67–95.
- Frost, J. J. (1992). Receptor imaging by positron emission tomography and single-photon emission computed tomography. *Investigative Radiology*, *27*, S54–S58.
- Friston, K. J., Frith, C. D., Passingham, R. E., Liddle, P. F., & Frackowiak, R. S. (1992). Motor practice and neurophysiological adaptation in the cerebellum. A positron emission tomography study. *Proceedings of the Royal Society of London, series B*, *248*(1323), 223–228.

- Frith, C. D., Friston, K., Liddle, P. F., & Frackowiak, R. S. (1991). Willed action and the prefrontal cortex in man. A study with PET. *Proceedings of the Royal Society of London, series B*, 244(1311), 241–246.
- Funke, K., & Eysel, U. T. (1995). Possible enhancement of GABAergic inputs to cat dorsal lateral geniculate relay cells by serotonin. *Neuroreporting*, 6(3), 474–476.
- Gatley, S. J., DeGrado, T. R., Kornguth, M. L., & Holden, J. E. (1990). Radiopharmaceuticals for positron emission tomography. Development of new, innovative tracers for measuring the rates of physiologic and biochemical processes. *Acta Radiologica Supplement*, 374, 7–11.
- Gellhorn, E., & Kiely, W. F. (1972). Mystical states of consciousness: Neurophysiological and Clinical aspects. *Journal of Nervous Mental Disorders*, 154, 399–405.
- Guchhait, R. B. (1976). Biogenesis of 5-methoxy-N,N-dimethyltryptamine in human pineal gland. *Journal of Neurochemistry*, 26(1), 187–190.
- Hammeke, T. A., Yetkin, F. Z., Mueller, W. M., Morris, G. L., Houghton, V. M., Rao, S. M., et al. (1994). Functional magnetic resonance imaging of somatosensory stimulation. *Neurosurgery*, 35, 677–681.
- Herzog, H., Lele, V. R., Kuwert, T., Langen, K. J., Kops, E. R., & Feinendegen, L. E. (1990–1991). Changed pattern of regional glucose metabolism during Yoga meditative relaxation. *Neuropsychobiology*, 23, 182–187.
- Infante, J. R., Peran, F., Martinez, M., Roldan, A., Poyatos, R., Ruiz, C., et al. (1998). ACTH and beta-endorphin in transcendental meditation. *Physiology and Behavior*, 64(3), 311–315.
- Infante, J. R., Torres-Avisbal, M., Pinel, P., Vallejo, J. A., Peran, F., Gonzalez, F., et al. (2001). Catecholamine levels in practitioners of the transcendental meditation technique. *Physiology and Behavior*, 72(1–2), 141–146.
- Ingvar, D. H. (1994). The will of the brain: Cerebral correlates of willful acts. *Journal of Theoretical Biology*, 171, 7–12.
- Janal, M., Colt, E., Clark, W., & Glusman, M. (1984). Pain sensitivity, mood and plasma endocrine levels in man following long-distance running: Effects of naxalone. *Pain*, 19, 13–25.
- Jansen, K. L. R. (1995). Using ketamine to induce the near-death experience: mechanism of action and therapeutic potential. *Yearbook for Ethnomedicine and the Study of Consciousness* [Jahrbuch furr Ethnomedizin und Bewubtseinsforschung], 4, 55–81.
- Jevning, R., Wallace, R. K., & Beidebach, M. (1992). The physiology of meditation: A review. A wakeful hypometabolic integrated response. *Neuroscience Biobehavioral Review*, 16, 415–424.
- Jevning, R., Wilson, A. F., & Davidson, J. M. (1978). Adrenocortical activity during meditation. *Hormones and Behavior*, 10(1), 54–60.
- Joseph, R. (1990). *Neuropsychology, neuropsychiatry, and behavioral neurology*. New York: Plenum.
- Kalin, N., Shelton, S., & Barksdale, C. (1988) Opiate modulation of separation-induced distress in non-human primates. *Brain Research*, 440, 285–292.
- Kiss, J., Kocsis, K., Csaki, A., Gorcs, T. J., & Halasz, B. (1997). Metabotropic glutamate receptor in GHRH and beta-endorphin neurons of the hypothalamic arcuate nucleus. *Neuroreporting*, 8(17), 3703–3707.

- Kung, H. F. (1991). Overview of radiopharmaceuticals for diagnosis of central nervous disorders. *Critical Review of Clinical Laboratory Science*, 28, 269–286.
- Lazar, S. W., Bush, G., Gollub, R. L., Fricchione, G. L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *Neuroreporting*, 11, 1581–1585.
- Livesey, J. H., Evans, M. J., Mulligan, R., & Donald, R.A. (2000). Interactions of CRH, AVP and cortisol in the secretion of ACTH from perfused equine anterior pituitary cells: “Permissive” roles for cortisol and CRH. *Endocrine Reviews*, 26(3), 445–463.
- Lou, H. C., Kjaer, T. W., Friberg, L., Wildschiodtz, G., Holm, S., & Nowak, M. (1999). A 15O-H₂O PET study of meditation and the resting state of normal consciousness. *Human Brain Mapping*, 7, 98–105.
- Lynch, J. C. (1980). The functional organization of posterior parietal association cortex. *Behavior Brain Science*, 3, 485–499.
- Maziere, B., & Maziere, M. (1991). Positron emission tomography studies of brain receptors. *Fundamental Clinical Pharmacology*, 5, 61–91.
- McCarthy, G., Blamire, A. M., Puce, A., Nobre, A. C., Bloch, G., Hyder, F., et al. (1994). Functional magnetic resonance imaging of human prefrontal cortex activation during spatial working memory task. *Proceedings of the National Academy of Sciences of the United States of America*, 91, 8690–8694.
- Moller, M. (1992). Fine structure of pinealoptal innervation of the mammalian pineal gland. *Microscopic Research Techniques*, 21, 188–204.
- Newberg, A. B., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d’Aquili, E. G. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research: Neuroimaging*, 106, 113–122.
- Newberg, A. B., & Iversen J. (2003). The neural basis of the complex mental task of meditation: Neurotransmitter and neurochemical considerations. *Medical Hypothesis*, 61(2), 282–291.
- O’Halloran, J. P., Jevning, R., Wilson, A. F., Skowsky, R., Walsh, R. N., & Alexander, C. (1985). Hormonal control in a state of decreased activation: potentiation of arginine vasopressin secretion. *Physiology and Behavior*, 35(4), 591–595.
- Olds, M. E., & Forbes, J. L. (1981). The central basis of motivation: intracranial self-stimulation studies. *Annual Review of Psychology*, 32, 523–574.
- Pardo, J. V., Fox, P. T., & Raichle, M. E. (1991). Localization of a human system for sustained attention by positron emission tomography. *Nature*, 349, 61–64.
- Peng, C. K., Mietus, J. E., Liu, Y., Khalsa, G., Douglas, P. S., Benson, H., et al. (1999). Exaggerated heart rate oscillations during two meditation techniques. *International Journal of Cardiology*, 70, 101–107.
- Phelps, M. E., Huhl, D.E., & Mazziotta, J.C. (1981). Metabolic mapping of the brain’s response to visual stimulation. Studies in man. *Science*, 211, 1445–1448.
- Phelps, M. E., & Mazziotta, J. C. (1985). Positron emission tomography. Human brain function and biochemistry. *Science*, 228, 799–809.
- Pietrowsky, R., Braun, D., Fehm, H. L., Pauschinger, P., & Born, J. (1991). Vasopressin and oxytocin do not influence early sensory processing but affect mood and activation in man. *Peptides*, 12(6), 1385–1391.

- Poletti, C. E., & Sujatanond, M. (1980). Evidence for a second hippocampal efferent pathway to hypothalamus and basal forebrain comparable to fornix system: A unit study in the monkey. *Journal of Neurophysiology*, *44*, 514–531.
- Rao, S. M., Binder, J. R., Hammeke, T. A., Bandettini, P. A., Bobholz, J. A., Frost, J. A., et al. (1995). Somatotopic mapping of the human primary motor cortex with functional magnetic resonance imaging. *Neurology*, *45*, 919–924.
- Redding, F. K. (1967). Modification of sensory cortical evoked potentials by hippocampal stimulation. *Electroencephalography and Clinical Neurophysiology*, *22*, 74–83.
- Reghunandan, V., Reghunandan, R., & Mahajan, K. K. (1998). Arginine vasopressin as a neurotransmitter in the brain. *Indian Journal of Experimental Biology*, *36*(7), 635–643.
- Renaud, L. P. (1996). CNS pathways mediating cardiovascular regulation of vasopressin. *Clinical and Experimental Pharmacology and Physiology*, *23*(2), 157–160.
- Sergent, J. (1994). Brain-imaging studies of cognitive functions. *Trends in Neuroscience*, *17*, 221–227.
- Shaji, A. V., & Kulkarni, S. K. (1998). Central nervous system depressant activities of melatonin in rats and mice. *Indian Journal of Experimental Biology*, *36*(3), 257–263.
- Sim, M. K., & Tsoi, W. F. (1992). The effects of centrally acting drugs on the EEG correlates of meditation. *Biofeedback Self-Regulation*, *17*, 215–220.
- Strassman, R. J. (2001). *DMT: The spirit molecule*. Rochester: Park Street Press.
- Sudsuang, R., Chentanez, V., & Veluvan, K. (1991). Effects of Buddhist meditation on serum cortisol and total protein levels, blood pressure, pulse rate, lung volume and reaction time. *Physiology and Behavior*, *50*, 543–548.
- Thomas, A. G., Vornov, J. J., Olkowski, J. L., Merion, A. T., & Slusher, B. S. (2000). N-Acetylated alpha-linked acidic dipeptidase converts N-acetylaspartylglutamate from a neuroprotectant to a neurotoxin. *Journal of Pharmacology and Experimental Therapeutics*, *295*(1), 16–22.
- Tooley, G. A., Armstrong, S. M., Norman, T. R., & Sali, A. (2000). Acute increases in night-time plasma melatonin levels following a period of meditation. *Biological Psychology*, *53*(1), 69–78.
- Van Bockstaele, E. J., & Aston-Jones, G. (1995). Integration in the ventral medulla and coordination of sympathetic, pain and arousal functions. *Clinical and Experimental Hypertension*, *17*(1–2), 153–165.
- Van Praag, H., & De Haan, S. (1980). Depression vulnerability and 5-Hydroxytryptophan prophylaxis. *Psychiatric Research*, *3*, 75–83.
- Wallace, R. K. (1970). Physiological effects of transcendental meditation. *Science*, *167*, 1251–1254.
- Walton, K. G., Pugh, N. D., Gelderloos, P., & Macrae, P. (1995). Stress reduction and preventing hypertension: Preliminary support for a psychoneuroendocrine mechanism. *Journal of Alternative and Complementary Medicine*, *1*(3), 263–283.
- Waterhouse, B. D., Moises, H. C., & Woodward, D. J. (1998). Phasic activation of the locus coeruleus enhances responses of primary sensory cortical neurons to peripheral receptive field stimulation. *Brain Research*, *790*(1–2), 33–44.
- Weingartner, H., Gold, P., Ballenger, J. C., Smallberg, S. A., Summers, R., Rubinow, D. R., et al. (1981). Effects of vasopressin on human memory functions. *Science*, *211*(4482), 601–603.

- Yadid, G., Zangen, A., Herzberg, U., Nakash, R., & Sagen, J. (2000). Alterations in endogenous brain beta-endorphin release by adrenal medullary transplants in the spinal cord. *Neuropsychopharmacology*, *23*(6), 709–716.
- Yoshida, M., Sasa, M., & Takaori, S. (1984). Serotonin-mediated inhibition from dorsal raphe nucleus of neurons in dorsal lateral geniculate and thalamic reticular nuclei. *Brain Research*, *290*, 95–105.
- Ziegler, D. R., Cass, W. A., & Herman, J. P. (1999). Excitatory influence of the locus coeruleus in hypothalamic-pituitary-adrenocortical axis responses to stress. *Journal of Neuroendocrinology*, *11*(5), 361–369.

CHAPTER 3

NEUROIMAGING STUDIES OF RELIGIOUS EXPERIENCE: A CRITICAL REVIEW

Nina P. Azari

INTRODUCTION

What makes an experience *religious*, as opposed to *nonreligious*? This question continues to be a challenge in the study of religion (Martin, 1987). One dimension of all human experience is the body, of which the brain is a part. Accordingly, one place to look for a distinctive signature of religious experience—that which makes an experience *religious*—is at the level of the human neurophysiology, the human brain. The role the human brain plays in any experience cannot be assessed without recourse to the human neurosciences. Hence, neuroscience, specifically, studies of the live human brain, may have something important to contribute to the non-neuroscientific literature on the topic of religious experience. The question of interest from a neuroscientific perspective is: “What’s going on in the brain when a person reports having a religious experience?”

In this chapter, I offer a critical review of the functional neuroimaging studies that have investigated religious experience (broadly conceived).¹ The purpose of this review is to explore the extent to which neuroimaging studies may provide new insight into the nature and structure of religious experience.

Toward that end, first I will describe the human brain functional imaging techniques that have been used for such studies. Second, I consider the interpretive limits of any neuroimaging study (regardless of the topic of inquiry) and explore how they apply in the case of religious experience. Third, I will describe each study (i.e., methods, results, conclusions) and offer a critical

examination of the assumptions associated with those studies (especially as regards the concepts “religious” and “experience”). Finally, I will discuss how the recent neuroimaging studies, taken together, stand in relation to current non-neuroscientific theorizing about the nature and structure of religious experience. I conclude the chapter by considering prospects for future research.

FUNCTIONAL NEUROIMAGING TECHNIQUES

The most recent and direct way to study the living human brain is with functional imaging technologies, such as single photon computed emission tomography (SPECT), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI). These techniques are referred to as functional imaging methods because they afford an assessment of brain *activity* (i.e., function), not just *structure*—as opposed to MRI and CT (computerized tomography), both of which are structural imaging techniques. Thus, SPECT, PET, and fMRI can be used to examine what is going on in the brain when a person is engaged in doing something (i.e., performing a task, or just lying still). Functional neuroimaging techniques have made it possible, for the first time, to study brain function in normal, living humans, so afford an opportunity to investigate phenomena considered unique to human beings, more specifically, “higher-order” cognitive functions.²

Human brain functional imaging techniques all rely on the fact that the brain (specifically, neural tissue, tissue in which there are brain cells, or neurons) uses energy when it is working, and energy utilization requires both glucose (a simple sugar) and oxygen consumption.

Broadly speaking, there are two approaches to analyzing functional imaging data. On one approach (so-called categorical analysis), images acquired for one condition (e.g., control, baseline, or rest condition) are subtracted from those for another condition (e.g., experimental or activation condition). The resulting subtraction image is thought to provide information about discrete areas of salient brain activity that are greater in one condition as compared to another. On another approach (so-called network-type analysis), information is obtained not only about areas of task-related brain activity increases, but also about areas that participate in this function but do not increase their metabolic or blood flow level as compared with the respective control state. It is thought that these areas may be as important as the areas that show an enhanced metabolic or blood flow levels correlated with mental states (McIntosh, 2000).

While PET, SPECT, and fMRI all can measure indirect correlates of neuronal activity in the live human brain, the principles of measuring brain energy utilization are different for each imaging technique.

PET and SPECT

Similarities: PET can be used to measure rates of glucose or oxygen metabolism (called PET-rCMR_{glc}), or—as can SPECT—regional cerebral blood flow (called PET-rCBF). All SPECT and PET studies require the use of radioactive tracers or isotopes (such as hexamethyl propyleneamine oxamine [^{99m}Tc-HMPAO] in the case of SPECT; fluorine-18-deoxyglucose, in the case of PET-rCMR_{glc}; or oxygen-15-labeled [¹⁵O-] water or butanol, in the case of PET-CBF). Correspondingly, SPECT and PET studies are considered invasive in the sense that the subject is injected with a small amount of the radiotracer. The radiotracers that are used for these two functional neuroimaging techniques work like substances that naturally occur in the brain (e.g., water or glucose [a simple sugar]). That is, they must be able to travel efficiently from peripheral organs (i.e., the injection site, such as the arm) into the brain (cross the so-called blood-brain barrier), and they must be able follow the path of blood to the brain. Tracers labeled with the positron-emitting isotopes, such as [¹⁵O-], allow one to estimate rCBF in quantitatively (Herzog et al., 1996), or semi-quantitatively (Friston et al., 1994; Fox & Raichle, 1984).

Techniques such as SPECT or PET rely on the emission of positrons or photons of light (what radioactive tracers emit). In the case of PET, for example, when the brain is active, positrons are emitted in the brain areas that are using energy, and the positrons are localized in the brain with the use of external detectors surrounding the experimental subject's head. A special camera detects the emitted photons, and via subsequent computer processing steps, the pictures or images acquired are converted into three-dimensional representations of the brain (Raichle, 1998).

Differences: Notable differences between SPECT and PET include how long the radiotracer stays in the brain (longer for SPECT) and how accurately one can locate the areas of activation—referred to as spatial resolution (PET has better spatial resolution). Because the radiotracers used in SPECT studies are long-lived, the subject can be injected with the tracer and engage in the task/state that is being studied outside of the scanner. The actual brain scan is performed later. In contrast, since the radiotracers used in PET studies stay in the brain for less than 2 minutes, the subject must be in the scanner when injected with the tracer, and while engaging in the task/state of interest.

fMRI

For fMRI studies, changes in blood oxygenation level-dependent (BOLD) contrast is used as an indirect marker of cerebral blood flow changes (Calamante, Thomas, Pell, Wiersma, & Turner, 1999). Due to the excess of

blood flow increase relative to oxygen consumption in activated brain areas, the amount of diamagnetic oxygenated blood becomes locally enhanced. Thus, the paramagnetic deoxy-haemoglobin decreases, which results in a signal increase in the fMRI images. In proportion to the fast-evolving hemodynamics, this signal builds up in about 8 seconds, which can be followed with what are known as fast MR sequences, including echo-planar imaging (Bandettini et al., 1997; Frahm, Bruhn, Merboldt, & Hänicke, 1992; Kleinschmidt, Büchel, Zeki, & Frackowiak, 1998).

While image evaluation of PET-rCBF capitalizes on identifying significant changes that persist in the steady-state during the scanning interval compared to the control steady-state, fMRI exploits the consistency of activation-related signal changes over a couple of subsequent activation vs. control cycles. Importantly, this means that fMRI does not provide information for a single activation or nonactivation state as such (e.g., for a rest state) but, rather, provides information in changes in blood flow from one state to another (e.g., activation vs. control/baseline).

An fMRI scanner is essentially a large magnet in the form of a tunnel, inside of which is a strong magnetic field. For a typical fMRI investigation, subjects are put into the fMRI scanner tunnel. Accordingly, subjects must be free of any metal objects (e.g., watches, keys, coins, credit cards) before being scanned with fMRI.

Studies that use fMRI do not involve the use of radioactive tracers. In this regard, fMRI is a relatively noninvasive technique as compared to PET and SPECT. However, fMRI scanning involves subjecting the study participant to a loud knocking sound within the scanner, which is a consequence of how fMRI detects changes in brain function. That is, the technique of fMRI involves detection of rapid changes of magnetic fields, which allows the magnet to pick up signals from the brain. These changes in the magnetic field produce a moderately loud metallic-like noise for the individual who is in the MRI scanner. Thus, for acoustic protection, subjects are usually provided ear pads or plugs.

fMRI vs. PET and SPECT

The fact that fMRI does not require the use of radiotracers means that, in principle, one can perform an unlimited number of scans on the same subject (i.e., have the subject perform multiple tasks repeatedly). Of course, this is not practicable. Nonetheless, the relative noninvasiveness of fMRI as compared to PET and SPECT affords study designs that render greater statistical power (i.e., repeated measurements on a single subject). Further, subject recruitment is usually easier for fMRI studies. Thus, the sample size for fMRI studies is usually larger, another statistical advantage. As already noted, unlike PET, fMRI cannot provide information on what's

going on in a subject's brain when the subject is not engaged in any specific task (i.e., during the so-called rest state). As explained, this is because fMRI measures *changes* in BOLD effects (i.e., changes in brain function between different activation conditions). Finally, fMRI, but not PET and SPECT, now can provide information about the time-course of information processing in the brain (i.e., fMRI has better temporal resolution than PET and SPECT).

Functional imaging techniques—most especially PET and fMRI—have been used to investigate a wide variety of human mental phenomena (e.g., mental imagery, arithmetic, abstract problem solving, and memory recall [Binkofski et al. 2000; Cabeza et al. 1997; Dehaene, Spelke, Pinel, Stanescu, Tsivkin, 1999; Duncan et al. 2000; Kosslyn, Behrmann, Jeannerod, 1995]). Now, there are reports on the neural correlates of two different kinds of religious experience (Azari et al., 2001a, 2001b; Newberg et al., 2001; Newberg, Pourdehnad, Alavi, & d'Aquili, 2003).

FUNCTIONAL NEUROIMAGING STUDIES OF RELIGIOUS EXPERIENCE

Christian

Methods

Azari et al. (2001b) used PET-CBF to study a group of self-identified religious subjects, who were Protestant Christians, and a group of control subjects, who were self-identified as nonreligious. Specifically, the subjects in that study were 12 normal, healthy adults aged 28+/-5 years (mean +/- standard deviation). All were right-handed, native German speakers. Six subjects (2 women, 4 men) were self-identified as religious and were members of a Christian Free Evangelical Fundamentalist Community. They were teachers at a private Christian secondary school and had been selected for their teaching posts on the basis of rigorous faith-based criteria. Each of them reported having had a documented conversion experience and interpreted biblical text literally as the word of God. According to those religious subjects, the first verse of Psalm 23 (i.e., The Lord is my shepherd . . .) was essential for each to get into and sustain a religious state, defined as "being in a personal relationship with God as Jesus Christ." Six subjects (2 women, 4 men) were self-identified as nonreligious and were students at the University of Duesseldorf, studying various subjects in the natural sciences. For those subjects, religion did not play any significant role in their daily life, and, in fact, they reported feeling somewhat indifferent to religious matters (i.e., none was a committed atheist, none felt strongly about any particular set of religious beliefs or practices). The two groups were matched on age, gender, and level of education.

Azari et al. employed a self-induction functional neuroimaging paradigm, which involved asking the subjects to induce in themselves a religious state (as they understood that to mean) with the help of biblical text that the religious subjects themselves suggested would be most effective, namely, Psalm 23.

Subjects were PET-scanned in six conditions (occurring in a different order for each subject).³ For each scan, the subjects were asked to induce in themselves the requisite target state, with the help of particular textual material (i.e., cues). Directly before and after each scan, the felt-quality of each target state was assessed objectively, using a standardized questionnaire (called the Positive Affect Negative Affect Scale, or PANAS; Watson, Clark, & Tellegen, 1988). In addition, after each PET scanning session, the subjects were asked to assess the extent to which each felt he/she had attained the requisite target state (i.e., religious, happy, neutral; these self-assessment ratings ranged on a scale of 0–10 [10 max]). The scanning conditions were as follows: (1) religious-read, (2) religious-recite, (3) happy-read, (4) happy recite, (5) neutral-read, (6) rest. The textual cues used for the different task conditions were: religious—the first verse of biblical Psalm 23; happy—a well-known German children’s nursery rhyme; and neutral—instructions on using a phone card, taken from the Duesseldorf, Germany telephone book. Texts were matched on length, and the rhyme was not associated with music. All subjects were able to recite from memory both the religious and happy texts at the time of the PET scanning. In the read conditions, the texts were presented on a screen that was visible to the subjects as they lay on the scanner bed. In the recite conditions, the subjects had their eyes covered and recited the textual material silently to themselves. In the rest condition, they lay quietly with their eyes covered.⁴

Results

According to their self-assessment ratings, only the religious subjects achieved the religious state (while reciting the religious text). These Christian subjects described their personal religious experiences as being in a close interpersonal relationship with God as Jesus Christ. The functional brain imaging results during their religious state showed a brain activation pattern that corresponded to their individual self-perspectives.

The PET images acquired in the religious subjects in the religious state showed peak blood flow activation in the right dorsolateral prefrontal cortex as compared to the nonreligious subjects. This activation pattern was observed also in contrast to the happy state and the neutral read condition. Other activations in the religious state were the dorsomedial frontal cortex (or, pre-SMA) and a posterior parietal area identified as the right precuneus. Increased blood flow in the left amygdala (i.e., a limbic structure) was observed only for the happy emotion state; no significant changes in blood flow involving limbic structures was evident for the religious state.

To further explore the distinctiveness of religious experience, a network-type analysis was recently applied to the PET-CBF data of the Christian religious experience and the happy emotion (Azari, Missimer, & Seitz, 2005).⁵ The results indicated that the religious experience and the happy emotion were mediated by distinctive neural patterns, involving the areas identified in the prior categorical analysis of the PET data.

Conclusions

Neuroscientific studies different from that of Azari et al. have shown that areas that were associated with the Christian religious experience participate in complex cognitive processes. Specifically, the dorsolateral prefrontal cortex has been shown to play a central role in inferential reasoning and belief (Iacoboni, 2000) and seems also to be critical for managing memories stored in posterior areas of the brain, as well as for the conscious monitoring of thought (Duncan et al., 2000; Fletcher, Shallice, Frith, Frackowiak, & Dolan, 1998; McIntosh, 1999). Although little as yet is known about the function of the pre-SMA, the most current understanding is that it is involved in controlling and sustaining a readiness to act based on the current contents of working memory (Deiber et al., 1991; Tanji & Mushiake, 1996). The pre-cuneus has been shown (in independent neuroimaging studies) to play a key role in visual memory, that is, storing memories in the form of visual images or representations (Fletcher et al., 1995).

On this basis, the investigators proposed that religious experience (at least one kind) may be a cognitively structured phenomenon, for which thoughts-beliefs play a central role. This proposal challenges an alternative, highly popularized (e.g., Alper, 2001) view of religious experience, according to which religious experience is marked by (dysfunctional) brain activity involving limbic structures, that is, the so-called limbic marker hypothesis of religious experience (Joseph, 2001).⁶

In addition, the investigators suggested that the network analysis findings not only support the view that religious experience may be cognitively structured, but also further the conviction that religious experience and emotion, while necessarily related (Azari & Birnbacher, 2004), are not exactly the same thing (Dewey, 1969; James, 1902). The authors concluded that network analysis also suggested something *in common* between religious and nonreligious emotion experiences, namely, an essential cognitivity. That is, the investigators called attention to the fact that the religious experience and the emotion were distinguishable in virtue of a *single neural network* that evidenced *two distinctive forms* of expression—one corresponding to the religious experience, the other corresponding to the happy emotion—and the brain structures that were important to that single neural network (expressed differentially for the religious experience and happy emotion) have been shown to participate in

complex cognitive functions. In this way, the network analysis indicated that *both* religious experience *and* emotion may be cognitively structured.⁷

Buddhist

Methods

In another recent neuroimaging investigation, Newberg et al. (2001, 2003) used SPECT to study a Tibetan Buddhist meditation experience. They, like Azari et al., employed a self-induction neuroimaging paradigm in which they asked their subjects—four men and four women, self-described as experienced, practicing Tibetan Buddhist meditators—to meditate and try to achieve the most intense state of their meditative experience. Included in this study were nine nonmeditator controls subjects. The Buddhist participants were allowed to use incense (i.e., cues) to help them achieve the peak meditative state. Due to the special characteristics of SPECT scanning (discussed above), the subjects could meditate outside the scanner when the SPECT blood flow tracer was injected. The tracer accumulation in the brain reflected the activation during meditation and could be scanned thereafter. In the control condition the subjects were at rest.

Results

Newberg et al. (2001) reported brain activations in the cingulate cortex, superior frontal cortex, dorsolateral prefrontal cortex, orbitofrontal cortex, precuneus, thalamus, and cerebellum during the peak meditative state in the Buddhist subjects. In addition, the investigators found slightly decreased blood flow in the superior parietal cortex. This decrease was small in magnitude and not significant but correlated with the blood flow increase observed in dorsolateral prefrontal cortex. No blood flow changes in limbic structures were observed during the religious experience of the Buddhist meditators.

Conclusions

Similar to the findings from the study by Azari et al. (2001b), the brain structures that showed salient changes in blood flow during the Buddhist religious experience play a role in complex cognitive processes. Newberg et al. (2001) considered it likely that the negative correlation between prefrontal cortex and superior parietal cortex was of special significance for the Buddhist meditative experience they were investigating. They speculated that the sense of unity (one's own body with the external world) that is commonly reported for such peak meditative experiences may be mediated by relative decreased brain activity in superior parietal cortex,

an areas thought to be important for creating mental representations of bodily-self orientation in space.

Summary and Assumptions

Taken together, the neuroimaging results from two very different kinds of religious experience suggest that complex cognitive processes are central to at least some kinds of religious experience. Further, the results of the recent network analysis of the PET data suggest that at least one kind of religious experience is distinguishable from at least one kind of emotion.

At this point it is important to note how the two studies described above conceptualized the terms “religious” and “experience,” for doing so will serve to introduce some of the limitations inherent to any neuroimaging study, which will be discussed in greater detail below.

First, the term “experience” was conceptualized in both studies as a short-lived event. However, experience also can be conceptualized as occurring over a lifetime. Correspondingly, a religious experience could refer to one’s entire life span.

Second, in so far as both studies employed a self-induction paradigm, they both assumed that an experience is “religious” if the subject says it is. Accordingly, a religious experience is an experience that is consciously available to the subject, has reportable content, and can be self-induced. Clearly, there are religious experiences that do not meet these criteria (e.g., ineffable experiences, conversion experiences). Third, studies also assumed that religious experience is a normal, healthy phenomenon (i.e., normal, healthy people have them). There are cases, however, when people who are unwell report intense religious experiences.⁸ Note, because both studies assume that religious experience is a normal phenomenon, the results of neither study can be used to establish that religious experiences are *in fact* normal, healthy phenomena. Finally, in the Azari et al. (2001b) study, it was assumed that religious experience is accessible to nonexperts.

These assumptions limit interpretations of the neuroimaging data obtained for the neuroimaging studies of religious experience described in this chapter. It turns out that there are interpretive limits for *any* functional neuroimaging study regardless of the topic of inquiry. Gaining clarity on such limits will make the positive contributions that functional neuroimaging can make on the topic of religious experience all the more evident.

INTERPRETATIVE LIMITS

First, the strongest statements that can be made about the results from brain imaging studies are correlational, not causal.⁹ Functional neuroimaging techniques measure brain activity and mental activity concurrently; and,

this amounts to detecting a correlation between brain events (i.e., brain activity) and mind events. Correspondingly, one cannot appeal directly to neuroimaging data to establish the origins (or, causal root) of mental phenomena as such (i.e., determine why mental events occur or exist *at all*). Thus, the results of functional imaging studies of religious experience cannot properly be used to fund causal explanations for religious experience (i.e., why people have them at all), let alone explanations for religion (why there is religion at all; or, what the origins of religion are).

Second, functional neuroimaging data are not interpreted in terms of identifying special spots in the brain for particular mental processes or phenomena (see especially, McIntosh, 2000). Thus, it would be inappropriate to conclude, on the basis of functional imaging studies of religious experience, that there is a religious- or God-spot in the brain (versus, e.g., Alper, 2001).

Third, the proper object of study in functional imaging investigations is the human being. Such studies, then, can legitimately make statements only about the human experience or perception, not about the specific objects experienced or perceived (or about any perceived relationship therewith).¹⁰ Thus, in the PET study of the Christian religious experience, for example, just because the brain activity patterns of those Christians corroborated their belief that they were in a personal relationship with God (as Jesus Christ), this does not lead to the conclusion that the brain imaging findings prove that these Christians were *in fact* in such a relationship. Along the same lines, functional imaging studies cannot prove the *necessity* of any object of experience, or of any belief. In the PET study of the Christian religious experience, then, the functional imaging results cannot speak to the necessity of God, of a belief in God, or of the religious experiences of the Christian subjects (here, a personal interaction with God). In fact, the answer to the question of God's necessity depends on one's understanding of the nature of God in the first place. Does God change? Is God conditioned by human experience? Or is God unconditioned? Those questions call for conceptual analyses—or, perhaps, for recourse to faith.¹¹ Functional neuroimaging studies of religious experience have no contribution to make to that discussion.¹²

Finally, it is assumed for any functional neuroimaging studies that both brain events and mental events exist (i.e., both are real). Neuroimaging data, therefore, cannot be used to argue for the reality of mental phenomena. In other words, that there are observed neural correlates of a given mental phenomenon cannot be taken as proof of the existence or reality of that mental event. Thus, functional imaging studies of religious experience cannot establish the reality of such experiences (versus, e.g., Newberg & d'Aquili, 2001).¹³ In line with what has just been said, functional imaging

studies cannot address the truth or falsity of mental states (e.g., thought-belief); the question, in fact, is never even raised in such studies.¹⁴ Thus, the PET and SPECT studies described in this chapter cannot be used to adjudicate between the religious beliefs held by Christian and those held by Buddhists.

With these interpretive limits in mind, we can now ask what the functional imaging findings reviewed in this chapter have to say about the nature and structure of religious experience.

NATURE AND STRUCTURE OF RELIGIOUS EXPERIENCE: CONTRIBUTIONS FROM FUNCTIONAL NEUROIMAGING

Taken together, the recent human brain functional findings reviewed in this chapter provide support for the view (current among scholars of religion) that religious experience is a cognitively structured phenomenon for which thoughts and beliefs are central (Dupre, 1998; Gelphi, 1994; Henry, 1991; McIntosh, 1995; Proudfoot, 1985; Schlitt, 2001; Spilka, Brown, & Cassidy, 1992; Spilka, Ladd, McIntosh, & Milmoie, 1996; Spilka & McIntosh, 1995; Spilka, Shaver, & Kirkpatrick, 1985). Moreover, the findings suggested that the cognitiveness of religious experience may apply across at least two, quite different religious traditions—Buddhist and Christian. In this way, recent functional neuroimaging studies of religious experience challenge an alternative, highly popularized view that religious experience is entirely a matter of a pre-cognitive, arousal-type brain response localized to the limbic system. Instead, the studies reviewed in this chapter lead to the conclusion that what makes an experience *religious* as opposed to *nonreligious* has to do with complex cognitive factors. Further, the results of the recent network analysis (described above) imply that the distinctiveness of religious experience—what makes an experience religious versus nonreligious—has to do with a specific kind of cognitiveness.

Relational Cognitiveness and Religious Experience

The prefrontal cortex—a structure whose connectivity patterns were associated with the religious experience—is most recently understood to play an especially important role in particular kinds of social-relational cognitive processes (e.g., mentalizing or theory of mind) (Adolphs, 2003a, 2003b). Specifically, findings from recent functional imaging studies suggest that widespread connections involving especially the prefrontal and medial-frontal cortex are critical for reasoning processes that are necessary for social interactions, namely, those that involve mentalizing—that is, attributing

independent mental states to oneself and others; reflecting on one's own inner states and reading another's mind (Calarge, Andreasen, & O'Leary, 2003; Fletcher et al., 1995; Goel, Grafman, Sadato, & Hallett, 1995; Happe, 2003; Kampe, Frith, & Frith, 2003; Siegal & Varley, 2002; Vogeley et al., 2001); agency detection (Blakemore et al., 2003); intentional (vs. incidental) self-processing (Kirchner et al., 2002); decision-making in social context (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003); and complex emotions such as empathy and sympathy (Decety & Chaminade, 2003; Wicker, Perrett, Baron-Cohen, & Decety, 2003).

As already noted, the Christian religious subjects in the PET study described their individual religious experiences in terms of an interpersonal relationship with God (in the person Jesus Christ). In other words, the cognitivity that played into the Christian religious experience for those religious subjects seemed to have been structured in terms of a perceived social *relationship*. Also mentioned above, the authors of the SPECT study of the Buddhist meditation experience concluded that the brain areas most important to mediating that experience were those that mediate perceived changes in the orientation of the body/self in space (Newberg et al., 2001). This interpretation corresponded to the descriptions of such experiences within the Buddhist tradition relevant to that SPECT study, that is, a perceived change in the *relation* between the experient's body/self and the rest of space.

These observations, taken together, provide neuroscientific support for the notion, proposed much earlier by scholars of religion, that religious-*ness* of an experience is more a matter of the how or quality of the experience, than of the what or presumed object experienced (e.g., Dewey, 1934). This would imply that an experience is religious because of a particular kind of perceived relationship and not in virtue of some specific perceptual object as such (e.g., God). On this interpretation, God *as such* (or as an object) would not be what a Christian religious experience, for example, is about in the first place; God *as such* (or any other presumed object) is not what makes the experience specifically religious (e.g., Tillich, 1951). Rather, a perceived *relationship with*, for example, God would be what makes that experience religious (for a Christian) as opposed to nonreligious.

Cross-cultural Similarities and Differences

Recent functional neuroimaging findings on religious experience may point to a possible cross-cultural invariance of religious experience, namely, an essential relational cognitivity. Correspondingly, what may be common across religious traditions is a cognitivity that has to do with perceived relationality. This, then, would suggest that there is a universal factor that runs across a wide variety of experiences, all of which may belong to a broader

family called religious experience. At the same time, cross-cultural differences in religious experience may show up in terms of different kinds of relational cognitivity (and distinctive neural networks thereof), rather than in terms of different kinds of perceived objects of experience.

PROSPECTS FOR FUTURE RESEARCH

Varieties of Religious Experience

What has emerged from recent neuroimaging studies so far is that the neurophysiological correlates of religious experience seem to involve cognitive brain structures and that such a fundamentally cognitive pattern seems to apply across at least two different and diverse kinds of religious experience (Christian and Buddhist). Furthermore, given the conclusions drawn in this chapter, religious experience seems to involve a particular kind of cognitivity, namely, that having to do with a perceived relationality, but that relational cognitivity does not seem to be monolithic in terms of correlated neural activation patterns. That is, different kinds of perceived relationality (e.g., inter-personal, orientation of body in space) seem to have different patterns of correlated neural activity. More neuroscientific studies along the lines of what has already been done on varieties of religious experience itself are needed to see if the results obtained so far will have any significant power as regards broader generalizations.

Religious Versus Nonreligious Experiences

So far, brain imaging findings suggest that the neural expression of at least one kind of Christian religious experience seems to be different to that of at least one kind of nonreligious emotion experience, a happy emotion. At the same time, that particular religious experience showed similarities with that particular emotion experience in the sense that both phenomena had neural correlates that involved brain areas that can participate in higher-order cognitive processes and behaviors, even as the extent of activation of those cognitive brain structures was different between the religious and emotion states. Clearly, there need to be more neuroscientific studies comparing religious and nonreligious experiences (e.g., different kinds of emotion). There are, of course, many nonreligious experiences, besides commonly characterized emotions, that have yet to be explored neuroscientifically on their own merits, let alone being compared and contrasted with religious experience (e.g., aesthetic experiences, such as listening to a favorite piece of music, viewing a particular painting, or listening to/reading poetry). How would these kinds of neural patterns compare to those correlated with different kinds of religious experience? Alternatively, there are phenomena that appear to have something in common with religious

phenomena on a seemingly different level, namely, the level of feelings of conviction. So, one could ask, how would the neural correlates of, for example, feelings of nationalism-patriotism or political affiliation compare to those of feelings that go with particular kinds of religious conviction?

Neural Correlates of Relational Cognitivity

There is much work to be done also in terms of describing the neurophysiology of relational cognitivity. That is, mapping the neural bases of complex kinds of relational cognitivity (e.g., the neural correlates and functional connectivity patterns of different kinds of perceived causal relations) may be critical for gaining further insight into the neural bases of religious experience. The results of such studies, taken together with results of new neuroscientific studies of different kinds of religious and nonreligious experience, may provide new insight into cross-cultural similarities and differences in the embodied nature of the cognitivity of religious experience, as well as new insight into similarities and differences between religious and nonreligious phenomena. For example, one may conceive of different kinds of inter-personal relationality that may or may not map to different neural patterns. In the case of the neuroimaging study of the Christian religious experience, the perceived “other” with whom the Christian subjects reported experiencing a close relation was God (an objectively nonobservable being) personified as Jesus Christ. Hence, the character of that relationality was perceived as inter-personal. What kind of neural pattern might correlate with a perceived inter-personal relation with an objectively observable other not objectively a person, for example, experiencing a close relation with the family dog? Interestingly, there is some preliminary evidence to suggest that there is a common neural network involved in the recognition of beloved familiar faces, regardless of species (Shinozaki, Hanakawa, & Fukuyama, 2005). Ultimately, one may be able to describe varieties of perceived relationality in terms of varieties of correlated neural patterns and to identify correspondences between those neural patterns and varieties of religious and nonreligious experiences.

Neuroplasticity and Religious Experience

Finally, the topic of neuroplasticity—the capacity of the brain to change (Azari & Seitz, 2000)—may be of special relevance to the study of religious experience, specifically, types of conversion experiences (Richardson, 1985) or a “falling into” religion, which is described in terms of some kind of change (sudden or gradual). Might there be corresponding changes at the neural level? Similarly, might different kinds of apostasy (Bromley, 1988)—“falling out of” religion—map to different neural patterns? No doubt, such studies

will be especially challenging for the imaging data would have to capture the critical switch (i.e., to or from religion) involved in such experiences.

NOTES

1. The adjective “religious” can classify an experience in terms of its subject matter (i.e., its contents), or in terms of a judgment made by the experient regarding the religious significance of the experience (Martin, 1987; Smith, 1995). The same can be said of two other, closely related terms: “spiritual” and “mystical.” While the non-neuroscientific literature in study of religion has highlighted important differences among the terms religious, spiritual, and mystical (Hood, 2003; Katz, 1977; McGinn, 1991; Pargament, 1999; Zinnbauer et al., 1997), the neuroscientific literature tends to use these adjectives interchangeably. I do not include in this review studies that do not at all refer to the phenomenon under investigation as religious (e.g., studies of meditation, with no reference to the term religious [i.e., Herzog et al., 1990; Lazar et al., 2000; Lou et al., 1999]).

2. In contrast to electroencephalography (EEG) and magnetoencephalography (MEG), the techniques of PET, SPECT, and fMRI do not assess brain electrical activity directly, but, rather, they assess activity-related changes in cerebral hemodynamics. In addition to activation studies, these techniques also can be used to investigate neuroreceptor and neurotransmitter systems in the live human brain.

3. The neuroimaging (PET-rCBF) data were acquired with a 24-ring ECAT EXACT-HR camera. Resolution 4mm in-plane, 9mm FWHM, slice distance 2.4 mm.

4. For each scan, 555 MBq of ^{15}O butanol were injected into the right brachial vein, flushed with saline. PET scanning began at the moment of the injection, and lasted for 60 sec. The 40 sec of dynamically recorded head uptake were used for calculation of the rCBF data. PET images slices were reconstructed using a Hanning filter to an effective image resolution of 9mm (FWHM) with slice distance of 2.425 mm (see also, Duncan et al., 2000; Herzog, Seitz, Tellmann, & Müller-Gärtner, 1996).

5. There is a long tradition in religious and theological studies of trying to elucidate what makes an experience distinctly religious—as opposed to nonreligious—by comparing religious experience to, or analyzing it in terms of, emotion (Dewey 1969; James 1902; Martin 1987; Smart 1997; Smith 1995).

6. The limbic marker hypothesis maintains that limbic activity is *necessary* for (any and all) religious experience. Correspondingly, there have been suggestions that direct stimulation (electrically or magnetically) of the limbic system will artificially generate a religious experience (Persinger, 1983), and that removing limbic structures will render someone incapable of having religious experiences (Ramachandra & Blakeslee, 1998). These suggestions have furthered the notion—inherent to the limbic marker hypothesis—that what makes an experience religious, as opposed to nonreligious, has to do with a pre-cognitive, automatic-type brain response in the limbic system. There has been considerable evidence cited against this hypothesis (Tucker, Novelly, & Walker, 1987), and, most serious scholars of religion—in particular, those concerned with the neurophysiological processes of religious phenomena—do not endorse this view of religious experience (Austin, 1998; Glassman, 2002; Hood, Spilko, Hunsberger, & Gorsuch, 1996;

McNamara, 2002; Peterson, 2001, 2002; Teske, 2001). Nonetheless, the limbic marker hypothesis of religious experience persists.

7. This finding fits well with current theorizations on emotion, all of which conceptualize emotion as essentially cognitive (Ben Ze'ev, 2000; Damasio, 1999, 2003; Eich, Kihlstrom, Bower, Forgas, & Niedenthal, 2000; LeDoux, 2000; Nussbaum, 2001; Ochsner & Barrett, 2001; Rolls, 2001; Scherer, Schorr, & Johnstone, 2001). Moreover, the results suggest that emotion may play a role in religious experience at a complex cognitive level, and not necessarily (if at all) at the level of a basic arousal response or pre-cognitive feeling (Azari & Birnbacher, 2004).

8. An opposite view of religious experience (i.e., that it is abnormal) is associated with studies using particular patient populations (i.e., TLE, schizophrenia [cf., Bear, 1979; Bear & Fedio, 1977; Bear, Levin, Blumer, Chetham, & Ryder, 1982; Dewhurst & Beard, 1970; Puri, Lekh, Nijran, Bagary, & Richardson, 2001; Ramachandran & Blakeslee, 1998; Stifler, Greer, Sneck, & Dovenmuehle, 1993]), as well as those using healthy volunteers (Persinger, 1983, 1984). On this view, the neurophysiological basis of religious phenomena is fundamentally a matter of an abnormal brain state, localized to the limbic system (Persinger, 1983, 1987).

9. The word “cause” can take many meanings (Hulswitt, 2002). Here, I use the term to refer to the most common understanding of cause, especially as it has been applied in the natural sciences, namely, efficient cause. This interpretive limitation is a consequence of a foundational assumption that is made for any functional brain imaging study, namely, that mental events emerge from brain events—the character of that emergence, however, is left unspecified.

10. For example, one cannot prove or disprove that there is *in fact* a bear out there, simply by looking at the neural activity of a person's brain when that person reports having an experience of, or perceiving, a bear. All one can do is conclude that the observed brain activity corresponds to a person's conviction that what he or she perceived was something he or she took to be a bear.

11. What about the necessity of *belief in God*—regardless of the truth of such belief (i.e., of whether God exists or not)? As explained above, the brain areas that have so far been involved in religious experience can serve a variety of cognitive functions. Thus, there is as yet no neuroscientific evidence to support the claim that such activation patterns *must* involve *belief in God*. Further, claiming that the neuroimaging findings can establish the necessity of religious belief (e.g., in God) is based on reducing such belief to something evolutionarily useful. There may not be a necessary evolutionary function for religious belief, specifically (Boyer, 1994).

12. In effect, what this means is that results from functional neuroimaging studies of religious experience do not reduce away religious belief, religion, or God. That being said, there is another kind of reductionism that may pose a challenge to theology, namely, that of the reduction of traditional theological concepts to cognitive neuroscientific ones. That is, one can talk about religious experience in traditional cognitive neuroscientific terms. Does this mean that neuroscience has reduced religious experience, not to brain stuff, but to a collection of ordinary, everyday cognitive functions? If cognitive functions and capacities that are traditionally attributed to the soul—for example, emotion, rationality, morality—are now described neuroscientifically, what does this imply for the concept of soul?

13. Further, a claim that neuroimaging studies of religious experience can establish the reality of such experiences *just because* there are observed (i.e., real) neural correlates thereof is equally untenable. For, it is already assumed that for *any* given mental event, there will be *some kind of* brain correlate/event (i.e., in keeping with current thought, the human neurosciences assume that all human experiences are embodied). In fact, it is difficult to conceive of a functional neuroimaging study, the results of which could support the conclusion that there simply *are* no brain correlates for mental phenomenon X, say.

14. On a pragmatic understanding of truth, the truth of a thought-belief, for example, is determined by the (long term) consequences of holding that thought or belief (cf., James, 1902). An inquiry into mental phenomena using functional neuroimaging techniques (currently available today) is constrained to talk about mental phenomena in terms of brain activity that happens (begins and ends) within a relatively short window of time. Functional neuroimaging studies cannot consider the pragmatic consequences of what is observed in the brain for any given mental phenomenon.

REFERENCES

- Adolphs, R. (2003a). Cognitive neuroscience of human social behavior. *Nature Reviews Neuroscience*, *4*, 165–178.
- Adolphs, R. (2003b). Investigating the cognitive neuroscience of social behavior. *Neuropsychologia*, *41*, 119–126.
- Alper, M. (2001). *The 'God' part of the brain: A scientific interpretation of human spirituality and God*. New York: Rogue Press.
- Austin, J. H. (1998). *Zen and the brain*. Boston: MIT Press.
- Azari, N. P., & Birnbacher, D. (2004). The relation between emotion and religious experience: An interdisciplinary inquiry. *Zygon*, *43*(9), 901–918.
- Azari, N. P., Missimer, J., & Seitz, R. J. (2005). Religious experience and emotion: Evidence for distinctive cognitive neural patterns. *International Journal for the Psychology of Religion*, *15*(4), 263–281.
- Azari, N. P., Nickel, J. P., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001a). Neural circuitry of religious experience. In *Proceedings of the 31st Annual Meeting of the Society for Neuroscience*, *1*, 382. San Diego: Society for Neuroscience.
- Azari, N. P., Nickel, J. P., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001b). Neural correlates of religious experience. *European Journal of Neuroscience*, *13*, 1649–1652.
- Azari, N. P., & Seitz, R. J. (2000). Brain plasticity and recovery from stroke. *American Scientist* (Sept–Oct), 426–431.
- Bandettini, P. A., Kwong, K. K., Davis, T. L., Tootell, R. B. H., Wong, E. C., Fox, P. T., et al. (1997). Characterization of cerebral blood oxygenation and flow changes during prolonged brain activation. *Human Brain Mapping*, *5*, 93–109.
- Bear, D. M. (1979). Temporal lobe epilepsy: A syndrome of sensory-limbic hyperconnection. *Cortex*, *15*, 357–384.

- Bear, D. M., & Fedio, P. (1977). Quantitative analysis of interictal behavior in temporal lobe epilepsy. *Archives of Neurology*, *34*, 454–467.
- Bear, D., Levin, K., D. Blumer, D., Chetham, D., & Ryder, J. (1982). Interictal behavior in hospitalized temporal lobe epileptics: Relationship to idiopathic psychiatric syndromes. *The Journal of Neurology, Neurosurgery, and Psychiatry*, *45*, 481–488.
- Ben-Ze'ev, A. (2000). *The subtlety of emotions* (1st ed.). Cambridge, MA: MIT Press.
- Binkofski, F., Amunts, K., Stephan, K. M., Posse, S., Schormann, T., Freund, H. J., et al. (2000). Broca's region subserves imagery of motion: A combined cytoarchitectonic and fMRI study. *Human Brain Mapping*, *11*, 273–285.
- Blakemore, S. J., Boyer, O., Pachot-Clouard, M., Meltzoff, A., Segebarth, C., & Decety, J. (2003). The detection of contingency and animacy from simple animations in the human brain. *Cerebral Cortex*, *13*, 837–844.
- Boyer, P. (1994). *The naturalness of religious ideas: A cognitive theory of religion*. Berkeley: University of California Press.
- Bromley, D. G. (1988). Religious disaffiliation: A neglected social process. In D. G. Bromley (Ed.), *Falling from the faith: Causes and consequences of religious apostasy* (pp. 9–25). Newbury Park, CA: Sage.
- Cabeza, R., Grady, C. L., Nyberg, L., McIntosh, A. R., Tulving, E., Kapur, S., et al. (1997). Age-related differences in neural activity during memory encoding and retrieval: A positron emission tomography study. *Journal of Neuroscience*, *17*, 391–400.
- Calarge, C., Andreasen, N. C., & O'Leary, D. S. (2003). Visualizing how one brain understands another: A PET study of theory of mind. *American Journal of Psychiatry*, *160*, 1954–1964.
- Calamante, F., Thomas, D. L., Pell, G. S., Wiersma, J., & Turner, R. (1999). Measuring cerebral blood flow using magnetic resonance imaging techniques. *Journal of Cerebral Blood Flow and Metabolism*, *9*, 701–735.
- Damasio, A. R. (1999). *The feeling of what happens: Body and emotion in the making of consciousness* (1st ed.). Orlando: Harcourt.
- Damasio, A. R. (2003). *Looking for Spinoza*. Orlando: Harcourt.
- Decety, J., & Chaminade, T. (2003). Neural correlates of feeling sympathy. *Neuropsychologia*, *41*, 127–138.
- Dehaene, S., Spelke, E., Pinel, P., Stanescu, R., & Tsivkin, S. (1999). Sources of mathematical thinking: Behavioral and brain-imaging evidence. *Science*, *284*, 970–974.
- Deiber, M. P., Passingham, R. E., Colebatch, J. G., Friston, K. J., Nixon, P. D., & Frackowiack, R. S. J. (1991). Cortical areas and the selection of movement: A study with positron emission tomography. *Experimental Brain Research*, *84*, 393–402.
- Dewey, J. (1934). *A common faith*. New Haven, CT: Yale University Press.
- Dewey, J. (1969). The place of religious emotion. In J. Boydston (Ed.), *John Dewey: The early works, 1882–1898, Vol. 1: 1882–1888*. London: Southern Illinois University Press, Feffer & Simons.
- Dewhurst, K., & Beard, A. W. (1970). Sudden religious conversions in temporal lobe epilepsy. *The British Journal of Psychiatry*, *117*, 497–507.
- Duncan, J., Seitz, R. J., Kolodny, J., Bor, D., Herzog, H., Ahmed, A., et al. (2000). A neural basis for general intelligence. *Science*, *289*, 457–460.
- Dupre, L. (1998). *Religious mystery and rational reflection: Excursions in the phenomenology and philosophy of religion*. Grand Rapids, MI: Eerdmans Publishing.

- Eich, E., Kihlstrom, J. F., Bower, G. H., Forgas, J. P., & Niedenthal, P. M. (Eds.). (2000). *Cognition and emotion*. New York: Oxford University Press.
- Fletcher, P. C., Happe, F., Frith, U., Baker, S. C., Dolan, R. J., Frackowiak, R. S. J., et al. (1995). Other minds in the brain: A functional imaging study of "theory of mind" in story comprehension. *Cognition*, *57*, 109–128.
- Fletcher, P. C., Shallice, T., Frith, C. D., Frackowiak, R. S. J., & Dolan, R. J. (1998). The functional roles of the prefrontal cortex in episodic memory. II. Retrieval. *Brain*, *121*, 1249–1256.
- Fox, P. T., & Raichle, M. E. (1984). Stimulus rate dependence of regional cerebral blood flow in human striate cortex, demonstrated by positron emission tomography. *Journal of Neurophysiology*, *51*, 1109–1120.
- Frahm, J., Bruhn, H., Merboldt, K. D., & Hänicke, W. (1992). Dynamic MR imaging of human brain oxygenation during rest and photic stimulation. *Journal of Magnetic Resonance Imaging*, *2*, 501–505.
- Friston, K. J., Holmes, A. P., Worsley, K. J., Poline, J. P., Frith, C. D., & Frackowiak, R. S. J. (1994). Statistical parametric maps in functional imaging: A generalized linear approach. *Human Brain Mapping*, *2*, 189–210.
- Gelphi, D. L. (1994). *The turn to experience in contemporary theology*. Mahwah, NJ: Paulist Press.
- Glassman, R. B. (2002). "Miles within millimeters" and other awe-inspiring facts about our "mortarboard" human cortex. *Zygon*, *37*, 255–277.
- Goel, V., Grafman, J., Sadato, N., & Hallett, M. (1995). Modeling other minds. *Neuroreport*, *6*, 1741–1746.
- Happe, F. (2003). Theory of mind and the self. *Annals of the New York Academy of Sciences*, *1001*, 134–144.
- Henry, C. F. H. (1991). Theology: 20th-century trends. In J. D. Douglas, (Ed.), *New 20th-century encyclopedia of religious knowledge* (pp. 820–824). Grand Rapids, MI: Baker Bookhouse.
- Herzog, H., Seitz, R. J., Tellmann, L., & Müller-Gärtner, H. W. (1996). Quantitation of regional cerebral blood flow using an autoradiographic-dynamic approach in positron emission tomography. *Journal of Cerebral Blood Flow and Metabolism*, *16*, 645–649.
- Herzog, H., Lele, V. R., Kuwert, T., Langen, K. J., Kops, E. R., Feinendegen, L. E. (1990). Changed pattern of regional glucose metabolism during yoga meditative relaxation. *Neuropsychobiology*, *24*, 182–187.
- Hood, R. W. (2003). The relationship between religion and spirituality. In D. Bromley (Series Ed.) & A. L. Griel & D. Bromley (Vol. Eds.), *Defining religion: Investigating the boundaries between the sacred and the secular: Vol. 10. Religion and the social order* (pp. 241–265). Amsterdam, The Netherlands: Elsevier Science.
- Hood, R. W., Jr., Spilka, B., Hunsberger, B., & Gorsuch, R. (Eds.). (1996). *The psychology of religion: An empirical approach*. New York: Guilford Press.
- Hulswit, M. (2002). From cause to causation: A piercean perspective (Vol. 90). In K. Leher, (Ed.), *Philosophical studies*. Dordrecht: Kluwer Academic Publishers.
- James, W. (1902). *The varieties of religious experience* (Foreword by J. Barzun). New York: New American Library, Penguin Putnam.
- Joseph, R. (2001). The limbic system and the soul: Evolution and neuroanatomy of religious experience. *Zygon*, *36*, 105–136.

- Kampe, K. K. W., Frith, C. D., & Frith, U. (2003). "Hey John": Signals conveying communicative intention toward the self activate brain regions associated with mentalizing, regardless of modality. *Journal of Neuroscience*, *23*, 5258–5263.
- Katz, S. T. (1977). *Mysticism and philosophical analysis*. New York: Oxford University Press.
- Kirchner, T. T. J., Brammer, M., Bullmore, E., Simmons, A., Bartels, M., & David, A.S. (2002). The neural correlates of intentional and incidental self processing. *Neuropsychologia*, *40*, 683–692.
- Kleinschmidt, A., Büchel, C., Zeki, S., & Frackowiak, R. S. J. (1998). Human brain activity during spontaneously reversing perception of ambiguous figures. *Proceedings of the Royal Society of London, series B*, *265*, 2427–2433.
- Kosslyn, S. M., Behrmann, M., & Jeannerod, M. (1995). The cognitive neuroscience of mental imagery. *Neuropsychologia*, *33*, 1335–1344.
- Lazar, S. W., Bush, G., Gollub, R. L., Fricchione, G. L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *Neuroreport*, *11*, 1581–1585.
- Lou, H. C., Kjaer, T. W., Friberg, L., Wildschiodtz, G., Holm, S., & Nowak, M. (1999). A ¹⁵O-H₂O PET study of meditation and the resting state of normal consciousness. *Human Brain Mapping*, *7*, 98–105.
- LeDoux, J. E. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience*, *23*, 155–184.
- Martin, J. A. (1987). Religious experience. In M. Eliade (Ed.), *The encyclopedia of religion* (12th ed., pp. 323–330). New York: MacMillan Publishing.
- McGinn, B. (1991). Appendix: Theoretical foundations: The modern study of mysticism. In: B. McGinn (Ed.), *The foundations of mysticism* (pp. 265–343). New York: Crossroads.
- McIntosh, A. R. (1999). Interactions of prefrontal cortex in relation to awareness in sensory learning. *Science*, *284*(5419), 1531–1533.
- McIntosh, A. R. (2000). Towards a network theory of cognition. *Neural Networks*, *13*, 861–870.
- McIntosh, D. N. (1995). Religion as schema, with implications for the relation between religion and coping. *The International Journal for the Psychology of Religion*, *5*, 1–16.
- McNamara, P. (2002). The motivational origins of religious practices. *Zygon*, *37*, 143–160.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., J. Santanna, J., & d'Aquili, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research*, *106*, 113–122.
- Newberg, A. B., & d'Aquili, E. (2001). *Why God won't go away: Brain science and the biology of belief*. New York: Ballantine Books.
- Newberg, A., Pourdehnad, M., Alavi, A., & d'Aquili, E. G. (2003). Cerebral blood flow during meditative prayer: Preliminary findings and methodological issues. *Perceptual Motor Skills*, *97*, 625–630.
- Nussbaum, M. C. (2001). *Upheavals of thought: Intelligence of emotions*. New York: Cambridge University Press.

- Ochsner, K. N., & Barrett, L. F. (2001). A multiprocess perspective on the neuroscience of emotion. In T. J. Mayne, G. A. Bonnano, & P. Salovey (Eds.), *Emotions: Current issues and future directions* (pp. 38–81). New York: Guilford Press.
- Pargament, K. I. (1999). The psychology of religion and spirituality? Yes and no. *International Journal for the Psychology of Religion*, 9, 3–16.
- Persinger, M. A. (1983). Religious and mystical experiences as artifacts of temporal lobe function: A general hypothesis. *Perceptual Motor Skills*, 57, 1255–1262.
- Persinger, M. A. (1984). People who report religious experiences may also display enhanced temporal-lobe signs. *Perceptual Motor Skills*, 58, 963–975.
- Persinger, M. A. (1987). *Neurophysiological bases of God beliefs*. New York: Praeger.
- Peterson, G. R. (2001). Think pieces: Religion as orienting worldview. *Zygon*, 36, 5–19.
- Peterson, G. R. (2002). Thinkpieces: *Mysterium tremendum*. *Zygon*, 37, 237–253.
- Proudford, W. (1985). *Religious experience*. Berkeley: University of California Press.
- Puri, B. K., Lekh, S. K., Nijran, K. S., Bagary, M. S., & Richardson, A. J. (2001). Spect neuroimaging in schizophrenia with religious delusions. *International Journal of Psychophysiology*, 40, 143–148.
- Raichle, M. E. (1998). Behind the scenes of functional brain imaging: A historical and physiological perspective. *Proceedings of the National Academy of Sciences*, 95, 765–772.
- Ramachandran, V. S., & Blakeslee, S. (1998). *Phantoms in the brain*. New York: William Morrow.
- Richardson, J. T. (1985). The active vs. passive convert: Paradigm conflict in conversion/recruitment research. *Journal for the Scientific Study of Religion*, 24, 163–179.
- Rolls, E. T. (2001). *The brain and emotion*. Oxford, UK: Oxford University Press.
- Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (2003). The neural basis of economic decision-making in the ultimatum game. *Science*, 300, 1755–1758.
- Scherer, K. R., Schorr, A., & Johnstone, T. (Eds.). (2001). *Appraisal processes in emotion*. New York: Oxford University Press.
- Schlitt, D. M. (2001). *Theology and the experience of God*. New York: Peter Lang.
- Shinozaki, J., Hanakawa, T., & Fukuyama, H. (2005). The neural correlates of common affection to human and animal family members studies by fMRI. Abstract. OHBM June 2005 Meeting, Toronto, Canada.
- Siegal, M., & Varley, R. (2002). Neural systems involved in “theory of mind.” *Nature Reviews Neuroscience*, 3, 463–471.
- Smart, N. (1997). *The religious experience*. Upper Saddle River, NJ: Prentice Hall.
- Smith, J. Z. (Ed.). (1995). *The HarperCollins dictionary of religion*. San Francisco: Harper San Francisco.
- Spilka, B., Brown, G. A., & Cassidy, S. A. (1992). The structure of religious mystical experience in relation to pre- and post-experience lifestyles. *The International Journal for the Psychology of Religion*, 2, 241–257.
- Spilka, B., Ladd, K. L., McIntosh, D. N., & Milmoie, S. (1996). The contents of religious experience: The roles of expectancy and desirability. *International Journal for the Psychology of Religion*, 6, 95–105.

- Spilka, B., & McIntosh, D. N. (1995). Attribution theory and religious experience. In R. W. Hood (Ed.), *Handbook of religious experience* (pp. 421–445). Birmingham, AL: Religious Education Press.
- Spilka, B., Shaver, P., & Kirkpatrick, L. A. (1985). A general attribution theory for the psychology of religion. *Journal for the Scientific Study of Religion*, 24, 1–20.
- Stifler, K., Greer, J., Sneek, W., & Dovenmuehle, R. (1993). An Empirical Investigation of the discriminability of reported mystical experiences among religious contemplatives, psychotic in-patients, and normal adults. *Journal for the Scientific Study of Religion*, 32, 366–372.
- Tanji, J., & Mushiake, H. (1996). Comparison of neuronal activity in the supplementary motor area and primary motor cortex. *Brain Research. Cognitive Brain Research*, 3, 143–150.
- Teske, J. A. (2001). Neuroscience and spirit: The genesis of mind and spirit. *Zygon*, 36, 93–103.
- Tillich, P. (1951). *Systematic theology* (Vol. I). Chicago: University of Chicago Press.
- Tucker, D. M., Novelly, R. A., & Walker, P. J. (1987). Hyperreligiosity in temporal lobe epilepsy: Redefining the relationship. *Journal of Nervous and Mental Disease*, 175, 181–184.
- Vogeley, K., Bussfeld, P., Newen, A., Herrmann, S., Happe, F., Falkai, P., et al. (2001). Mind reading: Neural mechanisms of theory of mind and self-perspective. *NeuroImage*, 14, 170–181.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology*, 54, 1063–1070.
- Wicker, B., Perrett, D. I., Baron-Cohen, S., & Decety, J. (2003). Being the target of another's emotion: A PET study. *Neuropsychologia*, 41, 139–146.
- Zinnbauer, B. J., Pargament, K. I., Cole, B., Rye, M. S., Butter, E. M., Belavich, T. G., et al. (1997). Religion and spirituality: Unfuzzifying the fuzzy. *Journal for the Scientific Study of Religion*, 36, 549–564.

RELIGION AND THE LIFE COURSE:
IS ADOLESCENCE AN “EXPERIENCE
EXPECTANT” PERIOD FOR RELIGIOUS
TRANSMISSION?

Candace S. Alcorta

When that sign is carved on the body the abstract is not only made substantial but immediate . . . and if the mark is indelible, as in the case of the subincision, the excised canine, the lopped finger, the scarified face, chest or back, it is ever-present. As the abstract is made alive and concrete by the living substance of men and women, so are men and women predicated by the abstractions which they themselves realize. (Rappaport, 1999)

The incessant drizzle did little to dampen the spirits of the 100 disheveled teenagers that filed onto the powder blue, 1960s vintage school buses. It was early and uncharacteristically quiet. Most of the teens had been up late socializing on the first night of this week-long mission program and had still not fully awakened, but they smiled and nodded as they grabbed their rakes and shovels and climbed onboard.

This was my first morning with the group. As an anthropologist conducting research on adolescent religiosity, I had been invited to come and observe this fledgling youth mission program, now in its second year of existence. The project had been initiated by a local minister who saw it as an opportunity to bring together urban and suburban teens while addressing inner city needs. Over the course of the next week, the teens participating in the program would spend the majority of their time cleaning, shoveling, raking, and hammering as helpers at Habitat for Humanity and Head Start projects throughout the city. The 100 teens in the mission group included Latino,

African-American and Anglo adolescents from seven different suburban and urban churches. Although clothing and hairstyles differed throughout the group, all of the youth participants shared a common aversion to the daily 6:00 A.M. wake-up call and a common belief in the importance of the project.

What I observed over the next several days was, from an anthropological perspective, a classic example of adolescent rites of passage. The work teams of the mission project didn't create ancestral clans, but they soon created their own fictive kin groups, aided by organized team-building activities that included team names and badges, ropes course training, and inter-group competitions. There were no psychological ordeals, although sleep deprivation was very real as the teenagers struggled to be on time for their early morning bus departure each day. The beatings, scarification, and bodily mutilation that are central elements of adolescent initiation rites among such groups as the Ndembu of Africa and the Baktaman of New Guinea were noticeably absent here. The physical labor required of team members each day was, however, clearly a novel and painful physical ordeal. The communal song, dance, and ritual that feature prominently in rites of passage across traditional cultures were all integral parts of the mission program as well. Every evening after returning from their mission work, team members spent several hours practicing for a talent show to be performed at the final ceremony of the week's activities. Each day ended in the hushed and darkened seminary chapel where all the teens shared their project experiences, recounted their "highs" and "lows," and joined together in prayer and song. By the end of the week, the adolescent volunteers who had arrived with 100 different backgrounds, personalities, and beliefs had become a single, cohesive unit. The mission project had succeeded in generating what anthropologist Victor Turner called "communitas"—an intensely shared feeling of community among this previously diverse group of American adolescents.

For an evolutionary anthropologist steeped in the selfish gene theories of Dawkins and the inclusive fitness models of Hamilton and Trivers, the mission program was puzzling. Why would 100 unrelated American teenagers who didn't know one another or those they were helping give up a week of their summer vacations to live in a cramped seminary dorm room and perform hard physical labor? Certainly, some of the youth who participated in the program had been encouraged by their parents to do so. For the majority of the adolescents, however, the decision to volunteer for the mission program had been an individual choice. Whether involvement was self-initiated or parentally inspired, parents clearly approved of their teen's participation in the program, even though this entailed both time and monetary costs. In many cases, parents not only supported their child's participation, but actively participated themselves.

Mission programs are but one aspect of American adolescents' religious involvement. A recent national survey conducted by sociologist Christian

Smith (2005) found that many American teens are actively involved in religious youth groups, church and synagogue activities, and an active program of religious youth camps throughout the nation. Adolescence is also the time when American youth attend confirmation classes, participate in bar/bat mitzvahs, and publicly assert and acknowledge their religious beliefs. Americans are not unique in their focus on adolescence as a significant life period for “learning and living” religion. Most cultures throughout the world consider adolescence to be the appropriate life period for religious initiation. Nearly three-quarters of the societies studied by anthropologists have formalized adolescent initiation rites for the express purpose of transmitting religious knowledge (Lutkehaus & Roscoe, 1995). Numerous anthropological accounts describe these “rites of passage” as the most elaborate and significant religious ceremonies performed within a culture. Religious systems as different as those of Arapesh animists, American Protestants, and Asian Buddhists all include such rites and focus on adolescence as the developmental period most appropriate for religious transmission.

This universal focus on adolescence as the most important time of life for the transmission of religious beliefs and behaviors is taken for granted by most of us. Like learning music or learning language, it is something that comes naturally and is seldom questioned. But why does learning religion during adolescence come naturally? Why don't we learn religion when we learn language? If beliefs are the critical element of religious systems, then humans should be able to learn religion once language skills are mastered. Yet, there are no societies reported to conduct “childhood rites of initiation.” Why is adolescence the preferred developmental period for religious transmission across cultures as different as those of Australian Arunta hunter-gatherers, African Ashanti agriculturalists, and American industrial Protestants? Is religion, like music and language, a universal human capacity that is best developed during a particular life stage? If so, what happens in the absence of such development? We still do not have answers to many of these questions, but new research is beginning to provide intriguing insights into possible answers and to expand our understanding of both the neurophysiology and the evolutionary function of religion.

MAKING THE ABSTRACT IMMEDIATE: MUSIC, LANGUAGE AND RELIGION

Anthropological and archaeological research indicates that religion is a universal human trait with a long history. Every culture known includes religious beliefs and behaviors that are recognizable as religion, even to outsiders unfamiliar with the language and customs of that culture. Like music and language, religion is both culturally specific and species universal. Music, language, and religion are all cultural constructions that must be learned

through social transmission; however, both the capacity for and constraints on such learning appear to be hard wired in all human brains. Whether we enjoy the sitar or the sousaphone, speak Hindi or English, and worship Vishnu or the Holy Trinity depends on the culture in which we are socialized. Yet our ability to speak any language, enjoy any musical tradition, or engage in any religious experiences all appear to derive from genetically encoded neural capacities common to all humans.

We not only possess the ability to learn music, language, and religion; we also exhibit innate predispositions to do so. These innate predispositions structure our experiences and bias our learning. As a result, what we learn is highly influenced by predispositions to attend to and process particular classes of stimuli during specific developmental periods. What we learn is culturally prescribed. When we learn appears to be a function of brain growth patterns.

Much of human brain growth occurs after birth. The brain of a human newborn continues to grow at a rapid fetal rate throughout the first year of life. By the second year of the human infant's life, only about 50 percent of brain development is complete. The human brain does not reach its maximum size until adolescence. This brain growth is not uniform. Different parts of the human brain mature at different times. Sensory cortices, including those for sight and hearing, mature relatively early in development, while other brain regions, such as those involved in language processing and abstract thought, mature much later. During development, periods of high dendrite and synapse proliferation are interspersed with periods of pruning in which the total number of neurons and their interconnections are reduced (Kolb, Forgie, Gibb, Gorny, & Rontree, 1998). The neuronal interconnections that remain are enhanced through the formation of lipid sheaths around axons that speed neuronal transmissions. This process of myelination creates the white matter of the brain and is one of the last stages of neuronal maturation.

The prolonged pattern of brain development in humans and the differential maturation rates of various brain regions have profound implications for learning and behavior. During brain growth, neuronal dendrites proliferate. Each of these dendrites has the potential to interconnect with other neurons through the creation of synapses. Synapses link the axons and dendrites of one neuron with another. Environmental stimuli that activate specific neurons cause these synapses to fire, thereby strengthening the inter-neuronal connections. This process creates associational networks within the brain. Synapses that are seldom fired are eliminated, and their energetic resources are reallocated to active networks. Since the maturation rates of various brain structures differ, the optimal developmental periods for shaping neural interconnections through experientially based firing of synapses differ as well. As a result, environmental stimuli are processed differently and have different

impacts on the brain at various stages of development (Kolb et al., 1998). The human capacity to learn music offers a glimpse into this process.

MUSIC: A DEVELOPMENTAL MODEL

Throughout the world, mothers and other caregivers sing to newborns. These songs are sung in hundreds of different languages, but the style in which they are sung is universal. Songs sung to infants are slower, higher pitched, and have an exaggerated rhythm when compared to noninfant songs. No matter what the language, these are the songs infants prefer. Even two-day-old infants born from congenitally deaf parents who sign and do not speak or sing prefer infant-directed singing to adult-directed singing. Videotaped studies of infants as young as six months old demonstrate that even at this early age humans perceive and attend to both the structural and emotional features of musical sounds (Trehub, 2001). These apparently innate musical capacities and preferences are shaped during early childhood through cultural exposure and socialization. By age 3 children are able to recognize “happiness” as represented by the musical forms of their culture, and by age 5 they are able to discriminate between happy and sad musical excerpts on the basis of tempo differences. By 6 years of age children readily employ both tempo and mode to identify sadness, fear, and anger in music (Trehub, 2001). Once developed, this ability to read the emotions encoded in a culture’s musical conventions seems to remain unchanged throughout the remainder of life. Psychologist Sandra Trehub (2001) compares this culturally patterned learning of music’s emotional meaning to that which occurs in relation to facial expressions. Both appear to derive from basic innate predispositions and encompass several apparently universal features, but both also require socialization experiences within a particular developmental window in order for the culturally defined components to be fully developed.

For music, the development of these innate abilities is directly linked to the neural maturation of specific brain areas. The ability of young infants to distinguish pitch is dependent upon the maturation of neurons that make up “tonotopic” maps of the right temporal lobe that associate sound frequencies with pitch. Similar processing of time intervals in music occurs in the homologous region of the left temporal lobe, resulting in perceptions of rhythm (Liegeois-Chauvel, Giraud, Badier, Marquis, & Chauvel, 2001). These initial functions perceptually organize and structure sound such that infants enter the world with a brain capable of organizing sound frequencies in relation to rhythm and pitch. The association of these components with culturally prescribed meaning occurs later. The songs sung to infants begin this experiential process of shaping associational networks between the auditory processing areas of the temporal lobes and limbic structures, such as the anterior cingulate cortex, involved in investing them with emotional

meaning. Although the capacity to create these interconnections is innate, the development of these capacities depends on, and is shaped by, the social experiences in the infant's world.

Language learning, like music, also involves the social development of innate predispositions. The development of language capacities occurs slightly after that of music and may actually build on several of the capacities developed during music acquisition. The associations between sound patterns and meaning and the correlations between sound patterns and syntactic structure that are critical elements in language are first developed in relation to music (Koelsch & Friederici, 2003). The pitch, tone, and cadence of speech, collectively referred to as speech prosody, are the first elements attended to in linguistic communication. In contrast to the left-hemisphere processing of all other language features, these elements of language are processed in the right "musical" side of the brain. Likewise, the predominant rhythms of a culture's speech sounds reflect the predominant musical rhythms of the culture (Patel, 2003). Brain studies show that children first learn to process structure in music around the age of 5. The processing of structure in language follows a similar developmental trajectory but occurs approximately four years later.

Brain imaging studies clearly demonstrate the existence of dedicated neural structures underlying innate human capacities for both music and language. Full development of these capacities, however, depends on the maturation of functional brain regions responsible for specific components of these capacities, as well as development of the neural networks that link these regions together. At each specific stage of development, associations among regions are shaped by activation of specific neurons that occurs in response to social and cultural experiences. Our innate predispositions to learn the music and language of our culture reflect the existence of neural structures specific to music and language. Maturation of these various structures at different times during development creates what neurophysiologist William Greenough (1986) has called "experience expectant" periods for learning. Infancy appears to be such a period for learning culturally encoded meanings of musical rhythm and pitch. These learned capacities then provide a basis for the development of language skills during childhood. What about religion? Do we also possess an innate predisposition to learn religion? Does the development of our religious capacity build on previously learned skills? Is there an experience expectant period for religion, as there is for music and language? There is considerable evidence that the answer to many of these questions is "yes."

THE "DEEP STRUCTURE" OF RELIGION

Religion, like music and language, is a universal human trait that is at once individual and social, innate and learned. Like music and language, religion

exhibits structural features that are universal and allow us to recognize religion in cultures very different from our own. These features include: (a) a belief in socially omniscient supernatural agents; (b) separation of the sacred from the profane; and, (c) music-based communal ritual.

Across cultures, religious systems include supernatural agents that regularly violate natural categories and laws and also possess extraordinary powers. These agents are conceived of in different forms across cultures. The supernatural agents of some religions, such as those of the Arctic Inuit and the Australian Arunta, are embodied in animal totems. In other cultures, as among the Ilahita Arapesh of New Guinea, such agents may be the ghosts of the recently deceased. In monotheistic religions, such as Islam, Christianity and Judaism, a single god is considered to have omnipresent, omnipotent, and omniscient powers. This omniscience is a distinguishing feature of the supernatural agents of all religions. Whatever form these agents take, they are always knowledgeable about human social behaviors and human affairs. People everywhere seem to possess an innate predisposition to believe in such socially omniscient agents. When they are not formally incorporated into the religion of a culture, as in Buddhism, they tend to sneak in through the back door, or,—as evident from the spirit houses commonly found throughout southeast Asia,—the front door. Cognitive scientist Scott Atran notes that “Even Buddhist monks ritually ward off malevolent deities by invoking benevolent ones” (Atran & Norenzayan, 2004, p. 714). A common human proclivity to believe in such agents may be a part of our make-up. Experiments conducted by psychologist Jesse Bering (2004) found that young children innately believe in such omniscient supernatural agents. These agents retain their omniscience throughout childhood, even as initial childhood perceptions of parents as omniscient begin to fade. By adolescence not only do these beliefs persist, but they also expand to include the belief that such agents are able to act on their knowledge. Not only do the gods and ancestors know what we’re doing; they can also let us know that they are displeased.

Throughout the world these innate predispositions to believe in powerful, socially omniscient supernatural agents are shaped by the cultures in which they occur. They are transmitted from generation to generation through the use of highly memorable images, concepts, and narratives. Totemic animals that talk, incorporeal spirits that eat, and powerful gods capable of transforming themselves into swans and volcanoes are not quickly forgotten. Such supernatural agents grab our attention because they violate universal expectations about the world’s everyday structure. At the same time, they engage sets of cultural beliefs about these agents that derive from their real life counterparts. When these counterintuitive concepts are embedded within memorable narrative frameworks, they are easy to learn and remember (Atran & Norenzayan, 2004). And when they

are associated with emotionally arousing rituals, they are almost impossible to forget.

Anthropologist Maurice Bloch (1989) has identified music, chanting, and dance as “distinguishing marks of ritual” in all cultures known. These features of ritual are found in the traditional societies studied by anthropologists, but they are also basic components of religion in contemporary Western cultures. In their recent nationwide survey of U.S. congregations, sociologist Mark Chaves and his colleagues (Chaves, Konieszny, Beyerlein, & Barman, 1999) found music to be the single most consistent feature of contemporary worship across all faiths studied in the United States. Even fundamentalist sects retain music as an essential element of religion. Cognitive scientists Scott Atran and Ara Norenzayan note that “even the Taliban, who prohibited nearly all public displays of sensory stimulation, promoted a cappella religious chants” (Atran & Norenzayan, 2004, p. 717). Throughout human history music and religious ritual have been inseparable, and in some cultures, such as that of the Igbo of Africa, a single word, “nkwa,” refers to both (Becker, 2001). It is only within the last 200 years of Western civilization that secular music has emerged as an entity separate from religious ritual. Even this music, however, is rooted in the monastic Gregorian chants of Medieval Europe (Cross, 2003). Music appears to be an integral part of religions throughout the world. It is capable of eliciting joy, awe and ecstasy, as described by the eleventh century Persian Sufi mystic Ghazzali:

The heart of man has been so constituted by the Almighty that, like a flint, it contains a hidden fire which is evoked by music and harmony, and renders man beside himself with ecstasy. These harmonies are echoes of that higher world of beauty which we call the world of spirits, they remind man of his relationship to that world, and produce in him an emotion so deep and strange that he himself is powerless to explain it. (Becker, 2001, p. 145)

This sense of the infinite, eternal, and sacred described by Ghazzali is not unique to Sufi mystics. A contemporary American woman describes very similar responses to a performance of Mahler’s Tenth Symphony:

I remember tears filling my eyes. I felt as if I understood a message, from one time to another, from one human to another. . . . The way through the symphony had been hard and frightening, even shocking, but it was a great happiness—almost an honor—having had the opportunity to experience this. . . . now all words would have been superfluous, even my own. My thoughts had nothing to do with words. (Gabrielsson, 2001, p. 441)

These emotions elicited by music appear to be common to humans across both time and space. Just as music is a central feature across religions, the

emotions music evokes are also a critical element in the experience of “the sacred.” The ability of religious ritual to evoke such emotions in the creation of the sacred is the second feature common to all religions.

In all cultures religious ritual is the means by which people, places, objects, and beliefs are sanctified (Eliade, 1958; Rappaport, 1999). As a result of participation in religious ritual, adherents come to view the ordinary as extraordinary and to invest special meanings and powers in sacred things. Among the Mbuti pygmies of the African Congo, the religious “molimo” festival transforms a rusty pipe that remains submerged beneath river water throughout most of the year into a sacred flute capable of eliciting reverence and awe (Turnbull, 1962). Likewise, canonization rituals of the contemporary Roman Catholic Church transform ordinary men and women into saints invested with miraculous abilities. Things perceived to be sacred—whether pipes or people—are also perceived to have power. The source of this power lies in the ability of sacred things to evoke strong emotions of joy, fear, awe, and danger in those who believe. These intense emotions influence choices and motivate individual behaviors. Mbuti men who hear the voice of the forest spirit in the molimo flute not only feel a sense of awe, but also feel a sense of dread if there is reason to believe that the forest spirit may be displeased or angry with their conduct in human affairs. These feelings have the power to change behaviors, making the lazy more energetic and the stingy more generous. Studies conducted on Israeli kibbutzim by anthropologist Richard Sosis and economist Bradley Ruffle (2003) provides empirical evidence of the effects of religious participation on individual behaviors. This research demonstrated a positive and significant correlation between regular participation in religious ritual and measures of cooperation. Music and other elements of religious ritual, such as candle-lit cathedrals, life-like statues, and stylized movements that heighten our emotional engagement, better prepare us to experience the sacred. These elements of religion elicit emotions capable of transforming ordinary objects, places, and beliefs into sacred things by investing them with extraordinary emotional meaning for ritual participants.

These three structural features of religion—belief in supernatural agents, music-based communal ritual, and the emotional significance of the sacred—are elements common to all religions (Alcorta & Sosis, 2005). Humans exhibit an innate predisposition to develop culturally defined emotional responses to music during infancy. Humans also appear to possess an innate predisposition to believe in socially omniscient supernatural agents during childhood. It is, however, during adolescence that these developed capacities and beliefs are integrated into religious systems in the creation of the sacred. Cross-cultural studies suggest that adolescence may be a particularly important developmental period for shaping this experience and for associating it with the symbols and beliefs of religion.

ADOLESCENT RITES OF PASSAGE

Adolescent rites of passage are found in 70 percent of the world's cultures and vary widely from culture to culture. In some societies only males participate in adolescent initiation rites. Other societies restrict these rites to females. In cultures that do practice male rites of passage, approximately one-half of such rites are group rites. In contrast, nearly 90 percent of female rites of passage are individual (Lutkehaus & Roscoe, 1995).

There is considerable cross-cultural variation in the duration of adolescent rites of passage. In some societies, such as the Ndembu of Zambia, adolescent initiation begins for boys around the age of ten, as they are forcibly kidnapped from their mother's hut and taken to a secluded initiation site where they remain for the next several years. In other cultures, rites are brief. The Sunrise Ceremony of the Apache was celebrated when a girl began menstruation and lasted only a few days (Eliade, 1958; Paige & Paige, 1981). Adolescent initiation rites may be relatively simple and consist of little more than the transmission of sacred knowledge, as among the Yamana and Halakwulup of Tierra del Fuego, or they may be prolonged, intense, and psychologically and physically painful. Among the Baktaman of New Guinea, male initiates are routinely deprived of food, water, and sleep, repeatedly beaten and tortured, forced to dance to the point of exhaustion, and required to eat things initiates consider disgusting (McCauley, 2001). Many adolescent rites of passage include the permanent excision or mutilation of body parts, including removal of teeth or fingers, scarification, and genital mutilation (Glucklich, 2001). Initiation rites can and sometimes do result in permanent disfigurement, infertility, and even the death of initiates (Glucklich, 2001; Paige & Paige, 1981; Turner, 1967).

Anthropologists have traditionally viewed adolescent initiation rites as social institutions that function to redefine social roles and identities within society. Initiates who participate in these rites learn both the sacred and secular aspects of their new roles as men and women and are psychologically transformed from children to adults. This function is explicitly acknowledged. In most societies that conduct these rites, it is only after the successful completion of initiation that adolescents assume the culturally defined roles of adulthood. Only then can successful initiates enter into marriage and assume other reproductive, economic, political, and religious rights and responsibilities within their societies.

Although adolescent initiation rites exhibit considerable variation across groups, the underlying structure of these rites is highly consistent in every culture known. Nearly a century ago Arnold van Gennep (1960) identified three distinct phases of initiation rites, including separation, transition, and incorporation. He viewed these phases as psychological mechanisms that play an important role in the transformation of the initiate. Van Gennep

maintained that the separation of initiates from the safety and security of the familiar was an important first step in their psychological transformation. The separation of initiates may be as simple as a week voluntarily spent at an urban seminary. Alternatively, separation may involve forcible kidnapping and seclusion for several years. Although there are clear differences in the emotional impacts of these two experiences, in both cases the separation of the initiate from the familiar psychologically “primes” the individual for the transformation that occurs during the second phase.

The second phase of initiation rites is the transition or “liminal” phase. In this stage of initiation, participants are stripped of their old identities to recreate them anew. Anthropologist Victor Turner (1967) described this phase as “a moment in and out of time.” For Turner this state of liminality was a key element in preparing the initiate to realize and integrate the symbolic, imaginative, and emotional aspects of ritual. Across religions, ritual practices that alter normal body states and perceptions are a fundamental part of achieving the liminal state. Food and sleep deprivation, psychological and physical ordeals, and pain experienced by initiates serve to “grind (initiates) down to a uniform condition to be fashioned anew and endowed with additional powers to enable them to cope with their new station in life” (p. 95). This stripping away of external social identities and the “grinding down” of individual psyches promotes egalitarianism among initiates and allows the recognition of a generalized social bond. Once recognized, this bond can be enhanced and strengthened through joint participation in music-based communal ritual. The result is the development of “*communitas*,” a deeply felt, spiritually binding, and long-lasting communion among the initiates.

The nature, duration, and intensity of transition phase activities have a direct impact on both the loss of individual initiate identity and on the strength of group cohesion achieved. In the church mission group I observed, the ropes training course, the daily physical labor, and the evening social and communal worship activities all helped create the experience of “*communitas*” among participants. The emotional depth of these experiences, however, was far removed from that of Ndembu adolescent males who participate in that society’s Mukanda rites. For these adolescents the emotional intensity evoked by forcible kidnapping, prolonged seclusion, repetitive sleep and food deprivation, psychological and physical ordeals, and the excruciating pain of circumcision performed with a sharpened stone in the absence of anesthesia significantly intensify the psychological impacts of the liminal phase experience. Among the Ndembu these rites are especially traumatic as a result of the very close mother-child bond that exists in this society prior to kidnapping. This is also true for many of the patrilineal, patrilocal societies that practice highly intense and painful initiation rites. The intensity of these emotionally charged experiences have indelible psychological and neurological effects. In her book *Sacred Pain*, author Ariel Glucklich (2001) argues that

the pain experienced by initiates as a result of such practices as circumcision “is meant to produce a unity on the level of moral order instead of the particularistic order based on birth and motherhood” (p. 141). Initiates who share such extremely intense experiences together forge a bond. In initiation ceremonies this bond is further strengthened through joint participation in ritual, song, and dance. As a result, such highly intense group initiation ceremonies not only transform individual initiates, but also bring into being a new social body that did not previously exist.

The last phase of adolescent rites of passage involves the reintegration of initiates back into society. In this phase individuals re-enter the social group, but they do so as a new person who has been both psychologically and socially transformed. In many cultures initiation rites underscore this transformation through the symbolic death and rebirth of the initiate. In cultures that practice intense male group rites, such as the Baktaman and Ndembu, reintegration also involves the reintegration of the new social group that has been forged through the ritual process. The use of physical “badges,” including scarification, circumcision, and other alterations of physical appearance, serve as indelible testaments of the individual’s new identity as a member of this newly created social body.

Adolescent rites of passage clearly serve to signal a change in the social roles and statuses of initiates. The bar/bat mitzvahs of Judaism, Christian confirmation classes, and the Mukanda ceremony of the Ndembu all visibly and publicly announce the status change of initiates to all other members of society. The new powers and the responsibilities of initiates are announced and clarified, both to the initiates and to all others with whom they interact. Rites of passage transmit new knowledge, new skills, new beliefs, and new values and prepare initiates for new social roles, both cognitively and emotionally. Empirical evidence demonstrates that participation in such religious rituals creates social and moral bonds that strengthen group commitment and promote cooperative group behaviors (see Sosis, this volume). Increasing the “costs” of these rituals also increases the degree of commitment and cohesion among the ritual participants. Rites of passage that are most prolonged, intense, and painful should engender the greatest long-term cohesion and cooperation among initiates. A cross-cultural study of male rites of initiation and warfare conducted by anthropologist Richard Sosis and his colleagues (Sosis this volume, chap. 4) confirms this prediction. Non-state societies that most frequently engage in external warfare are also those societies that practice the most prolonged, intense, and painful male group initiation rites. Such rites appear to promote the highest levels of individual altruism and achieve greatest adherence to cooperative group goals—precisely the motivation and commitment you would want if you were frequently counting on your fellow initiates during war.

The initiation experience is one which adolescents never forget. This is certainly true for Ndembu males who bear bodily, as well as mental signals, of their initiation experience. It is also true for American teenagers who have participated in church mission trips. In my interviews with these youths, they consistently report mission trips as the most memorable of all their religious experiences. They also assert that these trips have changed the way they see the world. Although it is certainly not surprising that Ndembu initiates would be transformed by the intense, prolonged and painful experiences they undergo during rites of passage, it is somewhat more difficult to understand the impact of church mission trips on contemporary American teenagers. Such trips do not include memorably painful experiences, yet they appear to have a significant effect on adolescent perceptions of self and others. What is it about adolescent rites of passage that make such an impact on adolescents? And what is it about adolescence that render these rites particularly powerful?

ADOLESCENCE AS A LIFE STAGE

In many species adolescence is a relatively brief period between the juvenile and adult phases of the organism. In humans this transitional period between childhood and adulthood extends over several years and in some cultures, such as our own, may span more than a decade. Adolescence differs from puberty. Puberty refers to the attainment of sexual maturation and is defined in relation to specific neuroendocrine changes. Adolescence encompasses a gradual process that includes puberty, but also involves a series of "soft events," both behavioral and physiological (Spear, 2000). Not long ago adolescence was viewed largely as a cultural creation of wealthy developed nations. Proponents of this view argued that the lengthy period of adolescence that typifies contemporary industrialized nations did not occur in traditional societies in which children were quickly transitioned from childhood to adult status at the onset of puberty. Accumulating neurophysiological evidence refutes this view and indicates that the psychological and behavioral changes that define adolescence are not simply cultural constructions, but instead include significant physiological events that occur in nonhuman, as well as human species. Neuroscientists, biologists, and physicians increasingly view adolescence as a critical period of brain development. Although cultural variables clearly influence the duration of adolescence, the behavioral, neural, and physiological changes that occur during adolescence are not merely cultural creations. One leading interdisciplinary research group of scientists has defined adolescence as "that awkward period between sexual maturation and the attainment of adult roles and responsibilities" (Dahl, 2004, p. 9). This definition of adolescence applies to nonhuman species but is particularly relevant for human cultural systems in which both ecological

and social factors are critical in determining when adult status is attained. Cross-cultural research demonstrates that nutritional and ecological factors impact the onset and length of adolescence. In many traditional societies the average two-year period between puberty and marriage defines a relatively short adolescence for females, with a somewhat longer four-year average for males (Schlegel & Barry, 1991). In societies afflicted with poverty, stress, and poor nutrition, adolescence, like life itself, may be brief. In contrast, wealthy societies that benefit from good nutrition and healthy living conditions may extend adolescence across a decade as a result of both earlier physical and reproductive maturation and later social maturation (Dahl, 2004). Yet, whether adolescence occurs earlier or later in the life span, and whether it is brief or prolonged, there are universal changes in behavior, psychology, and neurophysiology that define this developmental period.

Adolescence has been called “a chronic state of threatened homeostasis” (Dorn & Chrousos, 1993). Adolescents react more quickly and with greater intensity to environmental stimuli than do either children or adults. Adolescents also perceive events as relatively more stressful than individuals at other life stages (Laviola, Adrianni, Terranova, & Gerra, 1999). Basal levels of circulating stress hormones, such as cortisol, are greater during adolescence than during any other period throughout the lifespan. Adolescents exhibit increased physiological responses to stressors, such as blood pressure and cardiac output response, as well. During adolescence metabolism and growth rates accelerate and appetitive behaviors increase (Spear, 2000). Total sleep time and slow wave sleep decrease and a phase delay occurs in the sleep pattern. As parents of teens can attest, adolescents eat more, sleep less, and sleep later than both children and adults.

Social behaviors also change during the adolescent period, as peer relationships, romantic interests, and sexual motivations become increasingly important. Inter-individual play behaviors decline and coordinated group behaviors, such as organized sports activities and dance, increase.

Adolescence is also marked by emotional intensity. Ronald Dahl (2004), a leader in pediatric psychiatry, has characterized adolescence as a period “prone to erratic . . . and emotionally influenced behavior” (p. 3). This change in emotional intensity during adolescence is accompanied by a heightened risk for emotional disorders, particularly in females. Increased risk taking and novelty seeking are characteristics of this life phase and are more pronounced in males (Dahl, 2004). Human sensation-seeking scores peak in late adolescence, as does vulnerability to drug and alcohol abuse (Spear, 2000). Even though adolescents are physically and immunologically more robust and resilient than younger children, mortality rates rise by nearly 200 percent during the teenage years. This is largely due to increases in “homicides, suicides, and accidents (that) collectively account for more than 85 percent of all adolescent deaths” (Spear, 2000, p. 421).

In addition to being a time of increased risk taking, novelty seeking, and emotional intensity, adolescence is also the developmental period when mental processing speeds increase and abstract reasoning develops. On experiments designed to test mental processing speed, scientific reasoning, and the ability to focus on task-relevant information show adolescents consistently outperform younger children (Kwon & Lawson, 2000).

ADOLESCENT BRAIN DEVELOPMENT

These various adolescent behaviors and abilities derive from widespread changes in neuroendocrine systems and reflect brain development patterns. During pre-adolescence, there is a large increase in the cortical gray matter of the brain. This increase is particularly dramatic in the frontal and parietal lobes. Although the parietal lobe has attained its maximum size in both males and females by age 12, localized growth in specific areas of the prefrontal cortex continues over the next several years (Sowell, Thompson, Holmes, Jernigan, & Toga, 1999). The temporal cortex also continues to increase in size during early adolescence and does not attain its maximum volume until around 16.5 years of age for males and 16.7 years for females (Giedd et al., 1999).

The frontal and temporal cortices of the brain are particularly important in relation to social behaviors and activities. The extensive changes that occur in these brain areas during adolescence impact these behaviors and activities. While the temporal lobe functions in music and language processing, and in facial recognition, the prefrontal region of the frontal cortex is responsible for various “executive” functions of the brain. It receives and integrates information from emotional processing and reward areas of the brain with input received from other brain regions. Processing of this information by the prefrontal cortex is important in planning, impulse control, abstract and symbolic reasoning, and social judgment. The development of these capacities throughout adolescence reflects the ongoing maturation of this brain region.

The cortex is not the only area of the brain that increases during adolescence. Limbic structures, including the amygdala and the hippocampus, also show volume increases during this time (Walker & Bollini, 2002). The hippocampus functions in memory processing and the amygdala is critical to the perception and processing of emotions. The amygdala projects to and influences the hypothalamus, which regulates autonomic functions in the body, such as heart rate, blood pressure, and respiration. Interconnections between the amygdala and the hypothalamus are important for mobilizing body functions in response to threatening and potentially harmful stimuli. The amygdala is also closely interconnected with both the prefrontal cortex and the reward systems of the brain. These

interconnections are crucial in providing emotional inputs to the prefrontal cortex that weight behavioral choices. Individuals whose prefrontal cortex and amygdala are both intact but disconnected from one another can solve abstract problems but lack the ability to apply these solutions to their personal lives (Damasio, 1994).

Adolescence is clearly a critical developmental period for limbic, temporal, and prefrontal regions of the brain. During adolescence neuronal connections between these structures are being shaped and defined through both growth and pruning processes. These connections play a role in the integration of emotional behaviors with cognitive processes (Walker & Bollini, 2002). The gray matter increases that occur during adolescence are followed by a decline that ultimately results in a net decrease in brain volume. Synaptic pruning eliminates as much as one half of the cortical synapses per neuron during this process (Spear, 2000). Synapses that are frequently activated are retained while those that are not are eliminated. Neuroscientist Jay Giedd and colleagues (1999) describe the process as one in which “the environment or activities of the teenager may guide selective synapse elimination during adolescence” (p. 863).

At the same time that gray matter is being decreased through synaptic pruning, white matter increases through myelination. This occurs predominantly in the tracts connecting frontal and temporal areas of the brain and in limbic structures. These changes in both gray and white matter streamline adolescent brain function by eliminating infrequently activated interconnections and enhancing those that remain. Biologist Linda Spear (2000) sees this process as increasing “focal activation of the brain, with less widespread activation of brain function during task performance as development proceeds through childhood and adolescence” (p. 439).

Neurotransmitter systems are also undergoing change during adolescence, as receptors for various neurotransmitters are pruned from their pre-adolescent over-production. Most such pruning eliminates excitatory stimulation reaching the cortex. This results in a decline in brain activity. During adolescence, prefrontal cortex activity is further suppressed as dopamine inhibitory input to the prefrontal cortex peaks. This affects judgment, decision-making, and impulse control. At the same time that dopamine inhibitory input to the prefrontal cortex reaches its maximal levels, dopamine inhibition of limbic activity, including that of the amygdala, is apparently lowest. Brain imaging studies show that when adolescents are tested on tasks that require them to identify the emotional state of others based on facial expressions, they exhibit much greater activity in the amygdala than in the frontal lobe while completing this task. Adults, however, exhibit greater activation in the frontal lobe than in the amygdala when engaged in the same activity (Spear, 2000). The adolescent shift in dopaminergic dominance may underlie these differences.

The shift in the dopaminergic systems that takes place during adolescence affects the “reward circuitry” of the brain, as well. This shift is implicated in the increased vulnerability of adolescents to drug and alcohol abuse. It may also provide the neurophysiological basis for “developing” religion. The reward circuitry is responsible for assigning incentive value to stimuli. As a result, it is important in translating motivational stimuli into adaptive behaviors. Some things, such as food, sex, and psychoactive drugs, have intrinsic reward value. They initiate approach and goal-seeking behaviors by activating the reward system. It is possible for stimuli with no intrinsic reward value to acquire incentive value through a process of learning. This has been demonstrated in individuals addicted to such drugs as cocaine. Brain imaging studies of these individuals have shown that, over time, the places and paraphernalia associated with cocaine are capable of activating the brain’s “reward circuitry” even in the absence of the drugs themselves.

During adolescence the shift in the brain’s reward system and the simultaneous maturation of the prefrontal cortex create an important opportunity for such learning to occur. The simultaneous shift in the dopaminergic reward system and the emergence of symbolic thought provides a developmental window for assigning reward value to social and symbolic stimuli. Changes in interconnections between the amygdala and the prefrontal cortex create an opportunity for integrating emotional valuations of these stimuli, as well. During adolescence emotional reactivity is at its peak, reward systems are in flux, and the prefrontal cortex itself is undergoing changes that introduce capacities for abstract and symbolic thought. Music, language, and social networks constitute the most important symbolic systems in human cultures. The maturation of the prefrontal and temporal cortices during adolescence allows the integration of these capacities with the brain’s emotional and reward systems. The simultaneous shift in the brain’s dopaminergic reward system, the change in amygdala limbic and prefrontal inter-connections, and the maturation of temporal and prefrontal cortices provide a unique developmental window for investing abstract and symbolic constructs with both incentive value and emotional meaning.

THE EMOTIONS AND SYMBOLS OF RELIGION

Religion is well suited to this task. The creation of “the sacred” depends on the formation of emotionally valenced association networks (Alcorta & Sosis, 2005). In religious systems highly memorable symbols make up the nodes of these networks. The settings, rituals, and beliefs of religion purposefully elicit emotions, both positive and negative. Darkened caves, chapels and cathedrals, grotesque masks, bleeding statues, and powerful supernatural agents that violate our normal expectations all activate our evolved vigilance systems and evoke an emotional response. These elements of ritual alert us,

focus our attention, and emotionally engage us. Adolescent rites of passage that involve deprivation, pain, and fear further intensify these emotions. Such powerful emotions result in indelible memories that may be repressed but are never erased (Adolphs, 2002).

Of course, religion also evokes positive emotions. The awe-inspiring temples of Buddhism, the beautiful paintings that adorn Renaissance churches, and the engaging lyricism of Judeo-Christian psalms, Sufi poetry, and the Koran evoke emotions of peace and joy. Most significantly, in every religion known, music plays a central role in eliciting and entraining the positive emotions of sacred joy and ecstasy in adherents.

Music not only evokes such emotions, it also conjoins and entrains those who experience these emotions. Individuals listening to the same music share elicited emotions. They also share the autonomic changes in heart rate, respiration, skin conductance, and pulse rate engendered by those emotions. Studies by neuropsychologist Robert Levenson (2003) show that such shared autonomic functions highly correlate with the ability to empathize, an important element in cooperation. Music is highly symbolic. It not only elicits emotion, it also evokes social meaning. A musical phrase, like Proust's madeleines, can instantly recall a person, an event, or a year. This ability of music to simultaneously elicit emotions, entrain listeners, and symbolize events situates it in a unique position as a "proto-symbolic" system. The pivotal role of music in religions everywhere suggests that these attributes of music play a significant role in the ability of religious ritual to promote cooperation and unify groups.

ADOLESCENCE, RELIGION, AND BEHAVIOR

Adolescent rites of passage are a particularly effective mechanism for the experiential sculpting of emotionally valenced social-symbolic networks. As adolescents transition from the predominantly kin-based world of childhood to the expanded adolescent peer group encompassing unrelated individuals, they face the difficult task of sorting potential allies from adversaries. Biologist Norbert Sachser (1998) notes that in humans and other mammalian species, "the time around puberty seems to be essential for the acquisition of those social skills needed to adapt to unfamiliar conspecifics in a non-stressful and non-aggressive way" (p. 891). Religions throughout the world address this need by creating emotionally weighted value systems that guide social interactions. During the "experience expectant" period of adolescence, religion is particularly salient in integrating emotions and social-symbolic systems.

Can we find empirical evidence that religious participation does impact adolescent values and social behaviors? The traditional societies studied by anthropologists certainly support this argument. Adolescent rites of passage

in these societies clearly and effectively shape adolescent values. The psychosocial changes in novices found in a longitudinal study of Thai adolescents participating in a Buddhist ordination program support this thesis (Thananart, Tori, & Emavardhana, 2000). The significant positive relationship between external warfare and highly intense and painful adolescent rites of passage provides additional empirical support for this argument (Sosis, Kress, & Boster, 2005). In traditional societies, however, alternative choices for adolescents are limited, and values may be dictated as much by the possibilities of everyday existence as by individual choice.

Contemporary developed nations provide a more rigorous testing ground for assessing the impacts of religious participation on values and social relationships. The wider religious diversity and the greater economic and political opportunities available to adolescents in these societies offer alternative secular lifestyles not available in traditional cultures. Recent sociological studies conducted in the United States have also found a significant positive relationship between adolescent religious involvement and pro-social values (Donahue & Benson, 1995; Smith, 2005). Adolescents who regularly attend religious services are significantly less likely to engage in delinquent behaviors, and less likely to use tobacco, alcohol, or drugs; they are also less likely to engage in premarital sex and risky sexual behaviors. Studies of the relationship between adolescent religious participation and sexual attitudes and activity in U.S. Christian populations have consistently found that young people who attend church frequently are less likely to hold permissive sexual attitudes and are as much as 50 percent less likely to engage in sexual behavior than nonattending teens (Donahue & Benson, 1995; Smith, 2005). Early life course exposure to religion also impacts adolescent predispositions toward childbearing. Sociologist Linda Pearce (2002) conducted an 18-year intergenerational panel study of mothers and children and found that "religion seems to act as a cultural system for these young adults that influences their larger views on childbearing, as well as their personal plans" (p. 232). These influences are both psychological and physiological. C.T. Halpern and his colleagues from the University of North Carolina (Halpern, Udry, & Campbell, 1994) conducted a study that looked at religious attendance, male adolescent testosterone levels, and sexual activity. They found a significant negative correlation between church attendance and sexual activity. They also found a significant negative correlation between church attendance and male testosterone indices. The effects of religious participation on adolescents clearly go beyond the psychological and include neuroendocrine changes, as well.

An accumulating health literature comparing the mental and physical health of adolescents who regularly participate in religious worship with those who do not also supports these conclusions (Regnerus, 2003). If religion is important in the development of emotionally anchored values that effectively guide behavior, then adolescents who participate in religion should

experience less cognitive dissonance, and thus, less psychological distress, than nonparticipating teens. Accumulating research “confirms that religiosity is inversely related to depression and suicide ideation among adolescents” (Nooney, 2005, p. 341). Additionally, suicide rates are significantly lower for youth who regularly attend worship services as compared to those who do not (Donahue & Benson, 1995).

RELIGION AND THE LIFE COURSE

Human adolescence appears to be an “experience expectant” period of brain development for learning emotionally weighted social-symbolic schema. The structural elements of religious systems, and particularly those of adolescent rites of passage, incorporate elements that optimize the learning of such schema. Contemporary adolescent suicide bombers willing to give their lives for a perceived religious cause is testimony to the efficacy of religion in inculcating such emotionally valenced values.

Religion may be of particular importance during adolescence, but in most societies and religions throughout the world, religious participation is not confined to adolescence. A peek inside any Christian church on a Sunday morning will reveal attendance by men, women, and children of all ages. A closer look at the “average” American congregation would reveal more women than men and more elderly than adolescent participants. Young children and teens, when present, would be accompanied by other family members, and young unmarried adults would be conspicuous by their absence (Argue, Johnson, & White, 1999). Most adult men in attendance would be married, employed full-time, and have young or teenage children. The majority of women in attendance would also be parents of school-age children. However, the single mothers surveyed would be more likely than married mothers to be full-time employees (Becker & Hofmesiter, 2001; Sherkat, 2001). These patterns of religious attendance recur in other contemporary developed nations as well and have been assumed by many sociologists to represent universal patterns of religious participation. A review of the anthropological literature refutes this assumption, however. These patterns are specific to modern Western cultures. They do not typify religious attendance across all cultures and all times.

In many traditional societies participation in religious ritual is predominantly the province of adult males. In some cultures, such as that of the Ilahita Arapesh of New Guinea, religious participation is restricted exclusively to males who have successfully completed adolescent initiation rites (Paige & Paige, 1981). In these societies the exclusion of children and females from religious rituals contributes to their perceived danger and awe. Sacred names softly whispered, fearsome masks barely glimpsed, and powerful spirits summoned by eerily haunting music all foster innate predispositions of

children to believe in the socially omniscient supernatural agents of their cultures and enforce cultural proscriptions and beliefs.

A rigorous cross-cultural comparison of religious participation patterns has yet to be conducted. Participation patterns reported for many traditional societies, as well as the patterns found by sociologists in contemporary American cultures, strongly suggest a relationship between religious participation and trust-based social affiliation. In traditional, non-state societies, such participation creates and reinforces political, as well as social, relationships in the absence of formalized political institutions (Paige & Paige, 1981). Religion may also serve this role for disenfranchised subcultures within modern nation-state societies. The importance of religion in mobilizing the African-American Civil rights movement of the 1960s, the growing political role of Pentecostalist churches throughout Latin America, and the increasing clout of the conservative religious right in U.S. politics all provide evidence of such a role for religion. The ability of religion to create cooperative, trust-based social groups also goes far in explaining the higher religious participation rates of females, and specifically of single working mothers, in contemporary U.S. religions, as well as the high participation rates of the elderly. Both of these groups lack a clearly defined power base within the dominant economic institutions of the United States, and both experience trust-based cooperative needs, such as childcare and social integration, that are not being met by either the kin systems or political institutions of the society. In my own research with American adolescents, I have found that one of the most important features of successful church youth groups is the creation of such trust-based social affiliations. The ability of religion to foster such affiliations may constitute the initial reason for its evolution and explain the ongoing importance of religion as a fundamental component of human cultural systems.

CONCLUSION

Do humans possess an innate predisposition to “learn” religion, and is there a sensitive developmental period for such learning to occur? There is mounting evidence that the answer to both of these questions is “yes.” Much like music and language, religion appears to be an evolved capacity of humans with both a neurophysiological and genetic basis, but that is dependent upon socialization experiences for its development. Like music and language, religion is both an individual and social construction. The development of each of these human capacities requires the creation of neural networks shaped through cultural experiences. Music, language, and religion all exhibit “experience expectancy”; each is best developed during specific brain maturation periods. “Learning” religion, like learning music and language, is a cumulative process that incorporates previously developed capacities and

builds upon them. The cultural encoding of emotional meaning in music, and the development of innate predispositions for language-based supernatural beliefs are part of this process. During adolescence music and language capacities are engaged in the construction of emotionally weighted symbolic systems that motivate individual behaviors and structure social relations. The shifting of neurotransmitter-based reward systems in the brain, and the maturation of brain regions responsible for planning, social judgment, abstract and symbolic thought, and individual impulse control create an “experience expectant” period for associating cultural symbols, individual emotions, and social relations. Religion generally, and adolescent rites of passage in particular, appear optimally selected to shape these associations.

Adolescence provides a particularly important developmental window for “learning” religion. Like music and language, religion appears to be a unique human adaptation made possible by the developmental plasticity of the human brain. This plasticity provides a substrate for the creation of emotionally valenced social-symbolic systems capable of integrating individual needs and social behaviors. The development of these emotionally weighted value systems plays a crucial role in the integration of individuals into larger cooperative social groups. The shared motivational force and meaning of religious symbols provide a foundation for both guiding and predicting social behaviors. In the absence of such a system, social interactions among unrelated individuals are fraught with misperceptions and predicated upon self-interest. Such circumstances simultaneously degrade social cooperation and increase individual stress. Religion’s vital role in the developmental of emotionally anchored social-symbolic systems, and its ability to cohere and create cooperative social groups, establish the foundations for human culture.

REFERENCES

- Adolphs, R. (2002). Social cognition and the human brain. In J. T. Cacioppo, G. G. Berntson, R. Adolphs, C. Carter, R. Davidson, M. McClintock, B. McEwen, M. Meaney, D. Schacter, E. Sternberg, S. Suomi, & S. Taylor (Eds.), *Foundations in social neuroscience* (pp. 313–332). Cambridge: MIT Press.
- Alcorta, C., & Sosis, R. (2005). Ritual, emotion and sacred symbols: The evolution of religion as an adaptive complex. *Human Nature*, 16(4), 323–359.
- Argue, A., Johnson, D., & White, L. (1999). Age and religiosity: Evidence from a three-wave panel analysis. *Journal for the Scientific Study of Religion*, 38, 423–435.
- Atran, S., & Norenzayan, A. (2004). Religion’s evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences*, 27, 713–730.
- Becker, J. (2001). Anthropological perspectives on music and emotion. In P. Juslin & J. Sloboda (Eds.), *Music and emotion* (pp. 135–160). Oxford: Oxford University Press.
- Becker, P. E., & Hofmeister, H. (2001). Work, family and religious involvement for men and women. *Journal for the Scientific Study of Religion*, 40, 707–722.

- Bering, J. M. (2004). The evolutionary history of an illusion: Religious causal beliefs in children and adults. In B. Ellis & D. Bjorklund (Eds.), *Origins of the social mind: Evolutionary psychology and child development* (pp. 411–437). New York: Guilford Press.
- Bloch, M. (1989). *Ritual, history and power*. London: Athlone Press.
- Chaves, M., Konieszny, M. E., Beyerlein, K., & Barman, E. (1999). The national congregations study: Background, methods and selected results. *Journal for the Scientific Study of Religion*, 38, 458–476.
- Cross, I. (2003). Music as a biocultural phenomenon. In G. Avanzini, C. Faienza, D. Minciacchi, L. Lopez, & M. Majno (Eds.), *The neurosciences and music* (pp. 106–111). Annals of the New York Academy of Sciences, Vol. 999. New York: New York Academy of Sciences.
- Dahl, R. E. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. In R. E. Dahl & L. P. Spear (Eds.), *Adolescent brain development: Vulnerabilities and opportunities* (pp. 1–22). Annals of the New York Academy of Sciences, Vol. 1021. New York: New York Academy of Sciences.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Avon Books.
- Donahue, M. J., & Benson, P. L. (1995). Religion and the well-being of adolescents. *Journal of Social Issues*, 51, 145–160.
- Dorn, L. D., & Chrousos, G. P. (1993). The endocrinology of stress and stress system disorders in adolescence. *Endocrinology and Metabolism Clinics of North America*, 22, 685–700.
- Eliade, M. (1958). *Rites and symbols of initiation: The mysteries of birth and rebirth*. Dallas, TX: Spring Publications.
- Gabrielsson, A. (2001). Emotions in strong experiences with music. In P. A. Justin & J. A. Sloboda (Eds.), *Music and emotion* (pp. 431–449). Oxford: Oxford University Press.
- Giedd, J., Blumenthal, J., Jeffries, N. O., Catellanos, F. X., Liu, H., Zijdenbos, A., et al. (1999). Brain development during childhood and adolescence: A longitudinal MRI study. *Nature Neuroscience*, 2, 861–863.
- Glucklich, A. (2001). *Sacred pain*. New York: Oxford University Press.
- Greenough, W. T. (1986). What's special about development? Thoughts on the bases of experience sensitive synaptic plasticity. In W. T. Greenough & J. M. Juraska (Eds.), *Developmental neuropsychobiology* (pp. 387–408). New York: Academic Press.
- Halpern, C. T., Udry, J. R., & Campbell, B. (1994). Testosterone and religiosity as predictors of sexual attitudes and activity among adolescent males: A biosocial model. *Journal of Biosocial Science*, 26, 216–234.
- Koelsch, S., & Friederici, A. D. (2003). Toward the neural basis of processing structure in music. Comparative results of different neurophysiological investigation methods. In G. Avanzini, C. Faineza, D. Minciacchi, L. Lopez, & M. Majno (Eds.), *The neurosciences and music* (pp. 15–28). Annals of the New York Academy of Sciences, Vol. 999. New York: New York Academy of Sciences.
- Kolb, B., Forgie, M., Gibb, R., Gorny, G., & Rontree, S. (1998). Age, experience and the changing brain. *Neuroscience & Biobehavioral Reviews*, 22, 143–159.

- Kwon, Y. J., & Lawson, A. E. (2000). Linking brain growth with the development of scientific reasoning ability and conceptual change during adolescence. *Journal of Research in Science Teaching*, 37, 44–62.
- Laviola, G., Adriani, W., Terranova, M. L., & Gerra, G. (1999). Psychobiological risk factors for vulnerability to psychostimulants in human adolescents and animal models. *Neuroscience and Biobehavioral Reviews*, 23, 993–1010.
- Levenson, R. W. (2003). Blood, sweat and fears: the autonomic architecture of emotions. In P. Ekman, J. J. Campos, R. J. Davidson, & F.B.M. de Waal (Eds.), *Emotions inside out*, (pp. 348–366). Annals of the New York Academy of Sciences, Vol. 1000. New York: New York Academy of Sciences.
- Liegeois-Chauvel, C., Giraud, K., Badier, J. M., Marquis, P., & Chauvel, P. (2001). Intracerebral evoked potentials in pitch perception reveal a functional asymmetry of the human auditory cortex. In R. J. Zatorre & I. Peretz (Eds.), *The biology of music* (pp. 117–132). New York Academy of Science, Vol. 930. New York: New York Academy of Sciences.
- Lutkehaus, N. C., & Roscoe, P. B. (Eds.). (1995). *Gender rituals: Female initiation in Melanesia*. New York: Routledge.
- McCauley, R. N. (2001). Ritual, memory and emotion: Comparing two cognitive hypotheses. In J. Andresen (Ed.), *Religion in mind* (pp. 115–140). Cambridge: Cambridge University Press.
- Nooney, J. G. (2005). Religion, stress, and mental health in adolescence: Findings from ADD health. *Review of Religious Research*, 46, 341–354.
- Paige, K. E., & Paige, J. M. (1981). *The politics of reproductive ritual*. Los Angeles: University of California Press.
- Patel, A. D. (2003). Rhythm in language and music. Parallels and differences. In G. Avanzini, C. Faienza, D. Minciocchi, L. Lopez, & M. Majno (Eds.), *The neurosciences and music* (pp. 140–143). Annals of the New York Academy of Sciences, Vol. 999. New York Academy of Sciences, New York.
- Pearce, L. D. (2002). The influence of early life course religious exposure on young adults' dispositions toward childbearing. *Journal for the Scientific Study of Religion*, 41, 325–340.
- Rappaport, R. A. (1999). *Ritual and religion in the making of humanity*. London: Cambridge University Press.
- Regnerus, M. D. (2003). Religion and positive adolescent outcomes: A review of research and theory. *Review of Religious Research*, 44, 394–413.
- Sackser, N., Durschlagim, M., & Hirzel, D. (1998). Social relationships and the management of stress. *Psychoneuroendocrinology*, 23(8), 891–904.
- Schlegel, A., & Barry, H. (1991). *Adolescence: An anthropological inquiry*. New York: Free Press.
- Sherkat, D.E. (2001). Investigating the sect-church-sect cycle: Cohort-specific differences across African-American denominations. *Journal for the Scientific Study of Religion*, 40(2), 221–233.
- Smith, C. (2005). *Soul searching. The religious and spiritual lives of American teenagers*. New York: Oxford University Press.
- Sosis, R., Kress, H., & Boster, J. (2005). Scars for war: Evaluating alternative signaling explanations for cross-cultural variance in ritual costs. Unpublished manuscript, University of Connecticut.

- Sosis, R., & Ruffle, B. (2003). Religious ritual and cooperation: Testing for a relationship on Israeli religious and secular kibbutzim. *Current Anthropology*, 44(5), 713–722.
- Sowell, E. R., Thompson, P. M., Holmes, C. J., Jernigan, T. L., & Toga, A. W. (1999). In vivo evidence for post-adolescent brain maturation in frontal and striatal regions. *Nature Neuroscience*, 2, 859–861.
- Spear, L. P. (2000). The adolescent brain and age-related behavioral manifestations. *Neuroscience and Biobehavioral Reviews*, 24, 417–463.
- Thananart, M., Tori, C., & Emavardhana, T. (2000). A longitudinal study of psychosocial changes among Thai adolescents participating in a Buddhist ordination program for novices. *Adolescence*, 35, 285–293.
- Trehub, S. E. (2001). Musical predispositions in infancy. In R. Zatorre, & I. Peretz, (Eds.), *The biological foundations of music* (pp. 1–16). Annals of the New York Academy of Sciences, Vol. 930. New York: The New York Academy of Sciences.
- Turnbull, C. M. (1962). *The forest people*. New York: Simon and Schuster.
- Turner, V. (1967). *The forest of symbols*. New York: Cornell University Press.
- van Gennep, A. (1960). *The rites of passage*. Chicago: Chicago University Press. (Original work published in 1909)
- Walker, E., & Bollini, A. M. (2002). Pubertal neurodevelopment and the emergence of psychotic symptoms. *Schizophrenia Research*, 54, 17–23.

NEUROTHEOLOGY: A SCIENCE OF WHAT?

Matthew Ratcliffe

INTRODUCTION

There is considerable current interest in the question of what, if anything, neuroscience can tell us about religion. Discussion of the topic is not confined to academia, but has captured the public imagination and found its way into the popular press. For example, an article appeared in the *LA Times* on October 29, 1997 and, subsequently, in other publications announcing that a “God spot” had been found in the brain. The story referred to the finding reported by V. S. Ramachandran and colleagues that heightened emotional response in certain subjects with focal temporal lobe epilepsy was specific to stimuli of a religious nature (Ramachandran & Blakeslee, 1998). Some work by Michael Persinger has also received considerable attention.¹ Persinger used a device called a transcranial magnetic stimulator to focus a weak magnetic field on areas of the brain and reported that stimulation of a particular area often resulted in a religious experience (Persinger, 2002b). The growing field of research on religion and the brain, which has taken its lead from such findings, often goes by the name “neurotheology,” a term that was in use at least as far back as the 1980s but has been employed increasingly during the last few years.

Why all the interest? The possibility of neural circuits specifically associated with religion raises all sorts of intriguing questions concerning the biological basis, function, and evolutionary history of religion. Perhaps it might even cast light on the question of God’s existence. But before such questions can be coherently addressed, it is important to be clear about

just what it is that is being studied. When claims are made about neural circuitry associated with “religion” or with “religious experience,” how are those terms to be understood? My aim here is to explore this question and, in so doing, to raise a number of related philosophical concerns that arise in connection with some of the better known recent work in neurotheology.

If the claim were that certain brain areas are specifically associated with religion, it would be highly problematic. Studies such as those of Ramachandran and Persinger do not investigate the neural correlates of *religion* but of certain kinds of *experience*, and brief reflection suffices to make clear that there is a lot more to religion than just religious experience. Religions incorporate texts, rituals, roles, statuses, ceremonies, practices, and shared belief systems. They interact in numerous ways with a broader culture and allow for many different levels and kinds of commitment and conviction on the part of their diverse practitioners.

Much of the structure of religion cannot be understood in terms of the cognitive dispositions of religious individuals, given that religion is also a cultural-historical framework into which those individuals are born or introduced and shaped. Religion, it seems, is not just a matter of the properties of individual brains, but of a shared way of life through which words, deeds, and experiences are interpreted (Phillips, 1986). Furthermore, religions differ in all manner of ways and, even if an essence common to all religions could be distilled, it would most likely not be something that could be wholly captured in terms of the beliefs and experiences of individuals viewed in isolation from culture.

The way to avoid such tricky issues is to stress that these studies are concerned not with religions as historical and cultural phenomena, but with the religious experiences of individuals. Now it might well be that all religions were originally inspired by such experiences, or, alternatively, it could be that religious experience is only one contributing factor in the formation of religions. Turning to individual practitioners, some people’s religious beliefs might originate in religious experience, while those of others might arise wholly from other sources, such as enculturation, indoctrination, or rational deliberation. However, regardless of the specifics, it is clear that religious experience is an important element of most, if not all, religions. Hence, discoveries about religious experience are likely to have at least some repercussions for a more general understanding of religion.

Unfortunately, focusing on religious experience does not dispense with the problem of identifying one’s subject matter, since it is by no means clear what religious experience is or whether various religious experiences have anything interesting in common. One might reply that a religious experience is just an experience of God. For instance, Persinger (2002a) repeatedly refers to

“the God experience,” suggesting that a distinct kind of experience has indeed been identified. However, other authors have described several different kinds of religious experience, some of which do not seem to incorporate the presence of the God of monotheism. For example, Caroline Franks Davis (1989, chap. 2) offers the following taxonomy:

1. Interpretive experiences: Experiences, such as fortuitous co-incidences, which are interpreted in religious terms.
2. Quasi-sensory experiences: These include visions, voices, dreams and tactile sensations.
3. Revelatory experiences: Sudden moments of insight that seem to come from elsewhere.
4. Regenerative experiences: Profound feelings of strength, comfort or joy.
5. Numinous experiences: Feelings of insignificance before the majesty of God.
6. Mystical experiences: The experience of encountering ultimate reality, often associated with feelings of oneness, serenity and a loss of the sense of space and time.

These experiences need not be mutually exclusive, and they might combine in all sorts of ways. The question is what, if anything, they all have in common. If some are very different from others, the search for neural correlates of a single type of religious, mystical, or spiritual experience would be futile, analogous to looking for the neural correlates of metal object experience, hairy thing experience, car experience or any other category that arbitrarily brought together many different kinds of phenomena. Thus, if neurotheology is to get off the ground, it must have as its subject matter a distinct experiential category or set of experiential categories.

This is not just a hypothetical concern. Seemingly different kinds of experience *do* run together in some of the literature. For example, Persinger (2002b, p. 280) hypothesizes that an experience of the “‘sensed presence’ of a Sentient Being,” as induced through weak magnetic stimulation of an area of the brain, is the prototype or experiential foundation for full-blown religious experiences. Why, he asserts this is unclear. Feelings of sensed presence often involve experiencing another being as utterly other than oneself, as detached and alien (Cheyne, 2001). In contrast, many religious experiences are characterized by a feeling of oneness with the cosmos, of a mystical union that is quite different from the sense that another sentient being, wholly distinct from oneself, is present.² So if such claims are to be made plausible, a clearer account is needed of why these experiences are similar in kind.

To demarcate its subject matter, neurotheology not only requires a plausible, explicit taxonomy of different religious, mystical, and spiritual experiences, but it also needs to draw a clear line between these and mundane, everyday experiences. If one is to study the neural correlates of *religious experience*, one must assume that there is such a thing as an intrinsically religious experience. An alternative possibility is that religious, mystical, or spiritual characteristics are not *part of* the experience at all but, rather, religious *interpretations* of experiences that possess no intrinsic religious elements. For example, it could be that many religious experiences are just emotionally charged experiences that are interpreted in religious terms by certain people.

Furthermore, many nonreligious experiences are far from mundane. Take intense feelings of grief, love, guilt, estrangement, and surreality. All of these can be very intense and utterly imbued with meaning, but they do not fall into the familiar categories of religious, spiritual, or mystical? Thus, there is the concern that attempts to study religious experience and the brain risk throwing a diverse range of experiences together while ignoring others, despite there being no arbitrary division between those studied and those cast aside.

All of this is not to say that religious experiences do not all have a common, underlying core. Perhaps they do. A well-known unitary account is that of William James. In his famous *Varieties of Religious Experience*, James (1902) suggests that there is a “nucleus” uniting superficially diverse religious experiences. This nucleus involves a sense that something is not quite right about oneself, the world, or one’s relation with the world. The unease is followed by a solution, whereby one discovers a higher part of oneself, a part that is not isolated from the rest of the universe but is instead bound up with a higher power.

James (1902) claims that differences between religious experiences are the result of different “over-beliefs,” by which he means culture-specific narratives through which the core experience is interpreted and communicated. God is not intrinsic to the experience but is just one over-belief in terms of which it can be interpreted and communicated to others (pp. 507–508).

Maybe neurotheology could adopt a description along similar lines. However, there might be a price. James’s account explicitly focuses on those rare individuals for whom religion is an “acute fever,” rather than a “dull habit” (p. 6), and it is perhaps not applicable to religious experiences more liberally construed. There may also be serious problems with James’s view, which rests on his questionable prioritizing of individual experience over cultural expression. According to James, the over-beliefs are imposed *upon* the core experience. However, it seems that our habits, our practices, our abilities and so forth also feed into our experiences and shape them in all manner of ways. To give an obvious example, think about seeing a sign that says “no smoking.” It is nearly impossible to look at this sign without comprehending its meaning, a grasp of which seems inseparable from one’s

experience of the sign. However, to experience it in that way, one must know how to read a particular language and also be a competent participant in a culture that recognizes both a practice known as smoking and the concept of an environment-specific prohibition applicable to all. Generalizing from any number of similar examples, it is arguable that the notion of a core experience, untainted by culture, is not sustainable. As Charles Taylor puts it:

The ideas, the understanding with which we live our lives, shape directly what we could call religious experiences; and these languages, these vocabularies, are never those simply of an individual. (Taylor, 2002, p. 28)

Any account focusing solely on individuals, or indeed on brains, runs the risk of neglecting the shared social contexts through which experiences are structured. By analogy, if one were to study the nature of baseball, an account that referred solely to the biological capacities of individuals that dispose them to play baseball would not only be incomplete, but largely beside the point, given that the activity of playing baseball is only possible given a particular cultural context. It is this context that explains the *existence* of baseball, rather than “baseball areas” in people’s brains.

Perhaps religious experiences are comparable. Even solitary meditation is performed in accordance with established norms and shared practices that are passed on from generation to generation via cultural, rather than biological, transmission. If historically stable cultural conditions are required before individuals can have experiences of a certain type, interpret their mundane experiences in a certain way, or categorize certain experiences as religious, spiritual, or mystical, then perhaps the brain is not the right place to start looking for answers.

Of course, just as there is variability in people’s expertise at baseball, there may well be differing individual propensities for religious experience, which are explicable in neurobiological terms. However, one could never arrive at an understanding of what baseball *is* just by studying the biological traits of individuals. One would have to start with an understanding of the game before one could make sense of what individuals were doing, how they came to do it, and why they do it. The same may well be true of religious experience and the brain. Unless one already understands something of what religious experience is, studies of relevant brain processes run the risk of descending into confusion.

THE NEURAL CORRELATES OF SOMETHING RATHER VAGUE

So far, I have briefly sketched some problems concerning the nature of religious experience,³ which will need to be addressed by any account of the

relationship between religious experience and the brain. However, it is not unreasonable to suggest that, although neurotheologists need to be mindful of such problems, they are not required to solve them before they can start work. It might well turn out that scientific studies will themselves play a role in distinguishing and clarifying the different categories of experience. To give an overly simple example, if several subjects all volunteer similar verbal reports of an experience but it turns out that two quite different patterns of neural activity are involved, with roughly half the subjects exhibiting each pattern, we might look at their descriptions of the experience again, note subtle differences between them, and realize that what we previously thought was an experience of type A is actually two quite different types of experience, A and B. Neurotheology does not need to solve all the philosophical problems before it can even get off the ground. Instead, it can seek progressive clarification of its subject matter as it proceeds.

With this in mind, I will now look at some specific claims made on behalf of neurotheology. I will suggest that some of the best known work in the area has not satisfactorily resolved the kinds of problems mentioned above, with the consequence that many of the bolder claims made concerning the successes of neurotheology are premature. Although I will focus primarily on a well-known book by Andrew Newberg, Eugene d'Aquili, and Vince Rause (2001), many of the problems I discuss are common to work in neurotheology more generally.

Perhaps the strongest claim that Newberg et al. (2001) make on behalf of neurotheology is that neuroscience has demonstrated that religious, mystical, and spiritual experiences do indeed exist. As they put it, "mystical experience is biologically, observably, and scientifically real" rather than "wishful thinking" (p. 7). The claim is that, regardless of whether or not these experiences turn out to be veridical, they are at least shown to be real. By analogy, the experience of seeing a chocolate cake is a real experience, regardless of whether it is a dream or a veridical perception. But is this claim on behalf of neuroscience defensible? The suggestion seems to be that, without the intervention of science, there would be doubt concerning whether mystical experiences do in fact occur. However, such skepticism certainly does not apply to most other experiences. If I claim to be recalling the holiday I had in Tobago last summer, you would presumably not doubt my testimony until you had scanned my brain to check that the neural pattern was appropriate. And you would not suspend your belief that other people experience trees, stars, music, and the taste of curry until neuroscience had come to your assistance. But perhaps mystical experiences are different, in that they are outside the norm and cannot be supported by other evidence, such as several photographs of me in Tobago or a spoonful of meat vindaloo in the mouth of the person claiming to taste curry. Hence, it might be argued, they warrant a greater degree of skepticism.

Nevertheless, skepticism concerning their existence is still hard to defend. Religious, mystical, and spiritual experiences have been discussed and written about by many thousands of people over the course of thousands of years. Now it seems safe to assume that all these people have had some kind of experience, regardless of philosophical problems involved in specifying what, precisely, such experiences consist of. The alternative would be to brand them all liars or proclaim them incompetent to report in any way on what their experiences are like. So it is unclear why neural correlates should be required to corroborate such a substantial body of testimony. However, maybe neurotheology tells us something more specific about the *nature* of the experience, something absent from subjective reports. Newberg et al. (2001) state that “. . . neurology makes it clear that spiritual insights are born in startling moments of mystical transcendence” (p. 139) and that “[t]he wisdom of the mystics, it seems, has predicted for centuries what neurology now shows to be true: In Absolute Unitary Being, self blends into other; mind and matter are one and the same” (p. 156).

Is this so? Imagine that you had never had a religious experience and had never heard of religious experience. In fact, all you had to go on was the neurobiological data. What could you ascertain about experience from this alone? Could you look at the results of brain imaging studies and conclude that “Absolute Unitary Being” was experienced or that “mystical transcendence” was occurring? The answer is no. Newberg et al. *presuppose* a conception of what the relevant experiences consist of. They claim to discover specific patterns of neural activity correlated with an experiential type, but this discovery clearly does *not* underlie their understanding of what the experiential type consists of or their belief that it exists.

Furthermore, suppose that someone claimed to be having a religious experience and that her pattern of neural activity differed from what is the norm in such cases. Would this be reason enough to dismiss her claim? I suspect not. Consider a fictional scenario where 100 people have their brains scanned in all manner of ways while entertaining the belief that “the Eiffel Tower is in Paris.” Now suppose that in 99 of these people, a specific area of the brain is active while they claim to entertain the belief. In the other person, that area is comparatively inactive, and several other areas are “lit up” instead. Would this be sufficient warrant for maintaining that the anomalous person had a different belief to the others? It would not, given that nobody claims that specific belief contents—such as “*Revenge of the Sith* is a *Star Wars* film,” “Santa Claus exists,” or “Sydney is warmer than the North Pole”—require the same patterns of brain activity in all people. Hence, there are clearly cases where we would not want to say that neuroscience overrides personal testimony. But, one might reply, Paris beliefs are not an appropriate object of study at all, given that they do not comprise an informative psychological kind. Anything one might learn about Paris beliefs would be equally informative with respect

to just about any other belief content; Paris and The Eiffel Tower are incidental. It could be added that Paris beliefs can be associated with all sorts of very different experiences and that neurotheology is preoccupied with certain kinds of experience, rather than abstract beliefs stripped of their connection to concrete experience.

However, the same concern about psychological kinds arises in relation to experience. Suppose one were to study cat experiences in constrained laboratory conditions. A variety of subjects are asked, one after the other, to sit in a chair in the corner of a monochrome square room. At the other end of the room is a large white cat, asleep in a basket. Participants are asked to focus solely on the cat for one minute, and, during that time, their patterns of brain activity are recorded, using whatever technique you like. Now suppose that there are common patterns of activity associated with the experience in all participants. What would this tell us about cat experience? Such studies might well tell us something about *experience and the brain*, but they would not tell us anything about specifically catty experiences because cat experience is not an informative experiential category. We do not ordinarily identify distinct kinds of experience by identifying different kinds of experiential objects, such as dogs, cats, chainsaws, and oranges, given that anything we learn about the structure of experience more generally will be equally applicable to experiences of all these things. Thus, a correlation between experience of entity X and brain activity A need not be remotely informative with respect to the experiential content X.

If correlations between neural activity and religious experience are to be informative, it must be the case that religious experiences, unlike cat experiences, comprise an experiential type about which illuminating generalizations can be made. So, what makes an experience religious? The obvious answer is its content, what it is about, as indicated by Persinger's (2002a) references to the God experience. However, we have just seen that, in other cases, types of experiential object, such as cats and dogs, do not serve to distinguish experiential types. Now, it may be contested that other types of experiential object are different. Take an experience of emotion. Surely this is a common *kind* of experience in a way that a cat experience is not. However, the comparison does not work. Experiences of emotions are not generally experiences of objects called emotions. One experiences objects *emotionally*, rather than experiencing the emotions themselves as objects. Perhaps one might similarly maintain that religious, spiritual, and mystical experiences are ways of experiencing things or forms of experience rather than categories of experiential objects. But this is hard to reconcile with the fact that many such experiences are described as experiences *of* something. So neurotheology seems to be caught on the horns of a dilemma. If the experiences it explores constitute a type in virtue of their objects, then it is hard to see why that type would be worthy of study in its own right.

And, if they involve a way of experiencing, the question arises as to how they can be described so as to make clear what binds them together as a group, without appealing to their objects.

Do Newberg et al. (2001) manage to say anything in support of mystical experience being a distinctive experiential type with informative neural correlates? Consider the following passage:

[humans] are natural mystics blessed with an inborn genius for effortless self-transcendence. If you ever “lost yourself” in a beautiful piece of music, for example, or felt “swept away” by a rousing patriotic speech, you have tasted in a small but revealing way the essence of mystical union. (p. 113)

This seems to indicate that mystical experiences form a continuum with everyday experiences. Now, all our experiences are intricately structured and incorporate different elements to differing degrees and so the question arises as to what makes mystical elements stand out from the rest in such a way that they can be regarded as a distinctive experiential type. Newberg et al. emphasize a sense of oneness with things as the core characteristic and state that in everyday life, by contrast, “we experience that world as something from which we are clearly set apart” (p. 115). However, such pronouncements about everyday experience are simplistic to say the least. In a recent paper (Ratcliffe, 2005b), I try to make explicit some of the many different ways in which we experience our relationship with the world during the course of our everyday lives. Consider feeling detached from things, at home in the world, slightly lost, removed from it all, abandoned, disconnected, empty, powerless, in control of things, trapped and weighed down, at one with nature, part of a greater whole, out of it, at one with life, there, not quite there, part of things, cut off from reality, brought down to earth or unreal. And the list seems to go on indefinitely. There are feelings of strangeness, unreality, oneness, intangibility, belonging, familiarity, completeness, power, fragility, disjointedness, coherence, meaningfulness, emptiness, mystery, unintelligibility, separation and so forth. Some of these terms are synonyms for others, whereas others seem to point to subtly distinct experiences. But the bottom line is that any attempt to force all our experiences into the categories of either mundane separation or mystical oneness would fail to do justice to the varieties of experience and their complex relations to each other.

Even if we assume that mystical oneness is a distinctive way of experiencing, it is clear that we have drifted a long way from specifically religious experience and thus from anything warranting the name neurotheology. In discussing ritual, Newberg et al. (2001) state that “when the unitary states generated by the neurobiology of ritual occur in a religious context, they are usually interpreted as a personal experience of

the closeness of God" (p. 90). This suggests that God, religion, and all manner of other contents are not part of the mystical experience of unity, but are imposed upon it through acts of interpretation. So we seem to have arrived at a rather Jamesian view, according to which multifarious interpretations rest upon an underlying way of experiencing one's relationship with things.

Can worthwhile neurobiological generalizations be made with regard to this way of experiencing? In an earlier publication, Newberg and d'Aquili (2000) acknowledge that the experiences in question are not simple states:

Religious and spiritual experiences are highly complex states that likely involve many brain structures including those involved in higher order processing of sensory and cognitive input as well as those involved in the elaboration of emotions and autonomic responses. (p. 251)

This suggests a recurrence of the cat experience problem, which is not avoided by a shift in emphasis from the objects of experience to oneness as a way of experiencing. Suppose that all the constituents of mystical, religious, or spiritual experiences are common to other kinds of experiences and that there are no neural correlates specific to these experiences and only these experiences. Consider a type of experience A, which is already known to incorporate elements B, C, D, and E, these elements also being present to varying degrees in many other kinds of experience. Now assume that there are neural correlates of B, C, D, and E. Will this tell us anything specific about A? The answer is no. A common pattern of argument in neurotheology is as follows:

1. A incorporates B.
2. There are interesting neural correlates of B.
3. Therefore there are interesting neural correlates of A.

However, what is true of B here need not be true of A. For example, there are all sorts of neural processes specific to visual experiences but that does not make them informative with respect to visual experiences of cats.

Consider Newberg, d'Aquili, and Rause's work on meditating subjects. They report that unusual neural activity is consistently found in the "posterior superior parietal lobe" at the peak of meditation (p. 4). This area is associated with a sense of spatial orientation and so Newberg et al. (2001) hypothesize that the area is starved of input during prolonged periods of physically inactive meditation, resulting in a breakdown of spatial boundaries and a sense of oneness (p. 28). Now it is clear from subjective reports that certain mystical experiences involve a loss of spatial and temporal locatedness. Thus, it should

come as no surprise that brain areas associated with spatial and temporal locatedness are implicated in the experience. However, there is no evidence to suggest the experience is wholly constituted by a loss of spatial and temporal boundaries. Newberg et al. do not enquire as to whether similar brain activities can be found in other unremarkable or very different experiences. So it is not clear that the correlations discovered through such studies pick up on something specific to mystical experience, as opposed to an element common to many, although not all, kinds of experience.

The problem is illustrated more clearly in other claims made by Newberg et al. (2001). For example, they state that “the visual association area may . . . play a prominent role in religious and spiritual experiences that involve visual imagery” (p. 27). It will, presumably, play a role in any experience associated with visual imagery. That neural circuits are specific to B and that B is involved in A need not say anything remotely informative about A. The same kind of logic could be applied equally to experiences of cups of tea. There are plenty of similar examples. For example:

We believe that part of the reason the attention association area is activated during spiritual practices such as meditation is because it is heavily involved in emotional responses—and religious experiences are usually highly emotional. (Newberg et al., p. 31)

If the claim were simply that many religious experiences are emotional, it would hardly come as a surprise. The fact that certain religious experiences are highly emotional is readily apparent from a huge body of testimony and from observation of people lying prostrate on the floor wailing, with tears streaming down their faces, to cite but one of many obviously emotional behaviors that are frequently associated with religious experience. The claim is instead about the neural basis of religious experience. However, it actually relates to emotion and only trivially to the many experiences that involve emotion. All it amounts to, so far as I can see, is that religious experiences have similar constituents to other experiences and will involve brain areas that are associated with those constituents. It says nothing informative about the category “religious experience” and does nothing to address the still unresolved question of whether such experiences even comprise a distinctive experiential category.

This explanatory pattern is not just evident in the work of Newberg and colleagues. Consider one of the best known studies of the neural basis of religious dispositions, carried out by Ramachandran and colleagues (Ramachandran & Blakeslee, 1998). Ramachandran’s findings show that heightened affective response in certain subjects is not stimulus-general, but specific to religious words and icons. Given this finding, Ramachandran goes on to speculate about there being neural structures dedicated to the mediation

of religious experiences. Now, what the study certainly does achieve is a clear distinction between two possibilities, “globally heightened affect” and “specific affective responsiveness,” plus a good empirical case for the latter. What it does not do is tell us anything at all about the relationship between specifically *religious* tendencies and the brain. How can that be? Well, it seems safe to assume that affective responsiveness to particular religious icons is not hard-wired from birth but learned. With this in mind, consider an alternative scenario. Throughout his life, Arnold, who perhaps suffers from focal temporal lobe seizures, has been obsessed by the films of Steven Seagal. Indeed, such is the extent of Arnold’s obsession that his interest in all other stimuli is rather diminished. One day Arnold is taken into a laboratory, and his galvanic skin response is monitored while he is presented with various stimuli.⁴ Among these stimuli are the DVD covers of several as yet unreleased Steven Seagal films, none of which Arnold has yet acquired or even heard of. Sure enough, we find that Arnold’s skin response to these stimuli is far higher than his response to any of the others, including stimuli of a horrific, religious, or sexual nature. What can we conclude from this? Well, we can certainly say something about response specificity, but the content of the stimulus is utterly contingent; it could have been anything. One would certainly not be justified in speculating about a Steven Seagal spot in the brain or embarking on the new science of neuroStevenSeagalology.

What is the difference between the two cases? Granted, the structure of our culture and the significance attached by many people to religious iconography and language make it more likely that Arnold will be aroused by religious stimuli than by Steven Seagal. However, in both cases, I do not think the results tell us anything informative about the relationship between the stimulus *content* and brain biology. Areas of the brain associated with emotion are only contingently related to religion, and studies that tell us something about emotion and the brain need not tell us anything interesting about religion and the brain.

In summary, it seems that certain work in the general area of neurotheology suffers from confusion about its subject matter. It is difficult to see how this science can make significant progress unless these problems can be sorted out or at least lessened. Unless one has a reasonably good sense of the experiential category that one is studying, one’s conclusions will either turn out to be vague or about something else altogether.

Further problems may well arise due to this lack of clarity. For example, without a good sense of what religious experience is, it is difficult to draw a clear line between genuine cases of religious experience and other, perhaps pathological, cases that resemble religious experiences in some superficial respect. For example, the serial killer Peter Sutcliffe, who terrorized the North of England in the 1970s, notoriously claimed that he heard voices of Divine origin ordering him to kill women (Mackie, 1982, p. 180).

Presumably one would want to distinguish Sutcliffe's experiences (if he indeed had these experiences) from those of a meditating Buddhist monk. Perhaps one could restrict talk of religious experiences to nonpathological cases. For instance, Franks Davis (Chapter 8 of this volume) suggests that it is possible to distinguish between healthy religious experiences from various pathologies that are superficially similar. William James (1902, Lecture 1), in contrast, argues that religious experiences are both inextricably entangled with psychopathology *and* of profound spiritual significance. So the issue is not an easy one to resolve. Of more direct relevance to neurotheology is the worry that laboratory studies of religious experience might be exploring artifacts brought about by experimental conditions, experiences that differ from genuine religious experiences had by people in their natural environments. Without a clear sense of what the relevant experiences are, the boundary cannot be drawn.

FUNCTIONS, FABLES AND FAITH

I do not wish to suggest that the problems discussed above are *irresolvable*. Indeed, it is at least conceivable that religious experience will turn out to be a quite distinctive way of experiencing things, supported by dedicated neural circuitry. My conclusion is, rather, that there is insufficient evidence for such a view and, more importantly, that the issue is obscured by substantial conceptual problems. In this section, I want to look at further issues that would arise should the claim turn out to be true. Once we have identified a type of experience and an associated neural structure, where do we go next?

One important question is whether the structure in question has the *function* of generating religious experiences. In addressing this question, it must be kept in mind that, even if there are certain circuits associated with religious experience, they may not comprise a discrete system that does most of the work of generating religious experience. Instead, they could be part of a much larger system. By analogy, my hands are very active when I type but do not constitute an autonomous typing system, the operation of which can be understood in isolation from a plethora of other capacities. Thus, if A plays a role in generating B, it should not be assumed that A is primarily or wholly responsible for B. But let us suppose for now that some such system does exist. What might the function of a biological capacity for religious experience be?

I will start by looking at a currently popular hypothesis concerning the function of religious experience and will suggest that it is problematic in a number of respects, some of which are also likely to plague rival hypotheses. I will then address the question of whether a functional account of the capacity for religious experience could, in principle, tell us anything about whether

such experiences are veridical or illusory, that is, whether they reveal something real or whether they are merely psychological in nature.

Accounts of function are intimately connected with evolutionary accounts of how a biological structure evolved. Indeed, the function of X is taken by many to be synonymous with what X was selected or adapted for. Thus, functional accounts of religious experience often take the form of evolutionary narratives, which explain how a biological structure evolved and why it was favored by natural selection.

When speculating as to the evolutionary origins of any psychological or behavioral trait, it is important to exercise considerable caution, given that much work in sociobiology and evolutionary psychology has been charged with concocting superficially plausible stories on the basis of inadequate evidence. This failing was famously satirized by Stephen Jay Gould and Richard Lewontin (1979), who branded adaptationist accounts concerning the evolved functions of various traits just so stories, no more respectable than Rudyard Kipling's account of how the elephant got his trunk, which involved a crocodile attached to the elephant's nose and a python pulling in the opposite direction, resulting in considerable elongation of the appendage. Similar accusations continue to be made against various hypotheses proposed by evolutionary psychologists.⁵ Are they fair? For present purposes, I remain agnostic with respect to the charge leveled against evolutionary psychology in general. However, I will suggest that the label "just so story" is quite appropriate for certain evolutionary explanations of a capacity for religious experience. I will focus on the claim that belief in God has the function of lessening the fear of death, which would otherwise detrimentally affect the psychological well-being of thoughtful creatures like us, impairing our ability to survive and reproduce. An account along these lines has been proposed by Persinger (2002a), among others:

A biological capacity for the God experience was critical for the survival of the species. Without some experiences that could balance the terror of personal extinction, the existence of the human phenomenon called the "self" could not be maintained. (p. 274)

Persinger claims that by associating oneself with the infinite or with a greater whole, one manages to escape the unpleasant burden of one's finitude and impending death. What can be said for this hypothesis? Well, even leaving aside the concern that there may be no such thing as a species-universal God experience, it is still beset with problems. First of all, correlation is not cause. The experience may have arisen for some other role and only by happy coincidence have the effect of making unavoidable death more bearable. Association of a capacity with a beneficial effect does not entail that the capacity arose because it produced that effect. Second, there is a difference between religious belief and religious experience. Religious belief could, presumably, have arisen

without religious experience. Thus, it is not clear why the death avoidance adaptation should involve a capacity for experience rather than belief by some other means. And, if there are many different routes to religious belief, then a single adaptationist account is unlikely to encompass all of them. Third, there is a failure to consider the possibility that all sorts of other mechanisms could have evolved to block out thoughts of one's inevitable demise or cope with such thoughts. A death thought prevention system would do the job nicely. Another solution would be to wire death thoughts into the sex drive, so that as soon as you start having them, you procreate instead. The question of whether or not we *do* have such mechanisms, which, for the most part, satisfactorily perform the function ascribed to religion, is not even addressed. By analogy, one would not hypothesize that the nose is a propulsion system without first having given due consideration to the role played by limbs. Fourth, and perhaps most problematic, is the assumption that an understanding of death really did pose a threat to our ancestors' survival. Last week, I had a pub conversation with a lecturer from the English Department at Durham University, who informed me at length that inevitable death without hope of an afterlife did not bother him in the slightest. Despite my own protestations that death was horrific and somehow metaphysically unacceptable, he would not concede. Now I don't know how many people are indeed troubled by the prospect of death, in what ways, and to what extent. And I don't know whether religious people are less preoccupied with it than others or, alternatively, equally preoccupied by it but not as horrified by it. Even if death did pose less of a problem for them, the direction of causation would be unclear. Do people become religious because they are *already* unable to grasp the possibility that death really is the end, or do they have fewer problems with death because of their religious dispositions?

Such questions need to be carefully addressed before one starts positing death-avoidance functions. Furthermore, even if current humans, atheists in particular, are often troubled by death, it by no means follows that our ancestors were. I tend to think about death rather more when I'm not concentrating on other, more immediate things. An urgent piece of work or a particular threat to my well-being tends to shift my attention somewhat. Furthermore, as an academic philosopher, I have far more time to think about death than many people, including, I suspect, our Pleistocene ancestors. They may well have had so much else to contend with that the prospect of eventual death was the last thing on their minds. So it is unclear that death thoughts amounted to a problem in the first place, and it is also unclear why religious experience should have emerged as a solution. It might also be argued that unwavering religious belief could have a similarly detrimental effect to behavioral paralysis in the face of death. If you know you have eternal life in a better place, why worry about this world? The resultant apathy would surely not have conferred a survival advantage. So this all looks suspiciously like a just so

story. To make things worse, Persinger (2002b) just assumes that religious experience has some function:

From a Darwinian perspective, we might appreciate the maintenance of the temporal lobe experiences that promote the God belief. If there had not been survival value associated with both the experience and the belief in gods, these behaviors should have been selected against long ago. They should have been deleted from our genetic expressions. (p. 290)

The argument is that for any current human trait X, X would not now exist unless X conferred some past survival advantage. Presumably this must apply to traits such as a disposition toward heart attacks, brain hemorrhages, unpleasant skin growths, constipation, and lung cancer. In response, it could be argued that such things are not normal, healthy everyday features of organisms, whereas a capacity for religious experience, like eyes, ears, and lungs, is. However, even if one were to accept the highly questionable view that the capacity for religious experience is a healthy trait that many of us exercise frequently, the argument still fails. Tooth decay, bad breath, and occasional instances of very poor reasoning are pretty much universal throughout the species but don't merit functional explanations. The same applies to countless other bodily characteristics, capacities and behavioral traits. So the argument doesn't even get off the ground.⁶

Now perhaps other such stories have more going for them. However, this case study does bring to light a more general question; that of how any such account could be supported by adequate evidence. What evidence could possibly arbitrate between a host of rival stories, given that most of the historical facts may not just be currently unavailable but irrevocably unavailable? As Robert Richardson (2001) has argued, in the case of many evolutionary stories concerning human cognition, the relevant evidence may be impossible, in practice, to obtain and "without history, evolutionary explanation is empty" (p. 334).

But let us suppose that the conceptual and evidential problems are eventually overcome and that a plausible functional account of religious experience is formulated. The question I want to look at now is that of whether such an account could constitute evidence for or against the view that religious experiences incorporate genuine communication with the Divine, apprehension of the true nature of Being, or something along similar lines. Ramachandran and Blakeslee (1998) explicitly adopt a stance of principled agnosticism concerning this question. Newberg, d'Aquili and Rause (2001), however, suggest that mystical experiences do indeed comprise grounds for belief in a higher reality:

[We] saw evidence of a neurological process that has evolved to allow humans to transcend material existence and acknowledge and connect

with a deeper, more spiritual part of ourselves perceived of as an absolute, universal reality that connects us to all others. (p. 9)

However, what is clear from their discussion is that this view has no empirical basis. None of the studies cited provide any evidence whatsoever for or against a “universal reality that connects us to all others.” It is just unsubstantiated speculation, unconnected with the science (Pigliucci, 2002).

Nevertheless, I want to suggest that a *comprehensive* account of the neurobiology of religious experience would *inevitably* have considerable repercussions for the view that such experiences involve contact with something real, be it God or a higher reality. Thus, it would also have repercussions for the question of whether religious beliefs are well grounded, in so far as such beliefs are based on religious experiences. This is something that I argued in a 2003 article. I will summarize the argument here and elaborate it in certain respects.

Why should a biological account of religious experience have any implications for the epistemological question of whether one should believe in the reality of what one experiences? Well, consider, first of all, the possibility that religious experience is the result of a malfunction. Massimo Pigliucci (2002) succinctly states the implications of such a hypothesis:

if we realize that mystical experiences originate from the same neurological mechanisms that underlie hallucinations from sensorial deprivation and drug-induced “visions,” I bet dollar to donut that the reality experienced by meditating Buddhists and praying nuns is entirely contained in their mind and is not a glimpse of a “higher realm,” as tantalizing as that idea may be. (p. 270)

The bottom line is that incredulity is the best bet when an experience arises from malfunction and, if that is so with religious experience, it is best explained without reference to the supernatural. Cheyne (2001) advocates a similar position with regard to certain sensed presence experiences, which he explains in terms of malfunctioning activation of vigilance systems in the brain. Given that these experiences can be traced to specific brain processes *going wrong*, rather than the intervention of an external source, Cheyne maintains that they call for a “straightforward naturalistic explanation” (p. 136).

The tension between a malfunction explanation and the claim that the resultant experiences are veridical becomes unavoidable if one accepts a noncontingent connection between function and well-formed belief. Certain theists and atheists alike have argued that well-formed beliefs just are those that are generated by properly functioning cognitive apparatus operating in normal environmental conditions.⁷ If this is the case, then any belief arising as a result of malfunction is, by implication, not to be trusted.

Of course, malfunction is only one possibility. Another is that religious experience is an unavoidable by-product or side-effect of some other functional cognitive process. An analogous example would be the human chin, which, it has been argued, emerged as an inevitable side-effect of building a functional human-type jaw (Gould & Lewontin, 1979). Again, this would seriously threaten the case for veridicality. If the historical emergence of something can be fully accounted for in terms of some other wholly non-mysterious phenomenon, then there is no need to resort to an additional supernatural element to explain its presence.

However, what about an account that assigns a *function* to religious experience? Again, no such account will be neutral with respect to the question of veridicality. If a *comprehensive* functional account made no reference to the causal role of the supernatural in producing the experience, this would imply that the supernatural had no role to play in the genesis of the experience. Otherwise the account would be incomplete. If the function of religious experience were, say, to communicate with God, then any functional account that did not make reference to God would be either false or highly impoverished.

Thus, it would seem that any *complete* functional account will constitute evidence either for or against veridical religious experience and, consequently, for or against the credibility of any religious beliefs that are founded in the experience. However, things are not so simple. Investigation of the function of religious experience cannot be a wholly empirical affair, meaning that one cannot simply read functions off the natural world without first making significant assumptions. For example, if one were to examine a fish and attempt to explain the function of its fins, one could only do so if one entertained, at some point in one's examination, the possibility that water were a feature of the fish's environment. To venture a more vivid example, in *The Country of the Blind*, a short story by H. G. Wells (2004), the protagonist, Nunez, finds himself in the valley of the blind, where all the inhabitants lost their sight hundreds of years ago and passed on the trait to future generations. This valley has cut off from the rest of the world for hundreds of years and so the whole population has been deprived of any experience of sighted people until the arrival of Nunez. Indeed, they have even lost the concept of sight. Nunez tries repeatedly to convince them that he can see. However, they refuse to admit the possibility of sight and instead interpret his various assertions as reports of delusional experiences. They hypothesize that these delusions have their source in the enlarged, rapidly moving globes on either side of Nunez's nose and thus propose to cure his delusions by removing them.

The point of the example is that biological structures are interpreted and assigned functions only on the basis of prior assumptions about possible constituents of the environment, such as the ambient optic array in the case of sight. If such things are denied, the biology will be interpreted differently,

albeit wrongly in the case of Nunez's eyes. The same applies to the function of brain areas, which will be interpreted through a backdrop of presuppositions concerning what the world is like. Now this is not a problem in the majority of cases, where everyone agrees as to what the relevant features of the environment are. However, it is extremely problematic when it comes to religious experience, a case where some people take God to be a very real part of the world that it is possible to commune with, while others begin with the assumption of a Godless world. To pursue the analogy with Wells' story, we don't know who is blind and who is not.

Neuroscience cannot provide decisive evidence for or against the existence of cats, coriander, kestrels, or curtains solely by monitoring the brain processes that occur when such entities are perceived, given that the processes in question would only be interpreted as relating to those entities if their existence and presence were already presupposed or at least regarded as likely. And I suggest that a similar lesson applies to so-called religious experiences. Regardless of whether or not one believes in a higher being or greater reality beyond the mundane world, one can interpret the data so as to accord with one's prior beliefs. The science itself will not, in this case, be able to arbitrate between conflicting presuppositions.

What I am *not* suggesting here is that naturalism and various religious belief systems amount to utterly rigid standpoints that cannot be arbitrated between. So the result is not endorsement of a species of relativism, according to which two radically divergent worldviews can assimilate all the information they like, in such a way as to cohere with their own basic assumptions. I am making the more modest suggestion that neuroscience just does not have enough of an empirical kick to do the job. Something far less subtle and easy to absorb into one's prior worldview would be required to break the deadlock and challenge entrenched patterns of interpretation. Why should we expect neuroscience to come up with the goods when much more dramatic evidence pertaining to the grounds for religious conviction is available to us in the form of famines, plagues, tsunamis, genocidal maniacs, acts of self sacrifice, visions of futility, feelings of meaningfulness, the beauty of nature and the brutality of nature, the combined impact of which has failed to settle the issue?

FEELING IS BELIEVING?

I will conclude these rather skeptical musings on a more positive note. Despite the various empirical and conceptual problems associated with research on religion and the brain, I do think that neuroscience can cast at least some light on the nature of religious experience and belief. In this section, I will provide a brief sketch of what I take to be an interesting avenue of research.

Subjective reports and neurobiological studies generally emphasize the central role of *emotion* in religious experience, and I suspect that research into the nature of emotion can contribute to an understanding of religion. The research in question is not specific to religion. However, it is something that can be applied to the topic of religious belief and experience. Hence, the outcome would be an interdisciplinary study of certain aspects of religion, rather than a new science of neurotheology. There are insufficient grounds for positing religion-specific brain processes, and many, if not all, of the emotions involved will not turn out to be religion-specific. So I don't think talk of God spots or a bold new science of religious experience is defensible. But it is still possible to understand certain aspects of religious belief and experience by exploring the role of emotion.

Believing in the existence of God is not like believing that the Eiffel Tower is in Paris. For many believers, it is a very different *kind* of commitment; it is imbued with feeling rather than being a proposition that one can indifferently assert from a standpoint of neutral detachment. The emotional element is not just something that accompanies religious experience and commitment but is integral to it.

Philosophical discussion of religious belief is littered with attempts to prove the existence of God or at least provide good grounds for religious belief on the basis of reason and evidence. Accompanying these, there are various arguments aimed at showing religious belief to be unwarranted. For example, there are many arguments starting from the well known problem of evil, which attempt to show that the world contains too much evil for it to be the product of an all good, all knowing, all loving God.⁸ Although many such arguments and counter-arguments are extremely sophisticated, I, like many others, have always had the feeling that they somehow fail to connect with the realities of religious belief. Belief in God is not, ordinarily at least, a proposition that one asserts on the basis of reason or evidence. Rather, it is something that is *felt*. And the same can be said for other spiritual and mystical convictions that do not incorporate a monotheistic God. That heightened emotions play a role in religious experiences and temperaments is indicated by recent work on God and the brain, which emphasizes the role of affect in religious experience (Newberg et al. 2001) and the emotional nature of many people's responses to religious language and imagery (Ramachandran & Blakeslee, 1998). As Ramachandran and Blakeslee (1998) say:

I find it ironic that this sense of enlightenment, this absolute conviction that Truth is revealed at last, should derive from limbic structures concerned with emotions rather than from the thinking, rational parts of the brain that take so much pride in their ability to discern truth and falsehood. (p. 179)

Such a view does not depend on more specific hypotheses concerning religion-specific brain structures or religion-specific experiences. All it requires is that the various experiences that we term mystical, religious, or spiritual often incorporate heightened emotion. And the neuroscience does at least indicate that much. Even so, it should be noted that this is hardly a new discovery, given that the role of emotion in religious experience was recognized long before neuroscience came along. Nevertheless, neuroscience does perhaps provide further corroboration for it and also has the potential to cast new light on the nature and role of the relevant emotions.

But surely, one might object, the claim that emotion plays a pivotal role runs the risk of trivializing religious conviction, by reducing it to mere feeling. However, this is not the case at all. Recent work on emotion increasingly recognizes that emotions and feelings are not just bodily twinges; they are ways of experiencing the world that contribute to our deepest commitments, our sense of how things are.⁹ One experiences the world and thinks about things through a framework of commitment, which does not take the form of a set of deeply entrenched propositions but, rather, a background feeling of what is and should be the case. This is beautifully articulated in numerous works by William James and applied specifically to religion in his *Varieties of Religious Experience*.¹⁰

According to James, one believes as a whole person, as an active, feeling agent rather than a cold, calculating mind that could, for all events and purposes, be disembodied. Our most fundamental sense of “what is” is not something we acquire by prowling around and looking for evidence. It is felt with a form and degree of conviction that is much deeper. As James (1902) puts it:

Individuality is founded in feeling; and the recesses of feeling, the darker, blinder strata of character, are the only places in the world in which we catch real fact in the making, and directly perceive how events happen, and how work is actually done. Compared with this world of living individualized feelings, the world of generalized objects which the intellect contemplates is without solidity or life. (pp. 501–502)

Religious belief, he says, is something had at the level of these “living individualized feelings.” To believe in God is not simply to place a tick next to the sentence “God exists.” Such utterances are superficial and imperfect articulations of the underlying conviction. The convictions that comprise one’s deepest sense of how the world is are constituted by feeling, and it is only upon these unarticulated core convictions that reason goes to work:

in the metaphysical and religious sphere, articulate reasons are cogent for us only when our inarticulate feelings of reality have already been

impressed in favor of the same conclusion. . . . The unreasoned and immediate assurance is the deep thing in us, the reasoned argument is but a surface exhibition. (p. 74)

Both having a sense of “the more” and having a sense that “this is all there is” are, for James, forms of responsiveness to the world that come preformed before reason even gets a look in. Whether one is an atheist, a theist, or something else is not usually an outcome of deliberation. It is a presupposed receptivity to things, a background sense of how things are with the world. Any understanding that fails to recognize this element of our lives and takes a belief in God to be the explicit positing of some entity, analogous to positing the existence of Paris, will thus lead to a distorted conception of religious conviction. One can draw on such insights without committing to James’s individualism, which I criticized in the first section of this chapter.

Is there any way of arbitrating between different background convictions, of deeming some well-formed and others not? This question is complicated by James’s claim that certain truths can only be recognized by one who is already committed in some way, just as a true friendship can only reveal itself as what it is if one first adopts a background of trust and commitment. As James (1956) puts it, “there are . . . cases where a fact cannot come at all unless a preliminary faith exists in its coming” (p. 24). Thus, it is not enough to simply look and judge.

All sorts of tricky questions then arise as to whether some feelings are better guides than others, whether some are intrinsically religious, mystical, or spiritual, and how one might go about demarcating healthy, truth-disclosing backgrounds of commitment from pathological experiential forms and dead ends. Further questions arise concerning the relationships between believing, feeling, emoting, and experiencing. Answering these questions will not be an easy task and applying the answers so as to cast light on the nature of religion will require a level of understanding, caution, and careful interdisciplinary engagement between philosophy, theology, and various scientific disciplines that is absent from so-called neurotheology.

NOTES

I am grateful to Beth Hannon and Benedict Smith for helpful comments on an earlier draft of this chapter.

1. See, for example, the article “This is your brain on God” in *Wired Magazine* 7, no.11 (November 1999).

2. As Emmons and Paloutzian (2003, p. 381) observe, “how religion and spirituality are conceived and measured vary from study to study.”

3. I will alternate between the terms “religious,” “mystical,” and “spiritual,” as I address different authors and arguments. I will sometimes use them interchangeably, with “religious” as my default term. This will not have any repercussions for my overall argument.

4. Galvanic skin response is an indirect way of measuring emotional arousal. When one is emotionally aroused, even slightly, the palms sweat and moisture content increases. This can be detected through increased electrical conductance.

5. For several such criticisms, see the essays edited by Rose and Rose (2000).

6. This kind of argument structure is sadly not restricted to Persinger’s work. For example, Alper (2002) claims that “every trait we possess, from stereoscopic vision to our opposable thumbs, must have a specific reason for having emerged in us. Since the driving force underlying all evolutionary processes is the preservation of a species, every trait must somehow serve to increase our species’ chances of survival” (2002, p. 293). Even leaving aside the fact that natural selection seldom, if ever, acts upon species, this kind of assertion is clearly misguided. Alper, like Persinger, assumes it as a premise for a death-avoidance account of religious experience.

7. See, for example, Plantinga (1993) for a theistic version of this view and Papineau (1993) for a naturalistic account.

8. See Mackie (1982) for one of many excellent discussions of such arguments.

9. See, for example, Damasio (1995, 2000). For several recent philosophical accounts of emotion, see Solomon (2004).

10. See Ratcliffe (2005a) for a detailed discussion of William James’s view of emotion.

REFERENCES

- Alper, M. (2002). The evolutionary origins of spiritual consciousness. In R. Joseph (Ed.), *Neurotheology: Brain, science, spirituality, religious experience* (pp. 293–303). San Jose: University Press.
- Cheyne, J. A. (2001). The ominous numinous: sensed presence and ‘other’ hallucinations. *Journal of Consciousness Studies*, 8(5–7), 133–150.
- Damasio, A. (1995). *Descartes’ error: Emotion, reason and the human brain*. London: Picador.
- Damasio, A. (2000). *The feeling of what happens: Body, emotion and the making of consciousness*. London: Vintage.
- Davis, C. F. (1989). *The evidential force of religious experience*. Oxford: Oxford University Press.
- Emmons, R. A., & Paloutzian, R. F. (2003). The psychology of religion. *Annual Review of Psychology*, 54, 377–402.
- Gould, S. J., & Lewontin, R. C. (1979). The spandrels of San Marco and the Panglossian Paradigm: A critique of the Adaptationist Programme. *Proceedings of the Royal Society of London, series B*, 20, 581–598.
- Hitt, J. (1999). This is your brain on God. *Wired Magazine*, 7, no. 11 (November).
- James, W. (1902). *The varieties of religious experience*. London: Longmans, Green.
- James, W. (1956). *The will to believe and other essays in popular psychology*. New York: Dover Publications.

- Mackie, J. L. (1982). *The miracle of theism: Arguments for and against the existence of God*. Oxford: Oxford University Press.
- Newberg, A., & d'Aquili, G. (2000). The neuropsychology of religious and spiritual experience. *Journal of Consciousness Studies*, 7(11–12), 251–266.
- Newberg, A., d'Aquili, E., & Rause, V. (2001). *Why God won't go away: Brain science and the biology of belief*. New York: Ballentine Books.
- Papineau, D. (1993). *Philosophical naturalism*. Oxford: Blackwell.
- Persinger, M. (2002a). The temporal lobe: The biological basis of the God experience. In R. Joseph (Ed.), *Neuroethology: Brain, science, spirituality, religious experience* (pp. 273–278). San Jose: University Press.
- Persinger, M. (2002b). Experimental simulation of the God experience: Implications for religious beliefs and the future of the human species. In R. Joseph (Ed.), *Neuroethology: Brain, science, spirituality, religious experience* (pp. 279–292). San Jose: University Press.
- Phillips, D. Z. (1986). *Belief, change and forms of life*. London: MacMillan.
- Pigliucci, M. (2002). Neuro-theology: A rather skeptical perspective. In R. Joseph (Ed.), *Neuroethology: Brain, science, spirituality, religious experience* (pp. 269–271). San Jose: University Press.
- Plantinga, A. (1993). *Warrant and proper function*. Oxford: Oxford University Press.
- Ramachandran, V. S., & Blakeslee, S. (1998). *Phantoms in the brain*. London: Fourth Estate.
- Ratcliffe, M. (2005a). William James on emotion and intentionality. *International Journal of Philosophical Studies*, 13, 179–202.
- Ratcliffe, M. (2005b). The feeling of being. *Journal of Consciousness Studies*, 12(8–10), 45–63.
- Richardson, R. (2001). Evolution without history: Critical reflections on evolutionary psychology. In H. R. Holcomb III (Ed.), *Conceptual challenges in evolutionary psychology: Innovative research strategies*. Dordrecht: Kluwer.
- Rose, H., & Rose, S. (2000). *Alas, poor Darwin: Arguments against evolutionary psychology*. London: Jonathan Cape.
- Solomon, R. C. (Ed.). (2004). *Thinking about feeling: Contemporary philosophers on emotions*. Oxford: Oxford University Press.
- Taylor, C. (2002). *Varieties of religion today: William James revisited*. Cambridge: Harvard University Press.
- Wells, H. G. (2004). *The country of the blind*. London: Penguin.

RELIGION AS A BY-PRODUCT OF
EVOLVED PSYCHOLOGY: THE CASE OF
ATTACHMENT AND IMPLICATIONS FOR
BRAIN AND RELIGION RESEARCH

Pehr Granqvist

Whether in human infants or monkey infants, whenever the “natural” object of attachment behaviour is unavailable, the behaviour can become directed towards some substitute object. Even though it is inanimate, such an object frequently appears capable of filling the role of an important, though subsidiary, attachment-“figure.” Like the principal attachment figure, the inanimate substitute is sought especially when a child is tired, ill, or distressed. (Bowlby, 1982, p. 313)

This chapter follows a line of reasoning in which religion is viewed as a by-product of evolution, and not as a biological adaptation, or set of adaptations, in its own right (see e.g., Atran & Norenzayan, 2004; Hinde, 1999; Kirkpatrick, 2005; Kirkpatrick, this volume). Rather, religion is held to emerge indirectly from the operation of evolved psychological mechanisms that did, in turn, fill an adaptive function in the environments in which the human species evolved. The chapter focuses on one, among other, evolved mechanisms, namely the attachment behavioral system and its relation to religiousness. The first sections of the chapter outline attachment theory, followed by a review of the evidence showing that the attachment system is typically highly activated in believers’ perceived God relations and particularly during full-blown religious experiences such as sudden religious conversions. Also reviewed are findings indicating that individual differences in experiences of caregiver sensitivity and attachment security underlie different developmental

pathways to religion. Moreover, implications of the attachment and religion findings for brain and religion research are discussed. Finally, while the risk of producing an incoherent text seems clear enough,¹ some words of caution and paradigmatic suggestions are offered to the emerging field of brain and religion research and particularly to its “neurotheology” branch. These considerations are based on the multifactorial nature of religious experience, on a failed replication of key neurotheology findings (to be reviewed), and on the position that religion is a by-product of evolution. Most importantly, however, they are based on what is believed to be a proper understanding of the epistemological role of natural science in this area of research, namely, that it is nothing more, nor less, than an ontologically agnostic inquiry into the empirical constituents of religious experience and its physical and psychological causation. Both ontological reduction and embracement are held to reflect logical errors when drawn from neuroscience findings.

OUTLINE OF ATTACHMENT THEORY

Those who are not so familiar with attachment theory may think that the theory represents Neo-Freudianism gone empirical, with its advocates essentially dedicated to classifying infants and caregivers to different patterns of secure and insecure attachment, based on slight revisions of psychoanalytic theory. However, nothing could be more erroneous (see e.g., Granqvist, 2006). As the misconception is not infrequent, especially in the “hard” sciences, the theory will be fairly thoroughly introduced here. (Readers who are very familiar with attachment theory and research may want to move directly to the next sections.)

John Bowlby (1982, 1973, 1980), the founding father of attachment theory, parted company with Freud when Bowlby posited his motivational model underlying the developing organism’s behavioral, cognitive, and affective organization. Whereas Freud took a drive theory approach as the “motor” of his theory, understanding individual development as a series of transformations of a few basic, general drives (i.e., the sex drive and the death drive), Bowlby—inspired by the work of ethologists such as Lorenz (Schiller, 1957) and Hinde (1970)—based his motivational model on control systems theory and Darwinian theory of natural selection. According to such a model, the organism possesses a number of domain-specific behavioral systems (e.g., for reproduction, nourishment, exploration, attachment) that have been designed by selection pressures and that result in higher inclusive fitness in the members of a species who display that the behaviors governed by the systems compared to those who did not.

The implications of these differing points of departure are difficult to exaggerate. For example, whereas Freud (1940) thought that the *human* infant’s early preference for its caregiver resulted from the caregiver being

associated with satisfaction of the infant's oral needs for nourishment (i.e., ultimately a transformation of the sex drive), Bowlby and other ethologists postulated that this preference, which is clearly visible in *all mammals* and even in birds, reflected the operation of a behavioral system that assured infant proximity to protective caregivers. In other words, the systems postulated are psychological mechanisms, closely corresponding to biological adaptations. And whereas some control systems are mechanical and programmed by humans (e.g., thermostats, missiles), mammalian behavioral systems were programmed by selection pressures in the environments in which the species evolved (i.e., the environment of evolutionary adaptedness, EEA; Bowlby, 1982).

The aspects of attachment theory that deal with the evolution of the attachment system, its biological function, its ontogenetic maturation, and its activating and terminating conditions are often referred to as the "normative aspects" of the theory. The reason is that the system is genetically based and present among virtually all members of all mammalian species. That this particular phenotype (i.e., the attachment system) is genetically based should, thus, not be confused with genetic heritability (the proportion of *variance* in a phenotype explained by variance in its genotype). Had there been substantial variance in this phenotype, the case of its biological function would have been somewhat less compelling.

Besides the normative aspects of attachment theory, a huge body of research—some cross-cultural, some even in other species—has documented replicable individual differences in the organization of attachment behaviors and, in the human case, also in representational products (e.g., speech) related to attachment. This initially somewhat surprising (Ainsworth, Blehar, Waters, & Walls, 1978) finding is nowadays often taken as the starting point in empirical research projects relating to attachment theory. However, as this chapter will demonstrate, there is more to attachment than classifications of individual differences. Here, we will first consider the normative aspects in more detail, before describing the individual differences and their developmental implications. Finally, the study of attachment later in development is introduced.

Normative Aspects of Attachment Theory

A core set of observations behind the formulation of attachment theory was that in particular situations, such as physical separation, illness, pain, fear, distress, and predator approach, mammalian offspring tend to behave in certain ways (Bowlby, 1982). While it is common among offspring in other species to flee to a burrow or den, primate offspring have a strong tendency to flee to its primary caregiver in such situations (Bowlby, cited in Hesse & Main, 2000). It was based on observations such as these that Bowlby (1973, 1980, 1982)

argued that mammalian offspring possess an attachment behavioral system, originally designed by selection pressures in the EEA and henceforth activated by situations (external as well as internal to the offspring) that give a natural clue to danger.

Yet, the attachment system is not fully mature at birth, particularly not in higher mammalian species such as humans and other primates, whose periods of brain and behavioral immaturity is disproportionately large compared to other species. The ontogenetic development of the system follows a clear pattern in humans and other primates, from early lack of discrimination and seemingly reflexive signal behaviors, such as crying and smiling, to a more refined, coordinated, and flexible organization of behaviors, where the child comes to take a more active part in maintaining proximity (Bowlby, 1982).

Not until the second half of human infants' first years of life do they show a marked behavioral preference for their primary caregivers (i.e., attachment figures) to others. From having cried whenever on its own in the first few months of life, the infant now cries whenever its attachment figures depart. Not coincidentally, at about the same time, the infant typically becomes more mobile through developing the capacity to crawl off on its own and also develops stranger anxiety. At this point, infants restrict their proximity-directed behaviors (i.e., approaching), which now includes following their attachment figures, whereas they typically withdraw from others. When infants learn to walk on their own a few months later, their capacity to increase the distance from, as well as to actively follow, their attachment figures is further enhanced. Also, at this age, children normally develop a great deal of potentially hazardous curiosity in their surroundings (i.e., in the service of the developing exploratory system).

It is clear by this age that the attachment system is the primary mechanism within children that is responsible for maintaining them in safe levels of proximity to protective caregivers. This is seen, for example, in how most infants and small children monitor the whereabouts of their "secure bases" when engaged in exploration. Should a natural clue to danger occur, children typically immediately withdraw to their attachment figure as a "haven of safety."

With increased cognitive maturation in the preschool years (e.g., temporal understanding, the "theory of mind," ability to attribute goals and intentions to others), children are able to withstand longer separations from their attachment figures. Although present already in infancy, the consequences of attachment behaviors, specifically the responses of the attachment figure, become increasingly stored in cognitive representations (internal working models, IWMs) of self and others in interaction. Although the IWM construct may seem fancy to die-hard behaviorists, even rats and other "lower" organisms develop elementary cognitive representations (e.g., maps) of their surroundings (e.g., Tolman, 1948), which

allow them to navigate more efficiently than in the absence of such representations. Through the operation of IWMs, the success of children's forecasts regarding the self's likelihood to manage any given challenge, as well as the attachment figure's likely response in case of alarm, is greatly enhanced. Bowlby (1973, 1980) thus held IWMs as a reasonably accurate representation of the organism's surrounding, especially such aspects of the surrounding that have been related to selection pressures in the EEA. There should be no doubt that signs of the attachment figure's availability when the offspring's attachment system has been highly activated represent core candidates for aspects of the latter kind. Importantly, as IWMs develop prior to the development of explicit memories, their experiential origins will be unbeknownst to their host, and they will operate largely outside their consciousness as a set of implicit memory sequences.

So far, proximity to (usually) protective caregivers has been portrayed as the "set-goal" of the attachment system. Regarding biological functionality, that is more or less the end of the story. However, and as for *psychological functionality*, an important consequence of proximity to protective caregivers in situations giving natural clues to danger is a psychological state of "felt security" (Sroufe & Waters, 1977a). This psychological state, which early on corresponds very closely with physical proximity, becomes ever the more important with maturation. Later in life, from middle childhood to old age, the attachment system is considerably less easily activated, and when it is activated at lower levels, a telephone call, a letter, even the mere knowledge that an attachment figure would be available if the situation got worse, may suffice to give the individual a sense of felt security. However, when the attachment system is highly activated also later in life (e.g., following divorce or the death of a loved one), physical proximity with an attachment figure is, without comparison, the most effective mean of bringing that outcome about.

Relatedly, Bowlby (1979, 1982) repeatedly emphasized that the attachment system is active from the cradle to the grave, even if less easily activated after early childhood. Here, again, we see a notable difference to Freud's theory, which viewed adult behaviors, such as those expressing attachment, as regressive, a sign of dependency (see Granqvist, 2006). One might wonder then what the biological function of attachment, if any at all, has been later in development? A major proposal has been the co-option of this system for the maintenance of adult pair-bonds (e.g., Hazan & Zeifman, 1999), but some controversy has surrounded that proposal (e.g., Kirkpatrick, 1998a). Be that as it may, once a system has established itself within the gene pool due to its promotion of inclusive fitness, it may well continue to operate within animals throughout their life-span as long as its operation in later life periods was not detrimental to fitness in the EEA. Prepubertal sexuality is a case in point, post-menopause sexuality another, and sexual "perversions" a third;

all expressions of the reproductive system operating without leading to its biological function of reproduction.

Finally, as attachment is a genetically based system that is present in all mammals, and as all behaviors, cognitions, and affects are presumably mediated by brain activity, the attachment system is ultimately considered a neural system (see also Bowlby, 1982). However, already early in life, the attachment system draws on diverse neural processes associated with different neural structures, including regulation of attention (prefrontal cortex), sensory feedback (the sensory areas, cortical association area), memory structures (hippocampus, cortical association area), emotional processing (the limbic system, particularly the amygdalae), and motor outputs (motoric region). Consequently, the attachment system should not be confused with any concrete neurological *structure*. It seems wiser to consider it a *function* of the central nervous system.

Individual Differences in Early Attachment Organization

The behaviors resulting from attachment activation are modulated by the dyadic organization of the offspring-caregiver relationship (Ainsworth et al., 1978), which is, in turn, mediated by IWMs of self and others. As noted, such IWMs are thought to be constructed from previous experiences of caregiver availability and sensitivity to the individual's needs in attachment activating situations. In human infants, the behavioral manifestations of the infant's developing IWMs are often inferred from observations made in the Ainsworth strange situation (Ainsworth et al., 1978), a semi-structured laboratory procedure consisting of repeated sequences of play (i.e., exploration), separation from the caregiver (i.e., attachment activation), and reunion with the caregiver (i.e., attachment termination). Through a move to the representational level (Main, Kaplan, & Cassidy, 1985), the manifestations of IWMs are now also inferred from speech and other representational products later in development. Although attachment procedures to study individual differences have been developed on humans, they have more recently been adapted, imported, and shown useful as applied also to other mammals (e.g., Suomi, 1999; Weaver & de Waal, 2002).

Regardless of the age and mode of measuring the organization of attachment in humans, *secure* attachment implies certainty of the caregiver's availability and the self's worthiness of care during attachment activation and of ease in exploring other aspects of the surrounding when the attachment system is less active. Consequently, Main (e.g., Main et al., 1985) has suggested that the attentional focus of secure children shifts flexibly between attachment and exploration depending on whether the attachment system is activated.

In contrast, insecure attachment organization implies certainty of the caregiver's unavailability (insecure/*avoidant* attachment) or uncertainty of

the caregiver's availability (insecure/*ambivalent* attachment). Likewise, the self's worthiness of care in attachment activating situations is unclear in these children. Main (e.g., Main et al., 1985) has described the strategy of avoidant children as one of minimizing attention to attachment. Due to certainty of the caregiver's unavailability, the avoidant child defensively shifts attention to other aspects of the surroundings also in situations that should typically activate the attachment system and instead engages in defensive exploration. As evidence for the defensive quality of avoidant behavior, studies have documented psychophysiological reactions (e.g., heart-rate and skin conductance recordings) indicative of stress in these children during the strange situation (e.g., Sroufe & Waters, 1977b), in spite of their seeming behavioral "independence."

The strategy of ambivalent children has been described, in contrast, as one of maximizing attention to attachment (e.g., Main et al., 1985). Due to uncertainty of the caregiver's availability, the child keeps close track of and often clings to the caregiver even in situations that do not typically give clues to danger. The child's exploration of other aspects of the surrounding consequently suffers. While the minimizing and maximizing strategies give rise to very different behavioral and linguistic "outputs," they share an underlying rigid organization of attention and information processing with regard to attachment. Importantly, both also make the offspring less fine-tuned to differentiate between attachment activating and more neutral, normally exploration-facilitating conditions than the attentional organization of secure offspring, which is more flexible (see Suomi, 1999, for a similar description of infant rhesus monkeys).

Finally, a fourth, insecure/*disorganized* quality of attachment has been described (Main & Solomon, 1990). The disorganized child's attentional strategy is thought to break-down during stress (e.g., Hesse & Main, 2000) as manifest in disorganized behaviors, for example, behavioral freezing, prolonged stilling with a trance-like facial expression, simultaneous displays of contradictory behaviors. The disorganized behaviors show striking resemblances to what Hinde (1970) characterized as conflict behaviors in other mammals. The inference that the behavioral break-down results from stress is supported by elevated concentrations of a stress-related hormone (i.e., cortisol) in these infants during the strange situation (e.g., Spangler & Grossmann, 1993).

Numerous studies have shown that the best predictor of the infant's response to the strange situation is caregiver sensitivity to the infant during the infant's first year of life (e.g., Ainsworth et al., 1978; De Wolff & van Ijzendoorn, 1997). While there was some controversy between attachment and temperament theorists on this matter in the past, a large-scale behavioral genetic study of twins and adoptees has now documented a high proportion of explained variance from shared environment whereas

the influence of genetic heritability even failed to make it into the statistical model (Bokhorst, Bakermans-Kranenburg, van Ijzendoorn, Fonagy, & Schuengel 2003). Needless to say, both of these findings are highly unusual in psychology.

Sensitivity is implied when a caregiver *usually* notices the infant's signals, interprets them correctly, and responds to them promptly and adequately (Ainsworth et al., 1978). Not surprisingly, based on caregiver observations, caregivers of secure infants are independently judged higher in sensitivity than caregivers of insecure infants. Caregivers of avoidant babies are more rejecting (i.e., turn down the infant's bids for attachment, subtly avoid physical closeness) and caregivers of ambivalent infants are more inconsistent (e.g., oftentimes being neglecting, sometimes behaving sensitively) (see De Wolff & van Ijzendoorn, 1997, for a meta-analysis). These observations are helpful in understanding why the infants organize themselves around the caregiver in their own particular ways so as to escape danger, that is, why secure infants turn to their caregivers when distressed, are effectively consoled, and quickly return to exploration; why avoidant babies minimize their attention to attachment (i.e., avoid further rejection and the prospect of abandonment, while maintaining a safe level of proximity); and why ambivalent infants maximize their attention to attachment (i.e., activating the caregiver's attentiveness).

Caregivers of disorganized babies are not necessarily lower in general sensitivity. However, they have been found, in several studies, to be more often abusive and to display subtle behaviors that are frightening (e.g., quasi-predatory movements) and/or that indicate that the caregiver is frightened (e.g., sudden increase in distance from the infant, suggesting that the infant is experienced as alarming; see Hesse & Main, 2000). In other words, rather than being the solution to fear, these caregivers are actually part of the source of it. Yet, being in possession of an attachment system, infants are programmed to maintain safe levels of proximity to their caregivers, especially when alarmed. It is easy to see how this could create an irresolvable dilemma for the infant, hence, presumably, the behavioral break-down seen in conflict behaviors during attachment activation (Hesse & Main, 2000).

Cassidy (1994) has suggested that different strategies of affect regulation characterize individual differences in attachment organization. By drawing on the definition of Thompson (1994), as well as on Bowlby's postulated set-goal of the attachment system, affect regulation is defined as an adaptive process that drives the organism toward achieving its goals (i.e., to obtain proximity, in the case of attachment). Affect regulation not only refers to the inhibition of affective states, but sometimes also to a heightening of them. The responsibility for regulating affect is implicitly shared in secure dyads in that the infants freely and flexibly signal negative affect when distressed and positive affect when content and in that they are willing to let caregivers help

them resolve it would the scenario be of the former kind. This free display of affect is presumably a result of caregiver sensitivity in relation to previous displays. As a consequence of adequate caregiver responses, the child will subsequently achieve control over the affect states and their displays while still being able to turn to others for support when needed. When viewed this way, avoidant behavior may be seen as a strategy of minimizing negative affect (e.g., avoid crying during separation), whereas ambivalence reflects its maximization (e.g., complain when picked up, complain when let down), and disorganization reflects its confusion or, again, its break-down (e.g., hitting the parent when in an apparently good mood).

Due to the theoretical foundation in control systems theory and Darwinian theory, in conjunction with the solid measurement procedures developed to tap individual differences in attachment, attachment theory has now established itself as one of the major research paradigms in developmental psychology. Yet, unless it had been successful in predicting relevant aspects of development, it would have been of limited usefulness. However, attachment security, from infancy onward, has been found an important predictor of socioemotional development, even in long-term longitudinal studies following participants from infancy to adulthood. For example, attachment security predicts absence of behavioral problems (of both internalizing and externalizing kinds), higher empathic responses, higher social competence, higher peer popularity, earlier maturation of theory of mind, and higher resiliency to stress (see Weinfield, Sroufe, Egeland, & Carlson, 1999, for a review). Naturally, insecurity of attachment, and particularly disorganized attachment, has the opposite correlates (van Ijzendoorn, Schuengel, & Bakermans-Kranenburg, 1999; Weinfield et al., 1999). These predictive relations are often held to be explained by the temporal continuity and the self-verifying and generalizing nature of the child's IWMs, although other processes as well as environmental stability are likely involved as well (e.g., Weinfield et al., 1999).

Three correlates of attachment security are of particular relevance here. First, secure attachment is linked to a more successful internalization of parental standards and values (Ainsworth, Bell, & Stayton, 1974; Richters & Waters, 1991). For example, from an early age, secure children behaviorally adopt the conduct "recommended" by their sensitive attachment figures to a larger extent than do insecure children, whose attachment figures are also less sensitive (Londerville & Main, 1981). Second, as in the opening quote from Bowlby, Ainsworth (1985) made the intriguing suggestion that in the absence of a sensitive caregiver, insecure children may eventually turn instead to attachment "surrogates." This hypothesis has been supported with respect to insecurely attached children's reliance on peers, teachers, and relatives outside of the immediate family context (e.g., Booth, Rubin, & Krasnor, 1998; Elicker, Englund, & Sroufe, 1992).

Finally, aspects of infant disorganization (e.g., freezing, stilling) have been suggested to represent proto-dissociative states that may psychologically guard the infant from the behaviorally irresolvable dilemma described above (Hesse & Main, 2000). If that becomes a habitual response mode when faced with stress, disorganized attachment would make the individual prone to later experiences of dissociative mental states (e.g., experiences of de-personalization, out-of-the-body experiences). Confirmatory evidence comes from studies linking infant disorganization to dissociative states throughout childhood and adolescence (Carlson, 1998; van Ijzendoorn, Schuengel, & Bakermans-Kranenburg, 1999).

Attachment Later in Development

Although attachment theory and research initially concerned early childhood, interest eventually was directed to attachment processes later in development. As noted, Bowlby (1973, 1980, 1982), and also Ainsworth (1985), had stated that the attachment system is active throughout life, and both had considered long-term adult love relationships as exemplifying later attachment relationships. However, other researchers, working in two different traditions, developed the empirical study of attachment later in development.

Attachment at the representational level. The first of these traditions was pioneered by Main and colleagues in developmental psychology (Main et al., 1985) and emphasized the representational level of attachment later in development as manifested not only in behaviors, but also in speech and other representational products. For example, through the use of a structured interview about visually represented fictional child-parent dyads in different separation situations (the adapted Separation Anxiety Test, SAT; Kaplan, 1987), 6-year-old children varying in attachment classifications as infants were found to speak very differently about what pictured children would feel and do while separated. Whereas children who had been independently judged secure as infants acknowledged feelings of vulnerability and imagined constructive means of coping with the separations, children judged insecure as infants did not. For instance, the responses of previously disorganized children indicated fearfulness (e.g., the killing of self, invisible agents of action). In another task of this project, Main (1991) reported that some previously ambivalent infants had difficulties understanding the privacy of thought (cf. telepathy) and attributed psychical powers to themselves as well as their parents.

However, the truly pioneering work of Main and colleagues (1985) consisted in the construction of a semi-structured interview about adults' attachment biographies, the Adult Attachment Interview (AAI; Main, Goldwyn, & Hesse, 2003). Through the use of this method, adult attachment classifications of parents were found highly and specifically predictive of infants' ways

of organizing themselves around the parent in the strange situation (e.g., disorganized mothers had disorganized infants, secure mothers secure infants), a finding that has now been replicated in at least 20 independent samples (see van Ijzendoorn, 1995, for a meta-analysis of the first 14). Moreover, as infant classifications are not genetically heritable, the transmission of attachment is environmental in origin and partly mediated by the parent's sensitivity to the infant (see Fleming et al., 2002 and Suomi, 1999 for identical conclusions from experimental studies of rodents and rhesus monkeys, respectively). The vital role behind these predictive relations in humans is that when coding AAIs, the coder judges the *form* of current attachment discourse rather than only the *content* of discourse.

Secure (or "autonomous") discourse is characterized by coherence (e.g., internal consistency between global/semantic and specific/episodic memories). Importantly, such discourse can be present among individuals who are judged to have had largely negative experiences with parents, in which case "earned security" is the sub-classification used in demarcation to "continuous security." While an exception in and of itself, earned security is may be facilitated by therapy and reparative experiences with other attachment figures (Bowlby, 1988; Main et al., 2003). Earned security is, moreover, associated with similar levels of sensitivity to the offspring as is continuous security (Pearson, Cohn, Cowan, & Cowan, 1994).

Insecure discourse is, in contrast, characterized by incoherence. For example, ambivalent (or "preoccupied") discourse is marked by vagueness of speech and confused, detailed ranting about the failure of parents in providing for the speaker (i.e., preoccupying anger). Disorganized ("unresolved" or "cannot classify") discourse is found in one of two ways, firstly, in lapses of reasoning (e.g., dead, not-dead) and discourse (e.g., sudden intrusions of traumatic memories) specifically in relation to a significant event of abuse or loss through death (i.e., trauma), and secondly, in a more global incompatibility of discourse strategy (e.g., highly positive description of parent in the absence of episodic support in one part of the transcript, combined with highly preoccupying anger against the same parent in a different part of the transcript). Like disorganized infant attachment, disorganized AAI classifications have been found related, as expected, to dissociative states (Hesse & van Ijzendoorn, 1999). Also, AAI classifications have now been successfully predicted from the same individuals' infant strange situation classifications in several independent samples (see Fraley, 2002, for a meta-analysis; see Hesse, 1999, for additional aspects of convergent and discriminant validity of the AAI).

Romantic attachment. The second adult attachment tradition, developed by Hazan and Shaver (1987) in social psychology, concerns itself with adult pair bond relationships, particularly romantic love relationships, as the primary attachment relationships in adulthood. Taking Bowlby's (1973, 1980, 1982)

reasoning as the point of departure, the attachment system, the caregiving system, and the reproductive system are supposedly integrated in romantic love relationships; that is, both partners serve as attached, as caregivers, and as the primary persons in whom issues related to reproduction are invested (see Shaver & Mikulincer, 2002).

Also, a wide variety of self-report questionnaire methods have been developed, and the one mostly used currently (Brennan, Clark, & Shaver, 1998) yields two continuous dimensions of romantic attachment: *Avoidance* (of intimacy and dependency) and *Anxiety* (about insufficient love and the prospect of abandonment). While there are no latent taxa underlying these dimensions (Fraley & Waller, 1998), the dimensions can be used to form the four now well-familiar groups (see Shaver & Mikulincer, 2002, for a review). Concerning the origin of individual differences in romantic attachment, childhood attachment is thought to be an important determinant, as mediated by generalizing IWMs derived from the parental attachment relationships, but no data has hitherto been reported that addresses this issue.

A special topic of interest in the literature on romantic attachment is that of attachment processes in adolescence and early adulthood. The reason is that these are attachment transitional periods, where attachment components (i.e., the proximity seeking, safe haven, and secure base phenomena) are gradually transferred from parents to peers, most often love partners (e.g., Friedlmeier & Granqvist, 2006; Hazan & Zeifman, 1999). This attachment transition implies increasing autonomy vis-à-vis parents, as well as a relocation of attachment figures in the individual's attachment hierarchy, where long-term love partners gradually come to possess the principal position. Favorable experiences with parents are likely for the benefit of the smoothness with which the adolescent/young adult will make this transition, for example, finding a secure romantic partner while maintaining an affectional bond with sensitive parents, whereas unfavorable experiences with parents are detrimental, leaving the latter adolescents in a situation wherein felt security cannot be obtained either through parents or through a love partner (e.g., Allen & Land, 1999).

INVOLVEMENT OF THE ATTACHMENT SYSTEM IN RELIGIOUS EXPERIENCE

For hundreds of years, believers have likened their first experienced personal encounter with God to falling in love. Similarly, it has been known for at least 100 years that those experiences do not happen at random, but are associated with a precipitating period of emotional turmoil (e.g., James, 1902). Moreover, although likely surprising to those who associate religiousness primarily with a particular set of cognitive-intellectual and value-oriented positions, it is well-established that when asked to describe

the most important aspect of their religion, most believers pick their personal relationship with God (Gallup & Jones, 1989). Scholars of diverse theoretical persuasions in psychology have naturally struggled to explain such findings (see e.g., Spilka, Hood, Hunsberger, & Gorsuch, 2003). It was not until Lee Kirkpatrick (1992, 1999, 2005) applied attachment theory to religion that these pieces, along with others to be reviewed, came to fit in a solid theoretical framework that was also empirically testable and that in fact came to be empirically corroborated in future research, as will be described. In this section, focus will be on the normative aspects of attachment and believers' perceived God relations. First, believers' perceived relationships with God are briefly discussed in relation to the defining characteristics of attachment, and some terminological words of caution are offered. This is followed by a consideration of maturational aspects of attachment and the developing God relation.

Believers' Perceived God Relations vis-à-vis Attachment Relationship Criteria

The most obvious point of departure for the attachment theoretical application to religion was the centrality of the believer's personal relationship with a personal, caring God (see Kirkpatrick, 1999, 2005). However, the term "attachment relationship" does not refer to all types of close relationships, but exclusively to relationships that meet three distinct criteria: proximity maintenance, safe haven, and secure base (e.g., Ainsworth, 1985). Bowlby (1973) added a fourth criterion concerning characteristics of the attachment figure in relation to the attached person, namely that the former is perceived as stronger and wiser during stress.

Regarding proximity maintenance, God is thought by believers to be omnipresent, by definition always near. There are several means available to make this a more personal and concrete experience, such as religious symbols and rituals, for example, visits to the Temple. The most salient mean of obtaining closeness to God, however, is probably accomplished in prayer (Kirkpatrick, 1999). Maintaining proximity also means resisting separations. Accordingly, in two recent attachment experiments, theistic believers showed an increase in their wish to be close to God when primed with subliminal separation stimuli targeting either their relationship with God ("God has abandoned me") or their mothers ("Mommy is gone") versus participants in attachment neutral control conditions (Birgegard & Granqvist, 2004).

Regarding the safe haven aspect of attachment, individuals turn to God in situations of distress, and the more distressing the situation, the more likely they are to do so (Pargament, 1997). In highly distressing situations, the most likely religious/spiritual response is to pray to God (Argyle & Beit-Hallahmi, 1975), suggesting that private prayer may function as a religious analogue

to attachment behaviors (see Kirkpatrick, 1999, 2005). Further, and as noted above, in highly distressing life situations, religious experiences, significant religious changes, and conversions occur at a disproportionately high rate (Spilka et al., 2003; Ullman, 1982). Also, experiments using subliminal exposures of threat-related words, such as failure or death, have supported the notion of God as a safe haven in a Jewish sample of Israeli college students, who showed an increase in the psychological accessibility of God following the exposures (Gewirtz, 2004).

While the safe haven aspects of religious experience described are clearly embedded in the religious individual's relationship with an anthropomorphically shaped and institutionally sanctioned deity, this need not be the case. On the contrary, many seemingly spontaneous occurrences of "paranormal" experiences that are not sanctioned by institutionalized religion, such as out-of-the body experiences, are also generally precipitated by significant turmoil (Irwin, 1993). As such experiences may well occur in the absence of the individual's attributions to a divine power or any other form of sanctified, comforting presence, their occurrence does not require perceptions of the availability of any anthropomorphic safe haven. Later, we will consider the possibility that such experiences occurring in relation to perceptions of an available safe haven may have very different psychological correlates than the other experiences.

Concerning the secure base phenomenon, there is typically a notable increase in well-being following the conversion experience (Ullman, 1982), which, in attachment terms, may suggest that the individual obtains felt security from his or her perceived encounter with God. It is notable also that God is perceived to possess sensitivity-related attributes that are supposedly ideal for a secure base. For example, factor analytic studies show factors of "availability" (e.g., "gives comfort," "a warm-hearted refuge," "who will take loving care of me"; Tamayo & Desjardins, 1976) and "benevolence" (e.g., "comforting," "loving," "protecting"; Gorsuch, 1968) to account for most variance in God image. Moreover, correlates of religiosity suggest that possessing an image of and relating to God as a sensitive secure base is associated with positive outcomes, over and above the effects of virtually every conceivable covariate (e.g., George, Ellison & Larson, 2002). In the event that a person with such a perceived God relation would nevertheless become sick or depressed, their remissions are typically faster than the remissions of individuals without them (e.g., Koenig, George, & Peterson, 1998).

Finally, regarding relative strength and wisdom, and in being described as omnipotent and omniscient, God is perceived as both stronger and wiser than the believers themselves. While these descriptions as well as the omnipresence description of God may well express the "official dogma" more than the believers' own perceptions, it is still of interest to note that official dogma sanctions the idea of an attachment figure that is flawless in sensitivity.

Moreover, the fact that people *do* turn to God in distress, which in turn helps them to feel better, clearly indicates that they do in fact view God as stronger and wiser than themselves.

To summarize, in serving the function of obtaining/maintaining a state of felt security, aspects of attachment presumably function in a similar way for believers in relation to God as they do for children in relation to their parents. Hence, on the basis of the above considerations, it seems reasonable to conclude that God is used *like* an attachment figure by some adults and that the attachment system is typically highly operative in their perceived God relations. Whether God *is* an attachment figure, however, is another matter and not an easy one to settle. First, while an open issue at present, and as illustrated by the opening quote from Bowlby, it is far from inconceivable that many of the findings reported above could hold also for an individual's relation to other attachment "surrogates" that are not typically thought of as attachment figures (e.g., a child's "relation" to his/her blanket). As we will see later, however, the psychological significance of other attachment surrogates wane with maturation, whereas—if anything—the opposite is the case with God. Second, if one were to consider verifiable (i.e., through ordinary sensory channels) existence as well as observable behaviors in relation to the attached person as necessary conditions for inclusion in the class of "attachment figures," then God would not pass. This is not a declaration of atheism, but simply a testimony of the difficulties inherent in observing God's behaviors. On the other hand, and to the best of the author's knowledge, no one in the field of attachment has suggested in print that those should be considered necessary conditions, but it may be taken for granted. In either case, due to these ambiguities, and to prevent semantic dilution of the attachment concept, God will be referred to as an attachment-"like" figure, and the believer's perceived God relation as an attachment-"like" relationship.²

A final terminological note, of immediate relevance, on the use of the attachment concept in this context is that whereas the attachment system has a clear biological function within its usual sphere of operation (i.e., promotion of inclusive fitness through caregivers' protection of the offspring), the same cannot be said for its operation within the perceived God relation. In other words, it is highly unlikely that the latter relation promoted inclusive fitness by systematically protecting the individuals who had it from danger in the EEA. If most Neanderthals knelt down to pray when chased by predators, for example, this chapter would likely not have been written. Although some theorists would suggest that the God relation promoted inclusive fitness in some other ways than protection from danger, such as through sexual selection or group selection mechanisms, there are other compelling arguments against such proposals (see Kirkpatrick, this volume).

However, and as noted, once a mechanism has established itself within the gene pool, it may well continue to operate within individuals and in contexts

that were not associated with its biological function. Hence, the question of biological functionality is more or less isomorphic to the question of whether the believer-God relation involves the attachment system and is an attachment relationship. In fact, corporations, cultures, religions, and societal institutions may well capitalize on any system's operation outside the sphere of its biological functionality, whether knowingly or not. For example, pornography capitalizes on the reproductive system but is certainly not the biological set-goal of that system; hence, pornography is one of its by-products. No other resemblances with pornography implied, it is in this sense that the term "religion as a by-product" is used. In essence, religion is presumably a free-rider on evolved mechanisms and clearly riding the attachment system.

The Developing God Relation vis-à-vis Maturation of Attachment

So far, we have considered adult expressions of religious experience in relation to normative attachment considerations. The story really starts in childhood, though, and it should not be surprising by now that the perceived God relation develops in temporal conjunction with the maturation of the attachment system and the cognitive developments associated with its maturation. Moreover, already in childhood, situational experiences associated with heightened attachment activation are linked to an increased significance of the God relation (see Granqvist & Dickie, 2006, for a more detailed overview).

Although some scholars have theorized about the "spirituality" of infancy, characterized by the "sanctified" presence of the nurturing mother (e.g., Erikson, 1963; Fowler, 1981), it makes no sense to attribute such adult concepts to infants, unless the spirituality concept is stretched well beyond its, admittedly fuzzy, limits. Far from being cognitively able to grasp symbolic thought, the infant is busy enough to display a series of more or less reflexive behaviors, such as rooting, sucking, crying—and later on smiling and following—that are necessary to obtain the biological set-goals of nourishment and proximity to its protective caregiver. Naturally, the infants whose set-goals are frequently and regularly met are more content and well-organized than other infants, but this is no basis from which spirituality may be attributed.

However, as attachment to primary caregivers increasingly moves toward goal-corrected partnerships in preschool, and children have developed elementary capacity for symbolic thought (Bowlby, 1982), they are able to withstand longer separations, presumably due to the emerging capacity to represent their attachment figures symbolically. Already at this age, children develop a concept of God that they describe or draw as a person (Heller, 1986). Besides the development of symbolic thought, children start to elaborate a theory of mind; others have intentions and goals that motivate their behaviors. It is easy to see how these two aspects of cognitive development pave the way for an emerging

understanding of God, particularly when adults provide feedback consonant with the existence, or at least concept, of God. Hence, just as children experience themselves and imagine concrete others to have intentions, followed by certain behaviors, these attributes may now be cognitively generalized to abstract, symbolic others. Such abstractions are highly charming for adults to listen to because, although abstractions, they tend to be comparatively concrete and anthropomorphic in the view of adults (cf. the Piagetian concepts of preoperational egocentrism and animism). A child at this age may, for example, explain the rain as a result of God's need to pee.

Once these cognitive developments have occurred, when the attachment system is highly active, such as during separation, children might start to draw on this abstract (yet anthropomorphic) attachment surrogate and to do so more in such situations than in situations not involving attachment activation. Relatedly, Rizzuto (1979) has suggested that it is at this age that children develop a "living" God representation.

In middle childhood, as children enter school and move even farther from parents' immediate care, their God concepts become somewhat less anthropomorphic, although at the same time God is typically viewed as *personally* closer than in early childhood (Eshleman, Dickie, Merasco, Shepard, & Johnson, 1999; Tamminen, 1994). From early childhood on, empirical data clearly indicates that God is, indeed, perceived as available to serve a safe haven and secure base function in times of stress. For example, Tamminen (1994) found that 7- to 12-year-old Finnish children reported feeling close to God particularly during emergencies (e.g., escaping or avoiding danger, encounter with death or sorrow) and loneliness. Moreover, among the Finnish children, the category of situations in which God's guidance had been most frequently experienced consisted of external danger and difficulties, embraced by approximately 40 percent of the participating children. Additionally, Eshleman, Dickie, Merasco, Shepard, and Johnson (1999) found that American pre- and elementary school children placed a God symbol closer to a fictional child when the fictional child was in attachment activating situations (e.g., sick and in hospital, had fallen from a bike, the child's dog had died) than when the fictional child was in situations that were less clear-cut in terms of attachment activation (e.g., fictional child had stolen an apple, stolen a ball, and hurt another child).

These latter findings have now been conceptually replicated in two studies, one conducted in Sweden with 5- to 7-year-old children from religious and nonreligious homes (Granqvist, Ljungdahl, & Dickie, 2005), and one conducted in the United States with children of the same ages, most parents of whom were highly religious (Dickie, Charland, & Poll, 2005). The results of these two studies were conceptual, rather than direct, replications because they were based on a theoretically more clear-cut distinction between attachment activation and nonactivation. More specifically, the attachment neutral

stories included the fictional child in good-mood, bad-mood, and neutral-mood situations. Even with that more stringent control, children thus placed God closer to the fictional child in the attachment activating situations.

Adolescence and early adulthood, the most clearly visible attachment transitional periods in most individuals' lives, have also been long-known as major religious transitional periods (e.g., Granqvist, 2003; James, 1902). These are the life-periods most intimately associated with sudden religious conversions and other significant changes during which the God relation gains increased significance. As noted above, sudden religious conversions and other major religious changes are, not unexpectedly, typically precipitated by significant emotional turmoil, such as relationship problems with parents, with love partners, and other kinds of distress that are highly likely to keep the attachment system hyperactive at this sensitive period of attachment transition (Granqvist, 1998; Kirkpatrick & Shaver, 1990).

Compared to the preceding periods, mid-adulthood is, normatively speaking, less associated both with attachment transitions and religious drama as well as, in the latter case, more associated with maintenance and socialization of the religious habit (James, 1902) to the next generation. However, there are notable exceptions, the most pronounced being spousal break-up in separation and divorce. Not surprisingly, then, such attachment transitions have been found associated with increased significance of the God relation (e.g., Granqvist & Hagekull, 2000; Kirkpatrick, 2005).

Finally, in old age, the private God relation often re-gains importance, particularly when people suffer such a major attachment loss as the loss of their spouse through death. In an elegant study, which employed a prospective longitudinal design and a population-based sample of elders—some of whom were to suffer prospective bereavement and some of whom were not—Brown, Nesse, House, and Utz (2004) found not only a prospective increase in the importance of the God relation for the bereaved compared to the nonbereaved, but also that grief over the loss prospectively decreased as a function of the increased significance of the bereaved spouses' God relation. None of these effects were obtained for increases in church attendance, indicating that it may be specifically the attachment component of the individual's religiousness that is activated in such situations, and that its activation is what is needed to bring favorable psychological outcomes about in the context of attachment-related loss.

INDIVIDUAL DIFFERENCES IN ATTACHMENT AND DIFFERENTIAL DEVELOPMENTAL PATHWAYS TO RELIGION

Just as individual differences in attachment security moderate the behavioral and linguistic output of attachment activation in general, so do they moderate the effects of attachment activation in the context of believers' perceived

God relations. However, the matter is not as straightforward as one might guess. From the outset, Kirkpatrick (1992; Kirkpatrick & Shaver, 1990) noted that two partly opposing hypotheses could naturally be deduced from attachment theory concerning relations between religion and security—insecurity of attachment.

The first hypothesis has already more or less been spelled out; in the absence of a secure attachment relationship, the individual may turn to attachment surrogates to regulate distress (Ainsworth, 1985; Bowlby, 1982). As applied to religion, God and other entities, such as spirits or angels, would represent such surrogates for insecurely attached individuals (the *compensation hypothesis*). This idea had been supported, for example, by findings showing that religious converts, whose conversions were often preceded by emotional turmoil, reported more unfavorable childhood relationships with parents than a matched comparison-group of nonconverts (Ullman, 1982).

In contrast, through the operation of generalizing IWMs, securely attached individuals readily perceive others as available when needed (model of other), as well as exploit this availability due to an implicit valuing of themselves as worthy of care (model of self; Bowlby, 1973). Perhaps, then, this inclination can be further generalized to their perceived God relations, in which case secure, rather than insecure, attachment would be the foundation of a corresponding relationship with God (the *IWM/correspondence hypothesis*). This idea had been supported, for example, in cross-cultural research showing that God is construed as more loving in cultures where parenting is warm/accepting and more distant in cultures marked by rejecting parenting (Lambert, Triandis, & Wolf, 1959; Rohner, 1986).

A socially based aspect of religiosity has been added to Kirkpatrick's correspondence hypothesis (Granqvist, 2002; Granqvist & Hagekull, 1999). Hence, besides IWM correspondence, it has been suggested that religious beliefs and behaviors in the case of secure attachment partly reflect the adoption of a sensitive attachment figure's religious standards, whereas insecure offspring are hypothesized to be relatively less likely to adopt their more insensitive attachment figure's religious standards (*social correspondence*; Granqvist, 2002). This addition had been supported by numerous studies showing that the religiosity of offspring with more favorable parental relationships is highly similar to their parent's religiosity, whereas the religiosity of offspring with less favorable relationships is more or less orthogonal to parental religiosity (e.g., Spilka et al., 2003). Such results also converge with the findings in the attachment literature noted above, indicating that securely attached offspring are more inclined to adopt parental standards in general. Another reason for the addition of a principle of social correspondence was that *some* theoretical moderator was needed to avoid making attachment predictions irrefutable (cf. Popper, 1959), as the same outcome would otherwise have been predicted from opposing directions (i.e., secure

and insecure attachment). Moreover, parental religiousness consistently *did* act as such a moderator in the empirical studies (Granqvist, 1998, 2002, 2005; Granqvist & Hagekull, 1999; Granqvist, Ivarsson, Broberg, & Hagekull, 2005; Kirkpatrick & Shaver, 1990). Thus, securely attached individuals are expected to become actively religious insofar as their parents were, in line with social correspondence, and in which case their perceived God relations are expected to have attributes of security through IWM correspondence.

The correspondence and compensation hypotheses may be seen, then, as delineating distinct developmental pathways to religion, as well as to different religious profiles (i.e., modes of being religious). One of these paths is suggested via experiences with sensitive, religious caregivers (correspondence), and one is via regulation of distress following experiences with insensitive caregivers (compensation; Granqvist, in press; Kirkpatrick, 2005). It is in this developmental pathway sense that the compensation and correspondence hypotheses are used henceforth.

Below, findings supporting each of these pathways in relation to naturally occurring instances of religious beliefs and behaviors are reviewed. This is followed by a brief section on laboratory studies, in which attachment manipulations have been performed and their effects, as well as the moderating effects of security–insecurity, on religious outcomes have been studied. Finally, findings are reviewed on attachment security–insecurity in relation to a less orthodox domain of spirituality and associated paranormal experiences, namely the New Age movement. It should be cautioned that none of the studies to be reported followed study participants from infancy onward, although more short-term longitudinal studies are included.³

The Compensation Pathway

Many of the findings reported in the normative attachment-and-religion section have in fact now been found true specifically for individuals who have experienced parental insensitivity while growing up, whether using self-reports (e.g., Granqvist, 1998, 2002, 2005; Granqvist & Hagekull, 1999, 2003; Kirkpatrick & Shaver, 1990) or more indirect AAI-based assessments (Granqvist, Ivarsson et al., 2005) as attachment history criteria. For example, sudden religious conversions, the peaks of religious drama, are associated with parental insensitivity. This was originally reported in the pioneering study of Kirkpatrick and Shaver (1990) and has since been shown to hold in a meta-analysis of all studies conducted, including almost 1,500 participants (Granqvist & Kirkpatrick, 2004). Moreover, several studies have shown that other significant increases of religiousness reported by individuals whose parents have been judged low in sensitivity are typically relatively intense and precipitated by significant emotional turmoil, which is most typically relationship-derived (Granqvist & Hagekull, 1999;

Granqvist, Ivarsson et al., 2005). While the cited studies tapped religious changes retrospectively, Granqvist and Hagekull (2003) showed that the conclusion was warranted also prospectively. More specifically, reports of parental insensitivity predicted prospectively increased religiousness, particularly increased importance of the perceived God relation, following romantic relationship break-up.

Similarly, insecure romantic attachment has been found predictive of essentially the same kinds of religious changes. For example, Kirkpatrick (1997) found over a two-year period that women with insecure, particularly ambivalent, attachments prospectively established a new relationship with God (including religious experiences, such as being “born again” and speaking in tongues) to a larger extent than securely attached women. Findings of prospective increases in religiousness were replicated in a second study by Kirkpatrick (1998b) that spanned a shorter time period (e.g., four months) and included men and women. Again, such increases were tied to ambivalent romantic attachment. In both of these studies, the magnitude of the effects was modest. However, when the contextual condition of romantic relationship break-up was considered in yet another independent sample, insecure romantic attachment more strongly predicted prospective increases in religiousness (Granqvist & Hagekull, 2003).

Although these findings might seem to suggest that individuals with insecure attachment characteristics would become more and more religious over time, recall that this is expected primarily in the context of a need to regulate distress. Accordingly, religiousness may also decrease for such individuals (Granqvist, 2002). As expected, this happens following contextual conditions where the need to regulate distress is comparatively low, such as after establishing a new intimate relationship (Granqvist & Hagekull, 2003).

In summary, the developmental pathway to religion in the case of insecure attachment is one marked by attachment system (hyper-)activation, where the perceived God relation serves a distress regulatory function for the believer, whose other attachment figures are insufficient or unavailable. This conclusion is supported regardless of whether attachment insecurity refers to current romantic attachment or estimates of past experiences with parents. Also, the conclusion corresponds well with the more general speculations on the use of attachment surrogates offered by Bowlby (1982) and Ainsworth (1985). The opportunistic, surrogate use of religion is further strengthened in findings showing the God relation to wane when the need to regulate distress is low.

However, whereas AAI judges' estimates of parental insensitivity as the interviewees grew up did predict the interviewees' history of using religion to regulate distress, classifications of the interviewees' *current* attachment organization were generally unrelated to such compensatory aspects of religiosity in the only AAI study conducted (Granqvist, Ivarsson, et al., 2005).

An intriguing suggestion offered by these findings is that some individuals who have suffered attachment-related adversities in the past may in fact have “earned” a certain degree of attachment security from their surrogate God relation. While speculative at this point due to ambiguities of process direction, if confirmed in future studies, this would indicate that the God-relation is potentially reparative and that compensation may be psychologically functional, not just reactive.

The Correspondence Pathway

Believers' God relations are far from fully represented by the characteristics described in the above section. On the contrary, most religious individuals would shun away from these descriptions as unrepresentative of themselves and most members of their religious community. While Freudians might suspect a defensive maneuver here, empirical data supports it. In line with the correspondence hypothesis, participants reporting experiences of being sensitively cared for by parents have been shown to score higher in religiousness, but only insofar as their parents also displayed high levels of religiosity (Granqvist, 1998, 2002; Granqvist & Hagekull, 1999; Kirkpatrick & Shaver, 1990). In addition, they have been shown to score higher on a scale created to assess religiosity as socially based in the parental relationship (Granqvist, 2002; Granqvist & Hagekull, 1999). Moreover, both sets of findings have been supported in the AAI study when independent estimates of parental sensitivity were used (Granqvist, Ivarsson, et al., 2005).

Evidence for IWM correspondence has also accrued in relation to attachment history. Most notably, the AAI study showed independent estimates of parental sensitivity to be associated with participant reports of a loving, as opposed to a distant, God image (Granqvist, Ivarsson, et al., 2005). In addition, although religious changes are less frequent for individuals who have experienced sensitive caregiving, they sometimes do occur. When they do, the life-context and the constituents of the change are very different from those reported above. For example, prospective increases in religiousness occurred for participants reporting sensitive parenting following the establishment of a new intimate relationship (Granqvist & Hagekull, 2003).

Similarly, in the case of romantic attachment, positive relations have been obtained between secure romantic attachment and scores on the scale used to assess religiosity as socially based in the parental relationship (Granqvist, 2002). Regarding IWM-aspects of correspondence, such aspects have typically been supported in contemporaneous relations between religiosity and romantic attachment security. For example, Kirkpatrick and Shaver (1992) found that people with a secure romantic attachment displayed a higher degree of a personal belief in and relationship with God, as well as perceptions of God as loving. These findings have since been conceptually replicated in a number of

studies (Byrd & Boe, 2000; Granqvist & Hagekull, 2000, 2003; Kirkpatrick, 1998b; TenElshof & Furrow, 2000). For example, Byrd and Boe found that participants reporting secure romantic attachments engaged more in prayers that served to maintain closeness to God. However, even in prospective analyses, IWM-correspondence between romantic attachment security and religious change is supported in expected contexts, for example, following the formation of a close romantic relationship in between religiosity assessments (Granqvist & Hagekull, 2003).

In sum, substantial empirical support has been obtained for the idea that the developmental pathway to religion for individuals with secure attachments begins with sensitive, religious caregivers and leads to the development of a perceived God-relation with security-related attributes, such as a loving God image.

God in the Lab

Recently, two sets of attachment and religion studies, using direct attempts to activate attachment, have been performed (Birgegard & Granqvist, 2004; Granqvist, Ljungdahl, et al., 2005). In both, the effects of attachment activation were compared with attachment nonactivation on religious outcomes, and the potentially moderating effects of attachment security were studied. The normative attachment activation effects of these studies were described above. In both sets, however, security moderated the normative effects.

The first set of experiments employed subliminal priming methodology with separation cues to activate adult theistic believers' attachment systems (see Shaver & Mikulincer [2002] for a review of attachment studies using priming methodology). Although, as we have seen, individuals who have experienced insensitive care are the ones who typically regulate distress through their perceived God relation (i.e., a compensation effect), across the three experiments conducted within the first set of studies, an increase in the use of God to regulate distress was observed following the separation primes among adult believers who had reported sensitive experiences with parents, thus supporting IWM correspondence instead. As indirect assessments of religiosity (i.e., regression residuals from pre- to post priming) were used in the context of subliminal priming, participants were unconscious of attachment activation, which may have undermined the possibility of a "higher-order" compensatory use of religion in individuals who had experienced parental insensitivity, thus resulting in their withdrawal from God or, put differently, their defensive shift of attention away from attachment. Conversely, individuals with more sensitive experiences drew on God in this situation, presumably via automatic activation of IWMs, or turned their attention to attachment. They typically rely on other means to regulate distress in the context of conscious attachment activation.

Similarly, in the Swedish study of 5- to 7-year-old children's placements of a God symbol in relation to a fictional child who was in situations of attachment activation versus nonactivation, secure children placed God closer to the fictional child when the fictional child was in attachment-activating conditions, whereas the pattern was actually reversed when the fictional child was in attachment-neutral situations (i.e., insecure children placed God closer). Another way of describing this interaction pattern is that secure children's attention was on proximity to God specifically during attachment activation, whereas insecure children did not make a distinction between the two kinds of situations in their God figure placements. Importantly, this study used the adapted SAT (Kaplan, 1987), an indirect (semi-projective) method, to classify security, and the God placement procedure was similarly semi-projective (i.e., the fictional child, not the participating child, was in different situations with regard to attachment activation). As in the adult subliminal experiments, this may have undermined the higher-order compensatory use of religion in insecure children and instead yielded automatic activation of IWMs and thus support of the correspondence hypothesis.

Based on the foregoing review, we may predict that when attachment activation is consciously connected to its source, and its effects cause considerable subjective distress, individuals with insecure attachment will regulate distress by drawing on God (cf. "contrast" effects in priming studies; Wheeler & Petty, 2001). However, when attachment activation is not consciously connected to its source, and God is the only attachment-like figure available in the situation, automatic activation of IWMs will lead individuals with secure attachments to experience God as psychologically accessible (cf. "assimilation" effects in priming studies; Wheeler & Petty, 2001).

Compensation and Unorthodox Spirituality within the New Age

A large body of the attachment and religion research has been conducted in Sweden, a country marked by the continuous decline of traditional Western religion (Stark, Hamberg, & Miller, 2005). At the same time, a notable increase in more private, unorthodox, and less institutionalized forms of religion-like spirituality, most notably in the New Age movement, have co-occurred (for similar developments in another part of Western Europe, see Houtman & Mascini, 2002). Therefore, it was asked whether the New Age "religions" would attract some of the individuals who left more traditional forms of religion (Granqvist & Hagekull, 2001; Granqvist, Ivarsson, et al., 2005; see also Farias & Granqvist, in press, for a review of the psychology of the New Age).

Whereas traditional Western religion has an attachment-like figure (i.e., a theistic God) at the center from which all else is supposedly derived, the New Age movement typically does not. Instead, the New Age has been thought to represent the “celebration of the self” (Heelas, 1996), where the individual takes pride in many of the attributes traditionally ascribed to the deity. As we shall see, however, it may be more adequate to characterize the New Age as a failed attempt of reparation of the self. In either case, predictions from attachment theory were clear enough.

First, the within-generational increase in New Age endorsement could not be accounted for as socially based in the early parental relationship with religious parents, nor could it be characterized in terms of IWM correspondence, as “New Agers” typically do not perceive of a personal relationship with a loving God (see also Kirkpatrick, 2005). Hence, parental sensitivity and security of attachment could be ruled out as predictors of New Age endorsement.

Secondly, insecure attachment had been found to have correlates very similar to those implied in New Age endorsement in previous studies. More specifically, disorganized and ambivalent attachment were thought to be the prime candidates for later involvement in the New Age. For example, and as noted in the introduction, disorganized attachment predicts dissociative mental states, many of which are not only present but even sanctioned within the New Age (e.g., out-of-body experiences, trance states, hypnotic suggestion). Likewise, just as disorganized attachment is linked to experiences of abuse, so are many of the paranormal experiences associated with the New Age (e.g., Irwin, 1993). Also, disorganized (unresolved) attachment within the AAI system has as one of its central features difficulties of maintaining coherent and rational discourse surrounding loss through death. Moreover, Main and colleagues had found that disorganized AAI discourse correlates with many of the central features of the New Age (e.g., belief in astrology, contact with the dead; Main & Morgan, 1996).

Similarly, ambivalent attachment had been associated with difficulties in understanding the privacy of thought—a cardinal feature of the belief in telepathy—as well as with the attribution of psychic powers to some humans, most notably the self and the attachment figure. Needless to say, both sets of beliefs are well-represented within the New Age. Finally, ambivalent (preoccupied) attachment within the AAI is often expressed as preoccupying anger, wherein angry ranting against the attachment figure may occur in the presence of “authoritative” psychological statements, marked by overused phrases and psychological jargon (“psychobabble”). This naturally brings some of the popular psychology literature of the New Age movement to mind (e.g., on “toxic,” “dysfunctional” families and encounter groups). As a first step to test these predictions, a continuous questionnaire scale was created to measure a New Age lifestyle orientation, labeled the New Age Orientation Scale

(NAOS; Granqvist & Hagekull, 2001). This scale has now been tested in diverse populations, drawn both from New Age settings (e.g., “alternative” book stores and cafés) and the general population. Although serious attempts were made to tap the theoretical heterogeneity of New Age–related beliefs and activities, all studies conducted to date indicate that scale scores form one homogenous factor that is highly internally consistent (average inter-item $r = \text{ca. } .45$; $\alpha = \text{ca. } .95$; Farias, Claridge, & Lalljee, 2005; Granqvist & Hagekull, 2001; Granqvist, Fredrikson et al., 2005; Granqvist, Ivarsson et al., 2005).

In other words, although New Agers often take pride in formulating their own philosophies of life, that pride rests on a fallacious assumption, as other New Agers form “their own” philosophies of life in essentially the same manner.

Next, New Age endorsement was studied in relation to parental sensitivity and security of attachment. All findings obtained to date supports the compensation hypothesis. First, regarding parental sensitivity, participants drawn from New Age settings reported lower parental sensitivity than those drawn from the general population (Granqvist & Hagekull, 2001). Also, NAOS scores have been found to be positively related both to self-reports of parental insensitivity (Granqvist & Hagekull, 2001) and AAI judges’ independent estimates of parental insensitivity (Granqvist, Ivarsson, et al., 2005). Second, regarding romantic attachment, positive correlations have been found between romantic attachment disorganization (i.e., fearful avoidance) and NAOS scores (Granqvist & Hagekull, 2001), as well as between ambivalence and the inclination to be interested in spirituality and esoteric books (Saroglou, Kempeneers, & Seynhaeve, 2003). Finally, concerning attachment organization within the AAI, higher NAOS scores have been associated, as expected, with independent judges’ assignments of ambivalent (preoccupied) as well as disorganized attachment states (both trauma specific unresolved states and more globally disorganized “cannot classify” states; Granqvist, Ivarsson, et al., 2005).

These latter findings are particularly noteworthy when considering that AAI classifications are often unrelated to self-reports of external phenomena, although strongly related to behavioral observations and more indirect assessments of theoretically relevant constructs (see Hesse, 1999). In addition, the findings from the AAI study (Granqvist, Ivarsson, et al., 2005) show that whereas some individuals who have experienced parental insensitivity while growing up, and who have used God as a surrogate to regulate distress, *may* have earned a certain degree of attachment security from doing so, the same cannot be said for individuals drawn to the New Age. In contrast, the most serious forms of *current* attachment insecurity lingers within these individuals. A speculative theoretical interpretation of these discrepancies between traditional religion and the New Age in relation to insecurity within the AAI system is that traditional religion may promote earned security through offering perceptions of a reparative attachment surrogate, conceived of as the

perfect attachment figure, whereas such a figure is absent within the New Age. Of course, it is also possible that only the most seriously insecure individuals, who have suffered more serious forms of parental insensitivity (potentially including abuse), are drawn to the New Age, whereas the insecure attachment history of some individuals who come to use God as a surrogate may have been somewhat less serious. If that is the case, it is also readily understandable why the former individuals shun any attachment-like figure (e.g., it may be perceived as frightening), whereas the latter are less inclined to do so and instead make use of it. In any event, we are cautioned not to generalize without further study across spiritual domains if we want to understand the psychology of individuals drawn to the supernatural.

We have thus seen that the attachment system is operating within believers' perceived God relations, although very differently depending on individual differences in attachment security. Before closing this section on attachment and religion, a few additional issues have to be addressed. First, in much of what was said above, a distinction was not made between different patterns of insecurity in relation to religious outcomes, partly due to inconsistencies in results. However, a tentative conclusion that can be derived is that "charismatic" experiences (e.g., glossolalia), as well as an emphasis on alternative spirituality, as in the New Age, are associated with ambivalent attachment, marked by maximization of attachment and a general deficit in the regulation of distress. Spiritual experiences characterized by dissociative alterations in consciousness can be hypothesized to be linked to disorganization. Of course, such experiences are often present in the New Age but may also occur within nonorthodox expressions of traditional religion, for example, in spontaneously occurring mystical and trance states (though not necessarily their volitional production in meditation and prayer following a long period of exercise). The religious picture of avoidant attachment has been less clearly decipherable. For example, romantic attachment avoidance has been linked to contemporaneous atheism and agnosticism (Kirkpatrick & Shaver, 1992) on the one hand and to prospectively increased religiousness following romantic relationship dissolution (Granqvist & Hagekull, 2003) on the other. A topic currently under investigation is whether avoidant attachment is linked to a socially facile expression of religion (e.g., God is loving), which is, fundamentally, internally inconsistent (e.g., God sends sinners to hell; cf. idealization within the AAI). To fully tap such inconsistencies, a semi-structured interview focusing on the *form* of religious discourse is being used (Granqvist & Main, 2003).

Secondly, most of the research reviewed has concerned religion and spirituality within the Western world (for an exception, see Gewirtz, 2004, using a Jewish sample in Israel). Clearly, cross-cultural research is badly needed

here, especially in other (theistic) traditions that express the belief in a metaphysical attachment-like figure. Third, as high scores on any religious variable has low religiousness as their opposite, it should be understood that this chapter has also dealt with the negation of religion, although that requires from the reader a mental reversal of the findings presented.

Finally, although the attachment system is active within the individual's God relation, this does not mean that attachment theory may be considered a comprehensive psychology of religion. On the contrary, if there is a multi-dimensional phenomenon, religion is likely one of the first that comes to mind. As argued elsewhere, attachment theory is primarily relevant for understanding the relational dimensions of religion (Granqvist, 2006; Kirkpatrick, 2005), and although important, religion is larger than that. Relatedly, the attachment system is not the sole evolutionary adaptation on which religion rides piggy-back. There are clearly other mechanisms—associated with other systems—involved, such as kin-selection, reciprocal altruism, alliance tactics, naïve physics, naïve biology, and folk psychology (see Atran & Norenzayan, 2004; Kirkpatrick, 2005). More generally, it is obvious that besides mechanisms such as the attachment system, a complex operator (i.e., the human brain) is required to produce religious outcomes.⁴ For example, the human brain's capacity to comprehend abstractions is likely a prerequisite for what we normally think of as religious beliefs and interpretations, and it also explains why other animals are likely incapable of these same things. Combined with the more visibly domain-specific adaptations, however, it is easy to see how this general capacity to use abstractions may have produced a set of outcomes (i.e., religion) that represent, functionally speaking, output that the operator was not designed to produce.

IMPLICATIONS, CONCERNS, AND RECOMMENDATIONS FOR BRAIN AND RELIGION RESEARCH: WILL NEUROTHEOLOGY PLEASE RISE?

In terms of implications, it is clear from the above sections that tools that activate the attachment system may be useful in facilitating the occurrence of religious experience. As it runs the risk of being unethical to activate the system at higher levels, researchers are advised to attempt activation with caution (e.g., separation primes, mild fear inductions). In any event, this represents one of the potential uses of attachment theory that may help researchers studying religious experience in the lab, including its neurophysiological, biological, and chemical correlates.

As is also implied above, however, simply activating the brain's attachment function is likely to prove an inefficient means of producing religious experience. The reason is that religious experiences are multifactorial; that is, they

often do involve the operation of the attachment system, but their occurrences depend on other factors as well. Results from research in the psychology of religion, spanning over several decades, have—again and again—attested to the validity of this conclusion (see Spilka et al., 2003). For example, although psychedelic drugs have tremendous effects on the likelihood that people enter altered states of consciousness, as mediated by the effects of the drugs on the release of neurotransmitters in the brain, religious and mystical experiences (with religious interpretations) do not typically result unless the *setting* is religious (e.g., a divine service; Spilka et al., 2003). The same applies to the well-known effects of sensory deprivation on religious experience. Although a very well-established conclusion in the psychology of religion, in their fascination over brain activity—and what particular brain regions that light up in the religious experience versus baseline conditions—“neurotheologists”⁵ have often overlooked the multifactorial nature of religious experience.

This last remark serves to shift the focus of this chapter to a scrutiny of neurotheology as a developing field of brain and religion research. As it turns out, neurotheologists have often times also failed to distinguish between very different kinds of religious and paranormal experiences. Moreover, some of the key neurotheology findings have failed to replicate under double-blind conditions. Finally, the ontological and evolutionary conclusions occasionally drawn by neurotheologists on the basis of the few findings produced are baffling to the analytically minded, often reflecting very simple errors of logic. Each of these issues will be discussed in their own right, while the “theology” part of the “neuro-theology” equation is largely left for others to evaluate. The chapter will end with a few recommendations for the future development of brain and religion research.

The Multifactorial Nature of Religious Experience

The neurotheological literature has neglected consideration of sensory input conditions that makes the brain produce religious outcomes. This is akin to cognitively modeling spider phobia without including visual sensation of the spider as input to the brain in the cognitive model. Although, for example, the visual sensation of God certainly cannot be regarded as objective input to the brain in a scientific model, the visual sensation of a Crucifix or the auditory sensation of a Baroque organ could, and indeed do increase the brain’s production of religious experience. These remarks are not directed at neurotheologists studying neural *correlates* of religious experience but are of utmost relevance to those who claim to trigger the experience in the lab through manipulating just one variable.

For example, Michael Persinger (2002) has claimed in a large number of reports to produce religious experience through the application of a par-

ticular magnetic-field device to peoples' temporal lobes. Persinger claims that approximately 80 percent⁶ of all individuals from the normal population can be made to experience what he calls a "sensed presence" of a sentient being, believed by Persinger to represent the core of religious experience (i.e., the experience of God). This would be accomplished by electrical discharge in the limbic structures, essentially resulting in a micro epileptic-like seizure. As is well-known, temporal lobe epilepsy has long been thought to play a significant role in religious experience (see Saver & Rabin, 1997 and the chapter by Schachfer, this volume). Persinger has not advocated as strongly, though, that sensory deprivation is a necessary condition for the experience. Nor has he adequately addressed the moderating influence of personality factors (but see Persinger & Koren, 2005). What these examples illustrate is that Persinger's findings may not reflect (simply) the causal operation of the magnetic fields in discharging limbic structure activity but presumably (also) the causal effect of sensory deprivation and a moderating influence of personality. Yet, the influence of these latter parameters has been notably overlooked in his interpretations of the results.

There Are Different Kinds of Religious and Paranormal Experiences

Concerning the failure to distinguish between different kinds of religious/paranormal experiences, Persinger's research is a case in point. It departs from an empirically unsubstantiated assumption that the sensed presence experience represents the core of religious experience. Anecdotal reports from a few selected participants have been cited as support for this assumption (Persinger, 1997), yet other participants viewed the experience in purely secular terms, without that being used as a qualifier in the assumption or in the interpretation of results. In addition, the most frequently used dependent variable in Persinger's studies over the years (the "Exit scale"; Persinger, Tiller, & Koren, 2000) was constructed inductively and specifically for the task at hand but with unknown reliability and construct validity. Besides the one sensed presence item included in the scale, many of the experiences listed are somewhat vague ("tingling sensations," "felt odd," "the same idea kept occurring"), and their relations to the paranormal, mystical, and religious experiences, to which the findings are generalized, remain disputable.

Moreover, as we saw in the above sections on attachment, the psychological correlates of traditional religion and more unorthodox spirituality, such as in the New Age, are very different. This might well have implications also for the correlates of different religious/spiritual experiences. In other words,

experiencing a subjective sense of closeness to God, for example, is likely to be something very different than out-of-body experiences, haunt-experiences, perceived UFO-abductions, and so forth, although Persinger (1997, 2002) does not view these experiences as conceptually different from one other in any important way. All of them are simply held to result from limbic discharge gone awry.

Although faring much better in comparison, correlational SPECT and PET studies have focused on limited aspects of religious experience, for example, repetitive recital of religious texts (Azari et al., 2001) and meditation (e.g., Newberg & Iversen, 2003). While these were good and practically feasible starting points, they do not represent all forms of religious experience, and likely not full-blown mystical experiences. (Empirically, we have no way of knowing whether participants did reach, for example, mystical states, as the measurements of religious experience/meditational peak were “home-built,” constructed specifically for the individual studies.) Consequently, these investigations indicated the involvement of higher cortical regions, suggesting that focused attention, concentration, and other higher-order cognitive functions would be implicated rather than the basal affective components associated with limbic firing, as suggested by Persinger and others (e.g., Ramachandran & Blakeslee, 1999). While difficult to study in the lab, full-blown mystical experiences, such as those often involved in sudden religious conversion, may well involve massive limbic discharge.

Neurotheology Findings that Fail to Replicate

It is generally a problem in science that theories are under-determined by data (Quine, 1992) but almost in no other area does that seem truer than in neurotheology research. Although the “theory” part of the “theory-data” equation also requires a lot of tidying up in this discipline (see below), it is notable that what may have seemed the most well-replicated empirical findings—those of Persinger and the magnetic field device, replicated by Persinger himself in a long list of studies (see 1997)—in fact cannot be replicated under double-blind conditions by other researchers (Granqvist, Fredrikson, et al., 2005). These researchers sought to replicate the findings prior to performing a costly follow-up brain-imaging study that was planned to investigate the neural correlates of lab-triggered sensed presence and mystical experience. The failed replication had a number of design improvements compared to the original experiments, while still sticking in detail to the inductively based lessons allegedly learned by Persinger over the years. In fact, the magnetic field device and the computer software utilized was sent to the researchers by Persinger, and the experimental set-up, including

sensory deprivation, as well as the administration of the fields (time of exposure, particular wave pattern, strength, calibration, etc.) followed Persinger's instructions in detail. Moreover, effective magnetic field deliverance was verified pre- and post-experiment. (See Larsson, Larhammar, Fredrikson, & Granqvist, 2005, for their response to Persinger & Koren's, 2005, attempted rebuttal of the failed replication.)

However, from reading Persinger's studies (e.g., 1997), it was clear that they were not properly double-blinded (i.e., neither participants, nor experimenters should be aware of experimental group assignment). Hence, one important design improvement was to make the set-up double-blind, which was accomplished by having two experimenters, one who made experimental group assignments (and never interacted with the participants), and one who was unaware of group assignment (the one who interacted with the participants). While this may seem a somewhat finicky design requirement, it was considered important due to the described vagueness of some of the experiences used in the dependent variable (i.e., the EXIT scale) in Persinger's (1997) studies as well as the study under description. Considering humans' general suggestibility to induction (i.e., placebo effects), selective experimenter interaction across conditions could otherwise easily lead participants in the experimental condition to have some of the vague experiences, whereas those in the control condition (no magnetic field activated) would be less inclined to have them. If that were the case, a main-effect of experimental condition would result, just as Persinger's studies had demonstrated, although in his case allegedly as an effect of the magnetic fields. In addition, certain easily suggestible individuals in the experimental condition would be particularly inclined to report the experiences, in which case a moderating influence of personality would be obtained (i.e., a statistical interaction effect with experimental condition). As we have seen, a moderating influence of "temporal lobe signs" has also repeatedly been observed by Persinger (1997, see also Cook & Persinger, 2001).

It may not be so surprising to find, then, that the items used to tap temporal lobe signs (Makarec & Persinger, 1990) are in fact almost identical to the items of standard suggestibility questionnaires, such as Tellegen's absorption scale (Tellegen & Atkinson, 1974), validated against suggestibility to hypnotic induction. Indeed, these two scales are so similar that they are tapping the same construct, with a correlation of .72, almost identical to the internal consistency reliability ($\alpha = .73$) of the Temporal Lobe Signs questionnaire (Granqvist, Fredrikson, et al., 2005; r not reported). To conclude, an alternative suggestibility interpretation to the interpretation of magnetic field effects could certainly not be ruled out *a priori* and therefore needed to be addressed more thoroughly.

Another methodological improvement of the study under description is that it did not presume generalizability of the sensed presence experience

to religious experiences in general but used an adapted (i.e., to state-format) version of the most well-validated mystical experience scale (Hood, 1975) to empirically address that issue. Also, to make possible an investigation of whether religiousness moderated the experimental effects, both religious and nonreligious participants were included. Finally, although Cook and Persinger (2001) had indicated that the effect was so strong that only 16 participants were required to obtain significant results, to be on the safe side in terms of statistical power, the study under description included as many as 89 participants.

As noted, the study results failed to replicate those of Persinger (Granqvist, Fredrikson, et al., 2005). Instead, a pattern of findings was obtained that strongly favored the alternative suggestibility interpretation. First, neither main effects nor any interaction effects with experimental condition were obtained on any outcome variable, whether the EXIT scale and the mysticism scale in their entirety or the critical sensed presence item were used. Second, the suggestibility variables (i.e., the absorption and temporal lobe signs) displayed positive main effects on the outcomes. Third, religiousness was not associated with higher scores on any of the outcome variables. In follow-up analyses, however, religiousness specifically predicted mystical experiences *with religious interpretations* but not mystical experiences in the absence of such interpretations (Granqvist & Larsson, in press). This, again, contrasts with the less orthodox spirituality of the New Age. Like the suggestibility variables, scores on the New Age scale (Granqvist & Hagekull, 2001) were namely associated both with higher EXIT and overall mystical scale scores (see Farias & Granqvist [in press] for other indications of elevated suggestibility specifically in New Agers and not in traditionally religious individuals).

However disappointing it was that application of the magnetic fields failed to yield the predicted experiences, it was notable in this study that such experiences occurred seemingly spontaneously in a minority of study participants. On closer examination, however, this is not surprising. First, as in Persinger's (e.g., 1997) studies, when participants filled out the pre-experimental questionnaires (e.g., the Temporal Lobe Signs Inventory), they were asked about all kinds of anomalous experiences, spirituality, and religiousness, which may have acted as a prime for unusual experiences. Secondly, the magnetic field device was attached to participants' temporal lobes, potentially enhancing suggestibility further. Thirdly, they were then placed in a sensory deprivation context, which is, as noted, a well-known facilitator of religious and other anomalous experiences. For the highly suggestible, it is easy to see how these conditions may result in at least low levels of anomalous experiences. And for the less easily suggestible, it may at least activate relevant cognitive schemas; hence, religious individuals were more inclined to *interpret* any low-level mystical experience that did occur in religious terms.

Although these findings and interpretations might seem less relevant to other neurotheologists who may not have believed in Persinger's findings to begin with, they do imply that priming, cognitive schemas, sensory conditions, and personality dispositions are relevant for the production, and hence understanding, of religious and related experiences. Many of these constructs cannot be equated with, or studied as, neural states, nor do they seem likely to be possible to translate to neural states in the near future. Hence, the prospect for neuroscience to become a *comprehensive* paradigm for the study of religious experience does not seem promising (relatedly, see Paloutzian, Fikes, & Hutsebaut, 1992), although it will hopefully make important contributions for an understanding of the *neural* mechanisms and correlates associated with these experiences.

Evolutionary and Ontological Considerations in Neurotheology

From the few findings produced in the field, the wildest ontological and evolutionary conclusions have been drawn, and popular media has of course gone along for the ride. In fact, whereas only a handful to a dozen empirical studies have been published on brain and religion associations, hundreds of theoretical papers and books have been produced. Notably, the theoretical papers have most often been published in an "interdisciplinary" journal aiming for integration of science and religion (*Zygon*; impact rate 2004: 0.15). Although the question of the ontology of God is, in principle, independent of the question of the evolutionary function of religion, there are strong reasons to suspect that, in practice, they have not always been viewed this way by writers in neurotheology. In fact, the questions of God-ontology and evolutionary function often coincide with the neurotheologist's position on whether or not the brain is "hard-wired" for religion (the brain has a "God spot," "God module," etc.).

Regarding evolutionary considerations, a diverse set of opinions have been proposed by neurotheologists, but the most frequent are religion-as-an adaptation, or a special case of adaptation (exaptation), and evolution as driven by "intelligent design." While it is not within the scope of this chapter to address which of these alternatives is likely to be true (see Kirkpatrick, this volume, for a discussion), expressed opinions of neurotheologists are relevant for a diagnosis of their failure to distinguish between evolutionary considerations/religious modularity of the brain and God-ontology, and where in this picture neuroscience findings become relevant.

First, Persinger (e.g., 2002) might seem to have adopted a religion-as-by-product position in his argument that the God experience is an epiphenomenon of limbic discharge gone awry. In reference to the first believer studied who had the God experience under the influence of magnetic fields,

Persinger states (2002): “I never had the heart to tell that person about the electrical recordings. In fact, the realization that the God Experience could be an *artefact* of the human brain was intellectually paralyzing. But since then, like hundreds of other brain scientists who have been determined to separate semantics from science, I have observed the *symptoms* again and again” (p. 276, italics added). However, his position is adaptationist: “A biological capacity for the God experience was critical for the survival of the species” (2002, p. 274). While Persinger may then be complemented for his ability to distinguish between biological functionality and the ontology of God, his use of the words “artefact” and “symptoms” makes it fairly clear that he reaches a conclusion of God’s nonexistence partly based on the alleged lab-triggering of religious experience. When drawn from neuroscience findings, and even if the God experience could have been replicably triggered in the lab by independent researchers, this ontological reduction is nothing more than a pure example of the genetic fallacy. First, the question of the God experience is not equivalent to the question of God’s actual presence; the first is an issue of experiences that people have, the second a question of ontology that may well be independent of peoples’ experiences. More importantly, however—and as believers are often quick to point out—perhaps the triggering of limbic discharge is a reinvention of the wheel God has been using all along to get to people (i.e., a “God mediator”). This latter conclusion would, of course, be equally erroneous when drawn from neuroscience findings.

Second, Newberg, d’Aquili, and Rause (2002), in their oft-cited bestseller *Why God won’t go away*, explicitly state that they do not adopt a position on religion as an adaptation (e.g., “the evolutionary process suggests that the mind’s ability to enter unitary states did not evolve specifically for the purpose of spiritual transcendence,” pp. 123–124), and they then go on to do exactly that, although a special case of that. They draw a direct parallel between the “neurological machinery of transcendence [which] may have arisen from the neural circuitry that evolved for mating and sexual experience” (p. 125, brackets added) to birds’ wings, the foundation of which evolved to regulate temperature (i.e., their “original” adaptive function), only to be co-opted for flying (i.e., an exaptation). Note here that an exaptation merely represents a new adaptive function; unless a bird would have wings that allowed it to fly, it would likely fail to survive or reproduce in the new environment where most other birds had wings. A few pages later, Newberg and colleagues express the adaptation conclusion they initially rejected ever more forcefully: “we believe that evolution has adopted this machinery, and has favored the religious capabilities of the religious brain because religious beliefs and behaviors turn out to be good for us in profound and pragmatic ways” (p. 129), and “the strong survival advantages of religious belief make it very likely that evolution would enhance the neurological wiring that makes transcendence possible” (p. 139). In other words, the neurological machinery of transcendence is seen as a

domain-general adaptation, albeit a special case of it (see Alper, 2002, for an even more explicit religion-as-adaptation example).

Not coincidentally, the ontological conclusion follows just a few lines later: “our research has left us no choice but to conclude that the mystics may be on to something, that the mind’s machinery may in fact be a window through which we can glimpse the ultimate realness of something that is truly divine” (pp. 140–141). Whether Newberg and colleagues’ research did not leave them any choice but to engage in ontological embracement, as stated, or was simply taken as an opportunity to play with rhetorics and promote their ontological beliefs, could be discussed, but in either case the conclusion is erroneous, reflecting the confusion of biological functionality/religious modularity of the brain with ultimate ontology. Were they atheists, they might have suspected their mystics of hallucinating on grounds of low inter-rater agreement between the mystics’ reports of what was going on and the likely reports of the examiners in the room, had the perceptions of the latter regarding the presence of the divine been subjected to simultaneous research. It would be interesting to know if Newberg and colleagues would have derived a similar conclusion from doing brain-imaging research on dedicated fantasizers while fantasizing (i.e., do their fantasies exist outside of their brains?). Again, whether some brain areas are activated or some neurotransmitters released during meditative experience is orthogonal to the question of the ontological existence of the external referent imagined in the meditative state. Moreover, as discussed by Kirkpatrick (this volume), activation of brain areas during religious experience is far from convincing evidence that the brain is hard-wired for religion; particular areas of children’s brains will be activated when they imagine Santa Clause in anticipation of Christmas, but their brains were not hard-wired for that same effect.

Finally, although neurotheology is set out to be interdisciplinary, to integrate science and religion, and so forth, it may be surprising to find that some of the scholars in the field have gone so far as to suggest intelligent design as the basis for evolution, while still working within an alleged scientific discipline (see Hamilton III, 2002; Joseph, 2002). Although this could easily be dismissed as not worthy of serious consideration among many scientists, it should probably be taken very seriously and dealt with primarily as an epistemological issue in the practice of science. While advocating intelligent design is, by definition, a declaration of faith, to reject the same idea from the practice of science is not necessarily an outcome of atheism, but may simply be an expression of concern for the integrity of scientific explanation. Unless we aim for a resurgence of medieval scholasticism, when immaterial metaphysics and teleological causation had their hey-days, while scientific progress was modest at best, the idea of intelligent design will continue to be foreign to the practice of all natural sciences, based as they are on materialist metaphysics and physical principles of causation. This should be the case whether or

not any individual engaged in science is personally religious (i.e., ultimately *believes* in intelligent design). If they so happen to be, they must practice to resist the temptation of evoking teleological explanations when dealing with scientific thought with the same dedication that they practice meditation and prayer to experience a sense of personal closeness with God.

Recommendations for the Future: Will “-Theology” Please be Left Out?

It seems as though one has no choice but to conclude from the above scrutiny that the field of neurotheology does not seem to have much scientific potential for the future. With that being said, brain and religion research may well prove to be one of the most exciting and fruitful areas in the future science of religion. In this concluding section, a few recommendations will be offered to make the field reach its full potential.

First, theology—narrowly defined as anything dealing with the ontology of God—should be clearly demarcated from the practice of brain and religion science. In other words, attempts at integrating science and religion should probably be abandoned in the first step, as it seems to be doing both disciplines more harm than good. This is not to reject either one as a legitimate intellectual enterprise, but to express a conviction that they, if any two paradigms, are truly incommensurable (Kuhn, 1962). Among other things, natural science is based on materialist metaphysics and physical causation, engaging in explanation, description, and taxonomies, while applying Occam’s razor. In contrast, religion (again, among other things) is based on immaterialist metaphysics and teleological causation, engaging in values and existential props, while applying Occam’s shaving foam. Bridging these incompatible principles requires bigger leaps than bridging, say, quantum mechanics as a natural science with normative political ideology, although it would hardly be surprising if someone had tried just that, or will try.

Secondly, brain and religion research should give attention to the multidimensional and multifactorial nature of religious experience. Concerning different kinds of religious experience, those that involve profound dissociative alterations in consciousness may, for example, have very different correlates, neural and otherwise, than those that do not (e.g., meditative states, peace and tranquility). Regarding multiple causes, future attempts at triggering religious experience in the lab to study their neural correlates may be considerably enhanced in efficiency if they:

- activate relevant motivational systems/neural functions (e.g., attachment);
- facilitate/counteract neurochemical release (e.g., dopamine-enhancers, serotonin-blockers);

- utilize sensory priming (e.g., a visually presented Crucifix, the auditory presentation of a Baroque organ, the olfactory presentation of incense); and
- use a facilitating setting (e.g., sensory deprivation).

Even under these conditions, however, it may be necessary to screen for participants high in suggestibility who possess cognitive schemas of relevance to a particular interpretation of the experience under study. Admittedly, this will be complex, but so are the determinants of religious experience. Also, even if, for example, full-blown mystical experiences will be difficult/impossible to trigger in the lab while maintaining ethical standards of scientific conduct, future imaging investigators should capitalize on the psychometric developments made in the psychology of religion and investigate whether variance in the experience studied correlates with variance in neural firing.

Finally, if the religion-as-by-product position adopted here is correct, links between neural activity and religious experience are likely to be indirect and mediated by the (sum-total) operation of the evolved psychological mechanisms thought to underlie religious experience, one of which is the attachment system.

NOTES

1. It is hoped that through this linguistic licensing, the reader will turn the other cheek to, or at least be indulgent with, the author's violation of relevance (Grice, 1989).

2. It is far from clear that the most realistic approach toward category membership placements is in terms of necessary and sufficient conditions, as implied in the above sections. A very different approach is suggested in Wittgenstein's (1953) notion of family resemblances. As applied to the "family" of attachment relationships, the infant-caregiver relationship constitutes the prototype of the category. For inclusion of a new "family member," it should bear some convincing resemblances to this prototype, just as we have seen that the believer-God relationship does.

3. All of the attachment data requiring coding that is reported in this chapter was, of course, coded blind with regard to participant religiousness and spirituality. For example, the two certified coders used to code the AAIs were blind to other individual data and to the other coder's codings. Nevertheless, each coder's results reproduced, in detail, the results of the other coder.

4. The complexity of the brain likely evolved gradually, due to the hominids' increased ability to provide effective solutions to *specific* survival- and reproductive-related tasks. Hence, although the brain now has the appearance of being a high-efficiency, domain-*general* operator, selection pressures likely still acted domain-specifically, which is expressed also at present in our superiority at solving fitness-related tasks (e.g., detecting others' cheating in social exchange) compared to other tasks (e.g., Cosmides & Tooby, 1992).

5. The term neurotheologist is used in reference to scholars who have adopted that label themselves or published in neurotheology-titled books without making reservations as to the appropriateness of mixing theology—narrowly conceived as ontological considerations regarding God—and neuroscience. To label Persinger a neurotheologist may seem a stretch at first, but as will be seen, he engages in ontological considerations, or reductions to be more specific, based on neuroscience findings. Hence, on closer examination, the label is appropriate, as atheism is a position on theology.

6. Persinger's meta-analysis (1997), however, indicated that not fully 50 percent of participants receiving magnetic field application had such experiences, and it is unclear whether these represented all participants exposed or a subgroup of particularly "temporal-lobe-labile" participants. In other words, it is beyond this author's knowledge from where the figure 80 percent derived.

REFERENCES

- Ainsworth, M. D. S. (1985). Attachments across the life-span. *Bulletin of the New York Academy of Medicine*, 61, 792–812.
- Ainsworth, M. D. S., Bell, S. M., & Stayton, D. J. (1974). Infant-mother attachment and social development: "Socialisation" as a product of reciprocal responsiveness to signals. In M.P.M. Richards (Ed.), *The integration of a child into a social world* (pp. 99–137). Cambridge: Cambridge University Press.
- Ainsworth, M. D. S., Blehar, M. C. Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Lawrence Erlbaum.
- Allen, J. P., & Land, D. (1999). Attachment in adolescence. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment theory and research* (pp. 319–335). New York: Guilford.
- Alper, M. (2002). The evolutionary origins of spiritual consciousness. In R. Joseph (Ed.), *Neurotheology* (pp. 267–284). San Jose: California University Press.
- Argyle, M., & Beit-Hallahmi, B. (1975). *The social psychology of religion*. London: Routledge and Kegan Paul.
- Atran, S., & Norenzayan, A. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences*, 27, 713–770.
- Azari, N. P., Nickel, J., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001). Neural correlates of religious experiences. *European Journal of Neuroscience*, 13, 1649–1652.
- Birgegard, A., & Granqvist, P. (2004). The correspondence between attachment to parents and God: Three experiments using subliminal separation cues. *Personality and Social Psychology Bulletin*, 30, 1122–1135.
- Bokhorst, C. L., Bakermans-Kranenburg, M.J.P., van Ijzendoorn, M. H., Fonagy, P., & Schuengel, C. (2003). The importance of shared environment in mother-infant attachment security: A behavioral genetic study. *Child Development*, 74, 1769–1782.
- Booth, C. L., Rubin, K. H., & Krasnor, L. R. (1998). Perceptions of emotional support from mother and friend in middle childhood: Links with social-emotional adaptation and preschool attachment security. *Child Development*, 69, 427–442.
- Bowlby, J. (1973). *Separation anxiety and anger*. Vol. 2 of 3 in Attachment and loss series. New York: Basic Books.

- Bowlby, J. (1980). *Loss*. Vol. 3 of 3 in Attachment and loss series. New York: Basic Books.
- Bowlby, J. (1982). *Attachment* (2nd ed.). Vol. 1 of 3 in Attachment and loss series. New York: Basic Books.
- Bowlby, J. (1988). *A secure base: Parent-child attachment and healthy human development*. New York: Basic Books.
- Brennan, K. A., Clark, C. A., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46–76). New York: Guilford.
- Brown, S. L., Nesse, R. M., House, J. S., & Utz, R. L. (2004). Religion and emotional compensation: Results from a prospective study of widowhood. *Personality and Social Psychology Bulletin*, 30, 1165–1174.
- Byrd, K. R., & Boe, A. D. (2000). The correspondence between attachment dimensions and prayer in college students. *The International Journal for the Psychology of Religion*, 11, 9–24.
- Carlson, E. A. (1998). A prospective longitudinal study of attachment disorganization/disorientation. *Child Development*, 69, 1107–1128.
- Cassidy, J. (1994). Emotion regulation. Influences of attachment relationships. In N. A. Fox (Ed.), *The development of emotion regulation: Biological and behavioral consideration* (pp. 228–249). New York: Cambridge University Press. *Monographs of the Society for Research in Child Development*, 59(2–3).
- Cook, C. M., & Persinger, M. A. (2001). Geophysical variables and behavior: XCII. Experimental elicitation of the experience of a sentient being by right hemispheric, weak magnetic fields: Interaction with temporal lobe sensitivity. *Perceptual and Motor Skills*, 92, 447–448.
- Cosmides, L., & Tooby, J. (1992). Cognitive adaptations for social exchange. In J. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind* (pp. 163–228). New York: Oxford University Press.
- De Wolff, M. S., & van Ijzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68, 571–591.
- Dickie, J. R., Charland, K., & Poll, E. (2005). *Attachment and children's concepts of God*. Unpublished manuscript, Department of Psychology, Hope College, MI.
- Elicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships from early parent-child interactions. In R. D. Parke & G. W. Ladd (Eds.) *Family-peer relationships: Modes of linkage* (pp. 77–106). Hillsdale, NJ: Lawrence Erlbaum.
- Erikson, E. H. (1963). *Childhood and society* (2nd ed.). New York: Norton.
- Eshleman, A. K., Dickie, J. R., Merasco, D. M., Shepard, A., & Johnson, M. (1999). Mother God, father God: Children's perceptions of God's distance. *The International Journal for the Psychology of Religion*, 9, 139–146.
- Farias, M., Claridge, G., & Lalljee, M. (2005). Personality and cognitive predictors of New Age practices and beliefs. *Personality and Individual Differences*, 39, 979–989.
- Farias, M., & Granqvist, P. (in press). The psychology of the new age. In D. Kemp (Ed.), *Handbook of the new age*. London: Brills.

- Fleming, A. S., Kraemer, G. W., Gonzalez, A., Lovic, V., Rees, S. & Melo, A. (2002). Mothering begets mothering: The transmission of behavior and its neurobiology across generations. *Pharmacology, Biochemistry and Behavior*, 73, 61–75.
- Fowler, J. W. (1981). *Stages of faith: The psychology of human development and the quest for meaning*. San Francisco: Harper & Row.
- Fraley, R. C. (2002). Attachment stability from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms. *Personality and Social Psychology Review*, 6, 123–151.
- Fraley, R. C., & Waller, N. G. (1998). Adult attachment patterns: A test of the typological model. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 77–114). New York: Guilford.
- Freud, S. (1940). *An outline of psychoanalysis*. New York: Norton.
- Friedlmeier, W., & Granqvist, P. (2006). Attachment transfer among German and Swedish adolescents: A prospective longitudinal study. *Personal Relationships*, 13(3).
- Gallup, G. H., Jr., & Jones, S. (1989). *One hundred questions and answers: Religion in America*. Princeton, NJ: Princeton Religion Research Center.
- George, L. K., Ellison, C. G., & Larson, D. B. (2002). Explaining the relationships between religious involvement and health. *Psychological Inquiry*, 13, 190–200.
- Gewirtz, V. (2004). *The relation to God from an attachment theory perspective: Internal models of God and their accessibility in states of distress*. Unpublished Ph.D. dissertation, Bar-Ilan University, Ramat Gan, Israel.
- Gorsuch, R. L. (1968). The conceptualization of God as seen in adjective ratings. *Journal for the Scientific Study of Religion*, 7, 56–64.
- Granqvist, P. (1998). Religiousness and perceived childhood attachment: On the question of compensation or correspondence. *Journal for the Scientific Study of Religion*, 37, 350–367.
- Granqvist, P. (2002). Attachment and religiosity in adolescence: Cross-sectional and longitudinal evaluations. *Personality and Social Psychology Bulletin*, 28, 260–270.
- Granqvist, P. (2003). Attachment theory and religious conversions: A review and a resolution of the classic and contemporary paradigm chasm. *Review of Religious Research*, 45, 172–187.
- Granqvist, P. (2005). Building a bridge between attachment and religious coping: Tests of moderators and mediators. *Mental Health, Religion, and Culture*, 8, 35–47.
- Granqvist, P. (2006). On the relation between secular and divine relationships: An emerging attachment perspective and a critique of the depth approaches. *The International Journal for the Psychology of Religion*, 16, 1–18.
- Granqvist, P. (in press). The study of attachment in the psychology of religion. In D. Wulff (Ed.), *Handbook for the psychology of religion*. New York: Oxford University Press.
- Granqvist, P., & Dickie, J. R. (2006). Attachment theory and spiritual development in childhood and adolescence. In P. L. Benson, E. C. Roehlkepartain, P. E. King, & L. Wagener (Eds.), *The handbook of spiritual development in childhood and adolescence* (pp. 197–210). Thousand Oaks, CA: Sage Publications.
- Granqvist, P., Fredrikson, M., Unge, P., Hagenfeldt, A., Valind, S., Larhammar, D., et al. (2005). Sensed presence and mystical experiences are predicted by suggestibility,

- not by the application of weak complex transcranial magnetic fields. *Neuroscience Letters*, 379, 1–6.
- Granqvist, P., & Hagekull, B. (1999). Religiousness and perceived childhood attachment: Profiling socialized correspondence and emotional compensation. *Journal for the Scientific Study of Religion*, 38, 254–273.
- Granqvist, P., & Hagekull, B. (2000). Religiosity, adult attachment, and why “singles” are more religious. *The International Journal for the Psychology of Religion*, 10, 111–123.
- Granqvist, P., & Hagekull, B. (2001). Seeking security in the new age: On attachment and emotional compensation. *Journal for the Scientific Study of Religion*, 40, 529–547.
- Granqvist, P., & Hagekull, B. (2003). Longitudinal predictions of religious change in adolescence: Contributions from the interaction of attachment and relationship status. *Journal of Social and Personal Relationships*, 20, 793–817.
- Granqvist, P., Ivarsson, T., Broberg, A.G., & Hagekull, B. (2006). Examining relations between attachment, religiosity, and New Age spirituality using the Adult Attachment Interview. *Developmental Psychology*.
- Granqvist, P., & Kirkpatrick, L.A. (2004). Religious conversion and perceived childhood attachment: A meta-analysis. *The International Journal for the Psychology of Religion*, 14, 223–250.
- Granqvist, P., & Larsson, M. (in press). Contribution of religiousness in the prediction and interpretation of mystical experiences—activation of religious schemas. *Journal of Psychology*.
- Granqvist, P., Ljungdahl, C., & Dickie, J.R. (2005). God is nowhere, God is now here: Attachment activation, security of attachment, and perceived closeness to God among 5–7 year-old children from religious and non-religious homes. *Attachment and Human Development*.
- Granqvist, P., & Main, M. (2003). *The Attachment to God Interview*. Unpublished manuscript, Department of Psychology, Uppsala University, Sweden.
- Grice, H. P. (1989). *Studies in the way of words*. Cambridge, MA: Harvard University Press.
- Hamilton, W. F., III. (2002). Theogenesis: The intelligent universe. In R. Joseph (Ed.), *Neurotheology* (pp. 267–284). San Jose: California University Press.
- Hazan, C., & Shaver, P. R. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, 52, 511–524.
- Hazan, C., & Zeifman, D. (1999). Pair bonds as attachments: Evaluating the evidence. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 336–355). New York: Guilford.
- Heelas, P. (1996). *The New Age movement: The celebration of the self and the sacralization of modernity*. Oxford, UK: Blackwell.
- Heller, D. (1986). *The children's God*. Chicago: University of Chicago Press.
- Hesse, E. (1999). The Adult Attachment Interview: Historical and current perspectives. In J. Cassidy & P.R. Shaver, *Handbook of attachment: Theory, research, and clinical applications* (pp. 395–433). New York: Guilford.
- Hesse, E., & Main, M. (2000). Disorganized infant, child, and adult attachment: Collapse in behavioral and attentional strategy. *Journal of the American Psychoanalytic Association*, 48, 1097–1127.

- Hesse, E., & van Ijzendoorn, M. H. (1999). Propensities towards absorption are related to lapses in the monitoring of reasoning or discourse during the Adult Attachment Interview: A preliminary investigation. *Attachment and Human Development, 1*, 67–91.
- Hinde, R. A. (1970). *Animal behavior: A synthesis of ethology and comparative psychology* (2nd ed.). New York: McGraw-Hill.
- Hinde, R. A. (1999). *Why gods persist: A scientific approach to religion*. London: Routledge.
- Hood, R. W., Jr. (1975). The construction and preliminary validation of a measure of reported mystical experience. *Journal for the Scientific Study of Religion, 21*, 29–41.
- Houtman, D., & Mascini, P. (2002). Why do churches become empty, while New Age grows? Secularization and religious change in the Netherlands. *Journal for the Scientific Study of Religion, 41*, 455–473.
- Irwin, H. J. (1993). Belief in the paranormal: A review of the empirical literature. *Journal of the American Society for Psychical Research, 87*, 1–39.
- James, W. (1902). *Varieties of religious experience*. New York: Longmans, Green.
- Joseph, R. (2002). The death of Darwinism. In R. Joseph (Ed.), *Neurotheology* (pp. 69–110). San Jose: California University Press.
- Kaplan, N. (1987). *Individual differences in 6-years-olds' thoughts about separation: Predicted from attachment to mother at age 1*. Unpublished doctoral dissertation, Department of Psychology, University of California, Berkeley.
- Kirkpatrick, L. A. (1992). An attachment-theory approach to the psychology of religion. *The International Journal for the Psychology of Religion, 2*, 3–28.
- Kirkpatrick, L. A. (1997). A longitudinal study of changes in religious belief and behavior as a function of individual differences in adult attachment style. *Journal for the Scientific Study of Religion, 36*, 207–217.
- Kirkpatrick, L. A. (1998a). Evolution, pair-bonding, and reproductive strategies: A reconceptualization of adult attachment. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 353–393). New York: Guilford.
- Kirkpatrick, L. A. (1998b). God as a substitute attachment figure: A longitudinal study of adult attachment style and religious change in college students. *Personality and Social Psychology Bulletin, 24*, 961–973.
- Kirkpatrick, L. A. (1999). Attachment and religious representations and behavior. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment theory and research* (pp. 803–822). New York: Guilford.
- Kirkpatrick, L. A. (2005). *Attachment, evolution, and the psychology of religion*. New York: Guilford.
- Kirkpatrick, L. A., & Shaver, P. R. (1990). Attachment theory and religion: Childhood attachments, religious beliefs and conversions. *Journal for the Scientific Study of Religion, 29*, 315–334.
- Kirkpatrick, L. A., & Shaver, P. R. (1992). An attachment-theoretical approach to romantic love and religious belief. *Personality and Social Psychology Bulletin, 18*, 266–275.
- Koenig, H. G., George, L. K., & Peterson, B. L. (1998). Religiosity and remission of depression in medically ill older patients. *American Journal of Psychiatry, 155*, 536–542.

- Kuhn, T. (1962). *The structure of scientific revolutions*. Chicago: University of Chicago Press.
- Lambert, W. W., Triandis, L. M., & Wolf, M. (1959). Some correlates of beliefs in the malevolence and benevolence of supernatural beings: A cross-societal study. *Journal of Abnormal and Social Psychology*, *58*, 162–169.
- Larsson, M., Larhammar, D., Fredrikson, M., & Granqvist, P. (2005). Reply to M. A. Persinger and S. A. Koren's response to Granqvist et al. "Sensed presence and mystical experiences are predicted by suggestibility, not by the application of transcranial weak magnetic fields." *Neuroscience Letters*, *380*, 348–350.
- Londerville, S., & Main, M. (1981). Security of attachment, compliance, and maternal training in the second year of life. *Developmental Psychology*, *17*, 289–299.
- Main, M. (1991). Metacognitive knowledge, metacognitive monitoring, and singular (coherent) vs. multiple (incoherent) models of attachment: Findings and directions for future research. In C. M. Parkes & J. Stevenson-Hinde (Eds.), *Attachment across the life cycle* (pp. 127–159). London: Tavistock/Routledge.
- Main, M., Goldwyn, R., & Hesse, E. (2003). *Adult attachment scoring and classification systems*. Unpublished manuscript, University of California, Berkeley, Department of Psychology.
- Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood and adulthood: A move to the level of representation. In I. Bretherton & E. Waters (Eds.), *Growing points of attachment theory and research* (pp. 66–104). Chicago: University of Chicago Press.
- Main, M., & Morgan, H. (1996). Disorganization and disorientation in infant Strange Situation behavior: Phenotypic resemblance to dissociative states. In L. Michelson & W. Ray (Eds.), *Handbook of dissociation: Theoretical, empirical, and clinical perspectives* (pp. 107–138). New York: Plenum.
- Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in preschool years: Theory, research, and intervention* (pp. 121–160). Chicago: University of Chicago.
- Makarec, K., & Persinger, M. A. (1990). Electroencephalographic validation of a temporal lobe signs inventory. *Journal of Research in Personality*, *24*, 323–337.
- Newberg, A., d'Aquili, E., & Rause, V. (2002). *Why God won't go away. Brain science and the biology of belief*. New York: Ballantine.
- Newberg, A. B., & Iversen, J. (2003). The neural basis of the complex mental task of meditation: Neurotransmitters and neurochemical considerations. *Medical Hypotheses*, *61*, 282–291.
- Paloutzian, R. F., Fikes, T. G., & Hutsebaut, D. (2002). A social cognition interpretation of neurotheological events. In R. Joseph (Ed.), *Neurotheology* (pp. 189–194). San Jose: California University Press.
- Pargament, K. (1997). *The psychology of religion and coping*. New York: Guilford Press.
- Pearson, J. L., Cohn, D. A., Cowan, P. A., & Cowan, C. P. (1994). Earned- and continuous security in adult attachment: Relation to depressive symptomatology and parenting style. *Development and Psychopathology*, *6*, 359–373.

- Persinger, M. A. (1997). Keynote Address, International Symposium, Magnetic Fields: Recent Advances in Diagnosis and Therapy. Lawson Research Institute Conference, London, Ontario, Canada.
- Persinger, M. A. (2002). Experimental simulation of the God experience: Implications for religious beliefs and the future of the human species. In R. Joseph (Ed.), *Neurotheology* (pp. 267–284). San Jose: California University Press.
- Persinger, M. A., & Koren, S.A. (2005). A response to Granqvist et al. "Sensed presence and mystical experiences are predicted by suggestibility, not by the application of transcranial weak magnetic fields." *Neuroscience Letters*, 379, 346–347.
- Persinger, M. A., Tiller, S. G., & Koren, S. A. (2000). Experimental simulation of a haunt experience and elicitation of paroxysmal electroencephalographic activity by transcerebral complex magnetic fields: Induction of a synthetic "ghost"? *Perceptual and Motor Skills*, 90, 659–674.
- Popper, K. (1959). *The logic of scientific discovery*. London: Routledge & Kegan Paul.
- Quine, V. W. (1992). *Pursuit of truth*. Cambridge, MA: Harvard University Press.
- Ramachandran, V. S., & Blakeslee, S. (1999). *Phantoms in the brain*. New York: William Morrow.
- Richters, J. E., & Waters, E. (1991). Attachment and socialization: The positive side of social influence. In M. Lewis & S. Feinman (Eds.), *Social influences and socialization in infancy: Genesis of behavior series* (Vol. 6, pp. 185–213). New York: Plenum.
- Rizzuto, A. M. (1979). *The birth of the living God: A psychoanalytical study*. Chicago: Chicago University Press.
- Rohner, R. P. (1986). *The warmth dimension: Foundations of parental acceptance-rejection theory*. Thousand Oaks, CA: Sage.
- Saroglou, V., Kempeneers, A., & Seynhaeve, I. (2003). Need for closure and adult attachment dimensions as predictors of religion and reading interests. In P. Roelofsma, J. Corveleyn, & J. van Saane (Eds.), *One hundred years of psychology and religion* (pp. 139–154). Amsterdam: VU University Press.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *The Journal of Neuropsychiatry and Clinical Neurosciences*, 9, 498–510.
- Schiller, C. H. (Ed.) (1957). *Instinctive behavior: The development of a modern concept*. New York: International Universities Press.
- Shaver, P. R., & Mikulincer, M. (2002). Attachment-related psychodynamics. *Attachment and Human Development*, 4, 133–161.
- Spangler, G., & Grossmann, K. E. (1993). Biobehavioral organization in securely and insecurely attached infants. *Child Development*, 64, 1439–1450.
- Spilka, B., Hood, Jr., R. W., Hunsberger, B., & Gorsuch, R. (2003). *The psychology of religion: An empirical approach* (3rd ed.). New York: Guilford.
- Sroufe, L. A., & Waters, E. (1977a). Attachment as an organizational construct. *Child Development*, 48, 1184–1199.
- Sroufe, L. A., & Waters, E. (1977b). Heart rate as a convergent measure in clinical and developmental research. *Merrill-Palmer Quarterly*, 23, 3–27.
- Stark, R., Hamberg, E. M., & Miller, A. (2005). Exploring spirituality and unchurched religions in America, Sweden, and Japan. *Journal of Contemporary Religion*, 20, 3–23.

- Suomi, S. J. (1999). Attachment in rhesus monkeys. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 181–197). New York: Guilford Press.
- Tamayo, A., & Desjardins, L. (1976). Belief systems and conceptual images of parents and God. *Journal of Psychology*, *92*, 131–140.
- Tamminen, K. (1994). Religious experiences in childhood and adolescence: A view-point of religious development between the ages of 7 and 20. *The International Journal for the Psychology of Religion*, *4*, 61–85.
- Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences (“absorption”), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, *83*(3), 268–277.
- TenElshof, J. K., & Furrow, J. L. (2000). The role of secure attachment in predicting spiritual maturity of students at a conservative seminary. *Journal of Psychology and Theology*, *28*, 99–108.
- Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. In N. A. Fox (Ed.), *The development of emotion regulation: Biological and behavioral consideration* (pp. 25–52). Cambridge, New York: Cambridge University Press. *Monographs of the Society for Research in Child Development*, *59*(2–3).
- Tolman, E. (1948). Cognitive maps in rats and men. *Psychological Review*, *55*, 189–208.
- Ullman, C. (1982). Cognitive and emotional antecedents of religious conversion. *Journal of Personality and Social Psychology*, *43*, 183–192.
- van Ijzendoorn, M. H. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the Adult Attachment Interview. *Psychological Bulletin*, *117*, 387–403.
- van Ijzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, *11*, 225–249.
- Weaver, A., & de Waal, F.B.M. (2002). An index of relationship quality based on attachment theory. *Journal of Comparative Psychology*, *116*, 93–106.
- Weinfield, N. S., Sroufe, L. A., Egeland, B., & Carlson, E. A. (1999). The nature of individual differences in infant-caregiver attachment. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 68–88). New York: Guilford.
- Wheeler, S. C., & Petty, R. E. (2001). The effects of stereotype activation on behavior: A review of possible mechanisms. *Psychological Bulletin*, *127*, 797–826.
- Wittgenstein, L. (1953). *Philosophical investigations*. Oxford: Basil Blackwell.

CHAPTER 7

RELIGIOUS CONVERSION, SPIRITUAL TRANSFORMATION, AND THE NEUROCOGNITION OF MEANING MAKING

*Raymond F. Paloutzian, Erica L. Swenson,
and Patrick McNamara*

As scientists discover laws of the universe that are congruent with mind, artists discover visual images of the world that are harmonious with mind. Both explore the truth and beauty of the mind; at an abstract cognitive level, they are identical. (Robert L. Solso, 2003)

We have often wondered why art history and religious history are almost completely dependent upon each other. They overlay one another so much that it is practically impossible to learn one without being immersed in the other. Why did human beings express their creative abilities and their religious needs, strivings, and commitments in such an interlocking way? This is no mere coincidence. Solso (2003) argued that the mental abilities needed for the evolution of art are inherent in the capabilities that came with the development of the human brain. In particular, humans' creation of visual art corresponds to the development of visual perception involving neural structures and processes that enabled organisms to see both near and distant or peripheral objects. Extending this idea, the human capacity for religion may be a product of the same factors that enabled humans to develop art. In other words, the neural and psychological processes that made it possible for people to create artistic expression may be the same ones that made it possible for people to search for and find religion. At an individual level, artistic insight and religious conversion may be neurologically similar and may reflect the same psychological process of meaning-making.

Common psychological functions seem to be expressed through religion and art, embodied in perfect unity in religious art. Let us explore some neurological and psychological processes fundamentally routed in the human brain that may suggest that when humans became able to perceive, abstract, and conceptualize sufficiently enough for artistic insight, they were able to experience the revelation necessary for religious conversion. We are not trying to give a definitive explanation of how religious conversion or spiritual transformation happens in the brain—the research is too premature for that. At this point, we are using neurological research to suggest how phenomena might occur and to explore how that might correspond with the meaning system model. Let us begin by looking at religious conversion and spiritual transformation at a psychological level.

RELIGIOUS CONVERSION AND SPIRITUAL TRANSFORMATION

Conversions remain as interesting, controversial, and potentially powerful in human affairs today as they were when Paul heard a voice and was blinded on the road to Damascus, Augustine found peace in the garden in Milan, and when the early followers of Muhammad submitted to follow the Five Pillars of Islam. Since then, millions of conversions have altered the lives of ordinary people worldwide. In addition to adopting one of the world's three great missionary religions (Christianity, Buddhism, Islam), people adopt New Religions Movements (NRMs) and a variety of spiritualities not representative of traditional religious institutions (Paloutzian, Richardson, & Rambo, 1999). Thus, religious conversion and spiritual transformation can be regarded as identifiable, prominent ways that people change in the vast majority of human cultures. Given its pervasiveness and that a basic goal of psychology is to gain knowledge of the processes by which people change, understanding religious conversion is part of the heart and soul of our effort to synthesize neurological and psychological knowledge (Paloutzian, 2005).

To grapple with the ideas of religious conversion and spiritual transformation, it is necessary to distinguish between the concepts of religion and spirituality. This is because (a) the technicalities of what each concept means differ in the research literature (Zinnbauer & Pargament, 2005), and (b) they have overlapping connotations when translated into a meaning system model of change (Paloutzian, 2005). Whether there are common neurological processes that mediate religious conversion and spiritual transformation is a matter for future discussion. Let us examine the first two of these issues.

Religion, Spirituality, and Change

Zinnbauer and Pargament (2005) summarize the research on the distinction between religion and spirituality and clarify how the two concepts do

and do not correspond. Briefly, people tend to associate both religion and spirituality with frequent prayer and church attendance and intrinsic religious orientation (Allport & Ross, 1967; see Hill & Hood, 1999, for review). Both terms convey the idea of connecting with that which is perceived to be sacred (Hill et al., 2000). Spirituality is more associated with mystical experience and concern about personal growth and existential issues. In contrast, religion tends to connote participation in institutionalized religious practices and belief in church or denominational teachings (Zinnbauer et al., 1997). These distinctions can be seen by examining the wording on the instruments to measure each construct (see Hill & Hood, 1999, for examples). Measures of religiousness ask about things such as belief in certain teachings, participating in religious services, and supporting institutional religious programs. Measures of spirituality ask about things such as connecting with whatever is of the highest meaning to oneself, a sense of striving for oneness, and transcending one's own limitedness.

The (at minimum) four-fold ways that people claim or do not claim to be *religious* and/or *spiritual* are explained elsewhere (Paloutzian & Park, 2005; Paloutzian, 2006); suffice it to say that their meanings overlap but are not synonymous. Moreover, there is disagreement about which is the larger category. Religion is sometimes seen as one type of spirituality among many, and spirituality is sometimes seen as a subset of a larger category of phenomena called "religion" (Zinnbauer & Pargament, 2005). Although this distinction is interesting and important to keep in mind, it seems less crucial when we superimpose the model of meaning systems (Park, 2005; Park & Folkman, 1997; Silberman, 2005) on the literature on religion and spirituality, specifically when applied to religious conversion and spiritual transformation (Paloutzian, 2005). This is because for the purpose of understanding the psychological processes that mediate a change in a person's fundamental commitments, orientations, and beliefs, the particular label we use for it matters less than knowledge of the change process itself. Because of this, at an abstract cognitive and functional level, there may be little difference between religious conversion and spiritual transformation (Paloutzian & Park, 2005; Paloutzian, 2005). The language of the meaning system model ought to be powerful enough to incorporate research on these and closely related concepts.

From Religious Conversion to Meaning System Change

Although research on religious conversion is one of the earliest topics studied by scientific psychology (James, 1902; Starbuck, 1899), and although it has been empirically examined from a psychodynamic (Ullman, 1982, 1989), social-cognitive (Paloutzian, 1981), sociological (Richardson, 1985, 1995), and attachment theory (Granqvist & Kirkpatrick, 2004; Kirkpatrick, 2005a;

Oksanen, 1994) framework, psychologists of religion have longed for an idea capable of integrating the disparate lines of research. We think that the model of religion as a meaning system (Park, 2005; Park & Folkman, 1997; Silberman, 2005) is capable of doing this. This is because whatever else religion is about and regardless of theoretical ideas guiding research on it, religion is fundamentally about meaning. Humans apparently are built with a tendency to represent one thing with another; to assess information relative to a larger, more global idea; to use that idea to shape the interpretation of incoming information to guide behavior and establish a sense of consistency in their mental representation of life and their position in it. The implication is that religious conversion is about change in a person's spiritual meaning system (Paloutzian, 2005).

Although a meaning system involves emotions, actions, beliefs, expectations, and contingencies, it can be best conceptualized as a cognitive structure whose elements include an idea of global meaning, plus processes of appraisal and evaluation of new information in comparison to it (Park, 2005; Park & Folkman, 1997; Silberman, 2005). When pushed beyond some threshold, these processes would result in doubts—the reflection of a discrepancy between the *ought* and the *is* in a person's life (Hill, 2002; Paloutzian, 2005). A great deal of research has focused on what prompts religious conversion, such as family stressors or a need for meaning. These are well documented elsewhere (Beit-Hallahmi & Argyle, 1997; Paloutzian, Richardson, & Rambo, 1999; Rambo, 1993; Spilka, Hood, Hunsberger, & Gorsuch, 2003), so we will not go into these studies. As seen with a meaning system model, the greater the discrepancies, the more likely it is that a transformation of one or more elements of the meaning system will occur (Paloutzian, 2005).

Toward a Neurology of Spiritual Transformation

Given the evidence that the human brain developed in a way that gave it ample ability to symbolize and perform other relationship operations that are part of meaning systems (Deacon, 1998) and given evidence that religious activity seems to involve identifiable brain areas (Azari, Vol. 3, chap. 3; Azari, in press; Azari, Missimer, & Seitz, 2005; Azari et al., 2001a, 2001b), the question rises about the possible correspondences between psychological knowledge of religious conversion as seen through a meaning system model and possible neurological correlates or mediators of these processes. It would seem that there are two general ways that this issue can be examined. First, we can search for whatever knowledge can be gained through an examination of the dramatic special cases of conversion and assume that the inferences about brain processes that might have been involved based on the historical records are accurate. Second, we can apply the knowledge from current research in brain science to the understanding of the psychological processes involved in conversion and extrapolate it to the neurological level. It will be helpful to

examine the literature of each type. Many of the historical exemplars of conversion showed behaviors that suggest distinct neurological involvement.

THE NEUROLOGY OF EXEMPLARS OF CONVERSION

It is now almost proverbial to link temporal lobe epilepsy with religious experience and with conversion experiences in particular. Saver and Rabin (1997) trace the first recorded scientific observation of heightened religiosity in epileptics to Esquirol in 1838. William James (1902) may have been the first scientific psychologist to suggest that St. Paul's dramatic conversion experience on the road to Damascus may have been a "psychological nerve storm" like that of epilepsy. Like some epileptics, St. Paul experienced what neurologists would call auditory "command hallucinations" (a voice that gave him commands to follow), visual hallucinations, and then an apparently hysterical form of blindness, as well as an intense emotional upheaval (Saver & Rabin, 1997). We know that the Russian novelist Dostoyevsky, who focused on religious themes in his later novels, had some form of epilepsy with seizures he often described as ecstatic religious experiences. A perusal of the lives and experiences of many of the great religious leaders and saints down through the ages will reveal many signs of temporal lobe epilepsy such as intense emotionality, visions, transient ictal phenomena like smell and taste illusions, absence seizures or spells resembling a lapse of attention or a trance-like state, out of body experiences, auditory and visual hallucinations, changes in sexual desire and so forth. Saver and Rabin (1997) provide a table of at least 15 religious founders and mystics who may have had some form of epilepsy.

When temporal lobe epilepsy is associated with psychotic episodes, it certainly also increases the chances that the patient will experience unusually intense religious experiences and conversion experiences (Beard, 1963; Dewhurst & Beard, 1970; Geschwind, 1983). Dewhurst and Beard (1970) provide instructive examples of six cases of sudden religious conversions in six temporal lobe epileptics. In all cases the conversion occurred during the hours or days following increased seizure activity. Unlike the Dewhurst and Beard cases where the religious experience occurred after the onset of seizure activity, Waxman and Geschwind (1975) claimed that heightened religiosity can also occur during the inter-ictal period when no seizure activity was obvious. They claimed that this "inter-ictal behavior syndrome" consisted of hyper-religiosity, intense emotionality, circumstantiality, aggressive irritability and hypergraphia. Bear and Fedio (1977) later reported higher religiosity scores in patients with temporal lobe epilepsy relative to other patient groups with chronic neurologic disorder, and Bear (1979) attempted to provide a neuroanatomical explanation for the association by invoking a

possible hyperconnectivity between the limbic and temporal lobes. But other authors failed to confirm a relationship between temporal lobe epilepsy and religiosity (Roberts & Guberman, 1989; Tucker, Novelly, & Walker, 1987).

The consistent association of religious phenomena with temporal lobe epilepsy has led some authors to claim that the temporal lobes constitute the neural substrate of religious conversion experiences (e.g. Persinger, 2002; Ramachandran & Blakeslee, 1999). This conclusion is open to question, however. First, religious saints, mystics, and founders of new religious or spiritual movements often do not follow a pattern of mental impairment that is typically associated with temporal lobe epilepsy. Instead, they often lead lives of extraordinary accomplishment. Second, electrical spikes in the temporal lobes often have effects on other parts of the brain that could also contribute to the clinical symptomology of temporal lobe epilepsy (Devinsky, 2004; Leung & Wu, 2006). Third, many temporal lobe epilepsy patients with religious symptoms also have electrical foci in other parts of the brain in addition to the temporal lobes. For example, at least half of Dewhurst and Beard's (1970) original patients also evidenced loci in the frontal lobes. Fourth, overactivity of the temporal lobes is known to elicit compensatory responses (e.g., increased activity of the frontal lobes) elsewhere in the brain, in particular in the orbitofrontal cortex. Thus, one needs to be careful when assigning the neural substrate for religious conversion to a single part of the brain—given the connectivity patterns between the frontal lobes and the temporal lobes.

The frontal lobes are in mutual inhibitory balance with posterior cortical sites including the temporal lobes and structures deep to the temporal lobes including the hippocampus, amygdala, and the limbic system (Goldberg, 1987; Lhermitte, 1986). If electrical spikes are occurring in the temporal lobes, it seems likely that a compensatory inhibitory response would be elicited in the frontal lobes and thus the neurologic network that is producing enhanced religiosity might be frontal-temporal, not just temporal.

Certainly, the neuroanatomy supports the latter supposition. The portion of the frontal lobes that directly modulate temporal and limbic cortex is the orbitofrontal cortex (OFC). The hallmark of OFC damage is social and emotional disinhibition, which demonstrates that one function of the OFC is to inhibit impulses arising from limbic and temporal lobes (Chow & Cummings, 1999; Schneider & Gutbrod, 1999). The OFC is densely interconnected with structures of the limbic system and the temporal lobes. The superior temporal lobes sends afferents to the OFC, and the medial OFC both receives and sends projections to the temporal limbic and limbic regions (Chow & Cummings, 1999; Nauta, 1979; Van Hoesen, Pandya, & Butters, 1975; Zald & Kim, 1996). The OFC sends direct inhibitory fibers onto the amygdala, including a dense set of fibers from the caudal OFC onto the central nucleus of the amygdala. Because the amygdala is the major source of efferents to the brainstem and hypothalamus, the medial OFC indirectly controls a range of endocrine and

autonomic behavioral responses. A clear example of OFC inhibitory control of a limbic system behavior is that of reactive aggression. A specialized OFC-amygdala circuit mediates dis-inhibition of aggressive responses (Blair, 2004). This latter circuit is controlled by efferents from the medial OFC and runs from the medial portion of the amygdala through the stria terminalis and the medial hypothalamus to the peri-aqueductal gray. In short, the anatomy supports the contention that one needs to speak of densely interconnected and functional neural networks when examining behaviors linked to the limbic temporal lobes and therefore also when talking about conversion and spiritual transformation.

Given the above functional neuroanatomy and the clinical evidence from temporal lobe epilepsy, one could just as easily argue that religious conversion and spiritual transformation may be mediated by OFC because OFC is the site that controls limbic and related responses. Instead, it seems more reasonable to say that the complex psychological process called “religious conversion” *may* be related to a series of neural networks housed in limbic and OFC sites because they normally mediate emotional states (limbic), language comprehension (medial temporal lobe), hippocampus (memory), and personality (OFC). Thus, the confluence of all of these higher order brain/mind functions orchestrate a transformation process that is best explained at the level of social psychology until we have better data on neurological correlates of conversion and spiritual transformation—when our knowledge at these different levels of analysis can be integrated.

The evidence summarized above suggests that the processes that mediate religious conversion and spiritual transformation cannot be localized in a particular brain area. The temporal lobe epilepsy model is too simple to accommodate the full range of conversion and transformation phenomena and may not be an area that is uniquely involved in conversion. It may profit our understanding, therefore, to invoke other levels of analysis and realize that religious conversion and spiritual transformation involve meaning system processes broadly construed, in addition to a broad range of neural processes. We need to consider how social, psychological, and neurological factors work in combination to create sufficient force within someone’s global meaning system so that it would change from a nonconverted brain state at time T to a transformed brain state at time $T+1$. In light of this, it may be that the knowledge gained from the exemplars of dramatic conversion is suggestive but nevertheless insufficient to account for the neurological involvements in the more ordinary cases of conversion.

The ideal research design would of course include empirical studies of brain activity before and after conversion in the same people. Rarely does the real world allow scientists to collect (ideally) definitive data of this sort. But perhaps we can move toward more accurate knowledge of conversion and transformative processes broadly construed by applying knowledge from

neuroimaging and other brain research to the understanding of conversion processes. Paloutzian and Swenson (in press) and Park and McNamara (Vol. 3. chap. 3) recently examined possible areas of correspondence between neurological findings and an analysis of meaning systems to take one step toward a multilevel interdisciplinary (Emmons & Paloutzian, 2003) understanding of spiritual experiences. They suggest that it may be fruitful to synthesize these two levels of knowledge. By extrapolation, it may be fruitful to attempt an elementary synthesis of knowledge gained from multiple levels of analysis (including neurological, hormonal, and psychological) around the question of how religious conversions and spiritual transformations occur in the broad band of ordinary cases.

POSSIBLE NEUROLOGICAL CORRELATES OF SPIRITUAL TRANSFORMATION

Although still speculative at this point, we hope to evaluate the processes involved in spiritual transformation by looking at the results of brain imaging studies. Several techniques are used to monitor brain activity during various kinds of mental behavior. Functional magnetic resonance imaging (fMRI), positron emission tomography (PET), and electroencephalography (EEG) can measure activity in various neurotransmitter systems (Raichle, 1998). Single photon emission computed tomography (SPECT) images help scientists identify which areas of the brain are active because the injected tracer is carried through the blood stream to the active brain cells, which appear darker on a SPECT image (Newberg, Alavi et al., 2001). As techniques become more advanced, it becomes easier to identify which brain regions and neurotransmitters are active during meditation and other spiritual practices (d'Aquili & Newberg, 1999; Newberg, d'Aquili, & Rause, 2001; Newberg & Newberg, 2005). Although these techniques have not yet been used in research on conversion per se, they have been used to study meditation, prayer, and religious rituals. Extrapolating from these studies, we hope to begin to understand the neurocognitive processes involved in spiritual transformation.

Paloutzian and Swenson (in press) describe possible correspondences between neurological activity and meaning system functions in the context of spiritual experiences. The present chapter extends that analysis by applying it to the understanding of the neurocognitive processes that may be involved in how conversion happens. Using what we know about the general changes that take place in the brain during different mental events may help us draw preliminary connections between neural activity during meditation and possible neuropsychological activity during spiritual transformations, that is, the processes that actually occur between times T and $T+1$.

An Experiential/Affective Process

Although not universally true, many sudden conversions are associated with heightened feelings and states of arousal (Paloutzian, 1996). Prior to conversion, a person may pray and meditate. Prayer and meditation have been linked to the following positive physiological and psychological states (Newberg, Alavi et al., 2001; Newberg & Newberg, 2005): (a) The person may feel that his or her stress, worries, and anxiety have dissipated. This relaxed state is indicated by lower levels of the stress hormone cortisol in urine and plasma during meditation (Sudsuang, Chentanez, & Veluvan, 1991). (b) The person is likely to feel less pain and fear than under normal conditions, while breathing slower and having sensations of joy and euphoria (Newberg & Newberg, 2005). These positive feelings are associated with the release of beta-endorphins during meditation (Kiss, Kocsis, Csaki, Gorcs, & Halasz, 1997). Beta-endorphins are opioids produced in the hypothalamus and distributed to the brain's sub-cortical areas. (c) The sensations of happiness and euphoria may be further enhanced by the overall elevation in serotonin during meditation, as shown by the increased breakdown products of serotonin in urine after meditation (Walton, Pugh, Gelderloos, & Macrae, 1995). Higher levels of serotonin provide feelings of happiness and have a modulatory effect on dopamine, which also leads to feelings of euphoria (Newberg & Newberg, 2005). (d) The person may experience the sensation of progressively deeper relaxation. This is linked to the increased parasympathetic nervous system activity during meditation, which leads to lower heart and respiratory rate (Newberg & Newberg, 2005). (e) Sensitivity to pain and activity in the central nervous system may be reduced thanks to the neurohormone melatonin (Shaji & Kulkarni, 1998). Melatonin is produced in increased levels during meditation (Tooley, Armstrong, Norman, & Sali, 2000).

A meaning system analysis says that such experiences are important not merely because of their unusual phenomenology or because they happen to be pleasurable, but because they are interpreted and experienced within the person's meaning system. They are appraised and given new meaning (Park, 2005) and given the right circumstances can produce change in central elements of the person's meaning system sufficient to call it religious conversion or spiritual transformation (Paloutzian, 2005).

These positive effects may be enhanced when the potential convert is in a social context with religious adherents who are also praying and meditating (Paloutzian, Fikes, & Hutesbaut, 2002). It would make sense that experiencing a sense of euphoric happiness through prayer or meditation would make a person more likely to convert, especially when circumstances dictate a new religious or spiritual attribution for the experience (Spilka, Shaver, & Kirkpatrick, 1985; Spilka et al., 2003). We hypothesize that the positive physiological experiences that a person has during meditation will make sudden

conversion more likely. It seems, therefore, that neurological evidence may be consistent with well-known principles from social psychology that indicate that a change in belief may be a *consequence* of a change in behavior. In fact, in a classic text on the relation between attitude, belief, and behavior change, it was observed that in the Old Testament (Hebrew Bible), “the rabbis are enjoined not to make their parishioners or converts believe in God *before* they are asked to pray, but to have them pray first so that belief will follow” (Zimbardo & Ebbesen, 1970, p. 13).

A Transformative Experience as Self-Authenticating

Further, there seems to be a self-authenticating aspect to conversion and spiritual transformation such that, although at one level converts do have rationales and can state reasons for their change, at another level they may embrace the change for the experience itself. The change can be its own validation, and its perceived truth does not depend upon independent verification. This would presumably be true for those experiences that were particularly potent or blissful. For example, those who are heavily involved in charismatic expressions of Christianity may be sustained by the very nature of the experience that occurs when they participate in the practice prescribed by their faith, that is, the mental and emotional sensations that the person experiences when speaking in tongues. Participants may regard the experience as proof of its own validity, such that one may claim an awareness of God even though it can be neither sensed nor assessed by another person. When asked for verification of the claim to have connected with God, a person will occasionally respond, “I know it was God because I experienced it.” Given such an initial experience and interpretation of it, whatever may follow can be interpreted within a new meaning system that solidifies it in the mind of the person.

Observing what one’s body is doing may also be part of this process. Participation in a spiritual or religious activity engages the body in a process that automatically invokes a blend of evaluating, questioning, and confronting a spiritual question even if the person’s mind doesn’t consciously think so. For example, the mere presence of one’s body at a religious ritual in which one does not consciously believe (Spilka, 2005) acknowledges the ritual and religion in question and sets in motion a process of appraisal that could lead to an (unintended or unanticipated) change in the meaning system initially invoked to interpret it. In other words, there may be a discrepancy between what one’s body is doing and what one’s mind is thinking. According to a meaning system model, this discrepancy would have to be appraised and resolved, and one way to resolve it is to accept the beliefs and practices that one is participating in. Thus, experiencing a state of bliss or peace, as is common during a spiritual experience (Paloutzian & Swenson,

in press; Newberg & Newberg, 2005), may involve behaving in a way that begins the process of spiritual transformation.

Ergotropic and Trophotropic Activity

Let us further speculate about brain activity during spiritual transformation by extrapolating from research on a spiritual activity such as meditation. Newberg, Alavi et al. (2001) found that when Buddhists meditate, the hypothalamic ergotropic centers (lateral part) and trophotropic centers (medial part) reach maximum intensity. If some conversion and transformative experiences are similar to meditation, then perhaps ergotropic and trophotropic activity may be at least moderately involved in the process of spiritual transformation.

Newberg and d'Aquili (2000) suggest that during a spiritual experience, one experiences simultaneous activation of the ergotropic and trophotropic systems. During powerful, unusual states of consciousness, which may include spiritual transformations, several changes and subsequent sensations may occur. Trophotropic activity increases, which is associated with feelings of quiescence. Feeling this sense of calmness may be perceived as the divine giving reassurance and peace. This could encourage the person to commit to religion or spirituality. In addition to feeling peace, the person undergoing a transformational experience is likely to have heightened concentration and arousal due to an increase in ergotropic activity. He or she is focused on the perceived meaning of what is occurring. In rare, powerful conversions, the person may experience more exaggerated effects of the trophotropic and ergotropic activity. These experiences would be marked by an energy release, orgasmic-like rush, and trance-like state (Newberg & d'Aquili, 2000), all of which could easily transform someone's meaning system due to the powerful self-authenticating nature of the experience combined with the absence of any need for external or public assessment of its truth value.

Activity in Frontal and Parietal Regions

Neurological images taken during religious experiences show activity in the frontal and parietal brain structures (Azari et al., 2001a, 2001b; Newberg, Alavi et al., 2001). These areas of the brain tend to be involved in cognitive processes such as concentrating or orienting oneself in space. During conversion or spiritual transformation, the person is often concentrating on the beliefs of the religion he or she is joining. As indicated in the term spiritual transformation, the person's self-identity is changing. Whether this occurs in solitude or in a social context, the person is actively orienting him or herself in relation to the perceived spiritual world—God or an Ultimate Concern, the universe, or perhaps spiritual bodies such as

angels. Because the process of spiritual transformation, at least in some cases, involves sustained, willful attention, we infer that the prefrontal and cingulate cortex could appear active during such times. The prefrontal and medial frontal cortical areas seem to be active when humans make inferences, plan, reason, and make decisions (Azari et al., 2005; Posner & Petersen, 1990). These mental operations may be involved in conversions that are deliberate, that is, the person willfully decides to change his or her life and follow a new religion. Thus, when a person weighs the options and makes a commitment to a new form of spirituality out of well-reasoned logic, his or her prefrontal and medial frontal cortical areas may be active. This would be consistent with Frith, Friston, Liddle, and Frackowiak's (1991) description of the prefrontal cortex as the seat of the human will. A person who intentionally chooses to redefine him or herself spiritually is engaging his or her will; this would presumably appear on brain imaging as activity in the prefrontal area. Also, however, this same activity might be what is invoking the person's meaning system at the highest known level—the level of self-aware, conscious thought.

An illustrative study using SPECT suggests that the dorsal lateral prefrontal region is involved in spiritual activity. In Newberg, Alavi et al.'s (2001) study of eight Tibetan Buddhist meditators and eight nuns, the brain images of the monks while mediating appeared very similar to the brain images of the nuns while praying. Both show increased activity in the dorsal lateral prefrontal region and decreased activity in the posterior superior parietal region. These areas are involved in cognitive processes such as complex visual perception, concentration, and orientation. Although we can only conjecture, the dorsal lateral prefrontal region may also be active during spiritual transformations that involve vivid images, focused attention, and reorientation. Whether the brain perceives a sense of oneness, as in the case of the Buddhists, or a connection to Christ, as in the case of the nuns, it seems that this brain region is active. It may also be active, therefore, in spiritual transformations that involve cognitive processes such as perceiving visual stimuli (e.g., a cross at the front of the sanctuary), concentrating (e.g., focusing on tenets of a religion), and orientation (e.g., trying to center oneself and become one with the universe).

Unlike the temporal lobe epilepsy theory of conversion, new evidence increasingly suggests that religious experiences (and by implication, perhaps also conversion) are cognitively mediated (Azari, in press). Azari (in press) found that religious subjects in a religious state had higher blood flow in the right dorsolateral prefrontal cortex, as indicated by PET. This brain area did not appear active in the nonreligious subjects. Both Buddhist and Christian religious experience involves the activation of dorsomedial and dorsolateral frontal cortical areas (Seitz, in press). The dorsolateral prefrontal cortex plays an important role in complex cognitive processes,

which may include how people infer that God is responsible for their perceived “calling” to convert, or how they make meaning out of their past, present, and future. The process of spiritual transformation inherently involves complex cognitive processes such as subjective awareness and belief-thought, and sufficient changes in them may constitute a transformed self-identity. Meaning-making, furthermore, is a complex cognitive process that involves appraising information in light of global beliefs (Park, 2005; Park & Folkman, 1997; Silberman, 2005). Therefore, based upon Azari et al.’s (2001b) PET findings and the way religion and spirituality seem to be involved with higher order cognition in meaning-making (Paloutzian & Swenson, in press), we think the dorsolateral prefrontal cortex may be active during spiritual transformations.

Parietal cortex

Christian spiritual experiences show activation in the parietal midline structure and precuneus (Seitz, in press). These areas are involved in the recall of a memory trace. Although tentative at this point, the parietal areas may also be activated during spiritual transformation. This is because an important factor in the transformative process may be the memory of previous encounters with religion or spirituality. Although the person may not have personally encountered a perceived divine until the time of conversion, he or she may have observed such changes in the lives of other people or learned about conversion through church, movies, articles, or other media. At the time the person initially learned about conversion, he or she may have been uninterested and apathetic. The memory of people’s accounts of their own conversions may nevertheless have influenced his or her own conversion even if only at a nonconscious level. Thus, although the present state of knowledge allows us only to tie somewhat loose ends together, we can at least speculate that spiritual transformations involve activity in the parietal cortex, since it plays a role in the recall of previous experiences (Seitz, in press).

Caveat

Although advances in technology have made it possible to begin to understand brain activity during religious experiences, we must be careful not to overstate the current state of knowledge. Neuroimaging does not give an exact picture of brain activity. Additionally, it is important to keep in mind that activated brain areas, such as the frontal cortex, are not uniquely specialized for spiritual or religious experiences (Seitz, in press). The brain areas that are likely to be active during spiritual transformation are active in many other mental and behavioral processes.

CONCLUSION

Of the many implications that could be drawn from our attempt to bring neurological and psychological knowledge together around the problem of understanding religious conversion and spiritual transformation, two stand out as particularly interesting and perhaps far-reaching. The first has to do with whether religious commitments are primarily to beliefs or to relationships. The second has to do with the capability of the human mind to conceive of, detect, and keep core ideas that it may see as true and beautiful, but not communicable.

Belief or Relationship?

The findings from two different lines of research seem to indicate that religiousness, and by implication religious conversion, may be heavily relationship-related. For example, research on religious conversion within the framework of attachment theory suggests that the dominant factor in determining whether someone experiences religious conversion during young adulthood is the attachment style of the person's primary caregivers during childhood. People who have insecure attachment relationships with their primary caregivers are more likely to develop an attachment to a loving God who they believe will never leave them (Kirkpatrick, 2005a, 2005b). Similarly, other evidence shows that the brain areas that are most active during certain religious activities such as prayer and meditation are the same areas that play a significant role in perceived social relationships (Azari, in press; Seitz, in press). Putting these two lines of evidence together, it is tempting to imagine that these same areas may also be involved in religious conversion. This ought especially to be so to the degree that, consistent with Kirkpatrick's findings, religious conversion is fundamentally a relational process. The possibility of this correspondence awaits more definitive evidence.

Art and Religion as Self-Authenticating

One way to appreciate what religious conversion is about is to liken it to creative insight in art. We can pose that both religion and art are ways that people try to tell a "truth that cannot be told" (Solso, 2003). During a conversion a person may know life's most direct meaning while at the same time it is the most difficult to grasp. To be "at one" with whatever is ultimate would seem to be an experience that fits universal properties of the mind. Such a process that would occur in the case of religious or other spiritual transformation would seem to involve the same global cerebral functions that came with the development of art as the human species knows it (Solso, 2003). This would have to include meaning-making functions.

Change evidenced by meaning made or remade is a central feature of how the human mind works. Across the vast sweep of human history, people have searched for and found religious meaning and more than once have proclaimed that what they found was the formerly untold Truth and have defended this (self-authenticating) claim to the death of themselves and, unfortunately, others. In particular, the finding of new religious meaning by either insight or revelation, usually initially in the mind and heart of only one person, has triggered the forces that would lead to the development of the world's great religions and, in companion form, most of the world's greatest works of art. This too cannot be mere coincidence but instead suggests common neurobiological and psychological processes that mediate art and religion, artistic creativity and religious insight, and construction of meaning in art and meaning found in religious conversion. In fact, both meaning construction in art and meaning found in religious conversion can be understood as meaning making in spiritual transformation. Like science and art, whose timeless aspects are held to be both true and beautiful because they match the mind's capability to hold and appreciate them (Solso, 2003), it may be that at the most abstract cognitive level the meanings of artistic insight and religious conversion are identical. It may also be that for the same neurological reasons Truth, psychologically speaking, is in the meaning system of the beholder (Paloutzian, 2006).

REFERENCES

The authors wish to thank the Catlin Foundation whose grant supported Erica Swenson's research assistantship and contribution to this chapter. Correspondence concerning this chapter can be addressed to Raymond F. Paloutzian, Department of Psychology, Westmont College, Santa Barbara, CA 93108-1099 (email: paloutz@westmont.edu).

- Allport, G. W., & Ross, J. M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, *5*, 432–443.
- Azari, N. P. (in press). The cognitivity of religious experience and emotion: Evidence from neuroscience. In C. Jäger (Ed.), *Brain—religion—experience: Multidiscipline encounters*. New York: Springer Publisher.
- Azari, N. P., Missimer, J., & Seitz, R. J. (2005). Religious experience and emotion: Evidence for distinctive cognitive neural patterns. *The International Journal for the Psychology of Religion*, *15*(4), 263–280.
- Azari, N. P., Nickel, J., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001a). Neural circuitry of religious experience. In *Proceedings of the 31st Annual Meeting of the Society for Neuroscience* (Vol. 1, p. 382). San Diego: Society for Neuroscience.
- Azari, N. P., Nickel, J., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001b). Neural correlates of religious experience. *European Journal of Neuroscience*, *13*, 1649–1652.

- Bear, D. M. (1979). Temporal lobe epilepsy: A syndrome of sensory-limbic hyperconnection. *Cortex*, *15*, 357–384.
- Bear, D. M., & Fedio, P. (1977). Quantitative analysis of ictal behavior in temporal lobe epilepsy. *Archives of Neurology*, *34*, 454–467.
- Beard, A. (1963). The schizophrenia like psychoses of epilepsy. II: Physical aspects. *British Journal of Psychiatry*, *109*, 113–129.
- Beit-Hallahmi, B., & Argyle, M. (1997). *The psychology of religious behaviour, belief and experience*. London: Routledge.
- Blair, R. J. R. (2004). The roles of the orbitofrontal cortex in the modulation of anti-social behavior. *Brain and Cognition*, *55*, 198–208.
- Chow, T. W., & Cummings, J. L. (1999). Frontal-subcortical circuits. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 3–26). New York: Guilford Press.
- d'Aquili, E. G., & Newberg, A. B. (1999). *The mystical mind: Probing the biology of religious experience*. Minneapolis: Fortress Press.
- Deacon, T. W. (1998). *The symbolic species: The co-evolution of language and the brain*. New York: Norton.
- Devinsky, O. (2004). Diagnosis and treatment of temporal lobe epilepsy. *Review of Neurologic Disorders*, *1*(1), 2–9.
- Dewhurst, K., & Beard, A. W. (1970). Sudden religious conversions in temporal lobe epilepsy. *Journal of Psychiatry*, *117*, 497–507.
- Emmons, R. A., & Paloutzian, R. F. (2003). The psychology of religion. *Annual Review of Psychology*, *54*, 377–402.
- Frith, C. D., Friston, K., Liddle, P. F., & Frackowiak, R. S. (1991). Willed action and the prefrontal cortex in man: A study with PET. *Proceedings of the Royal Society of London*, *244*, 241–246.
- Geschwind, N. (1983). Ictal behavioral changes in epilepsy. *Epilepsia Supplement*, *24*(1), S23–S30.
- Goldberg, G. (1987). From intent to action. Evolution and function of the premotor systems of the frontal lobe. In E. Perceman (Ed.), *The frontal lobes revisited*. (pp. 273–306). New York: IRBN Press.
- Granqvist, P., & Kirkpatrick, L. A. (2004). Religious conversion and perceived childhood attachment: a meta-analysis. *The International Journal for the Psychology of Religion*, *14*(4), 223–250.
- Hill, P. C. (2002). Spiritual transformation: Forming the habitual center of personal energy. *Research in the Social Scientific Study of Religion*, *13*, 87–108.
- Hill, P. C., & Hood, R. W., Jr. (1999). *Measures of religiosity*. Birmingham: Religious Education Press.
- Hill, P. C., Pargament, K. I., Hood, R. W., McCullough, M. E., Swyers, J. P., Larson, D. B., et al. (2000). Conceptualizing religion and spirituality: Points of commonality, points of departure. *Journal for the Theory of Social Behavior*, *30*, 51–77.
- James, W. (1902). *The varieties of religious experience*. New York: Longmans.
- Kirkpatrick, L. A. (2005a). *Attachment, evolution, and the psychology of religion*. New York: Guilford Press.
- Kirkpatrick, L. A. (2005b). Evolutionary psychology: An emerging new foundation for the psychology of religion. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook*

- of the psychology of religion and spirituality* (pp. 101–119). New York: Guilford Press.
- Kiss, J., Kocsis, K., Csaki, A., Gorcs, T. J., & Halasz, B. (1997). Metabotropic glutamate receptor in GHRH and beta-endorphin neurons of the hypothalamic arcuate nucleus. *Neuroreport*, 8, 3703–3707.
- Leung L. S., & Wu, K. (2006). Epilepsy-based changes in hippocampal excitability: causes and effects. *Advances in Neurology*, 97, 63–68.
- Lhermitte, F. (1986). Human autonomy and the frontal lobes. Part II: Patient behavior in complex and social situations: The “environmental dependency syndrome”. *Annals of Neurology*, 19(4), 335–343.
- Nauta, W. (1979). A proposed conceptual reorganization of the basal ganglia and telencephalon. *Neuroscience*, 4(12), 1875–1881.
- Newberg, A. B., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. G. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research: Neuroimaging*, 106, 113–122.
- Newberg, A. B., & d'Aquili, E. G. (2000). The neuropsychology of religious and spiritual experience. *Journal of Consciousness Studies*, 7(11–12), 251–266.
- Newberg, A. B., d'Aquili, E. G., & Rause, R. (2001). *Why God won't go away: Brain science and the biology of belief*. New York: Ballantine Books.
- Newberg, A. B., & Newberg, S. K. (2005). The neuropsychology of religious and spiritual experience. In R.F. Paloutzian & C.L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 199–215). New York: Guilford Press.
- Oksanen, A. (1994). *Religious conversion: A meta-analytical study*. Lund, Sweden: Lund University Press.
- Paloutzian, R. F. (1981). Purpose in life and value changes following conversion. *Journal of Personality and Social Psychology*, 41, 1153–1160.
- Paloutzian, R. F. (1996). *Invitation to the psychology of religion* (2nd ed.). Boston: Allyn and Bacon.
- Paloutzian, R. F. (2005). Religious conversion and spiritual transformation: A meaning-system analysis. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 331–347). New York: Guilford Press.
- Paloutzian, R. F. (2006). Psychology of religion, the human sciences, and the golden ring: Constructing the meaning of religion. In P. Clayton (Ed.), *Oxford handbook of religion and science*. Oxford, UK: Oxford University Press.
- Paloutzian, R. F., Fikes, T. F., & Hutsebaut, D. (2002). A social cognition interpretation of neurotheological events. In R. Joseph (Ed.), *Neurotheology: Brian, science, spirituality, religious experience* (pp. 215–222). San Jose: University Press.
- Paloutzian, R. F., & Park, C. L. (2005). Integrative themes in the current science of the psychology of religion. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 3–20). New York: Guilford Press.
- Paloutzian, R. F., Richardson, J. R., & Rambo, L. R. (1999). Religious conversion and personality change. *Journal of Personality*, 67, 1047–1079.
- Paloutzian, R. F., & Swenson, E. L. (in press). Spiritual experiences, neurology, and the making of meaning. In C. Jäger (Ed.), *Brain—religion—experience: Multidisciplinary encounters*. New York: Springer Publisher.

- Park, C. L. (2005). Religion and meaning. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 295–314). New York: Guilford Press.
- Park, C. L., & Folkman, S. (1997). Meaning in the context of stress and coping. *Review of General Psychology*, 1(2), 115–144.
- Persinger, M. A. (2002). Experimental simulation of the God experience: Implications for religious beliefs and the future of the human species. In R. Joseph (Ed.), *Neurotheology* (pp. 267–284). San Jose, CA: University Press.
- Posner, M. I., & Petersen, S. E. (1990). The attention system of the human brain. *Annual Review of Neuroscience*, 13, 25–42.
- Raichle, M. E. (1998). Behind the scenes of functional brain imaging: A historical and physiological perspective. *Proceedings of the National Academy of Sciences*, 95, 765–772.
- Rambo, L. R. (1993). *Understanding religious conversions*. New Haven: Yale University Press.
- Ramachandran, V. S., & Blakeslee, S. (1999). *Phantoms in the brain*. New York: William Morrow.
- Richardson, J. T. (1985). The active vs. passive convert: Paradigm, conflict in conversion/recruitment research. *Journal for the Scientific Study of Religion*, 24(2), 119–236.
- Richardson, J. T. (1995). Clinical and personality assessment of participants in new religions. *The International Journal for the Psychology of Religion*, 5(3), 145–170.
- Roberts, J. K. A., & Guberman, A. (1989). Religion and epilepsy. *Psychiatric Journal of the University of Ottawa*, 14, 282–286.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *The Journal of Neuropsychiatry and Clinical Neurosciences*, 9(3), 498–510.
- Schnider, A., & Gutbrod, K. (1999). Traumatic brain injury. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 487–508). New York: Guilford Press.
- Seitz, R. J. (in press). The neurophysiological basis of religious experience. In C. Jäger (Ed.), *Brain—religion—experience: Multidiscipline encounters*. New York: Springer.
- Shaji, A. V., & Kulkarni, S. K. (1998). Central nervous system depressant activities of melatonin in rats and mice. *Indian Journal of Experimental Biology*, 36(3), 257–263.
- Silberman, I. (2005). Religion as a meaning-system: Implications for the new millennium. *Journal of Social Issues*, 61(4), 641–664.
- Solso, R. L. (2003). *The psychology of art and the evolution of the conscious brain*. Cambridge, MA: MIT Press.
- Spilka, B. (2005). Religious practice, ritual, and prayer. In R.F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 365–377). New York: Guilford Press.
- Spilka, B., Hood, R. W., Jr., Hunsberger, B., & Gorsuch, R. (2003). *The psychology of religion. An empirical approach* (3rd ed.). New York: Guilford Press.
- Spilka, B., Shaver, P., & Kirkpatrick, L. A. (1985). A general attribution theory for the psychology of religion. *Journal for the Scientific Study of Religion*, 24, 1–20.
- Starbuck, E. D. (1899). *The psychology of religion*. London: Walter Scott.

- Sudsuang, R., Chentanez, V., & Veluvan, K. (1991). Effects of Buddhist meditation on serum cortisol and total protein levels, blood pressure, pulse rate, lung volume and reaction time. *Physiology and Behavior*, *50*, 543–548.
- Tooley, G. A., Armstrong, S. M., Norman, T. R. & Sali, A. (2000). Acute increases in night-time plasma melatonin levels following a period of meditation. *Biological Psychology*, *53*(1), 69–78.
- Tucker, D. M., Novelly, R. A., & Walker, P. J. (1987). Hyperreligiosity in temporal lobe epilepsy: Redefining the relationship. *Journal of Nerve-Related Mental Disorders*, *175*, 181–184.
- Ullman, C. (1982). Cognitive and emotional antecedents of religious conversion. *Journal of Personality and Social Psychology*, *43*, 183–192.
- Ullman, C. (1989). *The transformed self: The psychology of religious conversion*. New York: Plenum Press.
- Van Hoesen, G. W., Pandya, D., & Butters, N. (1975). Some connections of the entorhinal (area 28) and perirhinal (area 35) cortices of the rhesus monkey. II: Frontal lobe afferents. *Brain Research*, *95*, 25–38.
- Walton, K. G., Pugh, N. D., Gelderloos, P., & Macrae, P. (1995). Stress reduction and preventing hypertension: Preliminary support for a psychoneuroendocrine mechanism. *Journal of Alternative Complementary Medicine*, *1*, 263–283.
- Waxman, S. G., & Geschwind, N. (1975). The interictal behavior syndrome of temporal lobe epilepsy. *Archives of General Psychiatry*, *32*, 1580–1586.
- Zald, D. H., & Kim, S. W. (1996). Anatomy and function of the orbitofrontal cortex: Anatomy, neurocircuitry and obsessive compulsive disorder. *Journal of Neuropsychiatry and Clinical Neurosciences*, *8*(2), 125–138.
- Zimbardo, P., & Ebbesen, E. B. (1970). *Influencing attitudes and changing behavior*. Menlo Park, CA: Addison-Wesley.
- Zinnbauer, B. J., & Pargament, K. I. (2005). Religiousness and spirituality. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the Psychology of Religion and Spirituality*, (pp. 21–42). New York: Guilford Press.
- Zinnbauer, B. J., Pargament, K. I., Cole, B., Rye, M. S., Butter, E. M., Belavich, T. G., et al. (1997). Religion and spirituality: Unfuzzifying the fuzzy. *Journal for the Scientific Study of Religion*, *36*, 549–564.

RELIGION AND THE BRAIN: EVIDENCE FROM TEMPORAL LOBE EPILEPSY

Steven C. Schachter

As succinctly stated by Saver and Rabin, “All human experience is brain-based, including scientific reasoning, mathematical deduction, moral judgment, and artistic creation, as well as religious states of mind,” and that the challenge for behavioral neuroscientists “is to delineate the distinctive neural substrates of religious experience and their alteration in brain disorders” (Saver & Rabin, 1997). In this regard, investigations of the relationships between religiosity and brain function have often converged on the temporal lobes, including studies of people with epileptic seizures thought to originate in the temporal lobes, which is the subject of this review.

Epilepsy will first be briefly reviewed to provide a context for the studies of religiosity in patients with Temporal Lobe Epilepsy (TLE). Problems associated with the definition and measurement of religiosity and spirituality, as well as methodological issues in studies of religiosity, have been described elsewhere and are beyond the scope of this review (Berry, 2005; Stefanek, McDonald, & Hess, 2005).

OVERVIEW OF EPILEPSY

Epilepsy is a common neurological disorder that affects up to 4 million people in the United States (Hauser & Hesdorffer, 1990). A variety of medical conditions cause epilepsy, including congenital brain malformations, inborn errors of metabolism, brain trauma, brain tumors, stroke, intracranial infection, malformations of cerebral blood vessels, and disorders that cause

cerebral degeneration such as Alzheimer's disease. Yet up to 50 percent of patients with epilepsy have no identifiable cause.

Consequently, epilepsy is a syndrome, not a single disease, resulting from many different medical conditions, some yet to be discovered, which all have in common one or more symptoms that are clinically recognized as epileptic seizures. An epileptic seizure results when an abnormal and excessive synchronization of brain neurons causes a sudden and temporary change in behavior, the nature of which is determined by the specific networks of brain cells that discharge abnormally during the seizure. Seizures, therefore, usually lead to episodes in which consciousness is altered, or in which there are motor, sensory, autonomic, or psychic experiences with retained consciousness. While the behavioral symptoms of seizures experienced by any single patient tend to be similar and stereotyped, seizure manifestations vary from patient to patient, because the involved neuronal networks may be different from one patient to another.

Seizures are classified based on the symptoms they cause and the area(s) of the brain affected. The current seizure classification scheme divides epileptic seizures into partial seizures and generalized seizures.

Partial seizures originate in a discrete, or focal, region of the brain's outer layer, the cortex, and can be subdivided into those partial seizures that impair consciousness (called "complex partial seizures") and those that do not (called "simple partial seizures"). Both types of partial seizures, once underway, can spread rapidly via neuronal networks to other cortical regions, resulting in further behavioral alterations, including a convulsion (also called a "secondarily generalized tonic-clonic seizure").

Simple Partial Seizures

The symptoms of simple partial seizures depend on where the abnormally synchronized electrical discharges occur in the brain and at what point in this process the symptoms enter consciousness. For example, simple partial seizures affecting the part of the brain that controls muscle movements may cause rhythmic movements of the face, arm, or leg. Likewise, simple partial seizures affecting cortical regions that bring sensations into consciousness or those regions responsible for emotions and memory may produce symptoms such as olfactory, visual, or auditory hallucinations; feelings of *déjà vu* or *jamais vu*; and fear, panic, or euphoria.

Because, by definition, simple partial seizures do not affect consciousness, patients remember the symptoms caused by simple partial seizures. Since one or more discrete regions of cortex are involved in all conscious experiences that can occur under normal, everyday conditions or in altered states in which someone is nonetheless still conscious, and because seizures can arise from virtually any cortical region in any given patient, then virtually any

conscious experience can also occur as the primary symptom of a simple partial seizure in some patient with epilepsy. Hence, it would not be unexpected that brief spiritual or religious experiences could occur during simple partial seizures, if one assumes that such feelings have fixed cortical representations. Accordingly, simple partial seizures that result in transient religious experiences are of particular interest. Called “ecstatic auras,” and described by Fyodor Dostoevsky in *The Idiot*, possibly based on his own experiences (Hughes, 2005), these manifestations of simple partial seizures are described, albeit rarely, in case reports. For example, Cirignotta et al. evaluated a 30-year-old man with a 17-year history of episodes of “psychomotor arrest, slight lapse of consciousness, and above all, an ineffable sensation of ‘joy’” (Cirignotta, Todesco, & Lugaesi, 1980). The joy he felt was “so intense that he cannot find its match in reality . . . His mind, his whole being is pervaded by a sense of total bliss.” At the conclusion of a 24-hour electroencephalographic (EEG) recording, the patient had one of his typical episodes, and the EEG showed typical changes of a partial seizure over the right temporal lobe region.

Another patient, reported by Naito and Matsui, was a 62-year-old woman with no prior psychiatric history, but who was described as pious and possessing “a strong faith in the god of a new religion in Japan” (Naito & Matsui, 1988). At the age of 54, she suffered a head injury associated with unconsciousness and five years later had the first of several ecstatic episodes, for which she was occasionally, but not always, amnesic. For example, she would suddenly cry out, “I saw my god! I saw my god!” or “A halo appeared around god. Thank my god! Oh! Thank my god!” Another type of episode occurred once while she watched the rising sun, which she described as follows: “Triple haloes appeared around the sun. Suddenly the sunlight became intense. I experienced a revelation of god and all creation glittering under the sun. The sun became bigger and engulfed me. My mind, my whole being was pervaded by a feeling of delight.” An EEG, done in between these experiences, showed an abnormality arising from the left temporal lobe region during sleep, and she was diagnosed with and treated for TLE, after which the ecstatic episodes apparently stopped.

Complex Partial Seizures

Complex partial seizures are the most common seizure type in adults and the most difficult of all the seizure types to fully control with treatment. The hallmark of complex partial seizures is loss of awareness or consciousness, even though the individual appears to be awake. There may be a warning, called an “aura,” immediately preceding loss or reduction of awareness/consciousness, which may be the only aspect of the seizure that patients later remember. The warning is actually a simple partial seizure. Typical auras are

a rising sensation in the abdomen or chest, or emotional symptoms such as fear or panic, but auras may consist of complicated delusions, hallucinations, or the perception of smells or tastes.

Complex partial seizures typically last less than three minutes. During that time, patients may appear awake, but lose contact with their environment and do not respond normally to instructions or questions. Thus patients often say that they “black out.” During this part of the seizure, they usually stare and either remain motionless or display repetitive semi-purposeful behaviors, called “automatisms,” which may include facial grimacing, chewing, lip smacking, snapping fingers, gesturing, repeating words or phrases, walking, running, or even undressing. Patients do not recall these behaviors. After complex partial seizures, patients are often sleepy and confused and complain of headaches. These symptoms, called the “postictal state,” can last minutes to hours and may also include a disturbance of language or psychotic ideation, as described below.

The most common part of the brain giving rise to complex partial seizures is the mesial (inner) aspect of the temporal lobe, known also as part of the limbic lobe, including the amygdala and the hippocampus. This is especially true of patients whose seizures are not fully controlled by medications. Such patients, who are said to have TLE, usually have their first seizure before puberty, and often have a history of convulsive seizures in early childhood with high fevers.

Generalized seizures, by contrast, involve widespread regions of cortex and subcortical networks on both sides of the brain at the outset. The most familiar subtype of generalized seizures is the tonic-clonic seizure (sometimes called “grand mal,” or convulsion), which is often preceded by a cry, followed by sudden falling to the ground and convulsive movements, sometimes with tongue or mouth biting and loss of bladder control.

Diagnostic Tests

The two most important diagnostic tests for epilepsy are the electroencephalogram (EEG; also called a brainwave test) and neuroimaging studies. EEGs record brain electrical activity and are generally performed when the patient is not experiencing seizure-related symptoms (interictal); even so, patients with epilepsy often, but not always, have characteristic EEG abnormalities, especially during sleep. EEGs that are obtained during seizures (ictal recordings) are helpful to confirm that behaviors suspected of being seizures actually are caused by epileptic seizures; that is, ictal recordings offer the best possible proof that sudden onset, transient behaviors are seizures. The primary exception to this principle is that simple partial seizures may show no specific change in simultaneous EEG recordings. Recent technological advances have made it possible to record brainwaves over several

days, increasing the likelihood of recording the EEG during a seizure in patients with frequent seizures. Such testing is required to determine the site of cortical onset of seizures for patients undergoing evaluation for brain surgery and would constitute the best available evidence that a particular behavior was directly caused by a seizure.

Neuroimaging studies, such as magnetic resonance imaging (MRI) and computed tomography (CT), are performed to look for structural brain abnormalities, especially in patients with partial seizures. MRIs in children may reveal congenital abnormalities, whereas scans of young adults presenting with partial seizures may show mesial temporal volume loss or sclerosis (a common cause of TLE), changes associated with previous head trauma, congenital abnormalities, brain tumors, and abnormal blood vessels. In mid-life and beyond, scans may reveal strokes, tumors, and cerebral degeneration.

Functional neuroimaging studies can identify discrete areas of abnormal cortical functioning, even in patients with normal CT or MRI scans. Two common tests are single photon emission computerized tomography (SPECT) and positron emission tomography (PET), which can demonstrate characteristic discrete cortical changes in physiology during and between seizures. Functional imaging studies are generally reserved for patients undergoing evaluation for epilepsy surgery but like ictal EEG recordings can provide concrete evidence of alterations in brain function in association with specific seizure-related behaviors.

Treatment

Antiepileptic drugs (AEDs) are the mainstay of epilepsy therapy and are selected based on the patient's seizure type (generalized or partial), age, gender, and concomitant medical/psychiatric conditions as well as other factors. The primary goal of treatment is to completely suppress seizures without causing troublesome side effects. Nearly all AEDs have potential side effects, including headache, dizziness, drowsiness, ataxia, double vision, slurred speech, and confusion. They can also affect cognition and behavior. AEDs are generally taken by patients for years, especially when epilepsy begins in puberty or later.

Initial treatment prevents further seizures without side effects in up to 70 percent of patients. The prognosis for complete seizure control in the other 30 percent of patients is less favorable, even with the introduction of many new AEDs in the past 15 years. This is particularly true for patients with seizures that originate in the mesial temporal lobes. These patients often require numerous trials of AEDs, either alone or in combination, and they are often evaluated to determine if removing a portion of brain tissue would reduce their seizures without producing permanent neurological or

behavioral dysfunction. Nearly four in five such patients with TLE who are candidates for surgery may become seizure-free by removal of the anterior portion of the temporal lobe.

Associated Mood Disorders

Nearly one in three patients with epilepsy report significant concern about their mood, and patients with TLE are particularly likely to experience concomitant mood disorders. The three most common associated psychiatric disorders in this population are depression, anxiety, and psychosis.

Depression occurs in 10 percent to 20 percent of patients with controlled seizures and up to 60 percent of patients whose seizures do not respond to treatment (Mendez, Cummings, & Benson, 1986; O'Donoghue, Goodridge, Redhead, Sander, & Duncan, 1999). Depression in patients with epilepsy is generally a long-lasting, waxing and waning disorder, usually associated with variable levels of irritability and emotionality. Some patients experience depression during a simple partial seizure (ictal depression) or during the postictal state. The suicide rate in depressed patients with epilepsy is up to 10 times higher than in the general population and as much as 25 times higher in patients with complex partial seizures of temporal lobe origin (Harden & Goldstein, 2002).

Depression may arise from brain dysfunction, as well as a response to the social and vocational disabilities associated with having epilepsy (Gilliam & Kanner, 2002). Interestingly, depression may also be a risk factor for the development of epilepsy (Kanner & Barry, 2003).

Anxiety is nearly as common as depression in patients with epilepsy and, like depression, markedly compromises the quality of life and psychosocial functioning. Possible risk factors and neurobiological mechanisms have been reviewed elsewhere (Beyenburg, Mitchell, Schmidt, Elger, & Reuber, 2005). Anxiety occurring as a symptom of simple partial seizures is often mistaken for a panic disorder. Anxiety most commonly occurs between seizures and may be disabling, even in patients with infrequent or well-controlled seizures, such as patients who become seizure free following brain surgery (Wilson, Bladin, & Saling, 2004).

The incidence of psychosis varies from about 3 percent in patients with generalized epilepsy to 14 percent in patients with TLE, and from 0.6 percent to 7 percent of patients with epilepsy in the community to 19 percent to 27 percent of epilepsy patients requiring hospitalization.

Psychotic symptoms can occur as simple partial seizures, manifesting as hallucinations or delusions. Like other seizure-related symptoms, they are usually transient. Psychosis may also occur in some patients during the postictal period; generally, this begins years after the onset of epilepsy. Patients at particularly high risk for postictal psychosis are those who have seizures

that begin independently from both temporal lobes (bilateral seizure foci), or bilateral mesial temporal or limbic lobe lesions, or clusters of complex partial seizures. The typical pattern in such patients is a cluster of complex partial seizures of mesial temporal lobe origin, followed by affective symptoms together with grandiose and religious delusions, as well as simple auditory hallucinations. Psychosis may also occur between seizures (interictally), characterized as delusions and hallucinations with full alertness and ability to concentrate, though disorganized behavior and thought disorders may also occur. Religious ideation occurring in the context of delusions and hallucinations as the manifestations of an interictal psychosis is well described.

Psychosocial Aspects of Epilepsy

There are very few if any aspects of everyday living that are not affected by having a diagnosis of epilepsy. Fear of having a seizure is common among people with epilepsy and is “the worst thing about having epilepsy” according to nearly half of a sample of community-based people with epilepsy responding to a survey (Fisher et al., 2000a, 2000b). Specific fears include fear of dying from a seizure, fear that others would witness a seizure, fear of embarrassment in public, fear of losing employment, and fear of being involved in an automobile accident. Seizure worry can impact quality of life as profoundly as depression (Loring, Meador, & Lee, 2004).

Because seizures by their nature are unpredictable events, patients with epilepsy often struggle with regaining control over their lives. Au et al. describe self-mastery, which is generally measured by locus of control and self-efficacy, as the belief that a patient can control the course of his or her life despite having epilepsy (Au et al., 2002). They hypothesized that increasing coping skills of patients with epilepsy would result in better self-management and that psychosocial interventions that increase self-efficacy and social support would enhance quality of life. Consistent with this hypothesis, learning coping skills and stress management techniques can be beneficial (Gramstad, Iversen, & Engelsen, 2001; Sabaz et al., 2003), whereas believing that one’s health condition was significantly a matter of chance is detrimental to quality of life (Au et al., 2002). The roles of religion or spirituality in improving self-mastery, reducing fear and uncertainty, and coping with stress for patients with epilepsy have not been systematically explored as in other disorders (Harrison et al., 2005; Koenig, McCullough, & Larsson, 2001; Stefanek, McDonald, & Hess, 2005).

EPILEPSY AND RELIGIOSITY

Epilepsy and religion have been intertwined for centuries, despite the attempts of ancient Greek physicians to explain epilepsy—then known

as “The Sacred Disease”—as a natural disorder, no more divine than any other disease (Hippocrates, 1846; Riggs & Riggs, 2005). Indeed, seizures, and in particular generalized tonic-clonic seizures, have been viewed in many cultures from antiquity to the present day as resulting from supernatural influences, whether divine, demonic or both (Carrazana et al., 1999; Glaser, 1978; Ismail, Wright, Rhodes, & Small, 2005; Jilek-Aall, 1999; Kottek, 1988; Murphy, 1959). Religious figures, consequently, have often been called on to heal people with epilepsy. As recounted in the New Testament gospels of Matthew (17:14–20), Mark (9:14–29), and Luke (9:37–43), who was a physician, Jesus cast out the evil spirit from a boy with epilepsy who had just had a seizure, thereby curing him (DeToledo & Lowe, 2003).

Based on the recognition that partial seizures can cause a variety of symptoms, and an understanding of the relationship between epilepsy and psychosis, some modern scholars have suggested that temporal lobe seizures, or a related postictal or interictal psychosis, were the possible cause of prophetic visions and spiritually significant life-changing events of historical figures such as Muhammad (Freemon, 1976), Emanuel Swedenborg (Bradford, 1999), St. Birgitta of Vadstena (Landtblom, 2004), Joan of Arc (Foote-Smith & Bayne, 1991), Teresa de Ahumada (Garcia, 2003) and the apostle Paul (Saul of Tarsus) (Landsborough, 1987). Much controversy surrounds these assertions (Brorson & Brewer, 1988; Freemon, 1976; Johnson, 1994), in large part because of the hearsay nature of the facts and the lack of confirmatory medical and neurophysiological evidence.

In the 1800s, physicians and psychiatrists noted increased expressions of religiosity in patients with epilepsy who were confined to asylums (Devinsky, 2003), and, according to modern authors, this religiosity was interpreted as a “craving for sympathy by the desperate, helpless, socially isolated, intellectually deteriorating epileptic” (Devinsky, 2003) or as the result of “disability, social isolation and . . . [an] enhanced need for the consolation of religion” (Dewhurst & Beard, 1970).

In the 1970s, several landmark reports by Dewhurst and Beard (Dewhurst & Beard, 1970), Waxman and Geschwind (Waxman & Geschwind, 1975), Bear and Fedio (Bear & Fedio, 1977), and Geschwind (Geschwind, 1979) brought renewed attention to religiosity experienced during seizures or in association with a postictal or interictal psychosis and advanced the assertion that heightened interest in religious matters could develop as a personality trait, that is, as part of a non-psychotic interictal behavioral syndrome in patients with TLE.

A publication by Beard described 26 epileptic patients (out of 69 studied) who showed symptoms of religiosity (Beard, 1963). Dewhurst and Beard subsequently presented the detailed case histories of six patients from the same cohort, all with a diagnosis of TLE, who underwent sudden religious conversions (Dewhurst & Beard, 1970). In the opinion of Devinsky (Devinsky,

2003), this “classic paper provided some of the early support for the modern concept of the temporal lobe as the seat of religious cognitive–emotional experiences.” Four of the six patients had a strong religious upbringing. The initial religious conversion was temporally related to preceding seizures in three patients; a second religious conversion in a fourth patient followed a cluster of seizures. In all patients, the manifestations of the conversion persisted indefinitely, even though seizure frequency or severity improved in most of the cases. Religious ideation was often accompanied by visual, auditory, and olfactory hallucinations, as well as paranoia. The following case illustrates these points:

When he was a boy, the patient was taken to church by his father, who was very concerned that his son should live a religious life. This was the more so when the father was converted from Methodism to Christian Science. At the age of 9 the boy decided to become a minister, and at that time he used to get up at 6 a.m. to sing hymns. However, his interest in religion ebbed as the years passed and had become minimal by the time he was 21.

A fortnight after [his first minor seizure, which was an epigastric flush], while walking alone, he suddenly felt God’s reality and his own insignificance. As a result of this revelation, he recovered his faith and determined to live in a Christian manner. However, this conversion experience gradually lost its impact and he once again ceased concerning himself with religion. Then [12 years later] he had two of his rare grand mal attacks in one day. Within twenty-four hours of the second seizure he had another conversion experience as part of a florid religious psychosis that lasted a week—he had a sudden dream-like feeling, saw a flash of light, and exclaimed “I have seen the light.” He suddenly knew that God was behind the sun and that this knowledge meant power; he could have power from God if he would only ask for it. He had a series of visions in which he felt that his past life was being judged; a book appeared before him, a world atlas with a torn page; a pendulum was swinging and when it stopped, the world would end.

[Five months after a left temporal lobectomy], the patient was still so involved in his psychotic experience that he had no interest in other topics. He completely believed in the validity of everything he had seen and heard during the acute phase . . . He considered that he had received a message from God to mend his ways and help others, and the fact the he had been singled out in this way meant that he was God’s chosen instrument. Twelve months after operation . . . his religious beliefs remained strong and he was attending church regularly. The patient had since remained fit-free.

Thus the cases of Dewhurst and Beard are consistent with religiosity associated with postictal and interictal psychoses in patients with TLE. This assessment, of course, is speculative and limited by the absence of confirmatory neurophysiological testing.

Similarly, Waxman and Geschwind reported three patients with TLE who had religious conversions, as well as changes in sexual behavior and tendencies toward compulsive drawing and writing, which was often “concerned with moral, ethical, or religious issues” (Waxman & Geschwind, 1975). The authors postulated that this cluster of behavioral traits, which they called “interictal personality changes,” constituted a syndrome associated with TLE, which “may provide a useful model for the major psychoses because of its association with dysfunction at specific loci in the central nervous system,” specifically “temporal lobe foci.”

Whereas Waxman and Geschwind initially viewed interictal personality changes as a useful model for understanding psychosis, Geschwind subsequently differentiated the interictal behavioral syndrome from the psychoses associated with TLE described earlier, stating that only a “small number of patients with this syndrome are psychotic, although even in these cases one usually observes the same fundamental personality pattern” (Geschwind, 1979). Thus, he suggested that heightened interest in religious matters could occur interictally in the absence of psychosis in patients with TLE, often in association with “hypergraphia (a tendency to highly detailed writing often of a religious or philosophical nature), hyposexuality (diminished sex drive sometimes associated with changes in sexual taste), and irritability of varying degree.” He posed the question: “If this syndrome is so common, why has it not been observed by others more frequently?” and went on to answer his own question: “I have repeatedly had the experience of demonstrating these personality features in patients whose records made no mention of personality change or indeed denied its presence. Most physicians do not enquire about a tendency to write poetry or keep a diary, or about religious conversions. Studies which do not look for this syndrome of course cannot find it.”

ADDITIONAL PROSPECTIVE STUDIES

The papers just summarized and other contemporaneous observations set forth the hypotheses that religious conversions and ecstatic auras originated in the temporal lobes and that longer lasting changes in religious behavior could be influenced by more chronic pathological and functional disturbances of the same structures.

Thus, the stage was set for further studies to support or refute these hypotheses. These additional case reports and prospective studies, whether in healthy persons or in groups of patients diagnosed with TLE, either typically took a cognitive approach to defining religiosity, which, as described by Caird, “attempts to scale responses to questionnaires about attitudes or beliefs,” or a behavioral approach, which “assesses the frequency of practices such as church attendance or private prayer” (Caird, 1987).

Studies in Non-epileptic Persons

Persinger has published extensively on the correlations between religiosity and a history of symptoms reminiscent of those experienced by persons with TLE during simple partial seizures. For example, nearly 20 years ago, he administered a self-report inventory that included 140 temporal lobe symptoms to healthy college students and found that subjects who reported religious experiences, whether or not they regularly attended church, reported significantly more temporal lobe symptoms than subjects who did not report religious experiences. He concluded that religious experiences are “normal consequences of temporal-lobe function” (Persinger, 1984). Several years later, Persinger extended these results in a study of 868 college students enrolled in first-year psychology courses over a 10-year period (Persinger, 1991). He found a relationship between a religious experience as a preadolescent and “temporal lobe” symptoms as adults, such as feeling the presence of a Cosmic Consciousness, episodes in which their souls left their bodies, experiencing visions, depersonalization, intense smells, widened affect, and feeling the presence of another Being late at night. To the author, these results suggested that “the earlier the onset of limbic lability, the more subjective experiences are infused with affect and meaningfulness,” reflecting temporal lobe activity. This concept is similar to the “sensory-limbic hyperconnection” explanation of Bear and Fedio for the interictal behavior syndrome (see below). In a similar population, Persinger found that self-reported complex partial seizure-like symptoms correlated with paranormal and religious beliefs (Persinger, 1993), which he postulated were related to anatomically different temporo-limbic circuits.

In a similar study in nonepileptic subjects, MacDonald and Holland correlated self-reported complex partial seizure-like symptoms and a five-dimensional model of spirituality (Expressions of Spirituality Inventory; ESI) in 262 healthy undergraduates (MacDonald & Holland, 2002). Scores from the ESI subscales Paranormal Beliefs and Experiential/Phenomenological Dimension positively correlated with these symptoms, whereas neither ESI Cognitive Orientation Toward Spirituality nor ESI Religiousness predicted complex partial seizure-like symptoms in the regression analysis. The correlations persisted when age, sex, and reported religious involvement were controlled.

Studies in Patients with Temporal Lobe Epilepsy

Bear and Fedio (Bear & Fedio, 1977) administered questionnaires to patients with TLE who had unilateral temporal EEG abnormalities, as well as to healthy subjects, patients with neuromuscular disorders, and observers.

They found that a high percentage of the patients with TLE had features of the interictal behavior syndrome and, further, that there were differences in the behavioral profile between patients with TLE according to whether the EEG abnormalities occurred on the left or right. Thus, religiosity was associated with TLE lateralized to the left side. To explain their observations, Bear and Fedio postulated that “sensory-limbic hyperconnection,” resulting from TLE, accounted for the characteristic deepening of emotions in patients with TLE.

By contrast, Tucker and colleagues evaluated 76 patients with TLE of unilateral onset for hyper-religiosity, as measured by the Wiggins Religiosity Scale (Tucker, Novelly, & Walker, 1987; Wiggins, 1969). Two control groups consisted of patients with primary generalized seizures and patients with nonepileptic seizures. Overall religiosity scores in each cohort were consistent with the normative sample, and there were no significant group differences in religiosity between the left versus the right TLE groups, nor between patients with TLE and either control group, therefore refuting the notion that hyper-religiosity was an interictal behavioral trait in patients with TLE. As the authors noted, though, a different tool was used in their study to measure religiosity than the one employed by Bear and Fedio, and, perhaps more significantly, that one-third of the patients studied by Bear and Fedio had significant psychiatric histories, often requiring hospitalization, unlike the sample of Tucker et al. The implication here is that the population studied by Bear and Fedio may have been enriched with patients with psychosis and that therefore their finding of increased religiosity was possibly directly related to psychosis and only indirectly related to epilepsy.

However, Roberts and Guberman administered a questionnaire to 57 consecutive patients with epilepsy seen at a general hospital (Roberts & Guberman, 1989). The instrument consisted of 45 questions, including 23 items regarding current interest in religion, three items pertaining to an event such as a religious conversion (“My religious beliefs have undergone major change. There was a period in my life when I suddenly found religion. I have had some very unusual religious experiences.”) and three questions regarding paranormal interests, defined in this study as “abnormal interests.” The results showed that nearly 60 percent of the subjects had “abnormal interests,” and 51 percent indicated a past event such as a religious conversion. There was a significant association between “abnormal” interests, psychopathology, and religious conversion. The significance of these results are somewhat unclear because seizure types were not provided, and there was no control group.

Ogata and Miyakawa interviewed 234 Japanese patients with various forms of epilepsy, including 137 patients with TLE (Ogata & Miyakawa, 1998). Only three patients acknowledged religious experiences during the

interviews. Each of these patients had TLE, comprising 2.2 percent of all TLE patients in this series, and each experienced hyper-religiosity interictally and as part of a postictal psychosis, representing 27 percent of patients with postictal psychosis in the overall sample. One patient also had simple partial seizures with symptoms suggestive of a religious experience: "auditory hallucinations of the voice of deities telling her to 'kneel and pray before the gods and Buddha.'" Interestingly, none of the religious experiences of these patients was typical for the Japanese culture.

In a particularly intriguing study, Wuerfel and colleagues evaluated 33 patients with refractory partial-onset epilepsy and correlated amygdala and hippocampal volumes on quantitative MRI scans with scores on the religiosity, writing, and sexuality sub-scales of the Neurobehavioral Inventory (Blumer, 1995), an expanded and revised version of the Bear & Fedio scale (Bear, 1979; Wuerfel et al., 2004). They found that hyper-religiosity significantly correlated with reduced right hippocampal volumes. As the authors point out, some patients had frontal lobe epilepsy whereas others had TLE, and yet hyper-religiosity was found in patients with both groups, suggesting that some of the subjects with reduced right hippocampal volume had frontal lobe onset seizures.

CONCLUSION AND DIRECTIONS FOR FURTHER RESEARCH

Do the experiences of patients with TLE suggest that the temporal lobes are responsible for religious experiences and associated behavior? The medical evidence needed to answer this question affirmatively is surprisingly scanty given the sophistication of modern clinical epilepsy research, and, therefore, caution should be exercised in reaching conclusions that are not fully warranted. Descriptions and investigations of ecstatic auras are extremely rare in the literature, and there are no available EEG studies of religious conversions. Further, to the author's knowledge, there are no functional imaging studies (such as PET or SPECT scans) of these transient phenomena. Clearly, additional neurophysiological and neuroimaging studies are needed.

It appears to be well established that hyper-religiosity can occur in association with psychosis in patients with epilepsy. But what this means with respect to the temporal lobes is unclear. It would be of interest to determine whether hyper-religiosity is more often seen in patients with TLE and psychosis than in patients with nontemporal lobe onset seizures and psychosis and in nonepileptic patients with psychosis.

Yet the religious experiences described above in association with simple partial seizures or an epilepsy-related psychosis are remarkably similar, suggesting some common underlying neuroanatomical basis and include many

of the features of mystical experiences as summarized by Linn (Linn, 1967) and quoted by Runions (Runions, 1979):

1. *Inevitability*. The subject often insists that his experience is inexpressible and indescribable, that it is impossible to convey what it is like to one who has never experienced it.
2. *Noesis*. The subject has the feeling that the mystery of the universe has been plumbed, than an immense illumination or revelation has occurred . . . It seems to consist of layer upon layer of truth that, as it unfolds, may find expression in some familiar or even common-place thought that suddenly seems pregnant with new meaning . . .
3. *Transiency*. The actual mystical state may last only a moment or it may go on for an hour or two . . . It is as unforgettable as it is highly treasured, and it colors all subsequent activity.
4. *Passivity* . . . there is an abeyance of the will, as if the subject were in the grip of a superior power . . .
5. *Unio Mystica*. There is a sense of mystic unity with an infinite power, and oceanic feeling in which opposites are reconciled, in which there are “darknesses that dazzle” and “voices of silence.” There is a quality of timelessness, in which minutes and centuries are one and in which the past and the present are one.

However, even if one assumes that ecstatic auras and religious conversions are manifestations of pathologic dysfunction in the temporal lobes of rare patients with epilepsy, it is unclear whether these findings can be generalized to other patients with TLE given the apparent rarity of these findings, or even nonepileptic individuals—both because such experiences may require pathologic activation of neuronal substrates and because functional localization in the epileptic brain is often different than in the nonepileptic brain.

Likewise, hyper-religiosity, as part of an interictal behavioral syndrome in nonpsychotic patients with epilepsy, has not been found in all studies and has not been convincingly localized within the brain. The evidence from studies in nonepileptic subjects is suggestive but not conclusive.

The study of Wuerfel, just described, suggests a structural underpinning of religiosity in the right hippocampus but raises the question of whether epilepsy per se is related or an epiphenomenon. Would nonepileptic subjects with small right hippocampi be hyper-religious?

Finally, it remains to be determined whether a change in religious practices or interests is related to other associated mood disorders or psychosocial aspects of epilepsy. For example, a cognitive model would predict that patients might look for a Higher Power when confronted with an unpredictable problem such as seizures. Qualitative studies of hyper-religious patients

with epilepsy would be helpful to explore each individual's perspectives of the determinants of their religiousness and the interrelationships of their religious beliefs and their epilepsy (Ismail, 2005 #9386).

REFERENCES

- Au, A., Li, P., Chan, J., Lui, C., Ng, P., Kwok, A., et al. (2002). Predicting the quality of life in Hong Kong Chinese adults with epilepsy. *Epilepsy and Behavior*, 3(4), 350–357.
- Bear, D. M. (1979). Temporal lobe epilepsy—A syndrome of sensory-limbic hyperconnection. *Cortex*, 15(3), 357–384.
- Bear, D. M., & Fedio, P. (1977). Quantitative analysis of interictal behavior in temporal lobe epilepsy. *Archives of Neurology*, 34(8), 454–467.
- Beard, A. W. (1963). The schizophrenia-like psychoses of epilepsy. II: Physical aspects. *The British Journal of Psychiatry: The Journal of Mental Science*, 109, 113–129.
- Berry, D. (2005). Methodological pitfalls in the study of religiosity and spirituality. *Western Journal of Nursing Research*, 27(5), 628–647.
- Beyenburg, S., Mitchell, A. J., Schmidt, D., Elger, C. E., & Reuber, M. (2005). Anxiety in patients with epilepsy: Systematic review and suggestions for clinical management. *Epilepsy and Behavior*, 7, 161–171.
- Blumer, D. (1995). The neurobehavioral inventory: Personality disorders in epilepsy. In J. J. Ratey (Ed.), *Neuropsychiatry of personality disorders* (pp. 230–263). Boston: Blackwell Science.
- Bradford, D. T. (1999). Neuropsychology of Swedenborg's visions. *Perceptual and Motor Skills*, 88(2), 377–383.
- Brorson, J. R., & Brewer, K. (1988). St. Paul and TLE. *Journal of Neurology, Neurosurgery, and Psychiatry*, 51, 886–887.
- Caird, D. (1987). Religiosity and personality: Are mystics introverted, neurotic, or psychotic? *The British Journal of Social Psychology*, 26, 345–346.
- Carrazana, E., DeToledo, J., Tatum, W., Rivas-Vasquez, R., Rey, G., & Wheeler, S. (1999). Epilepsy and religious experiences: Voodoo possession. *Epilepsia*, 40(2), 239–241.
- Cirignotta, F., Todesco, C. V., & Lugaresi, E. (1980). Temporal lobe epilepsy with ecstatic seizures (so-called Dostoevsky epilepsy). *Epilepsia*, 21, 705–710.
- DeToledo, J. C., & Lowe, M. R. (2003). Epilepsy, demonic possessions, and fasting: Another look at translations of Mark 9:16. *Epilepsy and Behavior*, 4, 338–339.
- Devinsky, O. (2003). Religious experiences and epilepsy. *Epilepsy and Behavior*, 4, 76–77.
- Dewhurst, K., & Beard, A. W. (1970). Sudden religious conversions in temporal lobe epilepsy. *The British Journal of Psychiatry: The Journal of Mental Science*, 117, 497–507.
- Fisher, R. S., Vickrey, B. G., Gibson, P., Hermann, B., Penovich, P., Scherer, A., et al. (2000a). The impact of epilepsy from the patient's perspective I. Descriptions and subjective perceptions. *Epilepsy Research*, 41(1), 39–51.
- Fisher, R. S., Vickrey, B. G., Gibson, P., Hermann, B., Penovich, P., Scherer, A., et al. (2000b). The impact of epilepsy from the patient's perspective II: views about therapy and health care. *Epilepsy Research*, 41(1), 53–61.

- Foote-Smith, E., & Bayne, L. (1991). Joan of Arc. *Epilepsia*, 32(6), 810–815.
- Freemon, F. R. (1976). A differential diagnosis of the inspirational spells of Muhammad the Prophet of Islam. *Epilepsia*, 17, 423–427.
- Garcia, A. E. (2003). La epilepsia extatica de Teresa de Jesus [The ecstatic epilepsy of Teresa of Jesus]. *Revue Neurologique*, 37(9), 879–887.
- Geschwind, N. (1979). Behavioural changes in temporal lobe epilepsy. *Psychological Medicine*, 9, 217–219.
- Gilliam, F., & Kanner, A. M. (2002). Treatment of depressive disorders in epilepsy patients. *Epilepsy and Behavior*, 3(5 Supplement 1), 2–9.
- Glaser, G. H. (1978). Epilepsy, hysteria, and “possession.” *The Journal of Nervous and Mental Disease*, 166(4), 268–274.
- Gramstad, A., Iversen, E., & Engelsen, B. A. (2001). The impact of affectivity dispositions, self-efficacy and locus of control on psychosocial adjustment in patients with epilepsy. *Epilepsy Research*, 46(1), 53–61.
- Harden, C. L., & Goldstein, M. A. (2002). Mood disorders in patients with epilepsy: Epidemiology and management. *CNS Drugs*, 16(5), 291–302.
- Harrison, M. O., Edwards, C. L., Koenig, H. G., Bosworth, H. B., Decastro, L., & Wood, M. (2005). Religiosity/spirituality and pain in patients with sickle cell disease. *The Journal of Nervous and Mental Disease*, 193, 250–257.
- Hauser, W. A., & Hesdorffer, D. C. (1990). *Epilepsy: Frequency, causes and consequences*. New York: Demos.
- Hippocrates. (1846). The sacred disease. In *The genuine works of Hippocrates* (pp. 843–858). London: Sydenham Society.
- Hughes, J. R. (2005). The idiosyncratic aspects of the epilepsy of Fyodor Dostoevsky. *Epilepsy and Behavior*, 7(3), 531–538.
- Ismail, H., Wright, J., Rhodes, P., & Small, N. (2005). Religious beliefs about causes and treatment of epilepsy. *The British Journal of General Practice: The Journal of Royal College of General Practitioners*, 55, 26–31.
- Jilek-Aall, L. (1999). Morbus sacer in Africa: Some religious aspects of epilepsy in traditional cultures. *Epilepsia*, 40(3), 382–386.
- Johnson, J. (1994). Henry Maudsley on Swedenborg’s messianic psychosis. *The British Journal of Psychiatry: The Journal of Mental Science*, 165, 690–691.
- Kanner, A. M., & Barry, J. J. (2003). The impact of mood disorders in neurological diseases: Should neurologists be concerned? *Epilepsy and Behavior*, 4(Supplement 3), 3–13.
- Koenig, H. G., McCullough, M. E., & Larsson, D. B. (2001). *Handbook of religion and health*. Oxford: Oxford University Press.
- Kottek, S. S. (1988). From the history of medicine: Epilepsy in ancient Jewish sources. *The Israel Journal of Psychiatry and Related Sciences*, 25(1), 3–11.
- Landsborough, D. (1987). St. Paul and temporal lobe epilepsy. *Journal of Neurology, Neurosurgery, and Psychiatry*, 50, 659–664.
- Landtblom, A. (2004). Did St. Birgitta suffer from epilepsy? A neuropathography. *Seizure*, 13, 161–167.
- Linn, L. (1967). Clinical manifestations of psychiatric disorders. In A. M. Freedman & H. I. Kaplan (Eds.), *Comprehensive textbook of psychiatry* (pp. 572). Baltimore: Williams and Wilkins.

- Loring, D. W., Meador, K. J., & Lee, G. P. (2004). Determinants of quality of life in epilepsy. *Epilepsy and Behavior*, *5*(6), 976–980.
- MacDonald, D. A., & Holland, D. (2002). Spirituality and complex partial epileptic signs. *Psychological Reports*, *91*, 785–792.
- Mendez, M. F., Cummings, J. L., & Benson, D. F. (1986). Depression in epilepsy. Significance and phenomenology. *Archives of Neurology*, *43*(8), 766–770.
- Murphy, E. L. (1959). The saints of epilepsy. *Medical History*, *3*, 303–311.
- Naito, H., & Matsui, N. (1988). Temporal lobe epilepsy with ictal ecstatic state and interictal behavior of hypergraphia. *The Journal of Nervous and Mental Disease*, *176*(2), 123–124.
- O'Donoghue, M. F., Goodridge, D. M., Redhead, K., Sander, J. W., & Duncan, J. S. (1999). Assessing the psychosocial consequences of epilepsy: A community-based study. *The British Journal of General Practice: The Journal of Royal College of General Practitioners*, *49*(440), 211–214.
- Ogata, A., & Miyakawa, T. (1998). Religious experiences in epileptic patients with a focus on ictus-related episodes. *Psychiatry and Clinical Neurosciences*, *52*, 321–325.
- Persinger, M. A. (1984). People who report religious experiences may also display enhanced temporal lobe signs. *Perceptual and Motor Skills*, *58*, 963–975.
- Persinger, M. A. (1991). Preadolescent religious experience enhances temporal lobe signs in normal young adults. *Perceptual and Motor Skills*, *72*, 453–454.
- Persinger, M. A. (1993). Paranormal and religious beliefs may be mediated differentially by subcortical and cortical phenomenological processes of the temporal (limbic) lobes. *Perceptual and Motor Skills*, *76*, 247–251.
- Riggs, A. J., & Riggs, J. E. (2005). Epilepsy's role in the historical differentiation of religion, magic, and science. *Epilepsia*, *46*(3), 452–453.
- Roberts, J. K. A., & Guberman, A. (1989). Religion and epilepsy. *Psychiatric Journal of the University of Ottawa: Revue de psychiatrie de l'Université d'Ottawa*, *14*(1), 282–286.
- Runions, J. E. (1979). The mystic experience. A psychic reflection. *Canadian Journal of Psychiatry*, *24*, 147–151.
- Sabaz, M., Lawson, J. A., Cairns, D. R., Duchowny, M. S., Resnick, T. J., Dean, P. M., et al. (2003). Validation of the Quality of Life in Childhood Epilepsy Questionnaire in American epilepsy patients. *Epilepsy and Behavior*, *4*(6), 680–691.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *The Journal of Neuropsychiatry and Clinical Neurosciences*, *9*, 498–510.
- Stefanek, M., McDonald, P. G., & Hess, S. A. (2005). Religion, spirituality and cancer: Current status and methodological challenges. *Psycho-Oncology*, *14*, 450–463.
- Tucker, D. M., Novelty, R. A., & Walker, P. J. (1987). Hyperreligiosity in temporal lobe epilepsy: Redefining the relationship. *The Journal of Nervous and Mental Disease*, *175*(3), 181–184.
- Waxman, S. G., & Geschwind, N. (1975). The interictal behavior syndrome of temporal lobe epilepsy. *Archives of General Psychiatry*, *32*(12), 1580–1586.
- Wiggins, J. S. (1969). Content dimensions in the MMPI. In J. N. Butcher (Ed.), *MMPI: Research developments and clinical applications*. New York: McGraw-Hill.

- Wilson, S. J., Bladin, P. F., & Saling, M. M. (2004). Paradoxical results in the cure of chronic illness: The “burden of normality” as exemplified following seizure surgery. *Epilepsy and Behavior*, *5*(1), 13–21.
- Wuerfel, J., Krishnamoorthy, E. S., Brown, R. C., Lemieux, L., Koepp, M., Tebartz van Elst, L., et al. (2004). Religiosity is associated with hippocampal but not amygdala volumes in patients with refractory epilepsy. *Journal of Neurology, Neurosurgery, and Psychiatry*, *75*, 640–642.

THE FRONTAL LOBES AND THE EVOLUTION OF COOPERATION AND RELIGION

Patrick McNamara

INTRODUCTION

The prefrontal cortex (PFC) constitutes approximately one-third of human cortex and is the last part of the human brain to become fully myelinated in ontogeny, with maturation occurring in late childhood/early adolescence (Huttenlocher & Dabholkar, 1997). The PFC receives projections from the mediodorsal nucleus and gives rise to primary motor cortex, as well as premotor, supplementary motor, and the dorsal and orbital sectors of the prefrontal (proper) lobes. All of these PFC areas send inhibitory efferents onto their sites of termination in other areas of the brain and spinal cord, thus suggesting a supervisory or regulative role for the PFC.

Impairment in prefrontal cortical function in humans is functionally implicated in virtually every major neuropsychiatric disorder including depression (Starkstein & Robinson, 1991), schizophrenia (Lewis, Crus, Eggen, & Erickson, 2004), obsessive-compulsive disorder (Tek & Ulug, 2001), bipolar disorder (Haznedar et al., 2005), Parkinson's disease (Starkstein & Merello, 2002), Huntington's disease (Troster & Woods, 2003), the disinhibitory impulsivity syndromes (Berlin, Rolls, & Iversen, 2005), the addictions (Winstanley, Theobald, Dalley, Cardinal, & Robbins, 2006), and several others besides (e.g., memory retrieval dysfunction and the dementias (Cummings & Mega, 2003). The frontal lobes mediate what are believed to be distinctively human mental capacities such as language generativity (Miller & Cummings, 1999), autobiographical memory retrieval (Wheeler, Stuss, & Tulving, 1997), theory of mind (Baron-Cohen, 2004) empathy (Adolphs, Baron-Cohen, & Tranel, 2002), working memory (Goldman-Rakic, 1987), executive functions (Goldberg & Bougakov, 2005), impulse control

(Berlin, Rolls, & Iverson, 2005), volition (Passingham, 1995) and possibly even the sense of self (Northoff & Bermpohl, 2004).

To the extent that religion draws on these putatively distinctly human capacities the frontal lobes likely mediate important aspects of religiosity. We will see that the neurochemistry of the frontal lobes plays a crucial role in support of religious experience.

Neurochemistry of Frontal Lobes

The frontal lobes are densely innervated by dopaminergic (DA) fibers originating in the Ventral Tegmental Area (VTA) and the Substantia Nigra (SN). The nigrostriatal system indirectly influences the frontal lobes through the basal ganglia. The mesocortical system originates in the VTA and terminates in the ventral striatum, amygdala, nucleus accumbens, and the frontal lobes. This latter mesocortical system is crucially important for understanding human behavior as its stimulation appears to be intrinsically rewarding. All drugs/substances of addiction, for example, appear to derive their addicting properties by their abilities to potently stimulate this frontal dopaminergic system. Dopamine neurons of the VTA and SN have long been associated with the reward and pleasure systems of the brain. Virtually all of the known addictions (including, cocaine, heroin, amphetamines, alcohol, food, and sex) exert their addictive actions, in part, by prolonging the influence of dopamine on target neurons (Wise, 2005). VTA DA neuron responses appear to be necessary to facilitate formation of associations between stimuli that predict reward and behavioral responses that obtain reward (Schultz et al., 1995). The orbital frontal cortex integrates the most complex level of associations of reinforcement with both stimuli and responses (Rolls, 2004). In summary, stimulation of dopaminergic terminals in the meso-limbic-frontal systems constitutes the substrate for a most potent reward/reinforcing system.

The neurochemistry of the dopaminergic systems of the frontal lobes is shaped by a number of genes and genetic polymorphisms distinct to human beings.

Genetics of PFC

Prefrontal information processing is strongly influenced, though, of course, not determined by, specific genetic factors. Swan and Carmelli (2002) studied 78 dizygotic and 80 monozygotic twin pairs using a test battery of “executive functions” linked to the frontal lobes including Digit Symbol Substitution, color-word interference (Stroop), Trail Making B, and verbal fluency. Performance on all measures was adjusted for age and education. Significant genetic influences on performance were observed on each measure (range of heritability: 34–68%). The shared executive factor had a heritability of 79 percent, which

is similar to what has been reported by others (Fan, Wu, Fossella, & Posner, 2001) and accounted for 10–56 percent of the genetic variance in performance on each of the four tests. Schoenemann, Budinger, Sarich, and Wang (2000) studied links between brain volumes and cognitive abilities in sibling pairs. The only significant effect described a genetic correlation between frontal lobe volume and performance on the Stroop test. With respect to the issue of heritability of the frontal lobe volumes, one should expect strong effects as whole brain as well as gray and white matter volumes heritabilities are, in general, substantial (Winterer & Goldman, 2003). Pearson and intra-class correlations on frontal brain volumes between monozygotic twins range from 0.6 to 0.9. Geschwind, Miller, DeCarli, and Carmelli (2002) investigated heritability of frontal lobe volumes in 72 monozygotic and 67 dizygotic twins and reported that they ranged from 0.5–0.7 (at least in the left hemisphere).

With respect to specific genes that influence PFC function, the gene that codes for the enzyme *catechol-O-methyltransferase* (COMT), which is involved in cortical dopamine catabolism, is particularly interesting. Statistically significant associations of COMT genotype variations with prefrontal cognitive function have been confirmed (Egan et al., 2001; Joobar et al., 2002; Malhotra et al., 2002). The postsynaptic COMT enzyme methylates released dopamine as part of its metabolism to homovanillic acid. Studies in rats, knockout mice, and monkeys suggest that COMT is of particular importance with respect to intrasynaptic dopamine regulation in the prefrontal cortex, where an alternative route of dopamine-removal (i.e., dopamine transporter reuptake as in the striatum) is largely nonexistent. In humans, the COMT gene contains a highly functional and common variation in its coding sequence, at position 472 (guanine-to-adenine substitution), which translates into a valine-to-methionine (Val/Met) change in the peptide sequence. This single amino acid substitution dramatically affects the temperature lability of the enzyme, such that at body temperature the met allele has one-fourth the enzyme activity of the val allele. The met allele, furthermore, appears to be a unique human mutation because it has not been found in great apes, suggesting that it may be a factor in the evolution of the human prefrontal cortex and thereby of human consciousness more generally.

Prefrontal Neurochemistry and Religiosity

There is evidence that dopaminergic systems of the PFC contribute to religiosity:

1. A polymorphism on the dopamine receptor gene, DRD4, has been found to be significantly associated with measures of spirituality and “self-transcendence” on a personality scale (Comings, Gonzales, Saucier, Johnson, & MacMurry, 2000).

2. Disorders of excessive dopaminergic functioning, such as schizophrenia and obsessive compulsive disorder, are often associated with increases in religiosity (Brewerton, 1994; Saver & Rabin, 1997; Siddle, Haddock, Tarrier, & Faragher, 2002; Tek & Uleg, 2001; White, Joseph, & Neil, 1995). Anti-psychotic agents that block dopaminergic actions at the level of the limbic system result in changes (typically diminishment) in religious behaviors and religious delusions in these patients.
3. Hallucinatory agents that purportedly enhance religious or mystical experiences may also enhance dopamine transmission. 5-HT, however, is known to exert tonic inhibitory effects on dopaminergic, particularly in the limbic system, and thus removal of the inhibitory 5-HT influence enhances DA activity resulting in religious and hallucinatory experiences (Borg, Andree, Soderstrom, & Farde, 2003; Iqbal & van Praag, 1995; Robert, Aubin-Brunet, & Darcourt, 1999).
4. Many religious behaviors and basic religious cognitive processes depend on the prefrontal lobes (see McNamara, 2002, for review), and prefrontal system functioning, in turn, is strongly influenced by dopaminergic activity (Goldman-Rakic, 1987).
5. Dopaminergic activity, particularly limbic-prefrontal activity, functions to signal “significant” or salient stimuli (Schultz, Dayan, & Montague, 1997), thus if DA activity is increased due to treatment with dopamine enhancing drugs or to other factors, incoming information will more likely be tagged as overly significant, and a greater number of experiences will be experienced as “highly significant”—a hallmark of religious experiences.
6. Changes in prefrontal function can be associated with changes in religious behaviors (Miller et al., 2001).

Religiosity has traditionally been linked to the temporal lobes (e.g., Dewhurst & Beard, 1970; Bear & Fedio, 1977; Geschwind, 1983; Persinger, 1987). While the temporal lobes undoubtedly play a role in the religious experience, McNamara (2001, 2002) and McNamara, Andresen, and Gellard (2003) have prevented several lines of experimental and clinical evidence implicating the frontal lobes in mediation of a number of religious and ritual practices. The frontal lobes, as mentioned above, are critical for inhibition of impulsive behaviors and likely mediate high level executive functions (Stuss & Benson, 1984), voluntary actions (Passingham, 1995), the sense of self (Edwards-Lee & Saul, 1999; McNamara, Durso, & Harris, 2006) and theory of mind (Brune & Brune-Cohrs, 2006) capacities as well. All of the foregoing mental capacities are fundamental to both religious practices (e.g., prayer) and to cooperative behaviors. It is therefore reasonable to consider a role of the frontal lobes in religiosity. Newberg et al. (2001), using SPECT imaging techniques, have recently documented

strong prefrontal activation during meditative states. Similarly, Azari et al. (2001) using neuroimaging techniques, reported greater dorsolateral frontal, dorsomedial frontal, and medial parietal cortex activation during religious recitation in self-described “religious” patients. A more recent study (McNamara, Durso, & Brown, 2006) has demonstrated uncommonly low levels of religiosity in patients with moderate to severe Parkinson’s disease—a disease involving loss of striatal and prefrontal dopamine. Dopamine, in fact, has also been shown to be released during meditative practices (Kjaer et al., 2002) and hence may also relate to the ability of religious practices to affect these systems.

Some of the other chapters (e.g., those by Sosis, Bulbulia, Alcorta, McNamara and Emmons, and others) in these volumes argue that religious ritual facilitates cooperation within human groups. In the rest of this chapter, I will argue that one way that religion performs this adaptive function is by tapping the neurochemistry of the prefrontal lobes to support moral, filiative, and prosocial behaviors.

Costly Signaling Theory: The Evolution of Cooperation and Religion’s Solution to the Free-rider Problem

The recent application of costly signaling theory (CST) to evolutionary models of religion provides a theoretical model and offers a plausible mechanism for understanding how religion facilitates cooperative interchanges (Sosis, 2003; Sosis & Alcorta, 2003). Costly signals are those behaviors that involve strategic costs to the individual displaying them, costs that extend beyond the baseline costs that all behavioral actions entail, and are therefore hard to fake by individuals not able to bear the relevant costs (Sosis & Alcorta, 2003). Costly signaling theorists have argued that religious behaviors are costly-to-fake signals that advertise an individual’s level of commitment to a group, and they view religion’s ability to promote cooperation as its primary adaptive function (Irons, 1996, 2001; Sosis, 2003, 2004).

For cooperation to evolve, the problem of the free rider must be overcome. A free rider is someone who takes the benefits of cooperation without paying any of the costs associated with cooperation. They are cheats and exploiters. One way to handle this problem of the free rider is to impose stringent membership conditions for participation in the cooperative group. These membership requirements can serve as hard-to-fake tests (and ultimately signals when the individual adopts them) of an individual’s willingness and ability to cooperate with others. What kinds of signals could serve such a role? CST theorists (Irons, 1996, 2001; Sosis, 2003, 2004) have pointed out that a number of religious behaviors, like restrictive diets, participation in rituals

and rites, ascetical practices, and altruistic giving might be such signals as these behaviors are both costly and hard-to-fake. It is precisely the costliness of these behaviors or traits that render them effective since individuals incapable of bearing such costs could not maintain the behavior or trait. Free riders would find it too expensive to *consistently* pay the costs of religious behavior and thus could be winnowed out over time of the cooperative group. Most people (even free riders) can sustain a restrictive diet or attendance at ritual services for a short period of time, but few free riders would be willing to engage in such costly behaviors over long periods of time. Thus, for someone who is willing to cooperate, that is, who is willing to pay the costs involved in cooperation, they will need a way to inhibit over a long period of time the kinds of free-rider behavioral strategies that would exclude them from participation in the cooperative group. The frontal lobes provide such strong inhibitory capacities.

Since group members cannot measure directly a person's frontal lobe capacity or the person's willingness to inhibit free-rider behavioral strategies, they will need a different measure of willingness to inhibit free-rider tendencies. Willingness to perform costly religious behaviors for relatively long periods of time can function as reliable signals of willingness to inhibit free-rider strategies and ability to commit to cooperation within the group. Included in such costly religious behavioral patterns are the hard-to-fake *virtues and character strengths*, as free riders would not be willing to incur the costs in developing and practicing such virtues. Sustaining virtuous behavior is, to say the least, difficult. That is why character and virtue cannot be faked, at least not over the long term. Just as ritual and religious practices, *when practiced consistently over time*, help winnow out free riders from the group, so too will development of hard-to-fake character strengths. To act generously and altruistically consistently over time is a convincing indicator of character as it requires the ability to consistently inhibit short-term gratification of selfish impulses.

Religiosity, in short, promotes development of character strengths by facilitating inhibition of free-rider behavioral strategies via the requirement of the adoption of costly programs of behavior. Costly religious behaviors that are practiced consistently over long periods of time and that are associated with inhibition of free rider and exploitative behavioral impulses function as costly and reliable signals of quality and commitment. What could be more effortful or costly than to consistently inhibit appetitive drives around short-time rewards in hopes that such postponement of immediate gratification will pay off sometime down the road? It is a good bet that cooperation with such an individual, an individual who consistently displays virtuous behaviors, would be productive since he or she has, in effect, demonstrated that they could reliably inhibit free-rider appetitive drives/strategies.

Throughout history, religious practices have been the primary, although not exclusive, way that individuals and communities develop and foster these character strengths. Such religious practices, when they are associated with development of character strengths, enhance successful dyadic and group cooperation by signaling the trustworthiness of the individuals involved and their willingness to subordinate individual interests to group goals. Once again free riders would be winnowed out via development of character strengths because free riders would be unwilling or unable to inhibit selfish exploitative impulses in favor of cooperative exchanges. *CST, therefore, predicts that human beings needed to develop the ability to facultatively inhibit powerful impulsive and related free-rider behavioral strategies when seeking to cooperate with, or become a member of, a particular cooperative group.* It follows that the human mind/brain had to develop powerful inhibitory capacities around the suite of impulsive appetitive behaviors that motivate the free-rider behavioral strategy. This inhibitory capacity is precisely one of the best-established and major functions of the frontal lobes (Banyas, 1999; Barkley, 1997; Damasio & Anderson, 2005; Fuster, 1989; McNamara, 2001).

Role of the Frontal Lobes in Development of Cooperative Behavioral Strategies

Studies of potential neural correlates of the individual disposition to cooperate were reviewed recently by Fehr and Rockenbach (2004). Various independent studies show that the frontal lobes are the neural systems most consistently activated in association with decision-making around cooperative dilemmas. Much of this work has involved use of the public goods game. In this game an arbitrary number of players are given tokens that they can either contribute to a project that is beneficial for the entire group (the public good) or keep for themselves. A dilemma of cooperation arises from the fact that all group members profit equally from the public good, whether they contribute or not, and that each player receives a lower profit from tokens contributed to the public good than from tokens retained. A noncooperative player (a free rider) contributes nothing to the public good but benefits nonetheless. Interestingly, in one shot interactions between players of this “public goods” game between 40 percent and 60 percent of the players actually contribute to the “public good,” evidencing a considerable amount of cooperation. Consistent, however, with CST predictions regarding the role of time in cooperative group dynamics, cooperation diminishes over time when interactions are repeated beyond one-shot interactions (reflecting perhaps the inability or unwillingness of free riders to sustain cooperative strategies over time). Fehr and Gächter

(2002) showed that cooperation could be restored in these circumstances if free-riding could be inhibited by punishing noncontributors. Interestingly, when participant's brains were scanned during punishment decisions, the striatal-prefrontal dopaminergic system evidenced differentially high levels of activation. This association between the decision to cooperate and prefrontal dopaminergic activity has now been confirmed in several other studies (Blakemore, Winston, & Frith, 2004; de Quervain et al., 2004; Fehr & Rockenbach, 2004). It may be that those individuals who manifest the most consistent disposition to cooperate also evidence high (relative to noncooperators) prefrontal dopaminergic activity.

Prefrontal Cognitive Functions and Prosocial Behavior

As everyone knows, positive emotion toward, or liking potential collaborators can facilitate cooperation. Traditional neuropsychology placed the filiative emotions in the limbic system, but we now know that the limbic system itself is regulated by orbital frontal cortex and the frontal lobes participate directly in emotional processes. Data from clinical lesion studies, electrophysiologic studies, and PET activation studies suggest that the left frontal lobe normally mediates positive emotions and the right frontal cortex mediates negative emotions (see reviews in Bear, 1983; Borod, 1993; Davidson, 1995; Gainotti, Caltagirone, & Zocolotti, 1993; Starkstein & Robinson, 1991; Tucker & Williamson, 1984). Left frontal damage, for example, is far more likely to cause depression than are similar lesions to the right frontal cortex (Royall, 1999; Starkstein & Robinson, 1991). Conversely, lesions in right orbitofrontal cortex are more likely to lead to mania and unconcern than are similar lesions on the left (Bear, 1983; Borod, 1993; Damasio, 1996). Electrophysiologic studies consistently demonstrate right anterior activation during aversive emotional states in both animals and humans (Davidson, 1995). Patients with primary depression perform poorly on tests of left frontal function (indicating release of right frontal function) (see Royall, 1999 for review).

As mentioned above, dopamine neurons of the ventral tegmental area (VTA) and the substantia nigra (SN) that project in the meso-cortical tracts to the frontal lobes have long been associated with the reward and pleasure systems of the brain. Virtually all of the known addictions (including, cocaine, heroin, amphetamines, alcohol, food, and sex) exert their addictive actions, in part by prolonging the influence of dopamine on target neurons (Randolph-Schwartz, 1999; Schultz et al., 1995). VTA DA neuron responses appear to be necessary to facilitate formation of associations between stimuli that predict reward and behavioral responses that obtain reward (Schultz et al., 1995). The optimal stimuli for activating DA neurons are unexpected appetitive rewards, whereas fully predicted stimuli are ineffective. DA activity appears

to link stimuli predicting reward to the response-facilitation mechanisms in the nucleus accumbens and basal ganglia.

Inhibition of Anti-social Impulses

All religions claim to promote prosocial behavior, and it must be said that improved empathy and moral insight can be acquired via religious practices. Fundamental to the ability to engage in moral choice, empathy, and prosocial behaviors in general is the ability to delay gratification of one's own impulses. Freud argued that the ability to inhibit sexual and aggressive impulses is a prerequisite for social and civilized behavior. I have argued above that the evolution of cooperation likely depended to some extent on the ability to inhibit short-term appetitive drives associated with free-rider behavioral strategies. If individuals can derive real benefits (e.g., a larger return later) by learning to inhibit current appetitive or consumatory responses, then natural selection would favor those individuals with the ability to delay gratification of impulses. The child's acquisition of the ability to delay gratification of impulses develops in tandem with maturation of the frontal lobes (Samango-Sprouse, 1999). In adults prefrontal lesions are often associated with ECF deficits and disinhibition of drives and aggression (Benson & Blumer, 1975; Fuster, 1989; Pincus, 1999; Schnider & Gutbrod, 1999). One of the most disabling impairments associated with traumatic brain injury (which impacts primarily prefrontal cortex) is loss of the ability to delay gratification of prepotent or previously rewarded responses (Schnider & Gutbrod, 1999). Relaxed inhibitory control over appetitive and sexual drives leads to inappropriate social behaviors that prevent the patient from returning to full functional independence. Early evidence for a role of the frontal lobes in supporting the ability to inhibit impulsivity came from the 1868 report of the physician Harlow on his patient Phineas Gage. Gage, a railway workman, survived an explosion that blasted an iron bar (about 4 feet long and 1 inch wide) through his frontal lobes. After recovering from the accident, Gage's personality changed. He became irascible, impatient, impulsive, unruly, and inappropriate (Benson & Blumer, 1975). The damage had mostly been in the orbitalfrontal region of Gage's frontal lobes.

One way to investigate the role of the frontal lobes in supporting inhibition of the free-rider strategy is to investigate neuropsychological correlates of anti-social behavior. "Sociopaths" are by definition anti-social individuals, and the evidence for prefrontal dysfunction in these individuals is accumulating rapidly (Damasio, Tranel, & Damasio, 1991). Sociopaths typically exhibit an inability to empathize with others, egocentrism, an inability to form lasting personal commitments, and a marked degree of impulsivity. While they may appear to be charming, they evidence serious deficits in expression of the

social emotions (love, shame, guilt, empathy, and remorse). On the other hand, they are not intellectually handicapped and are skillful manipulators of others (Davison & Neale, 1994; Spinella, 2005). What little evidence exists suggests that sociopathy is associated with orbitalfrontal dysfunction (Damasio et al., 1991; Smith, Arnett, & Newman, 1992). Dorsolateral function, however, is preserved and would explain the lack of intellectual deficit in these individuals.

The more violent forms of anti-social behavior are also associated with frontal deficits. In their review of the literature on neuroimaging in violent offenders, Mills and Raine (1994) concluded that frontal lobe dysfunction is associated with violent offending. Raine, Buchsbaum, Stanley, and Lottenberg (1994), for example, found that violent offenders (22 subjects accused of murder) evidenced significantly lower glucose metabolic activation levels in medial and lateral prefrontal cortex relative to controls. High sensation seekers, criminals, and other individuals scoring high on measures of impulsivity and aggression also show prefrontal and frontal dysfunction, as well as significantly lower levels than others of the serotonin metabolite, 5-HIAA (see review in Raine, 1993). Serotonin exhibits important modulatory effects on dopaminergic activity in the frontal lobes (Robert et al., 1999). Individuals with psychiatric disorders characterized by disinhibited and aggressive behaviors such as anti-social personality disorder (Deckel, Hesselbrock, & Bauer, 1996), sociopaths (Damasio et al., 1991; Smith et al., 1992), substance use disorders (Tarter, Jacob, & Bremer, 1989), conduct disorder (Moffitt, 1993), and attention deficit hyperactivity disorder (Barkley, 1997; Swanson et al., 1998), have all been shown to perform poorly on frontal lobe tests. McAllister and Price (1987) found that 60 percent of psychiatric patients with prefrontal cortical pathology displayed disinhibited social behaviors, and 10 percent displayed violent outbursts. Heinrichs (1989) showed that the best predictor of violent behavior in a sample of 45 neuropsychiatric patients was a prefrontal lesion.

The Evolution of the Neurochemistry of the Frontal Lobes, Cooperation, and Religion

It may be that in the distant evolutionary past when the mutation that led to the COMT polymorphism regulating aminergic, particularly dopaminergic activity in the frontal lobes, our ancestors began to find that it was unusually easy to feel inclined to affiliate and cooperate with others. What is more, they themselves were better able to inhibit the powerful urge to attempt to take advantage of the cooperative fruits (e.g., killing of large game) of others . . . even over the long term. Thus, these new frontal capacities made long-term cooperative enterprises more feasible by supporting inhibition of the free-rider behavioral strategy and by supporting the building of hard to fake character strengths and the birth of ritual practices more generally.

REFERENCES

- Adolphs, R., Baron-Cohen, S., & Tranel, D. (2002). Impaired recognition of social emotions following amygdala damage. *Journal of Cognitive Neuroscience*, *14*(8), 1264–1274.
- Azari, N. P., Nickel, J., Wunderlich, G., Niedeggen, M., Heffer, H., Tellmann, L., et al. (2001). Neural correlates of religious experience. *European Journal of Neuroscience*, *13*(8), 1649–1652.
- Banyas, C. A. (1999). Evolution and phylogenetic history of the frontal lobes. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 83–106). New York: Guilford Press.
- Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, *121*(1), 65–94.
- Baron-Cohen, S. (2004). The cognitive neuroscience of autism. *Journal of Neurology, Neurosurgery, and Psychiatry*, *75*(7), 945–948.
- Bear, D. M. (1983). Hemispheric specialization and the neurology of emotion. *Archives of Neurology*, *40*, 195–202.
- Bear, D. M., & Fedio, P. (1977). Quantitative analysis of interictal behavior in temporal lobe epilepsy. *Archives of Neurology*, *34*, 454–467.
- Benson, D. F., & Blumer, D. (1975). *Psychiatric aspects of neurological disease*. New York: Grune and Stratton.
- Berlin, H. A., Rolls, E. T., & Iversen, S. D. (2005). Borderline personality disorder, impulsivity, and the orbitofrontal cortex. *American Journal of Psychiatry*, *162*(12), 2360–2373.
- Blakemore, S. J., Winston, J., & Frith, U. (2004). Social cognitive neuroscience: Where are we heading? *Trends in Cognitive Science*, *8*(5), 216–222.
- Borg, J., Andree, B., Soderstrom, H., & Farde, L. (2003). The serotonin system and spiritual experiences. *American Journal of Psychiatry*, *160*, 1965–1969.
- Borod, J. C. (1993). Cerebral mechanisms underlying facial, prosodic, and lexical emotional expression: A review of neuropsychological studies and methodological issues. *Neuropsychology*, *7*, 445–463.
- Brewerton, T. D. (1994). Hyperreligiosity in psychotic disorders. *Journal of Nervous and Mental Disease*, *182*, 302–304.
- Brune, M., & Brune-Cohrs, U. (2006). Theory of mind-evolution, ontogeny, brain mechanisms and psychopathology. *Neuroscience and Biobehavioral Reviews*, *30*(4), 437–455.
- Comings, D. E., Gonzales, N., Saucier, G., Johnson, J. P., & MacMurray, J. P. (2000). The DRD4 gene and the spiritual transcendence scale of the character temperament index. *Psychiatrica Genetics*, *10*(4), 185–189.
- Cummings, J. L., & Mega, M. S. (2003). *Neuropsychiatry and behavioral neuroscience* (2nd ed., revised). New York: Oxford University Press.
- de Quervain, D. J., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., et al. (2004). The neural basis of altruistic punishment. *Science*, *305*(5688), 1254–1258.
- Damasio, A. (1996). *Descartes' error: Emotion, reason, and the human brain*. London: Papermac.

- Damasio, A., & Anderson, S. W. (2005). The frontal lobes. In K. Heilman & E. Valenstein (Eds.), *Clinical neuropsychology* (4th ed., pp. 404–446). New York: Oxford University Press.
- Damasio, A. R., Tranel, D., & Damasio, H. (1991). Individuals with sociopathic behavior caused by frontal damage fail to respond autonomically to social stimuli. *Behavioral Brain Research*, *41*, 81–94.
- Davidson, R. J. (1995). Cerebral asymmetry, emotion and affective style. In R. J. Davidson & K. Hugdahl (Eds.), *Brain asymmetry* (pp. 361–383). Cambridge: MIT Press.
- Davison, G. C., & Neale, J. M. (1994). *Abnormal psychology* (6th ed.). New York: Wiley.
- Deckel, A. W., Hesselbrock, V., & Bauer, L. (1996). Antisocial personality disorder, childhood delinquency and frontal brain functioning: EEG and neuropsychological findings. *Journal of Clinical Psychology*, *52*, 639–650.
- Dewhurst, K., & Beard, A. W. (1970). Sudden religious conversions in temporal lobe epilepsy. *British Journal of Psychiatry*, *117*, 497–507.
- Durkheim, E. (1995). *The elementary forms of the religious life*. New York: Free Press. (Original manuscript published in 1915)
- Edwards-Lee, T. A., & Saul, R. (1999). Neuropsychiatry of the right frontal lobe. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 304–320). New York: Guilford Press.
- Egan, M. F., Goldberg, T. E., Kolachana, B. S., Callicott, J. H., Mazzanti, C. M., Straub, R. E., et al. (2001). Effect of COMT Val108/158 Met genotype on frontal lobe function and risk for schizophrenia. *Proceedings of the National Academy of Science of the United States of America*, *98*, 6917–6922.
- Fan, J., Wu, Y., Fossella, J. A., & Posner, M. I. (2001). Assessing the heritability of attentional networks. *BMC Neuroscience*, *2*, 14.
- Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. *Nature*, *415*, 137–140.
- Fehr, E., & Rockenbach, B. (2004). Human altruism: Economic, neural and evolutionary perspectives. *Current Opinion in Neurobiology*, *14*, 784–790.
- Fuster, J. M. (1989). *The prefrontal cortex. Anatomy, physiology and neuropsychology of the frontal lobe* (2nd ed.). New York: Raven Press.
- Gainotti, G., Caltagirone, C., & Zoccolotti, P. (1993). Left/right and cortical/subcortical dichotomies in the neuropsychological study of human emotions. *Cognition and Emotion*, *7*, 71–93.
- Geschwind, N. (1983). Interictal behavioral changes in epilepsy. *Epilepsy*, *24*(Suppl 1), 523–530.
- Geschwind, D. H., Miller, B. L., DeCarli, C., & Carmelli, D. (2002). Heritability of lobar brain volumes in twins supports genetic models of cerebral laterality and handedness. *Proceedings of the National Academy of Sciences*, *99*, 3176–3181.
- Goldberg, E., & Bougakov, D. (2005). Neuropsychologic assessment of frontal lobe dysfunction. *Psychiatric Clinics of North America*, *28*(3), 567–580.
- Goldman-Rakic, P. (1987). Circuitry of primate prefrontal cortex and regulation of behavior by representational memory. In V. Mountcastle & F. Plum (Eds.), *Higher cortical function: Handbook of physiology* (pp. 373–417). New York: American Physiological Society.

- Haznedar, M. M., Roversi, F., Pallanti, S., Baldini-Rossi, N., Schnur, D. B., Licalzi, E. M., et al. (2005). Fronto-thalamo-striatal gray and white matter volumes and anisotropy of their connections in bipolar spectrum illnesses. *Biological Psychiatry*, *57*(7), 733–742.
- Heinrichs, R. (1989). Frontal cerebral lesions and violent incidents in chronic neuropsychiatric patients. *Biological Psychiatry*, *25*, 174–178.
- Huttenlocher, P. R., & Dabholkar, A. S. (1997). Regional differences in synaptogenesis in human cerebral cortex. *Journal of Comparative Neurology*, *387*(2), 167–178.
- Iqbal, N., & van Praag, H. M. (1995). The role of serotonin in schizophrenia. *European Neuropsychopharmacology*, *5 Suppl*, 11–23.
- Irons, W. (1996). Morality, religion, and human nature. In W. Richardson & W. Wildman (Eds.), *Religion and science: History, method, and dialogue* (pp. 375–399). New York: Rutledge.
- Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Neese (Ed.), *Evolution and the capacity for commitment* (pp. 292–309). New York: Russell Sage Foundation.
- Joobar, R., Gauthier, J., Lal, S., Bloom, D., Lalonde, P., Rouleau, G., et al. (2002). Catechol-*O*-methyltransferase Val 108/158-Met gene variants associated with performance on the Wisconsin Card Sorting Test. *Archives of General Psychiatry*, *59*, 662–663.
- Kjaer, T. W., Bertelsen, C., Piccini, P., Brooks, D., Alving, J., & Lou, H. C. (2002). Increased dopamine tone during meditation-induced change of consciousness. *Cognitive Brain Research*, *13*, 255–259.
- Lewis, D. A., Cruz, D., Eggan, S., & Erickson, S. (2004). Postnatal development of prefrontal inhibitory circuits and the pathophysiology of cognitive dysfunction in schizophrenia. *Annals of the New York Academy of Sciences*, *1021*, 64–76.
- Malhotra, A. K., Kestler, L. J., Mazzanti, C., Bates, J. A., Goldberg, T., & Goldman, D. (2002). A functional polymorphism in the COMT gene and performance on a test of prefrontal function. *American Journal of Psychiatry*, *159*, 652–654.
- McAllister, T., & Price, T. (1987). Aspects of the behavior of psychiatric inpatients with frontal lobe damage: Some implications for diagnosis and treatment. *Comprehensive Psychiatry*, *28*, 14–21.
- McNamara, P. (2001). Frontal lobes and religion. In J. Andresen (Ed.), *Religion in mind* (pp. 237–256). Cambridge: Cambridge University Press.
- McNamara, P. (2002). The motivational origins of religious practices. *Zygon*, *37*(1), 143–160.
- McNamara, P., Andresen, J., & Gellard, J. (2003). Relation of religiosity and scores on verbal and non-verbal fluency tests to subjective reports of health in the elderly. *The International Journal for the Psychology of Religion*, *13*(4), 259–271.
- McNamara, P., Durso, R., & Brown, A. (2006). Religiosity in patients with Parkinson's disease. *Journal of Neuropsychiatric Diseases and Treatment*.
- McNamara, P., Durso, R., & Harris, E. (2006). Frontal lobe mediation of the sense of self: Evidence from the studies of patients with Parkinson's disease. In A. P. Prescott (Ed.), *The concept of self in medicine and health care*. Hauppauge, NY: Nova Science.
- Miller, B.L., & Cummings, J.L. (1999). *The human frontal lobes: Functions and disorders*. New York: The Guilford Press.

- Miller, B., Seeley, W. W., Mychack, P., Rosen, H. J., Mena, I., & Boone, K. (2001). Neuroanatomy of the self: Evidence from patients with frontotemporal dementia. *Neurology*, *57*(1), 817–821.
- Mills, S., & Raine, A. (1994). Neuroimaging and aggression. *Journal of Offender Rehabilitation*, *21*, 145–158.
- Moffitt, T. E. (1993). The neuropsychology of conduct disorder. *Developmental Psychopathology*, *5*, 135–151.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquilli, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research*, *106*(2), 113–122.
- Northoff, G., & Bermpohl, F. (2004). Cortical midline structures and the self. *Trends in Cognitive Science*, *8*(3), 102–107.
- Passingham, R. E. (1995). *The frontal lobes and voluntary action*. New York: Oxford University Press.
- Persinger, M. A. (1987). *Neuropsychological bases of God beliefs*. New York: Praeger.
- Pincus, J. H. (1999). Aggression, criminality and the frontal lobes. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: functions and disorders* (pp. 547–556). New York: Guilford Press.
- Raine, A. (1993). *The psychopathology of crime: Criminal behavior as a clinical disorder*. San Diego: Academic Press.
- Raine, A., Buchsbaum, M. S., Stanley, J., & Lottenberg, S. (1994). Selective reductions in prefrontal glucose metabolism in murderers. *Biological Psychiatry*, *36*, 365–373.
- Randolph-Schwartz, J. (1999). Dopamine projections and frontal systems function. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 159–173). New York: Guilford Press.
- Rappaport, R. A. (1979). *Ecology, meaning and religion*. Berkeley: North Atlantic Books.
- Robert, P. H., Aubin-Brunet, V., & Darcourt, G. 1999. Serotonin and the frontal lobes. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 125–138). New York: Guilford Press.
- Rolls, E. T. (2004). The functions of the orbitofrontal cortex. *Brain and Cognition*, *55*(1), 11–29.
- Royall, D. R. (1999). Frontal systems impairment in major depression. *Seminars in Clinical Neuropsychiatry*, *4*(1), 13–23.
- Samango-Sprouse, C. (1999). Frontal lobe development in childhood. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 584–604). New York: Guilford Press.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *Journal of Neuropsychiatry and Clinical Neurosciences*, *9*, 498–510.
- Schnider, A., & Gutbrod, K. (1999). Traumatic brain injury. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 487–508). New York: Guilford Press.
- Schoenemann, P. T., Budinger, T. F., Sarich, V. M., & Wang, W. S. (2000). Brain size does not predict general cognitive ability within families. *Proceedings of the National Academy of the Sciences*, *97*, 4932–4937.

- Schultz, W., Dayan, P., & Montague, R. (1997). A neural substrate of prediction and reward. *Science*, *275*, 1593–1599.
- Schultz, W., Romo, R., Ljungberg, T., Mirenowicz, J., Hollerman, J., & Dickinson, A. (1995). Reward-related signals carried by dopamine neurons. In J. Houk, J. Davis, & D. Beiser (Eds.), *Models of information processing in the basal ganglia* (pp. 118–130). Cambridge: MIT Press.
- Siddle, R., Haddock, G., Tarrier, N., & Faragher, E. B. (2002). Religious delusions in patients admitted to hospital with schizophrenia. *Social Psychiatry and Psychiatric Epidemiology*, *37*(3), 130–138.
- Smith, S., Arnett, P., & Newman, J. (1992). Neuropsychological differentiation of psychopathic and nonpsychopathic criminal offenders. *Personality and Individual Differences*, *13*, 1233–1243.
- Sosis, R. (2003). Why aren't we all Hutterites? Costly signaling theory and religious behavior. *Human Nature*, *14*, 91–127.
- Sosis, R. (2004). The adaptive value of religious ritual. *American Scientist*, *92*, 166–172.
- Sosis, R., & Alcorta, C. S. (2003). Signaling, solidarity and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, *12*, 264–274.
- Spinella, M. (2005). Prefrontal substrates of empathy: Psychometric evidence in a community sample. *Biological Psychology*, *70*(3), 175–181.
- Starkstein, S. E., & Merello, M. (2002). *Psychiatric and cognitive disorders in Parkinson's disease*. Cambridge: Cambridge University Press.
- Starkstein, S. E., & Robinson, R. G. (1991). The role of the frontal lobes in affective disorder following stroke. In H. S. Levin, H. M. Eisenberg, & A. L. Benton (Eds.), *Frontal lobe function and dysfunction* (pp. 288–303). New York: Oxford University Press.
- Stuss, D. T., & Benson, D. F. (1984). Neuropsychological studies of the frontal lobes. *Psychological Bulletin*, *95*, 3–28.
- Swan, G. E., & Carmelli, D. (2002). Evidence for genetic mediation of executive control: A study of aging male twins. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*, 133–143.
- Swanson, J. M., Sergeant, J. A., Taylor, E., Sonuga-Barke, E. J. S., Jensen, P. S., & Cantwell, D. P. (1998). Attention-deficit disorder and hyperkinetic disorder. *Lancet*, *351*, 429–433.
- Tarter, R. E., Jacob, T., & Bremer, D. A. (1989). Cognitive status of sons of alcoholic men. *Alcoholism: Clinical and Experimental Research*, *13*, 232–235.
- Tek, C., & Ulug, B. (2001). Religiosity and religious obsessions in obsessive-compulsive disorder. *Psychiatry Research*, *104*, 99–108.
- Troster, A. I., & Woods, S. P. (2003). Neuropsychological aspects of Parkinson's disease and parkinsonian syndromes. In R. Pahwa, K. E. Lyons, & W. C. Koller (Eds.), *Handbook of Parkinson's disease* (pp. 127–157). New York: Dekker.
- Tucker, D. M., & Williamson, P. A. (1984). Asymmetric neural control systems in human self-regulation. *Psychological Review*, *91*(2), 185–215.
- Wheeler, M. A., Stuss, D. T., & Tulving, E. (1997). Toward a theory of episodic memory: The frontal lobes and autooietic consciousness. *Psychological Bulletin*, *121*, 331–354.

- White, J., Joseph, S., & Neil, A. (1995). Religiosity, psychoticism, and schizotypal traits. *Personality and Individual Differences, 19*, 847–851.
- Winstanley, C. A., Theobald, D. E., Dalley, J. W., Cardinal, R. N., & Robbins, T. W. (2006). Double dissociation between serotonergic and dopaminergic modulation of medial prefrontal and orbitofrontal cortex during a test of impulsive choice. *Cerebral Cortex, 16*(1), 106–114.
- Winterer, G., & Goldman, D. (2003). Genetics of human prefrontal function. *Brain Research: Brain Research Reviews, 43*(1), 134–163.
- Wise, R. A. (2005). Forebrain substrates of reward and motivation. *Journal of Comparative Neurology, 493*(1), 115–121.

MIND DESIGN AND THE CAPACITY FOR RITUAL PERFORMANCE

Carl Seaquist

Every fall a majority of the population of ancient Athens (including some women and slaves) walked over 18 miles to Eleusis in order to participate in “secret” rites. The festival was among the best known in Greece and is mentioned or discussed by many classical authors, including Pindar, Sophocles, and Aristotle; the earliest written source is the nearly 500-line hymn to Demeter attributed by some of the ancients to Homer. Yet despite or perhaps because of this notoriety, many basic details of the rites remain unclear to modern scholars. Given how widespread attendance was at this festival, the basic elements of performance were well-known to the ancients, but since this was technically a “mystery cult,” everyone who attended had to be initiated when they first participated, and with few exceptions the most crucial parts of the performance were only alluded to but never directly discussed in public.

The interpretation of the Eleusinian mysteries would appear, at first sight, straightforward. A cut ear of grain was probably displayed at a key part of the festival, and one of the main plot lines of the *Homeric Hymn to Demeter* tells of the rape of Persephone by Hades and her eventual recovery by her mother Demeter, on the compromise that Persephone spend a part of each year in the underworld during the winter when no plants grow. Most interpreters would therefore say that Demeter and her daughter are vegetation divinities, and that key elements of the ritual¹ were symbolic of the natural course of the year, with plants appearing to die in the winter, only to come back to life in the spring—just like Persephone, who goes to the underworld in the same way as dead mortals, only to rise (unlike mortals) later in the year and return to life.

One may further argue that the myths that went along with this ritual served as a sort of native interpretation of the ritual: after all, the story told in the *Hymn* may be classified as an “aetiological myth,” in that it tells the story of the origins of the festival and concludes by telling how Demeter went to the “law-administering kings” and taught them the secrets of her worship (lines 473–485). There are similarly close connections between myths and rituals in many cultures, and scholars have variously conjectured both that rituals are symbolic (they contain coded messages about the world) and that myths are symbolic (they contain messages about rituals or about the world).

If rituals and myths are designed to communicate hidden meanings, then it should not be surprising that their interpretations may not be immediately clear. Showing an ear of grain in silence is a somewhat ambiguous symbol, since the officiant could be pointing to the corn itself, its annual lifecycle, the fact that it has been cut by human hands, an implicit contrast between the rural area in which it was grown and the urban area in which most participants lived, and so forth. Similarly, the myth that went along with the ritual was itself somewhat hard to interpret (it was, after all, narrative rather than expository, and open to the same methods of interpretation as any story), but at least it could help to direct an observer’s interpretation of the ritual.

Let us assume that Demeter represents the spring; and Persephone, the plants that grow during the spring but lie as though dead during the winter. Then the story of the rape of Persephone could be viewed as an allegorical narrative, an indirect statement of the fact that plants grow in the spring but not in the winter. Isn’t this fact about the seasons rather obvious? Why write a 500-line poem to tell a story that everyone, even little children, know without being told? And why focus on this fact when there are so many other obvious but important facts that don’t have long, allegorical poems written about them? If we ask these questions about the myth told in the *Hymn*, we could also ask similar questions about the festival itself. If the goal is simply to instruct people about the seasons, why take a week to do so, to require them to buy and sacrifice a pig, to walk 60 kilometers? The symbolic approach to myth and ritual may seem intuitively obvious, because it has such a strong tradition in both scholarly and popular literature, from antiquity to the present, but there are good reasons to be skeptical of it.

We might think the ritual serves other purposes than the myth. For example, by performing rites in the temple of the goddess, perhaps the ritual serves to thank the goddess for bringing the spring each year, or by praising her to help ensure that she will bring the spring again next year. Such an operative dynamic is what scholars know as *do ut des*: it is as if the worshippers are saying “we give you worship so that you might give us crops next year.” We might conclude that the myth is symbolic, but the ritual is practical: the myth only tells a story (maybe a fact about the seasons, maybe

the origin of the ritual), but the ritual actually does something useful. Once the spring comes, there are practical means of bringing the crops in, and before the spring comes, there are practical ways of ensuring that it will come. According to this view, ritual should fall under the same category as harvesting. Both would be viewed as skills requiring specialized knowledge, which bring about a specific aim.

There is another way in which rituals tend to be associated with the sacred; consider again the Eleusinian mysteries. The playwright Sophocles said of initiates in the mysteries “three-times happy are those among mortals who have seen these rites and thus enter into Hades: for them alone there is life, whereas for the others all things are bad” (fragment 837, Radt 1985, my translation). It would appear that wealth in this life, in the form of bounteous crops, is one result of participating in the mysteries, and another is a better state in the afterlife. Greek conceptions of life after death were rarely discussed at much length, but if we take Odysseus’ journey to the underworld in book 11 of the *Odyssey* as representative, the Greeks imagined that the shades of the dead live a very impoverished life, unable to speak unless sated on blood of the living, just flitting about as shadows of their former selves. If the mysteries guaranteed a better state in the eternity of the afterlife, then the efforts to be initiated in them would seem quite reasonable. No wonder thousands participated every year. Thus, we could theorize that rituals differ from pragmatic actions either because we do not see a connection between their means of attainment and the ends to which they aim, or because their ends seem (regardless of their means) *otherworldly* in their orientation.

I have presented two views of rituals: that they encode information about the world that particular societies find especially important, or that they are practical means of attaining useful ends, like a better harvest or life after death. How should we choose between these options? Is it possible to combine them? This chapter will consider these questions with reference to several theories of ritual, which have been developed in the last 30 years, that apply methods from the cognitive sciences to the study of rituals. In what follows, I briefly summarize² the major cognitive theories of ritual, and then try to look for a larger trajectory in this research, by considering some continuities and discontinuities between what may at first appear to be rather disparate theories. My interest is the general terrain rather than each little feature of each theory, so sometimes for convenience of exposition I simplify arguments and glide over terminological distinctions.

SPERBER ON SYMBOLISM

Dan Sperber (1975) proposes that symbolism is best understood not in terms of abstract signs and their meanings that form a system of thought all their own but, rather, as part of our normal patterns of thought about

the world. The view that Persephone is a symbol for the plants that die and are reborn is an example of the former view, the one that Sperber rejects. Although this approach to symbolism has been, and continues to be, the most common one among anthropologists, historians, and scholars of literature, my initial remarks should be sufficient to demonstrate that it is far from clear that it is a sensible approach to symbolic materials.

Consider what happened when an ancient Athenian saw grain being harvested. He saw the ear of grain lifted in the air, then dropped into a basket. He would understand what was happening, even if he was from the city and had never observed a harvest before, because he could understand from his previous experience what was happening. He had eaten bread and seen it prepared from raw grain. He knew grain was grown in the fields, and he had in fact seen it growing. When he observed the harvest, he had a context to place it in: he knew how he got there, why he was there, etc. So nothing in the experience seemed deeply surprising to him, though some details of the act of harvesting no doubt differed from what he would have expected. In short, his background knowledge, knowledge of the context of this particular harvest, and general inferential abilities allowed him to understand what he was seeing. Nothing happened to make him think that he was missing something important.

Now, contrast this to the situation where an ear of grain was shown in the mysteries. Here the observer had less context to interpret the action. The grain seemed less likely to be destined for the dinner table, and in fact the whole context (the fact that the ritual was taking place in a temple, the march from the city, the indications that something was *meant* by showing the grain) indicated that something special was going on. But it was not clear what that something special was. So the observer would have searched his memory, trying to identify some fact that would make sense of the action. He would try to reason from previous knowledge, for example, thinking back to times he had observed ritual sacrifices and libations in Athens to develop a context for the current situation.

So Sperber encourages us to think of symbolism as a method, or stage, of reasoning. More precisely, he would have us think of it as the action of the component of the mind that is used in understanding objects and actions that cannot be properly accounted for by normal inferential processes. We can think of normal inferential processes as resulting from the interaction between memory and something we will call the “rational device,” that is, the part of the mind that applies logical operations and intuitive psychological understandings of the world to data presented by the senses. When such “rational” thought is not sufficient to interpret a given datum, then another part of the mind comes into play. We can call this the “symbolic device” because it processes what we may call “symbolic” data. We could hypothesize a number of differences between the rational and symbolic devices: perhaps the symbolic device is less constrained in producing output; or it is more

likely to reprocess its own output, even with little or no additional inputs; or it can produce multiple outputs simultaneously while marking these outputs as in some way provisional, in other words ready for reprocessing at a later time. In any case, symbolism would be understood as a means of processing data, rather than as a separate type of data.

Sperber argues for a particular theory of mental architecture (i.e., a theory of how the mind is put together and how its various parts interact) much more detailed than my brief characterization can do justice to. Curiously, there has been relatively little substantive criticism of Sperber's theory, with the exception of Toren (1983). It is not my place to present a detailed study here. What I wish to emphasize is that Sperber presents a radically new way of thinking about symbolism. He views symbolism as a mental process rather than a relation between something out in the world and its meaning. Meaning (the meaning of a ritual, or a myth, or a symbol) would count as an output of the symbolic device, but the connection between a sensory input and any semantic output could be highly contingent under such a theory. Two people may need to have similar cultural knowledge and similar means of interpreting symbolic data to reach the same interpretation of a symbol. So the connection between a symbol and its meaning, understanding these in the traditional sense, should not be understood as a fixed fact within a culture but, rather, as, at best, a statistical fact about the likely outcomes of symbolic processing by people within that culture.

I am inclined to date the beginning of cognitive studies of ritual to Sperber's book. After all, every tradition needs its history, even if it is somewhat factitious, and this seems the best place to begin. Of course, the history of processing models of cultural facts goes much farther back, so we could choose to begin with Freud, or even with Anaxagoras. But I would be inclined to consider these as part of the prehistory of cognitive studies of ritual, because of their reliance on dated and inadequate theories of mind. In any case, Sperber's book proposed a general theory of symbolism and devoted little attention to ritual. But the theory is particularly relevant to ritual study, since rituals are nonpropositional in a way that myths or other narratives (since they are expressed in language) are not, and thus they are particularly open to symbolic interpretation. So let us consider Sperber's theory as a first example of a processing model of ritual knowledge, and as a contribution to the study of cognitive architecture. And let us consider the theories I am about to discuss in the context of Sperber's theory of symbolism.

LAWSON AND MCCAULEY'S LINGUISTIC ANALOGY

Though Sperber and Frits Staal³ presented cognitive theories of religion in the 1970s, it was only after the 1990 publication of E. Thomas Lawson

and Robert McCauley's *Rethinking Religion* that scholars first began to consider the cognitive study of religion as a distinct subject in its own right. Their book remains the best-known work in this area, and the subsequent growth of the field owes a great deal to their efforts. Like Sperber, they present a theory of cognitive architecture and focus on the part of the mind that deals with symbolic/religious conceptions. But whereas Sperber feels that mistaken analogies between symbolism and language have kept people from realizing that symbolism derives from a cognitive mechanism, they favor an approach that models religion (in particular ritual) using formal methods from linguistics.

Let us begin with two key elements of Lawson and McCauley's theory: they propose that any proper theory of ritual is a theory of ritual *action*, and that the proper formal analogue of the ritual is the sentence. Furthermore, they think that any ritual, no matter how complex, is ultimately just a single action—perhaps a very complex action, but a single action none the less. Consequently, any ritual could in principle be described by a single sentence (maybe a complex one); let us call such a sentence an “action sentence.” They call the part of the mind that generates such action sentences the “action representation system.”

Just as a sentence is composed of both words and rules governing their combination in sentences, so the components of the action representation system are word-like elements (which they call “constituents”) and rules of combination (or “formation rules”) that determine how those elements can be put together to generate a viable action. By analogy to the sentence, Lawson and McCauley propose that ultimately any religious ritual is composed of three parts: two key participants united by an “action complex,” which is analogous to a verb (this may govern an optional third participant, the instrument). One participant is an agent (who performs the key action of ritual), and the other is the patient (who has the action performed on him). These correspond roughly to linguistic subject and object. Just as nouns in English can be modified by adjectives and verbs by adverbs, so in Lawson and McCauley's model agents can have properties, as can actions. Whereas any action representation must have an agent, action complex, and object, properties are optional. Call this the “sentential theory of action”: actions are like sentences, and the components of actions are like the components of sentences.

The sentential theory of action gets more complicated when Lawson and McCauley propose that any proper mental representation of a ritual contains (in some way) a representation of all the rituals (they call these “enabling actions”) that are presupposed by that ritual. Consider the following example (Lawson and McCauley 1990, p. 96): a Christian enters a church and blesses himself with water. The best sentence to describe this ritual is “the parishioner blesses himself by means of water.” But this statement doesn't fully

communicate the structure of the ritual action. It is only because the water has already been purified that we can use it for this purpose. Any mental representation of the ritual must indicate the full representation of the ritual, including all the enabling actions that lie behind it. So the full action sentence might be something like “the parishioner blesses himself by means of water that has previously been purified by a priest, who was ordained by God.” It is this embedding that makes some ritual actions complex: any ritual that presupposes enabling actions can only be described by an action sentence with subordinate, relative clauses.

Now, linguistics not only presents rules that tell us how words get put together to form sentences, it also tells us how those sentences get meanings; this part of linguistics is called “semantics.” In Lawson and McCauley’s theory, the part of the mind that assigns meanings to rituals is called the “religious conceptual scheme.” The mind has another, similar component that assigns meanings to nonritual actions, which we can call the “profane conceptual scheme.” These two “conceptual schemes” contain representations of cultural content, in other words, they provide the meanings that we find in rituals and other actions. The action representation system just gives us the form of a ritual; the conceptual schemes provide content to those forms. Think of the action representation system as generating molds: we can add copper or iron to a mold, and the result differs depending on the input metal. But the mold is the same regardless. It is a form devoid of contents.

Interestingly, Lawson and McCauley don’t give any reasons for any of the formal apparatus they develop, or the assumptions they make in the initial development of their theory. They hold that cognitive theories of religion have empirical content; in other words, their theory makes predictions that can be verified by evidence from real religions. Thus, they assume that the best current theory will be the one that agrees best with the evidence from actual rituals. So they simply present their theory, in all its complexity, and trust that it will win out over competitors.

Lawson and McCauley make it clear that their ritual theory is inspired by linguistic theory, and the notions of agent, patient, etc. seem clearly linguistic. But it may be that the notion of agent, at least, has other motivations. In McCauley and Lawson (2002), a recurrent subject is “theory of mind,” a property that humans but few other animals seem to possess. Theory of mind is the name for the belief that beings other than oneself possess minds. Thus, if I say that Smith has a theory of mind, it means that Smith can recognize Jones as having a mind just like Smith does. Many animals, it would seem, view other animals as little more than automata: they learn to predict their actions but don’t think too much about why they behave as they do. An animal with theory of mind may hypothesize that another animal is pushing the fallen tree trunk over because it believes that there might be grubs under it and that the other animal feels hungry. Belief and hunger are properties

we feel in ourselves, and the projection of these onto others implies that we believe other creatures have minds similar to ours. A key concept here is agency: when we attribute minds like ours to others, we believe that those creatures can be agents, that they can determine their own goals and work to achieve them. A compass needle may spin around, but we attribute this motion not to a belief that the compass has but, rather, to earth's electromagnetic field. But when a dog spins around, we don't attribute this to an electromagnetic field: we assume it wants to chase its own tail. If Lawson and McCauley's interest in agency is driven by their interest in theory of mind, it is possible that their use of a linguistic analogy is not intended to tell us much about the underlying sentential structure of the mind (in other words, maybe the part of the mind that lets us use language is fairly distinct from the part that lets us use ritual) but, rather, is merely a useful analogy.

RELIGIOUS NATURALISM AND THE CENTRALITY OF RITUALS

To tackle the next part of Lawson and McCauley's theory, I should explain what it means to naturalize religious cognition. Briefly, naturalizing something means understanding it in the context of our broader understanding of how the world operates. Empirical psychology is based on the assumption that all our thoughts and actions are the result of physical processes in the body in reaction to interactions with the outside world that are (in principle, if not always in practice) observable; and that our internal, physical states are the result of genetic blueprints that played themselves out in the process of ontogenetic development. There might be psychological phenomena that cannot be identified with particular physical phenomena, but in some way the physical and the psychological depend on each other, and psychological events result from merely physical processes. Thus psychology is naturalized: it is seen as deriving from natural (in this case, physical) processes. Now, one common approach to religion is known as the "phenomenology of religion." According to this view, religion is something *sui generis*; it is entirely unlike anything else and operates according to its own rules. Thus, while events in the physical world can be explained, the theory goes, there is no way to explain religious phenomena like (for example) conversion: our understanding of the natural world simply doesn't account for religious phenomena. So religious phenomena aren't natural (they might, of course, be *supernatural*). A phenomenological psychology of religion, then, would not be naturalistic. It would operate according to different rules than the rest of psychology. A naturalistic psychology of religion, in contrast, would explain religious cognition in the same way that it explains other types of cognition. And everyone who works in the cognitive study of religion is a naturalist.

Lawson and McCauley want a naturalized psychology of religion, so they want to be able to explain how people conceptualize ritual actions in the same way they would any other type of (merely profane) action. They thus propose that, once we have a formal analysis of some ritual, we should look at where the supernatural being occurs in the ritual's action sentence. It may be in the agent slot, or the patient slot, of the main clause in the sentence, or it may be agent or patient in one of the relative clauses representing embedded actions. Note that we can expect a supernatural being⁺ to be somewhere in the representation of the action precisely because the action is a ritual: rituals draw their content from the religious conceptual scheme, and this is the scheme that allows us to conceive of supernatural beings. If all the agents and objects were profane, then the action could be represented without using the religious conceptual scheme, and the action would not be a ritual. Other than the fact that a supernatural being occurs someplace in the action sentence, their analysis of ritual structure is basically the same as their analysis of action structure. This is how their theory is naturalistic: rituals are represented like any other actions, but for the one small difference that some of their participants are held to be supernatural beings.

Lawson and McCauley go on to argue that a number of properties of rituals can be predicted by looking at where the supernatural being occurs in the action sentence.

First, they present a hypothesis regarding how central a ritual is to a religious tradition. Through interviewing religious people, it is possible to determine how central a ritual is to the overall framework of a particular religion. It might not be possible to communicate the notion of centrality to interviewees, but it should be possible for scholars to identify the relative centrality of particular rituals by talking to people who practice the religion in question. Lawson and McCauley then claim that centrality will correspond to how deeply the clause containing the supernatural being is embedded in the action sentence. In the example given above ("the parishioner blesses himself by means of water that has previously been purified by a priest, who was ordained by God"), there were three clauses: in the first the main action was blessing; in the second, purification; in the third, ordination. The embedding of clauses stopped then because a god figured in the third clause. This ritual is more central than one that requires four clauses, but less central than one that requires two. This aspect of the theory constitutes a hypothesis because the relative centrality of a given ritual can be anticipated, before informants are consulted, by looking at the level of clausal embedding of the relevant supernatural being in the action sentence for that ritual.

Second, they argue that "special agent rituals" (those in which the relevant supernatural being is the agent of the action) have certain properties. They are reversible but nonrepeatable: there are rituals that can reverse the results of these rituals (for a marriage ceremony there is, in principle,

a divorce ceremony), but in general there is no need to repeat these rituals, since once they have effected a result, that result is fairly permanent. Special patient rituals, in contrast, are repeatable but nonreversible. Similarly, special agent rituals tend to be performed less often than special patient rituals, because they need not be repeated, and they tend to be associated with greater sensory stimulation. A tedium effect comes into play with frequently repeated rituals, so over time they tend to be performed with less sensory stimulation.

THE DEFINITION OF RELIGION

Let me pause briefly to summarize the overall structure of Lawson and McCauley's theory. Rituals are actions, and their overall form is analogous to a sentence. What differentiates them from profane actions is the role that supernatural agents play; supernatural beings are represented in the religious conceptual scheme, and when meaning is added to the bare form of the action sentence, some of that meaning comes from the religious conceptual scheme. This theory naturalizes rituals because the basic framework can be used to explain profane actions as easily as ritual actions. So the only thing that makes rituals special (makes them a clear subset of actions generally) is the role of supernatural beings.

As it happens, the argument that what is unique and special about religions is belief in supernatural beings is gaining traction⁵ in the cognitive study of religion, in part due to Lawson and McCauley's efforts. This separates it from a dominant strain of thought in religious studies more broadly, where many people would argue that there are religions that don't require belief in supernatural beings. Classical Buddhism is a common example. If everything is, in a deep and mystical sense, one rather than many, then there really isn't a distinction between morals and immortals. Distinctions of any kind aren't real, this one included. But Lawson et al. argue that no real Buddhists believe this, or at least none that really count. In practice, Buddhists worship gods in much the same way that Hindus do, and in fact "real" Buddhism, that is, Buddhism on the street rather than in theological treatises, is heavily involved in the worship of all manner of gods. So Lawson and McCauley hold that supernatural conceptions are the defining quality of religions, and they feel that the goal of a naturalistic theory of ritual is to explain how the cognitive processes that are used for profane purposes also allow people to form conceptions of supernatural beings.

But I will propose that it is possible to naturalize religious cognition without defining religious cognition as thought about supernatural beings. People who subscribe to a wide range of definitions of religion can still agree on what phenomena count as religious, and thus it is reasonable to hope that we can make progress understanding (and naturalizing) religious cognition

without subscribing to some particular definition of religion. Lawson and McCauley want to naturalize religion but still make a firm divide between religious and profane beliefs. I am proposing that we need not presume such a firm divide. Maybe religions can be set on a continuum, with some (like Classical Buddhism) looking rather unlike what we think of as prototypical religion, and maybe other traditions that we don't consider to constitute religions (like Marxism) nevertheless share many features with religions. We can similarly assume that mental representations of religious phenomena are on a continuum, with prototypical cases being clearly dependent on belief in supernatural beings.

I will leave it for the reader to determine whether this points to a problem for Lawson and McCauley's theory. I think it does present significant problems, but I won't lay my case out in detail here. Let me just say this. Perhaps the joining of the religious conceptual scheme to the action representation system is jerry-rigged: maybe they try to join two models that don't fit together particularly well. If the religious conceptual scheme accounts for all of the religious content of rituals, and the action representation scheme accounts for all of the structural features of rituals, then there is nothing particularly religious about ritual actions (in other words, all the religious features are exogenous to them as actions).

McCauley and Lawson (2002) is largely focused on contrasting their theory with Whitehouse's, so let me now turn to Whitehouse, and return to Lawson and McCauley later.

WHITEHOUSE'S MODES OF RELIGIOSITY

Harvey Whitehouse is an anthropologist whose field research was carried out on New Britain, an island off the coast of New Guinea. The village in which he worked was a center of a type of religion known as a "cargo cult," and around the time of his arrival, it was being swept up by a charismatic heterodoxy. Thus, he was faced with mapping the interrelationship between two different types of religion, the "traditional" cargo cult (called the Pomio Kivung) and the innovative new religion that was evolving under his very eyes. The general theory of ritual that he proposed to account for his observations thus relied on an opposition between two poles corresponding to these two types of religion. But he makes it clear that the two poles are not distinct types of religion. The new religion he found in the village of Dadul had much in common with the cargo cult from which it evolved, but with significant differences. When Whitehouse speaks of the two poles, he calls them "modes," and he argues that all religions are somewhere on a continuum, often exhibiting aspects of both modes but tending to emphasize one at the expense of the other. The "imagistic mode" is the older of the two, he argues, and paleolithic religions were purely imagistic, but most

contemporary religions exhibit aspects of the “doctrinal mode,” sometimes to the near exclusion of the imagistic.

Toward the end of his ethnographic monograph *Inside the Cult*, Whitehouse (1995)⁶ presents a table intended to highlight the key differences between these modes (p. 197), and by examining this, we get an idea of what he means by the term “mode” (he never really defines the word, and to some extent it appears to be pretheoretical, as if no further clarification of what it means is necessary). Thus, for example, religions in the doctrinal mode rely on verbal expression; are highly repetitive; spread by proselytization; and can occur over wide areas. Religions in the imagistic mode tend toward iconic imagery (i.e., their symbols lend themselves naturally to particular kinds of interpretation) without the need for verbal explanation; can have rituals that are performed very infrequently; and are hard to spread because they tend to occur only locally.

If these modes were types of religions, we could in principle demonstrate that known religions fall into one category or the other, and not into other categories that we could define (e.g., religions that rely on iconic imagery but occur widely). Then we could say that we had naturalized the modes of religiosity by demonstrating that naturally occurring religions belong to a discrete set of types. But Whitehouse makes it clear that the modes are not types of religions, and that most contemporary religions exhibit elements of both modes. Then it is not clear why he believes there are precisely two modes or what explanatory function the modes of religiosity serve. Why not identify a third mode, characterized by iconic imagery and wide distribution, or a fourth, or a fifth? Or why not identify a certain number of axes (Whitehouse proposes 13 “variables” in his characterization of the modes) and plot any given religion in a complex space defined by these 13 axes?

Part of the answer can be found when Whitehouse compares his imagistic/doctrinal distinction to similar distinctions that are well established in the anthropological literature, for example, Lewis’ contrast between central and peripheral cults or Turner’s between fertility rituals and political rituals. He argues that his distinction picks up on many of the same intuitions and makes sense of much of the data that motivated these other distinctions but that it is superior precisely because it is founded on a more sophisticated and scientific psychology. Clearly, he thinks the agreement among scholars that rituals can be divided into two categories lends credence to the belief that some natural distinction underlies all these various theories. And he believes that his theory best accounts for that distinction.

It is perhaps useful to consider next Whitehouse’s discussion of the fieldwork that Frederik Barth conducted among the Baktaman of New Guinea. The Baktaman perform complex and highly secretive rites of passage (rituals used to advance a group of people to the next stage in their life course), and because they are a small society, these rituals may only be performed once

every 10 or 20 years. A student of ritual may reasonably ask how it is that the Baktaman remember how to perform these rites, since they have so little practice in performing them, and there is a prohibition on speaking of their details in public. In seeking to answer this problem, Whitehouse points to a line of research examining “flashbulb memory,” a type of memory used to store details of highly unusual experiences that an individual takes to be of great importance.

Most memories, it is now widely acknowledged, make use of “scripts,” or typical sequences of events that tend to recur. We usually think of memories as being like movies, which we can run through our heads when we want to recall some detail from the past. But in fact it takes a great deal of space to store digitized movies on a computer, and similarly it would take a great deal of capacity to store our memories as movies in our brains. For most events, we may recall salient details, but in general we remember details not of particular events but, rather, of typical events (this Whitehouse calls “semantic memory”). If asked what I had for dinner last week, I may respond meatloaf, white potatoes, and green beans, when in fact I had lima beans instead: that is, if I generally have green beans with meatloaf, then I may have a “meatloaf script” that entails eating green beans along with meatloaf. I may only remember that the store was out of green beans, so I bought limas instead, if this event was sufficiently significant to me to justify my maintaining a specific memory of the event. Otherwise, I may simply rely on my generic meatloaf script and remember, erroneously, that I had green beans that night.

We remember lots of details about an event, the theory goes, only in unusual situations, when the details really matter, or when our senses are heightened by great emotional stimulation, for example, fear. Many people remember where they were when they heard that President Kennedy was killed, or when they saw the first footage of the Challenger disaster, or learned that the Twin Towers had been destroyed. These would be examples of flashbulb memories. Whitehouse argues that the emotions and intense sensory stimulation of Baktaman initiation rites, which are in great contrast to the rather mundane daily life of these people, would seem adequate for the formation of flashbulb memories. The cargo cult from which the new religion derived, however, is at the doctrinal end of the spectrum. Its methods of worship, and the means by which it is taught, rely heavily on missionary Christianity and thus place great emphasis on enforcing uniformity in ritual practice as a means of maintaining doctrinal orthodoxy. Correct ritual practice in such a religion could be expected to rely on semantic memory.

In short, the contrast between imagistic and doctrinal modes is paralleled, and underwritten, by the contrast between flashbulb and semantic memory. This reliance on distinct types of memory in turn serves to naturalize Whitehouse’s theory. After all, the two types of memory are used for remembering all kinds of facts, not just religious facts, and they account for

the contrast between religions. But it would seem unusual if a particular religion made use of only one type of memory to the exclusion of the other, since both types of memory are used in day-to-day cognition. This is consistent with Whitehouse's position that religions need not adhere only to one or the other of his modes. Just as people in all contemporary societies use both types of memory, so their religions can have elements of both modes.

WHITEHOUSE VERSUS MCCAULEY AND LAWSON

Recently the small field of cognitive studies in religion has started to coalesce around two dominant paradigms, those of McCauley and Lawson and that of Whitehouse. This is in part a result of their own efforts: McCauley and Lawson (2002) in their latest book, *Bringing Ritual to Mind*, present their theory explicitly as an alternative to Whitehouse's. They argue that their theory and Whitehouse's differ primarily in the empirical predictions that they entail, and consequently that carefully designed studies of contemporary and historical religions can select between the two theories. Whitehouse, meanwhile, has gained the funding to establish a research center at Queen's University in Belfast and is working to assemble an interdisciplinary team to consider a wide range of religions in the context of the modes of religiosity theory. Both sides, in other words, believe that the difference between their theories can be determined by demonstrating which agrees better with actual evidence.

There are a number of elements to this dispute. McCauley (1999) had argued that Whitehouse's treatment of flashbulb memories was somewhat naive and not supported by more recent research; this challenge recurs at some length in McCauley and Lawson (2002). Whitehouse (2000) responded to some of this criticism but without substantially changing his theory. Similarly, Whitehouse (2004) held up particular rituals as counterexamples to Lawson and McCauley's theory. This is not the place to resolve these disputes. Other, and perhaps more critical, issues have received less attention thus far, and it is to some of these that I turn.

Lawson and McCauley presented their original thesis as a whole, without giving any motivation for its various parts. As I read them, they believe that the best theory of ritual cognition will agree best with the facts about particular rituals. But it isn't clear that what they present is really an empirical theory: it is not clear, in other words, that counterexamples to their theory are even possible. It isn't clear that there is any way of measuring the degree of sensory stimulation in a ritual,⁷ and the idea of centrality of a ritual is still rather murky (Lawson and McCauley's theory predicts how central a ritual should be, based on its form, but it is not clear that these predictions could be verified). In this context, it is interesting and perhaps significant that one of the most penetrating criticisms of the Whitehouse-Lawson-McCauley

debate is given by Scott Atran (2002, pp. 290–292) only in a (rather long) footnote. Among other observations, he points out that “there are really no clear cases for trying to choose between the two models because there are no reliable methods for evaluating cases.”

And the theory does not appear to be very rich. It purports to be a general theory of how rituals are represented in the mind, but in practice it appears to serve mostly as the motivation for several “hypotheses,” for example that more frequently performed rituals will display less sensory stimulation. This seems a rather obvious generalization, one that hardly requires an elaborate theory to justify it. If an explanation is necessary, we might want to look to economics rather than cognitive science: elaborate rituals with great amounts of sensory stimulation require a lot of time and (often) material resources to stage, so there is a practical limit to how often they can be performed. Curiously, Whitehouse argues that among the Pomio Kivung rituals he observed, the most frequent ones were also the most “complex and elaborate” (Whitehouse 1995, p. 66): since this is somewhat contrary to our expectations, such a fact would appear in greater need of explanation than its opposite.

Another odd feature of Lawson and McCauley’s theory: we might imagine a budding priest learning first one ritual, then another, but this would be, strictly speaking, impossible according to the theory, unless the priest began at the beginning, with Jesus instituting the Christian church—a real example, according to Lawson and McCauley (1990, p. 114). Their theory implies that a Christian cannot bless himself with water, in other words he cannot know to⁸ perform the actions such that they constitute that ritual, unless he knows that Jesus founded the church. It would appear that it is impossible to know how to correctly perform rituals unless one knows the correct, orthodox theology that underlies those rituals. A person can, curiously, correctly perform rituals without a knowledge of theology, but he would not know that he was performing that ritual, even if he knew he was doing the same actions as other people, and even if he knew the name and purpose of the ritual. Lawson and McCauley’s theory really seems to be about understanding the orthodox theology behind rituals, rather than about knowing how to perform them.

Yet Whitehouse criticizes them for “restricting themselves to the problem of explaining how ritual *procedures* are transmitted, rather than how *ritual meanings* are reproduced and transformed” (Whitehouse 2004, p. 145). When he draws attention to the doctrinal aspect of ritual, Whitehouse is emphasizing the fact that rituals often are learned and transmitted as vessels for doctrine, that is, for theology. I began this chapter by considering the *Homeric Hymn to Demeter* to emphasize that often myths are viewed as means of understanding rituals; there is a significant quantity of scholarship that sees the relation between action and word (ritual and myth) in this way.

But Whitehouse picks up on another trend in scholarship, which sees ritual as a handmaiden for doctrine. His point may be valid. Some rituals could be preserved precisely because they are vehicles for doctrine. Unfortunately, it isn't clear that his theory is the best way of pursuing this claim. The theory draws attention elsewhere, for example, to memory and cognition, when really this claim depends more on the social context of ritual.

It would appear, then, that the theories of both Whitehouse and Lawson and McCauley focus our attention on the meanings that people attribute to rituals. Whitehouse does so explicitly, whereas Lawson and McCauley claim to focus on the structure of ritual representations, though these structures tell us more about theology than about "ritual procedures." We find a radically different take on the question of meaning in the work of Frits Staal, to which we turn now.

STAAL AND RITUAL COMPLEXITY

The ritual theory of Frits Staal⁹ shares some similarities to the last two theories I have considered. It is like Lawson and McCauley's in that it takes the analogy between ritual and language seriously, and it is like Whitehouse's in that it focuses attention primarily on memory. Staal's theory originates in fieldwork, like Whitehouse's. In the 1960s, he studied the recitation of Vedic mantras (hymns) among a small group of Brahmans in South India, and in the 1970s he came back and observed the performance of a highly complex ritual, which took 12 days and 17 priests (plus numerous helpers) to perform, called the Agnicayana. At the time, the ritual had only been performed 17 times in the previous century, in part because of the expense involved in staging it. The results of this research are contained in Staal (1983), a massive, two-volume study of the ritual as it was performed in 1975 and in comparison to its canonical form as presented in a series of ancient Indian ritual texts. These texts describe every ritually significant action that must be performed over the course of 12 days, and Staal's need to compare the actual ritual, as it was performed, with these ritual texts led him to study the sequencing of the ritual, act by act, in a way that is very rarely done by scholars.

I recently had the opportunity to discuss Staal's theory before a seminar composed of computational linguists, and they were surprised to learn that very few ritual scholars study in detail the actions that are performed in the course of carrying out rituals. "What do ritual scholars study, if not ritual?" was a sensible question that I had no good answer for. Ritual scholars usually study the social context of ritual, and they try to discover the explicit and hidden meanings of rituals, but they rarely describe the rituals they have observed in great detail. Staal's empirical researches are important not only because the complexity of the Agnicayana is far greater than that found in most rituals, but also because of the detail with which the performance was

described. And the uniqueness of his general theory of ritual stems largely from the uniqueness of his field and textual research.

Like Lawson and McCauley, Staal tries to provide a formal analysis of the structure of religious ritual, and like them he takes the formal apparatus for his analysis from modern linguistic theory. But whereas Lawson and McCauley begin with an a priori analysis (they assume that the structure of ritual is the structure of the sentence), Staal begins with actual, observational facts. And while Lawson and McCauley assume at the outset that they know the exact rules governing ritual structure (see Lawson and McCauley, 1990, p. 100), Staal merely argues for the general form of such rules, leaving the details to be determined by further, empirical study. He describes some simple patterns found in the Agnicayana and other Vedic rituals and attempts to demonstrate that even the most complex rituals in the Vedic tradition are composed of relatively simple actions, by means of two types of rules: phrase structure rules, which generate action sequences from individual (atomic) actions, and transformation rules, which act on the resulting sequences and change them into different sequences. Whereas Lawson and McCauley begin by assuming that each ritual, no matter how complicated, is represented in the minds of participants as a single action (it achieves a single purpose), they never explain how it is that a ritualist knows what to do next, at any given moment in the performance of a complex ritual. What they present is not really a theory of ritual structure, but of the structure of ritual interpretations, in other words, an account of what rituals mean. Staal, in contrast, begins with the sequencing of actions and shows how ritualists can remember extremely complex sequences of actions, sequences so long and detailed that they may seem to present human memory with insuperable challenges. The Agnicayana, after all, lasts for 12 days, and one of the priests is responsible for knowing the entire ritual and being able to catch and correct errors that may be performed by the other priests. How does he remember how the ritual should go, especially when the ritual is performed so seldom?

Staal's answer¹⁰ is that priests don't remember these indefinitely long sequences of actions, because that would indeed be too difficult. Rather, they remember how to perform individual actions, such as pouring liquid out of a vessel, placing small offerings in a fire, or laying a brick on an altar, and they have a general representation in their minds of the overall structure of the ritual. Then they know how to sequence particular actions by applying a small set of rules recursively, and this is sufficient to successfully guide their actions throughout even the most complex rituals.

The key here is recursion. In the early 1950s, in the process of trying to find the most general principles that govern the human ability to use language, Noam Chomsky discovered that it is possible to order all possible languages (not just natural languages like English or Japanese, but also

artificial languages like programming languages or mathematical languages) in a sequence from most complex to least complex. A rough sorting of languages into four categories is today known as the “Chomsky hierarchy,” and this is the locus classicus for discussions of the complexity of languages. The general theory of language complexity has proved to have significant practical applications, particularly in computer science, and has been important to the design of computer compilers. The reason is clear: more complex languages require greater computing power to “parse” (or, roughly speaking, to understand) than a simpler language would, and it is crucial for computer scientists to design programs that can deal successfully with the inputs they receive. Otherwise, programs will crash, or run indefinitely without producing output, or produce the wrong output, and then they are at best useless.

If we think of the human brain as a type of computer, then we see how this problem applies to human cognition. By studying the complexity of natural languages, we learn the minimum processing capabilities of the human brain, since we have plenty of evidence that humans can use natural languages. Your ability to read this book is proof enough of that. And Staal’s key argument, in a nutshell, is that the “language” of Vedic ritual is of the same level of complexity as natural languages like English or Japanese.

Staal draws two conclusions from this observation. First, he argues that rituals are *per se* meaningless. People can, and do, attribute all sorts of meanings to rituals, and we have seen that the identification of ritual meanings is one of the main research projects in ritual studies, but those meanings may tell us more about the people attributing them to rituals than they do about the rituals themselves. Staal argues that to perform a ritual, a ritualist need not have a mental representation of the meaning of the ritual, but he does need to have a representation of the actions to be performed and their sequencing. In fact, many of the ritualists he spoke to did not seem to attribute any meanings to their rituals, and some ancient philosophers and ritualists writing in Sanskrit had argued that rituals are in fact meaningless. So Staal believed he had empirical and theoretical support for this view, though it is very much contrary to the standard position among modern ritual studies scholars.¹¹ This brings us back to my observations at the beginning of this chapter. Maybe, as Sperber argued, three decades ago rituals are not primarily devices for communicating hidden meanings. Maybe they are simply practical activities, which tend to get meanings attributed to them, perhaps because their purposes deal with hidden matters that are not easily observed (like a good life after death) or because the connection between their means and their ends is not always obvious.

In any case, if rituals are meaningless, then the goal of ritual studies should not be to identify the meanings of rituals, since that would clearly be pointless. Rather, we should focus attention on how rituals are performed, and similarly the cognitive study of ritual should focus on how people know

how to perform rituals. It isn't necessary to assume that rituals are meaningless, however, to realize that it should matter to ritual studies how rituals are performed (and how ritualists learn and remember how to perform rituals). The interaction of form and meaning may well be the next big question for the cognitive study of ritual, and the study of how rituals are performed¹² definitely should be included.

In Seaquist (2004) I argue that Staal's claim that rituals are meaningless is not as radical as some people might believe. He allows that rituals can be meaningful in all sorts of ways (e.g., people can attribute meanings to rituals, and rituals can serve social functions like enhancing group solidarity), but not in the one way that is most important in the context of his comparison of ritual to language. Linguistic meaning is compositional; in other words, the meaning of an entire utterance is a function of the meanings of each component. "The boy hit the ball" does not have the same meaning as "the boy hit the television" because the two sentences do not contain exactly the same words, and the difference between those sentences lies just in the difference between their component words. If rituals have the same structure as linguistic utterances, and given that utterances can be meaningful due to compositional semantics (their parts individually contributing to and collectively constituting their meanings), we would expect that ritual meanings would also be compositional. But this doesn't seem to be the case. Whenever someone proposes the meaning for a given ritual, that meaning doesn't seem to be a compositional function of the parts of the ritual. Therefore whatever meanings rituals have, they are imposed on them from the outside: they don't derive from the ritual itself. Thus, when Staal argues that rituals are meaningless, he is not arguing that we can't find meanings in rituals but, rather, that, in some rather important sense, the meanings that we find aren't really in the ritual at all.

Second, Staal concluded that the capacity to perform rituals is just the capacity to use language (in the sense that both types of performance are exercises of the same underlying ability, though in different arenas) and that ritual is older than language. His arguments here are rather rudimentary: for example, his claim that animals have ritual but not language may best be viewed as a simplification of the work of early ethologists like Konrad Lorenz. But the other chapters in this book give ample indication that the intuition behind the theory is worthy of further investigation, and curiously the trend in recent scholarship is to support Staal's basic intuition, which seemed bizarre to most readers when it was first presented in the late 1970s.

CONCLUSION

It may benefit ritual studies to borrow observations, methods, or theories from the cognitive sciences, but this by itself does not make for a cognitive

theory of ritual: A true cognitive theory of ritual will have to contribute to our understanding of the structure of the human mind. I therefore have tried to indicate ways in which ritual studies scholars have attempted to increase our understanding of mental architecture. Sperber made a good start at this in the mid-1970s, but there has been very little attempt to build on this foundation. In fact, the continued obsession in the scholarly literature with trying to find the real meanings of rituals has obscured the message that we ought to take from Sperber's work. Staal makes a serious claim about the structure of the ritual faculty, and his theory is indeed a contribution to cognitive science. Yet the near-universal misunderstanding of his theory has prevented people¹³ from building on his work.

Lawson and McCauley claim to present a theory of cognitive architecture, but the formal side of their theory really just models the interrelationships that they see between rituals and sheds little or no light on the way rituals themselves are represented in the mind. Besides their claim that rituals are represented as actions, their formal analysis only serves to show how rituals can be represented as depending on previous rituals for their efficacy. A quick look at any of the tree diagrams in Lawson and McCauley (1990) shows that deep and surface structures of rituals are basically the same, except that one ritual is embedded in another in the sense that a later ritual cannot be performed unless another ritual was performed (or rather, is believed to have been performed) sometime in the past. An example would be the Christian mass, which requires that at some time in the past the officiating priest was ordained. Contrast this with the sense in which Staal speaks of embedding: namely, when the performance of one ritual includes the performance of another as a proper part, as when a mass requires the performance of the Eucharist as a part of its performance.

Whitehouse's theory seems to be more clearly a case of using cognitive theory to explain rituals, rather than a contribution to cognitive science in its own right. But inasmuch as representations in an individual's mind might depend on larger social processes, his theory might contribute to the cognitive sciences, in particular, to discussions of the "extended mind." This phrase comes from an article by David Chalmers and Andy Clark (1998) and refers to the theory that cognition extends beyond the skull and the software that it contains, with the result that in some sense it contains objects that aren't even part of a person's physical body.

I have tried throughout this chapter to introduce topics that cut across all the theories that I have considered, such as the role of naturalism in cognitive theories and the relative importance of studying ritual structure and meaning. Another interesting problem, which I have addressed perhaps less directly, is the curious fact that the people who have contributed most to the field have generally misrepresented the significance of their theories. Staal focused so much on his claims about the meaninglessness

of ritual that he has devoted almost no attention to the broader implications of his observation that ritual cognition is as complex as linguistic cognition. Whitehouse has focused so much on defending his theory against Lawson and McCauley that he has not emphasized the fact that his theory naturalizes ritual cognition by showing how it makes use of general-purpose memory processes. These scholars may object to my claim, of course, but I do believe that the cognitive study of religion now runs the risk of turning into so many ghettos, with each author trying to defend his theory¹⁴ against competitors. To the extent that this happens, we run the risk of losing an understanding of the larger problems, and we lose the ability, so important to the sciences, of letting theories build on each other. Rather than viewing the field as composed of competing theories, only one of which can be true, we should focus instead on how the theories interact. I have attempted to focus in this chapter on those larger problems and glide over details of particular theories when they did not contribute to a better understanding of those problems.

NOTES

1. Note that I sometimes call the festival, which lasted about a week and was performed partly in and around Athens and partly in Eleusis, a “ritual” and sometimes a “performance.” I do not intend these three words to have different senses, and I use them interchangeably in this paper.

2. Due to the scope of my argument in this chapter, I omit discussion of two theories that are very important for the cognitive study of religion and ritual: Sperber’s work on the “epidemiology of representations” and Pascal Boyer’s on the representation of religious agents; see Sperber (1996) and Boyer (1994).

3. See below for a discussion of Staal.

4. Note that Lawson and McCauley’s terminology is unfortunate. The concept of the supernatural presupposes the concept of the natural, and the latter is far from being a cultural universal. Nature, or *physis*, played a major role in the Greek tradition of philosophy, as well as in nonphilosophical speculations about the world, and the notion of nature is consequently quite understandable in modern Western conceptual schemes. But a good case can be made that, in many other traditions, the natural/supernatural distinction makes no sense. The Fang believe in witches. We think of witches as beings possessing supernatural powers. But witches are part of the normal furniture of the world for the Fang. For Lawson and McCauley’s theory to work, they need ritualists to actually contemplate the natural/supernatural distinction as part of their thinking about ritual, and there is no way to assume that ritualists do this in societies that don’t recognize that very distinction.

5. It appears that Whitehouse does not agree with McCauley and Lawson on this; see Whitehouse (2004, p. 142).

6. I believe that this monograph presents the clearest and most successful exposition of Whitehouse’s views. Whitehouse (2000) is intended as a more general work, a synthesis of the position first laid out in detail in *Inside the Cult*.

7. This is actually acknowledged in McCauley and Lawson (2002, pp. 118–119), though the problem is then ignored in favor a long discussion about how to measure frequency (a less significant problem, I suspect).

8. I must add the words “know to” because Lawson and McCauley repeatedly emphasize that their theory is a theory not of ritual but, rather, of ritual knowledge.

9. Staal’s theory has been widely misunderstood, and much of the reason for this, I believe, has to do with the way he has presented his argument. My presentation will, therefore, differ rather significantly from that found in, for example, Staal (1990). Since I have laid out the evidence for my interpretation of his argument at great length in Seaquist (2004), I will not do so again here.

10. Staal’s theory is pretty thoroughly expressed in two early papers, Staal, 1979a and Staal, 1979b. These, along with a lot of other material, are collected and loosely rewritten in Staal, 1993. Also to be recommended is the first half of Staal, 1993, which clearly defends Staal’s view that rituals are per se meaningless.

11. This is now beginning to change, as many of the chapters in this series demonstrate, thanks to the recent interest in the evolutionary origins of ritual. It is worthwhile to point out, however, that Staal’s theory does differ significantly from other evolutionary arguments, much like it differs from Lawson and McCauley’s. The signalling theories discussed by Sosis in the present volume, for example, focus (like much of traditional ritual studies) on social relations more than on internal mental processes.

12. Another important work in this context is Humphrey and Laidlaw (1994). I have not addressed this book in the present chapter because it does not present itself as being a contribution to the cognitive study of religion. But in fact Humphrey and Laidlaw make a good case for studying ritual practice (looking at the actions that constitute ritual performance) while setting aside questions of ritual meaning.

13. Scholars who have made attempts to build on Staal’s work on ritual include Roy Edwin Gane, Richard Payne, and Kristofer Schipper (see Seaquist 2004, pp. 118–128, for details).

14. This may reflect a style of scholarship common in the social sciences. In some social science disciplines, everyone develops their own theory and christens it with a name. The cognitive study of religion would do well to rely more on styles of scholarship common in the natural sciences, in other words, to let distinct theories emerge as an indirect result of debates over evidence, mechanisms, and causal processes, rather than treating theories as ends in their own right.

REFERENCES

- Atran, S. (2002). *In Gods we trust: The evolutionary landscape of religion*. New York: Oxford University Press.
- Boyer, P. (1994). *The naturalness of religious ideas*. Berkeley: University of California Press.
- Chalmers, D., & Clark, A. (1998). The extended mind. *Analysis*, 58, 10–23.
- Humphrey, C., & Laidlaw, J. (1994). *The archetypal actions of ritual: A theory of ritual illustrated by the Jain Rite of Worship*. Oxford, UK: Clarendon Press.
- Lawson, E. T., & McCauley, R. (1990). *Rethinking religion: Connecting cognition and culture*. Cambridge, UK: Cambridge University Press.

- McCauley, R. (1999). Bringing ritual to mind. In E. Winograd, R. Fivush, & W. Hirst (Eds.), *Ecological approaches to cognition: Essays in honor of Eric Neisser*. Hillsdale, NJ: Erlbaum.
- McCauley, R., & Lawson, E. T. (2002). *Bringing ritual to mind: Psychological foundations of cultural forms*. Cambridge, UK: Cambridge University Press.
- Radt, S. (Ed.). (1985). *Tragicorum graecorum fragmenta* (Vol. 4). Göttingen: Vandenhoeck & Ruprecht.
- Seaquist, C. (2004). *Ritual syntax*. Unpublished doctoral dissertation, University of Pennsylvania, Department of Religious Studies.
- Sperber, D. (1975). *Rethinking symbolism*. Cambridge, UK: Cambridge University Press.
- Sperber, D. (1996). *Explaining culture: A naturalistic approach*. Oxford, UK: Blackwell.
- Staal, F. (1979a). The meaninglessness of ritual. *Numen*, 26, 2–22.
- Staal, F. (1979b). Ritual syntax. In M. Nagatomi, B. Matilal, & J. M. Masson (Eds.), *Sanskrit and Indian studies: Essays in honor of Daniel H. Ingalls* (pp. 119–142). Ingalls and Dordrecht: Reidel.
- Staal, F. (Ed.). (1983). *Agni: The Vedic ritual of the fire altar*. Berkeley, CA: Asian Humanities Press.
- Staal, F. (1990). *Rules without meaning: Ritual, mantras, and the human sciences*. New York: Peter Lang.
- Staal, F. (1993). From meanings to trees. *Journal of Ritual Studies*, 7, 11–32.
- Toren, C. (1983). Thinking symbols. *Man* (NS), 18, 260–268.
- Whitehouse, H. (1995). *Inside the cult: Religious innovation and transmission in Papua New Guinea*. Oxford, UK: Oxford University Press.
- Whitehouse, H. (2000). *Arguments and icons: Divergent modes of religiosity*. Oxford, UK: Oxford University Press.
- Whitehouse, H. (2004). *Modes of religiosity: A cognitive theory of religious transmission*. Walnut Creek, CA: Altamira.

THE BRAIN, RELIGION, AND BASEBALL:
COMMENTS ON THE POTENTIAL FOR A
NEUROLOGY OF RELIGION AND
RELIGIOUS EXPERIENCE

Warren S. Brown

SETTING THE STAGE

The neurological study of religion, religiousness, and religious experience described in this volume is a new and developing field. While religious symptoms manifested by particular patients with neurological disorders have been described in the neurological literature over the last century, in the past decade there has been a significant increase in experimental research in this area. Thirty years ago an entire volume on the neurology of religious experience scarcely would have been possible. The development of a significant body of experimental research on neural correlates of religious behavior and experiences has even led some to designate this a unique field of study, variously called “neurotheology” or “theobiology” (Rayburn & Richmond, 2002).

This field of study, like the neuroscience study of other important high-level human capacities, has been notably accelerated by the development of techniques of relatively noninvasive forms of functional imaging of brain activity (e.g., functional MRI, PET, SPECT, multichannel EEG, MEG, etc.). These techniques have allowed investigators to study brain function *in vivo* during many forms of cognitive, emotional, and psychosocial mental activity.

The chapters of this volume cover a wide variety of perspectives on the neurology, neuroscience, and developmental psychology of religiousness and the religious experiences of persons. However, before we can adequately understand this research, a number of issues regarding the nature of religion

and its study need to be resolved. This concluding chapter will discuss the chapters of this volume and, more generally, the field of the neurology of religion and religious experience with respect to several more general questions and issues.

In the second section (“What Sort of Thing Is Religion”), I take up the issue of what sort of thing religion is and what other domains of human thought and behavior religion is most like. In the third section (“Appropriate Levels of Scale and the Scientific Study of Religion”), I consider the neurology of religious experience with respect to levels of scale of scientific study (micro to macro) in attempt to determine if religion and religious experience, as scientific variables, are at a level of scale appropriate for neurological study. The fourth section (“Neurology of Religion and the Cartesian Worldview”) describes the effects of a Cartesian worldview on our thinking about religion. The issue of abstract concepts and misplaced concreteness is addressed in the fifth section (“Reductionism versus Emergence”). Finally, in the sixth section (“Guidelines for a Nonreductive Neurology of Religiousness”), I offer my opinion regarding how the neurology of religion and religious experience ought to proceed and what might be accomplished in this area.

WHAT SORT OF THING IS RELIGION?

To have a coherent and meaningful neurology of religion, it is important to have clearly in mind what it is that one wishes to study. Is religion a fundamental and unique form of brain function? Or is it a human capacity reliant on an interactive combination of many basic brain functions—that is, a conglomerate of individual human capacities such as intelligence? Or is religion not a phenomenon of individual persons at all but, rather, a form of human interrelatedness and social activity?

One way to approach this issue is to consider what other domain of human functioning religion is most like. First, let us consider whether religiousness is a human cognitive ability that is like the capacity for language or music and thus can be studied in a manner similar to the neurological study of these capacities. Candace Alcorta (Chapter 4, this volume) argues that religiousness is such a basic human capacity. She says, “Music, language, and religion are all cultural constructions that must be learned through social transmission; however, both the capacity for and constraints on such learning appear to be ‘hard wired’ in all human brains. . . . [O]ur ability to speak any language, enjoy any musical tradition, or engage in any religious experiences all appear to derive from genetically encoded neural capacities common to all humans” (p. 3). From the point of view of neurology, the critical claims made by Alcorta are that, while the specific expressions of religion are learned, religiousness itself is “hard wired.” Such “hard wiring” implies that there exists a unique neurophysiological substrate that is not shared by other

neurocognitive processes, and that this substrate is genetically endowed. In favor of this view of religiousness, Alcorta relies primarily on cultural similarities in religions and religiousness, as well as her theory that religion is an “experience expectant” system with a critical period for its development.

Before discussing further the claim that religion is like language or music in its neurological substrates, we must recognize that neither “language” or “music,” per se, are capacities specific enough for neurological study. With respect to language, it has become increasingly clear that the neurology of language must be studied with respect to more refined cognitive contributions. In fact, even the division of language into “expressive” versus “receptive” capacities, widely utilized in clinical settings, is not sufficiently fine grain for neuroscience study. To track the neural systems involved one must focus on such subparts of language as syntax, semantics, lexicon, phonology, graphemics, etc. Only by fractionating language into such cognitive subcomponents can one make reasonable sense of the neural systems that participate in the emergent, abstract property we refer to as language (e.g., see Boller, Grafman, & Berndt, 2001).

Music is very similar to language with respect to neurological study. Like language, there is the expression of music and the appreciation of music. Both of these sub-domains are composed of multiple contributing capacities, each of which are more likely to have discrete neural systems that would be amenable to neurological study. For example, musical appreciation requires perception of rhythm, pitch, melody, harmonics, and emotional engagement. Expression of music also engages various motor skills that contribute to vocal or instrumental musical expression. Finally, music involves, in some circumstances, a unique form of written notation. (For a review of the neuropsychological study of music, see Peretz and Zatorre, 2005).

So, to the degree that individual religiousness is like language or music, it is also not itself a thing that can be studied at the level of neurology. One must first fractionate the behaviors and experiences into their cognitive subcomponents and then study the many contributing processes to find relatively unique or specific neural systems.

However, there are some very critical ways in which religiousness is not like either language or music. First, for both language and music there exists an extensive literature suggesting specific syndromes associated with relatively localized areas of damage to the brain. For example, various forms of language disorder (aphasia, alexia, or agraphia) are associated with damage to specific brain areas such as the left superior temporal gyrus, the left angular gyrus, and left inferior frontal lobe (Boller et al., 2001). While neuroimaging has made it clear that language processing always involves a large bihemispheric network, there are nevertheless rather specific symptom complexes associated with localized left hemisphere brain damage. While the syndromes are less clearly described for music, again there are consistent

reports of syndromes of musical disability associated with localized brain damage (Peretz, 2002; Peretz & Zatorre, 2005).

In contrast, there are not religion-specific syndromes or disorders that are associated with any particular areas of the brain. The closest candidate is the religious manifestation of temporal lobe epilepsy (TLE), well described by Stephen Schachter (Chapter 4 of this volume). However, the religious symptoms associated with TLE are only a small part of a wider variety of symptoms, and these symptoms can all be fairly well subsumed within more basic problems associated with deepened emotional responses and increased attribution of personal significance. Similarly, the impact of Parkinson's disease on religiousness (as describe by McNamara et al. in Chapter 1 of this volume) is a reflection of a more general outcome related to reduced interest in most daily activities and reduced initiative. Thus, religiousness is clearly not like language and music with respect to specific neuropathology and specific behavioral outcomes.

Behind much of the discussions of a neurology of religiousness is the assumption that genetics has endowed humankind with religious capacities or tendencies. Linden Eaves (2004) has presented evidence suggesting genetic contributions to religious tendencies such as church attendance, self-transcendence, and conservatism. However, these tendencies are hard to distinguish from more general aspects of personality and temperament, and Eaves does not present data that would support distinct genetic contributions to these aspects of religiousness. Alcorta (Chapter 4, this volume) argues in favor of a genetic contribution to religiousness because religious practices can be found in nearly all cultures. However, it would be difficult to identify aspects of religiousness that are sufficiently consistent across cultures to be a candidate for common genetic influence. Despite the fact that we can group the wide variety of cultural manifestations within the single abstract concept "religion," the variety of cultural expressions of religion are arguably much greater than the cultural variations associated with either music or language. Similarly, it would be hard to argue that there has been a sufficient duration of time since the appearance of complex cultures within *homo sapiens* for the genetic evolution of specific brain systems for something as complex as religiousness. Thus, it is more likely that religion is ubiquitous due to cultural evolution and transmission, rather than genetic evolution (Ayala, 1998), and that the genetic factors that have been suggested by Eaves have an influence on the form and degree of participation of specific persons via more general personality factors.

All of this suggests that we must look elsewhere for an appropriate metaphor for understanding the nature of religiousness. Matthew Ratcliffe (Chapter 5 of this volume) suggests the possibility that religion is more like baseball—a cultural and sociological concept that summarizes a wide variety of group and individual activities, events, and experiences. Certainly the

concept of “baseball” includes a very complex array of behaviors and experiences. It encompasses group participation as either spectators or players. For participants, baseball represents a particular set of motor skills and a form of group activity. For the dedicated fan, it is a topic of continual interest, conversation, and occasional attendance at games. Baseball can involve moments of intense emotional involvement (e.g., the emotion released by a walk-off home run to end an important game), longer periods of routine (e.g., practice sessions for participants or spring training for the fan), and certain ritual-like practices (e.g., pre-game and between-inning warm-up for players, the seventh-inning stretch, singing the National Anthem, etc.). For some, baseball is a complex entertainment business. Clearly, baseball involves many complex layers of interpersonal and social organization. We should consider the possibility that religion is not itself a basic cognitive process like language or music but, rather, is a more broadly inclusive social phenomenon like baseball.

The one critique of the baseball metaphor is that baseball is culturally not as prevalent as religion. Alcorta (Chapter 4, this volume) believes religion to be a fundamental human capacity because it is culturally ubiquitous. However, it would not be hard to argue that soccer (or “football” for most of the world) is a reasonable analogy since most of the world plays soccer. In addition, a wide variety of other games with the basic structure of soccer (e.g., American football, rugby, and basketball) are played within many different countries and cultures. A game not unlike soccer was played even by the ancient Aztecs and Maya.

If baseball (or soccer) is a better model for religion than either language or music, what would be the implications for neurological study? First, we would not expect to find a specific neurology of baseball—that is, no unique neurological systems that would contribute specifically to baseball and not to other forms of life. Baseball is neither sufficiently unitary as an experience or event, nor sufficiently temporally bound for study at the level of neurology. Second, we would not expect neuropathology specific to baseball, although many forms of neurological disorder might have an impact on different forms of participation in, or appreciation of, baseball. Thirdly, it would be somewhat far-fetched to imagine an evolution of the specific capacity for baseball, or to argue for the survival advantages of baseball to individuals or social groups, or to argue that the specific capacity for baseball is “hard wired.”

It is more reasonable to consider baseball a complex social emergent of many more basic sociocultural systems involving a wide variety of activities and experiences that, in turn, piggy-back cognitively, neurologically, and evolutionarily on a large number of more general cognitive capacities and skills. Thus, both religion and baseball are abstract concepts incorporating a wide range of human behaviors and experiences that should not be reified in a way that presumes these abstract concepts point to unitary and fundamental

human capacities available for study at the level of the brain. Thus, from the point of view of a naturalist neuroscience (although not from the viewpoint of theology), religion is more accurately understood as a large encompassing social and cultural phenomenon like baseball, rather than a fundamental human capacity like language or music.

To put this same point in a slightly different light, part of the question to be considered prior to engaging in any neurological study of religion is whether religion is essentially individual or corporate—within individuals persons or between persons (or persons and social contexts). If religion is primarily corporate—that is, if it exists in the interpersonal, social, and cultural domains—then any study at the level of neurology cannot be about religion, but must be about the neurology of more general cognitive and psychosocial functions that are engaged by a very particular form of interpersonal and social interactions in particular contexts. There would, therefore, not exist a neurology of religion, *per se*, nor would there be a neurology of particular forms of religious behavior or experience but, rather, a neurology of contributory neuropsychological systems that interact within the individual and between the individual and the socio-cultural environment, such as to allow for the emergence of religious behaviors and experiences.

APPROPRIATE LEVELS OF SCALE AND THE SCIENTIFIC STUDY OF RELIGION

The nature of an appropriate neuroscientific study of religion and religious experience can also be understood in terms of a hierarchy of the sciences with respect to level of scale of the phenomena being observed—extending from micro levels to more macro views of human functioning. At the most micro level are physics and chemistry. Moving to a slightly more macro level is biochemistry, including study of biological molecules like DNA or neurotransmitter receptors. At a higher level would be the study of the activity of neural cells. At an even higher level, we encounter research on neural interactions in local networks (such as studies of cellular interactions within the spinal cord, hippocampus, or olfactory bulb). Further up the hierarchy is the study of how such local systems interact to allow for properties like visual and auditory sensation, basic motor control, control of vegetative systems, and stereotypic behavior patterns.

At a still higher level, we begin to be able to use low-level psychological terms to describe what is being studied, such as perception, memory, attention, emotion, planning, and so forth. Here it becomes clear that the specifics of the functioning of these neural systems are formed by environmental interactions, mostly during childhood. For example, the specifics of the phonological systems of language are formed during early language experience, although the local circuits for this processing can be found at similar locations

within the brains of almost all normal individuals in all cultures. At a more macro level still, we encounter more global attributes such as personality or intelligence. Here we are referring to aspects of whole persons to which many brain areas and brain systems contribute. This micro-to-macro continuum extends on into the social and cultural domains in which higher-level systems emerge from the interaction of individual persons.

One of the important implications of this roughly described micro-to-macro continuum is that appropriate scientific conclusions regarding relationships between phenomena are difficult to draw when skipping over many levels. At the most extreme, it would be hard to conceive of a neurochemistry of baseball, since this would skip over very many levels of human functioning. While a neurochemical change might alter one's experience of baseball, it would do so indirectly by altering neurological and neurocognitive functions at many intervening levels that would have impact on a very wide variety of behaviors and experiences beyond just baseball. It would not be very scientifically meaningful to attempt to establish a direct relationship between a biochemical change and the participation in or experiences of baseball. The appropriate scientific conclusion would be about the effect of the biochemical change on particular forms of brain function, and the impact of these changes on rather generic forms of human behavior or experience that, in turn, might be involved in baseball. Conclusions about baseball, *per se* (even if baseball provided the context for observing the behavioral impact of the biochemical observation), would be inappropriate without considerable discussion about, and experimental evidence regarding, changes at many levels of intervening human function that are contributors not only to baseball, but also to many other domains of human life.

Let me take as an example of this hierarchy of complexity the relationship between neurochemistry, frontal lobe function, and religiousness described by McNamara (Chapter 9 of this volume). A wide range of neurophysiological, neurological, and behavioral data are surveyed to suggest the important role of dopamine systems and the prefrontal cortex on behavioral inhibition, cooperative social behavior, and religion. One might parse the data that McNamara presents into something like the following micro- to macro-hierarchy of function: First we have genetic contributions to the neurochemistry of dopamine (particularly the enzyme COMT), as well as genetic contributions (most likely less direct) to whatever processes control growth (and size) of the prefrontal cortex. Second, during the very complex interactive biological processes of prenatal development, dopamine neurons extend their axons to innervate the prefrontal cortex, and prefrontal neurons extend their axons "downstream" to innervate and modulate lower-level brain systems. This, then, allows for the emergence of the fundamental neuropsychological processes of executive control and inhibition of action. Capacities for inhibition of action lead, in turn, to the possibility of engaging in cooperative social behavior, including

the potential for those behaviors that constitute, in the evolutionary story provided, “costly signaling.” This capacity allows, in turn, for the social and cultural emergence of religious rituals, mores, and beliefs, which work recurrently back on the individual to develop virtues and character. Thus, in this quite plausible story, there are many steps between basic brain processes (genetics, neurochemistry, and functional systems) and complex social behaviors such as religiousness. The relevant neurological processes described are not specific to religiousness, but are properties of brain processing that serve the more general neuropsychology capacity of executive function.

A similar view might be taken of the description of religious conversion presented by Paloutzian, Swenson, and McNamara (Chapter 7 of this volume). In their theory, religiousness (and, thus, religious conversion) is a product of a more general cognitive capacity for meaning making (involving “emotions, actions, beliefs, expectations, and contingencies,” p. 6). Meaning making is, in turn, the product of interactions of a number of brain systems (involving the frontal, parietal, and medial temporal lobes). I suspect that even this 3-level analysis, while a very useful theory, is nevertheless a simplified summary encompassing a number of additional, discernable, intervening levels of function.

So, with respect to the micro-to-macro hierarchy of increasingly complex systems, we need to be clear where religion lies and whether it is sufficiently “close” to brain function to imagine specifically religious brain systems and to allow the search for correlations that are scientifically meaningful (i.e., correlations that imply direct, or nearly direct, causal relationships). Is religion an immediate cognitive emergent property of brain function involving domain-specific brain systems, or is religion a phenomenon many levels of emergent properties removed from brain functioning? Nobel Laureate Roger Sperry once expressed the problem of the gap between psychological and neurological phenomena in this way: “An objective psychologist, hoping to get at the physiological side of behavior, is apt to plunge immediately into neurology trying to correlate brain activity with modes of experience. The results in many cases only accentuates the gap between the total experience as studied by the psychologist and neuronal activity as analyzed by the neurologist” (Sperry, 1939, p. 295). It would seem to me that religion is not just psychological but, rather, a very high-level property of human sociocultural participation that is dependent on interactive contributions of many psychological (cognitive) systems that themselves emerge from interactions between a number of more basic brain systems. If religion entails social interactions, the gap described by Sperry becomes even greater.

My use of the term “emergent” is not meant to imply that something emerges that is nonmaterial (like a soul or mind in the Cartesian sense). New *properties* can emerge in a complex dynamic system by harnessing the activity of the lowest level physical constituents (atoms, molecules, or neurons) into

causally efficacious interactive patterns (see the discussion of complex dynamic systems in the fifth section).

NEUROLOGY OF RELIGION AND THE CARTESIAN WORLDVIEW

Study of the neuroscience of important, high-level human capacities is plagued by the remnants of a Cartesian worldview. Descartes gave Western culture a strong notion of the distinction between body and soul (or body and mind). The body, for Descartes, was a physical machine. However, unable to imagine how rationality could be manifest by a machine, Descartes argued that the soul (or mind) is a distinct nonmaterial entity. As the seat of rationality, the soul was presumed to be hierarchically superior to the body, and more important. In addition, this hierarchically more important soul (or mind) was presumed to reside inside the body.

The discussions of religious experiences and behaviors and brain function within this volume lean strongly toward an embodied (nondualistic) view of human religiousness. However, even within such a nondualist and generally materialist understanding of persons, it is hard to avoid the idea that the most important aspects of being human resides inside the head. The mind is still considered to be an entity that is found entirely inside the head in the form of brain functions that are distinct from the rest of the physical person and also distinct from the social environment. Instead of a body and an inner soul (or mind), we have a body and inner brain function (i.e., a brain-body dualism). This is the view that Daniel Dennett (1991) has referred to as “Cartesian materialism.” Consequently, we implicitly assume that all that is important and critical about human life must be identified with functions or properties that are inside individual human persons. This view relegates interpersonal relations and social systems to a secondary status with respect to our understanding of the most unique and important aspects of human nature. Within the Cartesian worldview, everything that is important about humanity must be both *inner* and *individual*.

By definition, a *neurology* of religiousness would deny that religiousness is exclusively about the experiences of a Cartesian nonmaterial mind or soul. However, an implicit assumption of this research is the Cartesian view that any important property of humanness, such as religion, must be resident inside individual human persons (presumably in some unique form of brain functions). Even though the chapters of this volume indicate that it is possible to contemplate religiousness outside of Cartesian body-soul dualism, it does not seem to be the case that we have moved past the Cartesian assumptions regarding innerness and individuality. If religion is a critically important part of what it means to be human, then (in this view) it must be the case

that religion resides inside of the person—within neural systems that are uniquely responsible for one’s religiousness and religious experiences.

For example, what is the rationale for discussing ritual (Seaquist, Chapter 10 of this volume) or adolescent religious awakening (Alcorta, Chapter 4 of this volume) in a way that presumes that the important determinants of these human events are within individual persons, rather than within the culturally bounded social networks in which persons are embedded? Might not even personal religious conversion (Paloutzian, Swenson, and McNamara, Chapter 7 of this volume) be better understood as a relationship between a whole complex person and a religious community or institution, or between a person and God (as the monotheistic religious traditions would suggest), rather than a primarily an internal event of individual meaning making? The neurochemical perspective on religious experience offered by Newberg (Chapter 2 of this volume) presumes religious experience to be entirely internal, and the existence of these internal mechanisms is “why God won’t go away” (Newberg & d’Aquili, 2001b). While Azari’s view of religious experience (Chapter 3 of this volume) points primarily to inner brain properties, her theory of religious experience has the merit of also pointing outward in that a religious experience is a form of “relational cognitvity.”

An alternative view that gains more distance from the Cartesian view is that, although humans have uniquely developed neural and bodily machinery, what is unique about humankind is the way the machinery is used to interact with the physical and social environment (and, some might believe, interactions with the Divine). The uniqueness of humankind is not about the neural machinery, per se, which, after all, is merely an extension and expansion of biological machinery found also in apes. Rather, human uniqueness resides in the social environment that our machinery allows us to create and to participate in. Thus, when studying uniquely human capacities like religiousness, the critical questions are not about the machinery itself (i.e., about brain systems), but about how, when we are embedded in the social processes of human culture, we are capable of remarkably more complex social interactions and experience notably increased degrees of freedom in thought and behavior compared to the rest of the animal world.

REDUCTIONISM VERSUS EMERGENCE

Reductionism relates to the hierarchy of micro-to-macro levels of scale described earlier in that it presumes that the laws governing lower-level processes (e.g., brain functions) can account for higher-level phenomena (e.g., religious experience) *without residual*. That is, all of the variance at the higher level can be exhaustively explained, in principle, by phenomena at some lower level. *Emergence*, on the other hand, presumes that new properties emerge at higher levels that, while dependent on lower-level functions,

cannot be entirely accounted for or explained by lower-level processes. Real *causal* properties emerge as lower-level phenomena form into larger interactive patterns. An account of the lower-level properties cannot do justice to higher-level emergents.

Dynamic systems theory gives the best account of emergence (for a good description of dynamic systems theory with respect to the human brain and behavior, see Juarrero, 1999). The massively and recurrently interconnected neuronal network that is the cerebral cortex is beautifully suited for emergence of the sort of higher-level properties described by the theory of complex dynamic systems. When pushed far from equilibrium by environmental interactions, dynamic systems self-organize into larger *patterns* that are constituted by *relational constraints between elements*. Thus, the elements of the system work together in a coherent or coordinated manner to create the larger-scale functional system. This larger system operates internally by restraining (or entraining) the future possibilities for each constituent element. Once organized into a system, lower-level properties interact (bottom-up) with the relational constraints created by the higher-level patterns (top-down), without implying any exceptions to lawfulness at the micro-level. As Juarrero explains it:

when parts interact to produce wholes, and the resulting distributed wholes in turn affect the behavior of their parts, interlevel causality is at work. Interactions among certain dynamical processes can create a systems-level organization with new properties that are not the simple sum of the components that create the higher level. In turn, the overall dynamics of the emergent distributed system not only determine which parts will be allowed into the system: the global dynamics also regulate and constrain the behavior of the lower-level components. (Juarrero, 1999, pp. 5–6)

These patterns self-organize (and reorganize) as demanded by the continual give-and-take of interactions with the environment. A new pattern of constraints will manifest new properties of the whole system that were not present prior to this process of self-organization.

In such systems, interactions with novel aspects of the environment cause repeated reorganizations that create increasingly more complex and higher-level forms of system organization. Thus, multiple smaller systems can be organized into even larger systems. Gibbs (2006) explains dynamic self-organization of behavior as follows: “an individual’s behavior emerges from interactions of brain, body, and environment. Simple and complex behavioral patterns are higher-order products of self-organization processes. Virtually all living organisms self-assemble, or are self-organizing systems, . . . Self-organized patterns of behavior emerge as stable states from the interaction of many subsystems” (Gibbs, 2006, p. 10). In this way, the dynamics of reorganization result in a

nested hierarchy of more and more complex functional systems, reminiscent of the micro-to-macro hierarchy of levels of scale described above.

In addition, *constraints* between individual elements or smaller patterns existing at lower levels result in the emergence of higher-level system properties that manifest substantially *greater freedom*. The system has a substantially greater number of possibilities with respect to its interactions with its surrounding environment than it had prior to each new level of self-reorganization. Again, as Juarrero expresses it, “The higher level of organization, whether thermodynamic, psychological, or social, possesses a qualitatively different repertoire of states and behavior than the earlier level, as well as greater degrees of freedom” (Juarrero, 1999, p. 145).

Thus, dynamic systems theory specifies how truly emergent, nonreductive properties are possible in complex interactive systems, most particularly within the hypercomplex human brain, as well as the social networks in which persons are embedded. Since the emergent properties of a complex dynamic system are interactive patterns that interface with the environment as a whole system, the properties of the patterns themselves cannot be entirely reduced to rules of action specifiable at lower levels. What is implied by emergence and dynamic systems analysis is an ontology of relationships and interactions—that is, *real things* emerge in the form of interactive patterns that are as real (at least in a causal sense) as the physical elements that constitute the patterns.

With respect to the study of neurology of religion and religious experience, one must ask whether the descriptions of the results published thus far have implied an unwarranted reduction of the phenomena of religion to brain systems (i.e., the neural components and sub-systems that are inside single individuals). In the descriptions of research outcomes, is it assumed that the activity of the brain systems that are identified as engaged during the religious experiences can entirely account for the higher-level properties of religious behavior and experiences? Might several levels of emergence of nonreductive causal properties (both individual and social) intervene between neurological descriptors and important aspects of human life such as religion?

GUIDELINES FOR A NONREDUCTIVE NEUROLOGY OF RELIGIOUSNESS

In this concluding chapter I have attempted to formulate a meta-view of the field of the neurological study of religiousness or religious experience—a view from which to both understand the research that has been done thus far, and to consider further research. In so doing, this chapter has been rather negative with respect to what might be learned about religion from neurological study. Nevertheless, a number of the chapters of this volume describe

interesting scientific outcomes that, if properly understood, represent progress in our understanding of the relationship (however distant) between brain function and religious experiences and behaviors.

How does one go about doing and evaluating studies of brain processes involved in religious behavior and experience? In what follows, I will venture some guidelines for both doing such research and evaluating how much has been learned from existing studies.

1. *We should study a specific, narrowly defined component of religiousness, and explicitly recognize the narrowness.* What is meant here is more than simply an explicit operational definition of the religious variable to be studied (although this is always a critically important task). Rather, we must choose to study a contributing component of religion that exists at a level appropriately narrow and specific for neurological study. Equally as important, we must not allow the introduction and discussion of the research to extend too far beyond this specificity. For example, if the study is about a certain form of meditation (e.g., the research of Newberg and colleagues described in Chapter 2 of this volume), the discussion of the research should be confined to this particular form of meditation and not wander beyond this particularity to a discussion of religion or religious experiences in general, as if experiences associated with a circumscribed form of meditation could adequately stand in for all or most religious experiences.
2. *We must consider all of the intervening cognitive contributions to the specific component of religious behavior or experience that we study, and, if possible, we should explicitly manipulate or measure in the research the contributions of the various intervening cognitive variables.* It is my contention that the religious variables are manifestations of the interaction of many lower-level cognitive processes, each with its own neural substrates. Manipulating or measuring intervening cognitive variables would make clear the degree to which the neurological correlates of religiousness are secondary manifestations of more general neurocognitive outcomes. A good example is the research on religiousness in patients with Parkinson's disease reported by McNamara and his colleagues (McNamara, Durso, Brown, and Harris, Chapter 1 of this volume). The impact of Parkinson's disease on religiousness was found to be primarily manifest in reduced participation in the private practices of religion and was paralleled by reduced participation in leisure activities and hobbies. To further clarify the impact of variables intervening between religious participation and brain processes, these authors also administered neuropsychological measures of executive function that showed that the outcome in religiousness was secondary to a more general abnormality affecting a wide range of behaviors strongly influenced by frontal lobe function.
3. *If possible, we should study the developmental path to the religious behavior or experience.* What neural systems must develop before the behavior or

experience can emerge? Are these systems general or specific to religiousness? The developmental timing of the appearance and maturation of the religious behavior or experience in question, when compared to the development of various cognitive capacities and social skills, will give further clues to the intervening neurocognitive skills and abilities manifest in the religious variable. Chapters in this volume by Alcorta (Chapter 4) and Granqvist (Chapter 6) describe the importance of prior social and cognitive development for the emergence of various forms of religiousness in children and adolescents.

4. *Any conclusions implying that a neural system or pattern of neural activation is specific to a religious state or behavior need to be supported by incorporation of many similar but nonreligious control conditions.* Considerable work needs to be done comparing the outcome associated with the religious variable and the possibility of the same outcome when manipulating similar, but nonreligious variables. For example, in the research of Newberg and his colleagues (Newberg et al., 2001a; Newberg, Pourdehnad, Alavi, & d'Aquili, 2003; described by Newberg in Chapter 2 and by Azari in Chapter 3), it would be important to know if any nonreligious practices or experiences would also result in the same pattern of increase in frontal lobe activation and reduction in right parietal lobe activation that was found during religious meditation studied. Without such information, the conclusion that a particular brain state is in any way specific to religious experiences is unwarranted.
5. *We must be clear about the social scaffolding (past and present) necessary for the behavior, experience, or event to be considered religious by the participant.* Religion may well be a contextual variable that controls a person's subjective interpretation of a neural event, not a primary outcome of the neural state itself. The cases of religious experiences associated with temporal lobe epilepsy described by Schachter (Chapter 4 of this volume) are important to consider. Would the experience of temporal lobe epileptic discharge be interpreted as religious by a person with no religious background whatsoever? Does a religious social history predispose a person to interpret a seizure experience as a religious manifestation? Variations in the interactions between the subjective experience resulting from a seizure and a prior religious history, and/or a concurrent religious context, might explain some of the variability in the findings regarding a relationship between temporal lobe epilepsy and religious experiences.
6. *We should avoid reductionist statements in describing research outcomes that imply that functions at one level are "nothing but" the operation of lower levels.* Emergence implies that real, novel, and causal properties emerge in the patterns of interaction of component parts that cannot be reduced to the properties of the parts themselves. So, as important as the brain is to human behavior and experience, no important human psychological property, much less a human sociocultural phenomenon like religiousness, can be reduced to nothing but the activity of a particular neural

system or specific pattern of neural activation. If nothing else, since the operation of neural systems is always embedded in ongoing interactions with the physical or social environment, appropriate interpretation of research findings necessitates specification of the nature of these ongoing interactions.

SUMMARY AND CONCLUSIONS

In these concluding remarks for this volume on *The Neurology of Religious Experience*, I have attempted to take the widest possible view of the field to gain perspective on what can and cannot be accomplished. I have suggested that the property of religion and religiousness might best be placed outside of the individual in characteristics of the sociocultural environment (like baseball), rather than within persons as a unique property of individual neurocognitive functioning (as in language). I have also suggested that attention needs to be paid to levels of scale when attempting to find associations between brain function and religiousness by asking whether the two domains are sufficiently close for study of their relationships, unmediated by many levels of intervening variables. I have also critiqued the basic formulation of the problem of human religiousness from the point of view of a Cartesian worldview, where everything that is important about humanness (like religion) must be both within the person and a property of the individual. Finally, I have used these arguments to make suggestions regarding things to consider in the further development of a neurology of religion and religious experience.

These perspectives and considerations suggest that the designation “neurology of religious experience” should be considered a convenient summary phrase, referring to for what is in reality a neurology of the cognitive contributions to specific behaviors and experiences labeled by the individual as “religious” due to social context (present or past). From my own theological perspective, the concept of “behaviors and experiences labeled by the individual as religious due to social context” would include the possibility that the “social context” includes a detectable presence of a nonmaterial God. However, as Ratcliffe suggests (Chapter 5 of this volume), nothing can be concluded about the reality (or nonreality) of God or his action in the world by a neurological study of religious behaviors and experiences. Existence of a divine being is a theological question, not a neuroscientific question.

REFERENCES

- Ayala, F. (1998). Human nature: One evolutionist's view. In W. S. Brown, N. Murphy, & H. N. Malony (Eds.), *Whatever happened to the soul: Scientific and theological portraits of human nature* (pp. 31–48). Minneapolis: Fortress Press.
- Boller, F., Grafman, J., & Berndt, R. S. (Eds.). (2001). Language and aphasia. In *Handbook of neuropsychology* (2nd ed.). Amsterdam: Elsevier Science.

- Dennett, D. (1991). *Consciousness explained*. Boston: Little, Brown.
- Eaves, L. (2004). Genetic and social influences on religion and values. In M. A. Jeeves (Ed.), *From cells to souls—and beyond: Changing portraits of human nature* (pp. 102–122). Grand Rapids, MI: Eerdmans Publishing.
- Gibbs, R. W. (2006). *Embodiment and cognitive science*. Cambridge, UK: Cambridge University Press.
- Juarrero, A. (1999). *Dynamics in action: Intentional behavior as a complex system*. Cambridge, MA: MIT Press.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. (2001a). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary spect study. *Psychiatry Research*, *106*, 113–122.
- Newberg, A. B., & d'Aquili, E. (2001b). *Why God won't go away: Brain science and the biology of belief*. New York: Ballantine Books.
- Newberg, A., Pourdehnad, M., Alavi, A., & d'Aquili, E. G. (2003). Cerebral blood flow during meditative prayer: Preliminary findings and methodological issues. *Perceptual Motor Skills*, *97*, 625–630.
- Peretz, I. (2002). Brain specialization for music. *Neuroscientist*, *8*(4), 372–380.
- Peretz, I., & Zatorre, R. J. (2005). Brain organization for music processing. *Annual Review of Psychology*, *56*, 89–114.
- Rayburn, C. A., & Richmond, L. J. (Eds.). (2002). Introduction. In *Theobiology: Interfacing theology, biology, and other science for deeper understanding*. *American Behavioral Scientist*, *45*, 1785–1788.
- Sperry, R. W. (1939). Action current study in movement coordination. *Journal of General Psychology*, *20*, 295–313.

INDEX

- Action, in ritual, 210
Action representation system, 210–11
Adaptation, religious experiences as, 138–41; Newberg et al. on, 139–40; Persinger on, 138–39; problems with theories of, 94–96
Adolescence, 64–76; cultural definition of, 67–68; emotional intensity in, 68; emotional reactivity in, 71; length of, nutritional and ecological factors on, 68; as life stage, 67–69; reactions to environmental stimuli in, 68; risk taking and novelty seeking in, 68
Adolescence, brain chemistry in: cortisol in, 68; dopaminergic shifts in, 70–71; neurotransmitter systems in, 70
Adolescence, brain growth and development in, 69–71; critical, 67; development in, 69–71; growth in, 58–59; mental processing in, 69; synaptic pruning in, 70; white matter increases in, 70
Adolescence, religion in: on behavior, 72–74; on depression and suicidal ideation, 73–74; emotions and symbols of, 71–72; on life course, 74–75; participation in activities of, 55–57; on social behaviors, 68; on trust-based social affiliation, 75; on values, 72–73
Adolescence, rites of passage in, 64–67; emotionally valenced social-symbolic networks from, 72; lifelong remembrance of, 67; social and moral bonds from, 66; on social status, 66; universal phases of, 64–66
Affect regulation strategies, in attachment theory, 112–13
Agency: in theory of mind, 212. *See also* Supernatural agents
Agnicayana ritual, 220–21
Ambivalent attachment, 111; New Age spirituality and, 128–29
Amygdala: function and connections of, 69–70; growth of, in adolescents, 69; in spiritual practices, 23
Antiepileptic drugs, 175–76
Anti-social impulses, frontal lobe inhibition of, 197–98
Anxiety, with epilepsy, 176
Arginine vasopressin, 20–21
Art: capacity for, capacity for religion and, 151–52; as self-authenticating, 164–65
Attachment, in children, 120

- Attachment relationship with God:
 biological functionality of, 119–20;
 in children, 120–22; direct *vs.* sur-
 rogate role of God in, 119; proximity
 maintenance in, 117; safe haven in,
 117–18; secure base in, 118; strength
 and wisdom in, 118–19; terminology
 in, 119
- Attachment security, 113–14
- Attachment surrogates, 113
- Attachment system: neural basis of, 110;
 ontogenetic development of, 108
- Attachment system, in religious experi-
 ence, 116–42; basis of rationale for,
 116–17; believers' perceived God rela-
 tions vis-à-vis attachment relationship
 criteria in, 117–20; developing God
 relation vis-à-vis maturation of attach-
 ment in, 120–22
- Attachment theory, 106–16; affect regula-
 tion strategies in, 112–13; ambivalent
 childhood attachment in, 111; attach-
 ment activation *vs.* nonactivation on
 religious outcome in, 127–28; attach-
 ment later in development in, 114–16;
 attachment security in, 113–14;
 attachment surrogates in, 113; biologi-
 cal functionality in, 108–9; Bowlby
 on, 106; brain and religion research
 and, 132–42 (*see also* Neurotheology);
 caregiver sensitivity in, 112; com-
 pensation and unorthodox New Age
 spirituality in, 128–31; disorganized
 babies in, as proto-dissociative, 114;
 disorganized babies in, caregivers of,
 112; early organization of, individual
 differences in, 107, 110–14; *vs.* Freud,
 106–7; individual differences in, and
 developmental pathways to religion,
 122–32 (*see also* Developmental path-
 ways to religion, differential); infant
 behavior in, 108; on infant response
 to strange situation, 111–12; inse-
 cure attachment in, 110–11; internal
 working models in, 108–9; lifelong
 function of, 109–10; misconceptions
 of, 106; normative aspects of, 107–10;
 offspring–caregiver relationship in,
 110; preschool children's behavior in,
 108–9; psychological functionality in,
 109; representational-level attach-
 ment in, 114–15; romantic attachment
 in, 115–16, 125; secure and insecure
 discourse in, 115; secure attachment
 in, 110; success of, 113
- Aura, in seizures, 173–74
- Automatisms, 173–74
- Autonomic activity, complex, in spiritual
 practices, 25–26
- Babies. *See* Infants
- Baktaman initiation rites, 216–17
- Baseball: neurochemistry of, 235;
 religion's similarity to, 85, 232–34
- Behavior: cooperative, frontal lobes in
 strategy development for, 195–96;
 dynamic self-organization, 239; prosoc-
 ial, prefrontal cortex in, 196–97
- Behavior, adolescent: religion on, 72–74;
 social, religion on, 68
- Behavior, in attachment theory: of
 infants, 108; of preschool children,
 108–9
- Beta-endorphin, in meditation, 21
- Biochemistry, 234
- Biological evidence, for Divine: reli-
 gious experiences as, 96–97. *See also*
 Neurotheology
- Brain, in religious experiences, 88, 92. *See
 also* Neurotheology
- Brain chemistry. *See* Neurochemistry
- Brain growth: after birth, 58; prolonged
 pattern of, 58–59
- Brain growth and development, in ado-
 lescence, 69–71; critical, 67; develop-
 ment in, 69–71; growth in, 58–59;
 mental processing in, 69; synaptic
 pruning in, 70; white matter increases
 in, 70
- Brain malfunction, religious experiences
 as, 97
- Buddhist religious experiences, functional
 neuroimaging studies of, 40–43, 162
- By-product of cognitive processes, reli-
 gious experiences as, 98, 162
- By-product of evolution, religion as,
 105. *See also* Attachment system;
 Attachment theory

- Caregiver sensitivity, in attachment theory, 112
- Cargo cult, 215, 217
- Cartesian materialism, 237
- Cartesian worldview, 237–38
- Catechol-O-methyltransferase (COMT), 191
- Categorical analysis, 34
- Causal properties, 239
- Chanting, in ritual, 62
- Chemistry, of religious and spiritual practices. *See* Neurochemistry, of religious and spiritual practices
- Children, attachment in, 120; ambivalent, 111; to God, 120–22; in preschoolers, 108–9
- Children, concepts of God in, 120–21
- Chomsky's hierarchy, of language, 221–22
- Christian religious experiences, functional neuroimaging studies of, 37–40
- Cingulate gyrus activation, in spiritual practices, 22
- Cognitive ability, religion as, 3, 230
- Cognitive processes, religious experiences as by-product/side effect of, 98, 162
- Cognitive study of religion, 210
- Compensation hypothesis, 123
- Compensation pathway, 123, 124–26; unorthodox New Age spirituality and, 128–31
- Complex partial seizures, 173–74
- Constraints, relational, between elements, 239–40
- Conversion, religious, 152–65, 236; meaning system change from, 153–54; neurology of exemplars of, 155–58; relationships in, 164; religion *vs.* spirituality and, 152–53; sudden, heightened feelings and states of arousal in, 159; with temporal lobe epilepsy, 180
- Cooperation: costly signaling theory and, 193–95; religion and, neurochemistry of frontal lobes and, 198; ritual and, 63
- Cooperative behavior strategy development, frontal lobes in, 195–96
- Correspondence pathway, 123–24, 126–27
- Cortisol: in adolescence, 68; in meditation, 21
- Costly signaling theory, 236; cooperation and, 193–95
- Cross-cultural similarities and differences, in religious experience, 44–45
- Dance, in ritual, 62
- Demeter, 205–7
- Depression: adolescent, religion on, 73–74; with epilepsy, 176; in Parkinson's disease, 8–9
- Descartes' worldview, neurotheology and, 237–38
- Developmental pathways to religion, differential, 124–32; compensation pathway in, 123, 124–26; correspondence pathway in, 123–24, 126–27
- Disorganized babies: caregivers of, 112; as proto-dissociative, 114
- DMT (5-methoxy-dimethyltryptamine), 25–26
- Doctrinal mode, 216
- Doctrine, religion as vehicle for, 220
- Dopamine: in adolescence, shifts in, 70–71; frontal lobes and, 3; on religiosity, 3–4, 235–36; on religiosity in Parkinson's disease, 7, 9–10
- Dopaminergic neurons of ventral tegmental area, 190; in reward and pleasure systems, 190, 196–97
- Dopaminergic systems: activity of, on significance of stimuli, 192; in adolescence, 70–71; hallucinogens on transmission in, 192
- Dopaminergic systems, in religiosity, 2; disorders of, 191; mesocortical, 1–2; in Parkinson disease, 7, 9–10 (*see also* Parkinson's disease, chemistry of religiosity in)
- Dostoyevsky, conversions of, 155
- DRD4 dopaminergic receptor gene, 191; in religiosity, 9
- Dynamic self-organization behavior, 239
- Dynamic systems theory, 239–40
- Ecological factors, on length of adolescence, 68
- Education, religiosity and, 9

- Eleusian mysteries, 205–7; symbolism in, 208
- Emergence, 238–39; *vs.* reductionism, 239–40
- Emotions: music and, 72; in religious experiences, 91, 100–102; symbols of religion and, 71–72
- Emotions, in adolescence: intensity of, 68; reactivity in, 71
- Empirical psychology, 212
- Endorphin, in meditation, 21
- Environmental stimuli, reactions to, in adolescence, 68
- Epilepsy, 171–72; diagnostic tests for, 174; mood disorders with, 176–77; neuroimaging studies of, 174–75; psychosocial aspects of, 177; in religious founders and mystics, 155–57; seizures in, complex partial, 173–74; seizures in, simple partial, 172–73; treatment for, 175–76
- Epilepsy, religiosity and, 155, 177–85; further research on, 183–85; history of, 177–78; prospective studies on, 180–83; religious conversions in, 180; seizures and prophetic visions in, 178; seizures and religious ideation in, 179; similar symptoms in non-epileptic persons and, 181
- Ergotropic activity, in spiritual transformation, 161
- Evolutionary considerations: in neurotheology, 138–41. *See also* Adaptation, religious experiences as
- Exaptation, 139
- Experiences, religious. *See* Religious experiences
- Experiential/affective process, spiritual transformation as, 159–60
- Flashbulb memory, 217, 218
- Free-rider problem, costly signaling theory and, 193–95
- Frontal lobe neurochemistry, 190; in religiosity, 191–93; in religiosity, cooperation and, 198
- Frontal lobes: in anti-social impulse inhibition, 197–98; in cooperative behavior strategy development, 195–96; dopamine and, 3; growth of, in adolescents, 69; meditation on, 2–3; meso-cortical dopaminergic system in, 1–2. *See also* Prefrontal cortex
- Frontal lobes, in religiosity, 2–3, 155, 191–98; spiritual transformation in, 161–63
- Functional neuroimaging. *See* Neuroimaging techniques, functional; *specific techniques*
- Gamma aminobutyric acid (GABA), in meditation, 20
- Genetics: of prefrontal cortex, 190–91; religious capacities and tendencies from, 232
- Glutamate, in spiritual practices, 24–25
- God experience, 83; of children, 120–21
- God relations: believers' perceived, vis-à-vis attachment relationship criteria, 117–20 (*see also* Attachment relationship with God); developing, vis-à-vis maturation of attachment, 120–22. *See also* Supernatural agents
- “God spot,” 81
- Hallucinogens, on dopamine transmission, 192
- Health, religion and, 4–6
- Hippocampus: function and connections of, 69–70; growth of, in adolescents, 69; in spiritual practices, 23
- Icons, religious, 91–92
- Imagist mode, 215–16
- Inevitability, 184
- Infants: attachment theory on behavior of, 108; attachment theory on response to strange situation of, 111–12; music and, 59
- Infants, disorganized: caregivers of, 112; as proto-dissociative, 114
- Insecure attachment, 110–11; New Age spirituality and, 128
- Inter-ictal behavioral syndrome, 155; hyper-religiosity in, 2
- Internal working models (IWMs), 108–9, 110
- Interpretive experiences, religious, 83
- IWM/correspondence hypothesis, 123

- Language: Chomsky's hierarchy of, 221–22; neurological study of, 231; religion's differences from, 213–32; religion's similarity to, 57–59; in ritual performance, 223; theory of complexity of, 221–22
- Language learning: innate ability for, 58, 60; neural structures for, 60
- Life course, religion on, in adolescents, 74–75
- Life stage, adolescence as, 67–69
- Limbic activation: in adolescents, 69–70; in spiritual practices, 23
- Limbic lobes: in complex partial seizures, 174; religiosity and, 155
- Limbic-prefrontal activity, on significance of stimuli, 192
- Liminal phase, of rites of passage, 64–66
- Linguistic theory, ritual theory and, 211–12
- Meaning system: in experiential/affective processes, 159; functions of, neurological activity and, 158; religion as, 154
- Meditation: beta-endorphin in, 21; Buddhist, functional neuroimaging studies of, 40–43, 162; cortisol in, 21; on frontal lobes, 2–3; functional MRI of, 18–19; functional SPECT imaging of, 18; GABA in, 20; melatonin in, 20; neurophysiological network of, 19; norepinephrine in, 21; on parietal lobes, 90; as positive physiological/psychological state, 159; on prefrontal networks, 2–3; research on neurochemistry of, 15, 20–21; serotonin in, 20, 25; Transcendental Meditation, physiological studies on, 20–21
- Melatonin, in meditation, 20
- Memory: flashbulb, 217, 218; semantic, 217
- Mental processing development, in adolescence, 69
- Meso-cortical dopaminergic system, 1–2
- Meso-limbic-cortical system, 7
- Micro-to-macro continuum, 234–36
- Modes of religiosity, Whitehouse's, 215–18
- Mood disorders: with epilepsy, 176–77. *See also specific disorders*
- Moral values. *See Values*
- MRI, functional, 16–18, 35–36; of meditation, 18–19; *vs.* PET and SPECT, 35–36
- Music: in communal ritual, 62–63; as developmental model, 59–60; emotions and, 62–63; emotions and, religious, 72; infants and, 59; innate ability for learning of, 58; neural structures for, 60; neurological study of, 231; religion's differences from, 231–32; religion's similarity to, 59–60
- Mystical experiences, 83; prefrontal cortex in (*see* Prefrontal cortex). *See also Religious experiences*
- Myths, hidden meanings of, 206
- Naturalism, religious, 212; centrality of rituals in, 212–14; supernatural beings in, 214–15
- Naturalistic psychology of religion, 212
- Network-type analysis, 34
- Neural cell activity, 234
- Neural networks, 234; interaction of, 234
- Neural structures: in religious experiences, 91–92. *See also specific structures*
- Neurochemistry, frontal lobe, 190; in religiosity, 191–93; in religiosity, cooperation and, 198
- Neurochemistry, of adolescence: cortisol in, 68; dopaminergic shifts in, 70–71; neurotransmitter systems in, 70
- Neurochemistry, of religious and spiritual practices, 1–10, 15–26, 234; cingulate gyrus activation in, 22; complex autonomic activity in, 25–26; correlates of spiritual practices in, 22–26; frontal lobes in, 190, 198; future directions in study of, 26; limbic activation in, 23; neuroimaging techniques in, 16–19 (*see also Neuroimaging techniques*); parasympathetic activation in, 23–24; in Parkinson's disease, 6–10 (*see also Parkinson's disease, chemistry of religiosity in*); physiological studies of, 19–21 (*see also Physiological studies*); positive-feedback circuit formation in, 24–25; posterior superior parietal lobule deafferentation in, 22–23; pre-

- frontal cortex in, 22, 191–93; thalamic activation in, 22
- Neuroimaging studies, of religious experience, 33–47; Buddhist, 40–41, 162; Christian, 37–40; cross-cultural similarities and differences in, 44–45; functional techniques for, 34–37 (*see also* Neuroimaging techniques, functional); future research on, 45–47; future research on, neural correlates of relational cognitivity in, 46; future research on, neuroplasticity in, 46–47; future research on, religious *vs.* non-religious experiences in, 45–46; future research on, varieties of experience in, 45; interpretative limits of, 41–43; nature and structure of experience in, 43–45 (*see also* Religious experiences, nature and structure of); relational cognitivity in, 43–44
- Neuroimaging techniques, 16–19; brain activation studies in, 16–17; functional and anatomic imaging in, 16; radioligands for, PET, 17; radioligands for, SPECT, 16
- Neuroimaging techniques, functional, 34–37; approaches to, 34; of epilepsy, 175; MRI, 16–19, 35–36; overview of, 34; PET and SPECT, 17, 35; use of, 34
- Neuroplasticity, in religious experience, 46–47
- Neuroscientific study of religion. *See* Neurotheology
- Neurotheology, 81–102, 132–42, 229; Cartesian worldview and, 237–38; evolutionary and ontological considerations in, 138–41 (*see also* Adaptation, religious experiences as); future recommendations for, 141–42; intelligent design theories in, 140; interest in, 81–82; levels of scale and, 234–37; nonreductive, guidelines for, 240–43; reductionism *vs.* emergence in, 238–40; religious experiences in, 82–102 (*see also* Religious experiences); replication of findings on, lack of, 135–38; scientific studies in elucidation of, 86; scope and structure of religion in, 82
- Neurotransmitter systems: in adolescence, 70. *See also specific neurotransmitters*
- New Age spirituality: ambivalent attachment and, 128–29; compensation pathway and, 128–31; God figures and relations in, 128; insecure attachment and, 128
- Nigrostriatal system, 6–7; impairment of, 7; in Parkinson's disease, 7
- NMDA receptors, in spiritual practices, 24–25
- Noesis, 184
- Norepinephrine, in meditation, 21
- Novelty seeking, in adolescence, 68
- Numinous experiences, religious, 83
- Nutritional factors, on length of adolescence, 68
- Offspring–caregiver relationship, in attachment theory, 110
- Ontology, in neurotheology, 138–41; Newberg et al. on, 139–40; Persinger on, 138–39
- Orbitofrontal cortex, religiosity and, 155–56
- Over-beliefs, of James, 84
- Paranormal experiences, different kinds of, 134–35
- Parasympathetic activation, in spiritual practices, 23–24
- Parietal lobes: activity of, in spiritual transformation, 161–63; in adolescents, growth of, 69–70; meditation on, 90; posterior, function of, 2; and spiritual transformation, 163
- Parkinson's disease: definition and chemistry of, 6–7; depression in, 8–9; on religiousness, 8–10, 232
- Parkinson's disease, chemistry of religiosity in, 6–10; dopamine in, 7, 9–10; lower levels of religiosity and, 8–10; nigro-striatal impairment in, 7; prefrontal function and, 8–9; ventral tegmental area-mesocortical impairment in, 7
- Partial seizures, 172; complex, 173–74; simple, 172–73

- Passivity, 184
- Persinger: failure to replicate studies
of, 135–38; on religious experiences,
82–83, 88, 94, 96; on religious experi-
ences, assumptions of functions of, 96
- PET imaging, functional, 17, 35; of
Christian religious experience, 37–40;
of Christian religious experience,
interpretative limits of, 41–43; *vs.*
fMIR, 35–36; radioligands for, 17; of
religious experience, 135
- Phenomenological psychology of reli-
gion, 212
- Phenomenology of religion, 213
- Phrase structure rules, 221
- Physics, 234
- Physiological studies, of spiritual prac-
tices, 19–21; arginine vasopressin in,
20–21; cortisol in, 21; GABA in, 20;
melatonin in, 20; neurophysiological
network in, 19; norepinephrine in, 21;
schematic overview of, 19; serotonin
in, 20
- Pleasure systems, dopaminergic neurons
of ventral tegmental area in, 190,
196–97
- Pomio Kivung rituals, 215, 219
- Positive-feedback circuit formation, in
spiritual practices, 24–25
- Posterior superior parietal lobe (PSPL)
deafferentation, in spiritual practices,
22–23
- Postictal state, 174
- Prayer: health and, 5–6; as positive physi-
ological/psychological state, 159
- Prefrontal cortex: in adolescents, growth
of, 69–70; genetics of, 190–91; medita-
tion on, 2–3; prosocial behavior and,
196–97; in spiritual practices, 22, 24;
structure and function of, 3, 189–90.
See also Frontal lobes
- Prefrontal cortex, religiosity and, 192;
activation of, in spiritual practices,
22; activation of, neurochemistry of,
191–93; changed function in, 192
- Prosocial behavior, prefrontal cortex in,
196–97
- Psychology of religion, naturalistic,
212–15. *See also* Naturalism, religious
- Psychosis, with epilepsy, 176–77
- Puberty, 67. *See also* Adolescence
- Quasi-sensory experiences, religious, 83
- Radioligands: for PET, 17; for SPECT, 16
- Reductionism, 238; *vs.* emergence,
239–40
- Regenerative experiences, religious, 83
- Reintegration phase, of rites of passage,
66
- Relational cognitivity, in religious experi-
ence, 43–44; neural correlates of, 46
- Relational constraints, between elements,
239–40
- Relationships, in religious conversion, 164
- Religion: as by-product of evolution,
105 (*see also* Attachment system;
Attachment theory); capacity for,
capacity for art and, 151–52; as cog-
nitive ability, 230; definition of, 141,
214–15, 230–34; doctrinal mode of,
216; imagist mode of, 215–16; neuro-
scientific study of (*see* Neurotheology);
vs. religious experiences, 82–83; scope
of, 82; as self-authenticating, 164–65;
vs. spirituality, 152–53; structure of, 82
- Religiosity: extrinsic, 5; as hard wired,
230–31; intrinsic, health and, 5–6;
measures of, 153; Whitehouse's modes
of, 215–18
- Religious cognition, naturalization of,
212. *See also* Naturalism, religious
- Religious conceptual scheme, 211
- Religious conversion. *See* Conversion,
religious
- Religious experiences: attachment
system activation and, 132–33 (*see
also* Attachment system, in religious
experience; Attachment theory); as
biological evidence for Divine, 96–97;
brain and, 88, 92; as brain malfunction,
97; as by-product/side effect of cog-
nitive processes, 98; comparativeness of,
84; complexity of, 90; convergence of,
83; criteria for, 33; cross-cultural simi-
larities and differences in, 44–45; Davis
classification of, 83; different kinds
of, 134–35; emotions in, 91, 100–102;

- existence of, 86; as experiential type, distinctive, 88–89; as intrinsic nature *vs.* interpretation, 84; James on, 84, 90, 93, 101–2; multifactorial, 133–34; nature and structure of, 43–45, 87, 88–89; neural structures mediating, 91–92; Newberg et al. on, 88–91, 96; *vs.* nonreligious experiences, neuroscience of, 45–46; patterns of arguments in, 90; Persinger on, 82–83, 88, 94, 96; personal testimony *vs.* neuroscience on, 87–88; Ramachandran et al. on, 91–92, 100; relational cognitivity in, 43–44; *vs.* religion, 82–83; ritual in, 89–90 (*see also* Ritual); spatial and temporal locatedness and, 90–91; strong nonreligious experiences *vs.*, 84; taxonomy of, 83–84; variability in, 84; visual association area in, 91; words and icons in, 91–92. *See also* Neurotheology
- Religious experiences, functions of, 93–99; death-avoidance in, 94–95; evidence for, 94–96; Persinger assumptions of, 96; problems with empiricism in, 98–99; problems with evolutionary explanations for, 94–96
- Religious naturalism, 212–15; centrality of rituals and, 212–14; supernatural beings in, 214–15
- Representational-level attachment, 114–15
- Rethinking Religion*, 210
- Revelatory experiences, religious, 83
- Reward circuitry, in adolescence, 71
- Reward systems, dopaminergic neurons of ventral tegmental area, 190, 196–97
- Risk taking, in adolescence, 68
- Rites of passage, adolescent, 64–67; change in social status with, 66; emotionally valenced social-symbolic networks from, 72; lifelong remembrance of, 67; social and moral bonds from, 66; universal phases of, 64–66
- Ritual: areas of study of scholars of, 220–21; centrality of, and religious naturalism, 212–14; as central to religious tradition, 213; complexity of, Staal on, 220–23; cooperation and, 63; emotions and, 71–72; hidden meanings of, 206; as meaningless, 222–23; music, chanting, and dance in, 62; Newberg et al. on, 89–90; predicting properties of, 213; purpose of, 206–7; purpose of performance of, 205–7; in religious experiences, 89–90; sanctification via, 63; special agent (supernatural) in, 213–14; theory of structure of interpretations of, 221; as vehicle for doctrine, 220. *See also specific rituals*
- Ritual performance, mind design and, 205–25; action in, 210; cognitive study of religion and, 210; definition of religion in, 214–15; Eleusian mysteries and, 205–7; language capacity in, 223; Lawson and McCauley's linguistic analogy on, 209–12; linguistic theory and, 211–12; religious naturalism and, 212–15 (*see also* Naturalism, religious); Staal on complexity of ritual in, 220–23; symbolism and, Sperber on, 207–9; transmission of ritual meanings *vs.* procedures in, 219; Whitehouse's modes of religiosity in, 215–18; Whitehouse *vs.* McCauley and Lawson on, 218–20
- Romantic attachment, 115–16, 125
- Sacred, power and emotional significance of, 63
- Scale, in science, 234–35
- Science. *See* Neurotheology; *specific areas*
- Secure attachment, 110
- Seizures: classification of, 172; complex partial, 173–74; in epilepsy, 172; partial, 172; in prophetic visions, 178; religious ideation in, 179; simple partial, 172–73. *See also* Epilepsy; Temporal lobe epilepsy, religiosity and
- Self-authenticating: art and religion as, 164–65; spiritual transformation as, 160–61
- Self-organization behavior, dynamic, 239
- Semantic memory, 217
- Sensitivity, caregiver, in attachment theory, 112
- Separation of initiates, in rites of passage, 64–65
- Serotonin, in meditation, 20, 25
- Side effect of cognitive processes, religious experiences as, 98, 162

- Simple partial seizures, 172–73
- Social affiliation, trust-based, religious participation and, 75
- Social behaviors, religion on, in adolescents, 68
- Social correspondence, 123–24
- Spatial locatedness, mystical experiences on, 90–91
- SPECT imaging, 158; radioligands for, 16
- SPECT imaging, functional, 17, 35; of Buddhist religious experience, 40–43, 162; *vs.* fMIR, 35–36; of meditation, 18; of religious experience, 135
- Spirituality: definition of, 153; *vs.* religion, 152–53
- Spiritual transformation, 152–65; neurology of, 154–55; religion *vs.* spirituality and, 152–53
- Spiritual transformation, neurological correlates of, 158–63; caveats in, 163; ergotropic and trophotropic activity in, 161; experiential/affective process in, 159–60; frontal and parietal region activity in, 161–63; as self-authenticating, 160–61
- St. Paul, conversions of, 155
- Striatal-frontal dopaminergic dysfunction, in negative effects of religious belief, 2
- Structure, of religion, 60–62; universal features in, 61
- Substantia nigra, 190; dopaminergic neurons of, in reward and pleasure systems, 190, 196–97
- Suicidal ideation, adolescent, religion on, 73–74
- Supernatural agents: belief in, 61, 63, 214; as defining quality of religion, 214; as defining quality of religion, argument against, 214–15; in ritual, 213–14
- Surrogates, attachment, 113
- Symbolism: as method/stage of reasoning, 207–9; Sperber on, 207–9
- Symbols, religious: emotions and, in adolescence, 71–72; music and, 72
- Synaptic pruning, in adolescence, 70
- Temporal lobe epilepsy, religiosity and, 232; further research on, 183–85; history of, 177–78; prospective studies on, 181–83; religious conversions in, 180; in religious founders and mystics, 155–56; seizures of, in prophetic visions, 178; seizures of, in religious ideation, 179; similar symptoms in non-epileptic persons and, 181
- Temporal lobe epilepsy, religious experiences in, 2, 81, 155–57, 177–85
- Temporal lobes, growth of cortex in, in adolescents, 69–70
- Temporal lobes, religiosity and, 2, 155, 192
- Temporal locatedness, mystical experiences on, 90–91
- Thalamic activation, in spiritual practices, 22
- Theobiology. *See* Neurotheology
- Theology, 141
- Theory of mind, 211
- Transcendental Meditation, physiological studies on, 20–21
- Transformation, spiritual. *See* Spiritual transformation
- Transformation rules, 221
- Transiency, 184
- Transitional phase, of rites of passage, 64–66
- Trophotropic activity, in spiritual transformation, 161
- Trust-based social affiliation, religious participation and, 75
- Unio mystica, 184
- Universal features: of adolescent rites of passage, 64–66; of religion, 61
- Values, adolescent, religion on, 72–73
- Varieties, of religious experience, 45
- Vedic ritual, 220–22
- Ventral tegmental area, 190; dopaminergic neurons of, in reward and pleasure systems, 190, 196–97
- Ventral tegmental area-mesocortical impairment, 7
- Visual association area, in religious experiences, 90
- White matter increases, in adolescence, 70
- Words, religious, 91–92

ABOUT THE EDITOR AND CONTRIBUTORS

EDITOR

Patrick McNamara, Ph.D., is director of the Evolutionary Neurobehavior Laboratory in the Department of Neurology at the Boston University School of Medicine and the Veterans Administration New England Health Care System. Upon graduating from the Behavioral neuroscience Program at Boston University in 1991, he trained at the Aphasia Research Center at the Boston Veterans Administration Medical Center in neurolinguistics and brain-cognitive correlation techniques. He then began developing an evolutionary approach to problems of brain and behavior and currently is studying the evolution of the frontal lobes, the evolution of the two mammalian sleep states (REM and NREM), and the evolution of religion in human cultures. He has published numerous articles and chapters on these topics pioneering the investigation of the role of the frontal lobes in mediation of religious experience.

CONTRIBUTORS

Candace S. Alcorta is an anthropologist specializing in the evolution and behavioral ecology of religion. She has conducted ethnographic research in Thailand and the United States and is currently completing a study of the relationship between adolescent religious involvement and resilience in fulfillment of doctoral dissertation requirements in the Department of Anthropology at the University of Connecticut.

Nina P. Azari earned her *first* Ph.D. in Human Cognitive Experimental Psychology and completed several years of postdoctoral training and research in human brain imaging at the National Institutes of Health. More recently, she also has completed a *second* Ph.D. in Religious and Theological Studies, the dissertation for which was on philosophical–theological implications of neuroscientific study of religious experience—most specifically her own collaborative work on the subject (a brain imaging study of a Christian religious experience). Consequent to being awarded an Alexander von Humboldt Fellowship, Dr. Azari initiated an international collaboration with the Departments of Neurology and Philosophy at the University of Duesseldorf in Germany, a collaboration that she has maintained and further developed over the past 10 years. Since 2004, Azari has been Assistant Professor of Psychology at the University of Hawaii-Hilo.

Ariel Brown received her B.A. in Psychology from Skidmore College in 2001. She is currently enrolled as a Ph.D. student in Behavioral Neuroscience at the Boston University School of medicine. Her current research interests are in the neuropsychology and functional neuroimaging of higher order cognitive function in neuropsychiatric populations. Past research experience and publications include topics such as implicit learning in amnesics, memory in chronic pain patients, and frontal functioning in Parkinson’s Disease.

Warren S. Brown Ph.D., is Professor of Psychology at the Graduate School of Psychology at Fuller Theological Seminary, where he is also Director of the Travis Research Institute. Prior to Fuller, Brown spent 11 years as a research scientist at the UCLA Brain Research Institute, and Department of Psychiatry and Biobehavioral Sciences, where he continues as a BRI member. He is actively involved in research related to human brain processes and cognition, most specifically related to the functions of the corpus callosum. His current research involves cognitive and psychosocial disabilities in individuals born without a corpus callosum. Brown has also done research on neuropsychological changes in aging and dementia; brain processes in language comprehension; attention deficits in schizophrenia; and brain wave changes associated with kidney disease and its treatment. Brown has contributed over seventy-five articles to peer-reviewed scientific journals such as *Neuropsychologia*, *Psychophysiology*, *Neurobiology of Aging*, *Biological Psychiatry*, *Developmental Neuropsychology*, *Kidney International*, and *Science*. Brown has also contributed to the understanding of the relationship between religion and neuroscience. He served as editor of two recent books: *Whatever Happened to the Soul: Scientific and Theological Portraits of Human Nature* (with Nancey Murphy and Newton Malony; Fortress Press, 1998) and *Understanding Wisdom: Sources, Science, and Society* (Templeton Press, 2001).

Raymon Durso, M.D., is the Director of the Movement Disorders Clinic at the Veterans Administration New England Healthcare System and the Department of Neurology, Boston University School of Medicine. He is also the Director of the Neuropharmacology Laboratory at the Boston Veterans Administration Medical Center.

Pehr Granqvist is an Associate Professor in Psychology at Uppsala University, Sweden, where he also got his Ph.D. in 2002. He has pursued research in two separate areas of relevance here. First, he has performed several studies examining relations between attachment processes and religion. Secondly, he was one of the principal investigators in the first properly double-blinded study that tested if the application of weak, complex magnetic fields to individuals' temporal lobes resulted in religious experiences, as hypothesized by others. Besides these research areas, he is involved in several projects in developmental psychology, relating attachment measurements and concepts to aspects of social and emotional development.

Erica Harris completed her B.A. from the University of Virginia in January 2001 with a major in Psychology and a concentration in Neuroscience. After graduation, she worked at Duke University Medical Center on studies involving at-risk youths and how they make successful transitions in school. She then obtained her MPH from Boston University in January 2005 with dual concentrations in Epidemiology and Social and Behavioral Sciences. Harris is currently a Research Coordinator in the Department of Neurology at the Boston University Medical Center. She works on a variety of projects including sleep, Parkinson's Disease, dreams, the concept of the self, the frontal lobes, and the relationship between religion and the brain.

Andrew B. Newberg, M.D., is Assistant Professor in the Departments of Radiology and Psychiatry and an Adjunct Assistant Professor in the Department of Religious Studies at the University of Pennsylvania. He graduated from the University of Pennsylvania School of Medicine in 1993. He did his training in Internal Medicine at the Graduate Hospital in Philadelphia and then completed a Fellowship in Nuclear Medicine in the Division of Nuclear Medicine, Department of Radiology, at the University of Pennsylvania. During this time, he has actively pursued a number of neuroimaging research projects, which have included the study of aging and dementia, epilepsy, and other neurological and psychiatric disorders. Dr. Newberg has been particularly involved in the study of mystical and religious experiences, as well as the more general mind/body relationship in both the clinical and research aspects of his career. His research also includes understanding the physiological correlates of acupuncture therapy, meditation, and

other types of alternative therapies. He has published numerous articles and chapters on brain function, brain imaging, and the study of religious and mystical experiences. He has also co-authored two books entitled, *Why God Won't Go Away: Brain Science and the Biology of Belief* and *The Mystical Mind: Probing the Biology of Belief*, which explore the relationship between neuroscience and spiritual experience. The latter book received the 2000 award for Outstanding Books in Theology and the Natural Sciences presented by the Center for Theology and the Natural Sciences.

Raymond F. Paloutzian received his Ph.D. degree in 1972 from Claremont Graduate School and has been a Professor of Experimental and Social Psychology at Westmont College, Santa Barbara, California, since 1981. He has been a Visiting Professor, teaching psychology of religion at Stanford University and Guest Professor, Katholieke Universiteit Leuven, Belgium. He is a Fellow of the American Psychological Association (APA; divisions of general, teaching, social issues, psychology of religion, and international), the American Psychological Society, and the Western Psychological Association, and has served as President of APA Division 36 (Psychology of Religion). The Division honored him with the 2005 Virginia Sexton Mentoring Award for contributing to the development of other scholars in the field. He wrote *Invitation to the Psychology of Religion*, 2nd ed. (1996, 3rd ed. forthcoming), and with Crystal Park, edited the *Handbook of the Psychology of Religion and Spirituality* (2005). Dr. Paloutzian is Editor of *The International Journal for the Psychology of Religion*.

Matthew Ratcliffe is a lecturer in philosophy at Durham University. His research interests include philosophy of mind, phenomenology, and philosophy of science. He has published articles on various topics, including intentionality, teleology, subjectivity, intersubjectivity, religious experience, delusions, emotions, and feelings. He is currently working on two monographs, entitled *Rethinking Commonsense Psychology* and *Feelings of Being: Phenomenology, Psychopathology and Taken-for-Granted Reality*.

Steven C. Schachter is Professor of Neurology at Harvard Medical School, Director of Research, Department of Neurology at Beth Israel Deaconess Medical Center in Boston, Massachusetts, and liaison to the Center for the Integration of Medicine and Innovative Technology from Beth Israel Deaconess Medical Center.

Dr. Schachter is past Chair of the Professional Advisory Board of the Epilepsy Foundation and serves on their Board of Directors. He is also past Treasurer of the American Epilepsy Society and served on their Board of Directors. He is the founding Editor-in-Chief of *Epilepsy & Behavior*, which

was recognized as the best new science and medical journal of 2000 by the Association of American Publishers, and Editor-in-Chief of the online journal, *Epilepsy.com*. Dr. Schachter has directed more than 80 research projects involving new treatments for epilepsy and has published 18 books and more than 200 papers.

Carl Seaquist is Visiting Lecturer in Religion at the University of Vermont. He holds a Ph.D. in Religious Studies from the University of Pennsylvania and an M.A. in Philosophy from the University of Wisconsin, Milwaukee.

Erica L. Swenson received her bachelor's degree summa cum laude from Westmont College in 2005. She has been a Research Assistant at the Psychology Department of Westmont College since 2004. She is currently a psychology Ph.D. student at TBA University with interests in the psychology of religion and spirituality.

ABOUT THE ADVISORY BOARD

Scott Atran, Ph.D., conducts research and is centered in the following areas: cognitive and linguistic anthropology, ethnobiology, environmental decision making, categorization and reasoning, evolutionary psychology, anthropology of science (history and philosophy of natural history and natural philosophy), Middle East ethnography and political economy, natural history of Lowland Maya, cognitive and commitment theories of religion, terrorism, and foreign affairs.

The evolution of religion is a topic he explores in his book *In Gods We Trust* (2002). He is based both at the National Center for Scientific Research in Paris and at the University of Michigan. His recent work has focused on suicide terrorism. He has marshaled evidence that indicates that suicide bombers are not poor and crazed as depicted in the press but well-educated and often economically stable individuals with no significant psychological pathology.

Donald Capps, Ph.D., is Princeton's William Harte Felmeth Professor of Pastoral Psychology. He draws on his training as a psychologist of religion in both his teaching and his writing. In 1989, he was awarded an honorary doctorate in sacred theology from the University of Uppsala, Sweden, in recognition of his publications in the psychology of religion and pastoral care and of his leadership role in the Society for the Scientific Study of Religion, for which he served as editor of its professional journal from 1983 to 1988 and as president from 1990 to 1992.

J. Harold Ellens, Ph.D., is series editor for Praeger's Psychology, Religion and Spirituality series. He is a research scholar at the University of Michigan, Department of Near Eastern Studies. He is a retired Presbyterian theologian and ordained minister, a retired U.S. Army colonel, and a retired professor of philosophy, theology, and psychology. He has authored, coauthored, and/or edited 111 books and 165 professional journal articles. He served 15 years as executive director of the Christian Association for Psychological Studies and as founding editor and editor in chief of the *Journal of Psychology and Christianity*. He holds a Ph.D. from Wayne State University in the psychology of human communication, a Ph.D. from the University of Michigan in biblical and Near Eastern studies, and master degrees from Calvin Theological Seminary, Princeton Theological Seminary, and the University of Michigan. He was born in Michigan, grew up in a Dutch-German immigrant community, and determined at age seven to enter the Christian ministry as a means to help his people with the great amount of suffering he perceived all around him. His life's work has focused on the interface of psychology and religion.

Harold Koenig, M.D., M.H.Sc., is an associate professor of psychiatry and medicine at Duke University. He is director and founder of the Center for the Study of Religion/Spirituality and Health at Duke University; editor of the *International Journal of Psychiatry in Medicine*, and founder and editor in chief of *Research News in Science and Theology*, the monthly international newspaper of the John Templeton Foundation. His latest books include the *Handbook of Religion and Mental Health*, *The Healing Power of Faith: Science Explores Medicine's Last Great Frontier*, and *Religion and Health: A Century of Research Reviewed*.

Koenig completed his undergraduate education at Stanford University, his medical school training at the University of California at San Francisco, and his geriatric medicine, psychiatry, and biostatistics training at Duke University Medical Center. He is board certified in general psychiatry, geriatric psychiatry, and geriatric medicine and is on the faculty at Duke as professor of psychiatry and behavioral sciences and associate professor of medicine. He is also a registered nurse.

Koenig has published extensively in the fields of mental health, geriatrics, and religion, with nearly 250 scientific peer-reviewed articles and book chapters and 26 books in print or in preparation. His research on religion, health, and ethical issues in medicine has been featured on approximately 50 national and international television news programs (including all major U.S. news networks), 80 national or international radio programs (including multiple NPR, BBC, and CBC interviews), and close to 200 national or international newspapers or magazines (including cover stories for *Reader's*

Digest, *Parade* magazine, and *Newsweek*). Koenig has been nominated twice for the Templeton Prize for Progress in Religion. His latest books include *The Healing Power of Faith* (2001), *The Handbook of Religion and Health* (2001), *Spirituality in Patient Care* (2002), and his autobiography *The Healing Connection* (2004).

Andrew B. Newberg, M.D., is director of clinical nuclear medicine, director of neuroPET research, and assistant professor in the Department of Radiology at the Hospital of the University of Pennsylvania. On graduating from the University of Pennsylvania School of Medicine in 1993, Newberg trained in internal medicine at the Graduate Hospital in Philadelphia—serving as chief resident in his final year—and subsequently completed a fellowship in nuclear medicine in the Division of Nuclear Medicine, Department of Radiology, at the University of Pennsylvania. He is board certified in internal medicine, nuclear medicine, and nuclear cardiology.

In collaboration with the Departments of Neurology and Psychiatry, Newberg has actively pursued neuroimaging research projects, including the study of aging and dementia, epilepsy, and other neurological and psychiatric disorders. Additionally, he has researched the neurophysiological correlates of acupuncture, meditation, and other types of complementary therapies.

Newberg has presented his research at national and international scientific and religious meetings; his numerous published articles and chapters cover the topics of brain function, brain imaging, and the study of religious and mystical experiences. In addition to the extensive press he has received, he has appeared on ABC's *World News Tonight* and is coauthor, with Eugene G. d'Aquili, M.D., of *The Mystical Mind: Probing the Biology of Belief*.

Recently, Newberg received a Science and Religion Course Award from the Center for Theology and the Natural Sciences to teach the course titled "The Biology of Spirituality" in the Department of Religious Studies, University of Pennsylvania (spring 2000).

Raymond F. Paloutzian, Ph.D., is a national and international expert in the psychology of religion and spirituality. He received his doctoral degree in 1972 from Claremont Graduate School and has been a professor of experimental and social psychology at Westmont College, Santa Barbara, California, since 1981. He has been a visiting professor teaching psychology of religion at Stanford University and guest professor at Katholieke Universiteit Leuven, Belgium. He is a fellow of the American Psychological Association (divisions of general, teaching, social issues, psychology of religion, and international), the American Psychological Society, and the Western Psychological Association and has served as president of the American Psychological Association's Division 36 (Psychology of Religion

and Spirituality). The division honored him with the 2005 Virginia Sexton Mentoring Award for contributing to the development of other scholars in the field. He wrote *Invitation to the Psychology of Religion* (2nd ed.1996; 3rd ed. forthcoming) and, with Crystal Park, edited the *Handbook of the Psychology of Religion and Spirituality* (2005). He is currently writing chapters on religion and spirituality for handbooks by Oxford University Press and Blackwell Publishers. His current research focuses on religiously motivated child abuse and medical neglect and on a systematic review of the literature on spiritual well-being. Paloutzian is editor of the *International Journal for the Psychology of Religion*.

Kenneth Pargament, Ph.D., has conducted nationally and internationally known research that addresses religion as a resource for coping with major life stressors. His research has also examined how religion can be a source of struggle for people facing major medical illnesses. He has studied the process by which people create perceptions about the sanctity of aspects of their life activities and the various effects of “sanctification” for individual and interpersonal well-being. Most recently, he has been developing and evaluating spiritually integrated approaches to psychotherapy. Pargament won the William James Award for Excellence in Research from Division 36 of the American Psychological Association. He also won the 2000 Virginia Staudt Sexton Mentoring Award from the American Psychological Association for his generous work in encouraging both faculty, undergraduate, and graduate research in the psychology of religion. He has published extensively and his work has received national and international media attention.

WHERE GOD AND
SCIENCE MEET

**Recent Titles in
Psychology, Religion, and Spirituality**

J. Harold Ellens, Series Editor

Married to an Opposite: Making Personality Differences Work for You
Ron Shackelford

Sin against the Innocents: Sexual Abuse by Priests and the Role of the
Catholic Church
Thomas G. Plante, editor

Seeking the Compassionate Life: The Moral Crisis for Psychotherapy and
Society
Carl Goldberg and Virginia Crespo

Psychology and the Bible: A New Way to Read the Scriptures, 4 Volumes
J. Harold Ellens and Wayne E. Rollins, editors

Sex in the Bible: A New Consideration
J. Harold Ellens

WHERE GOD AND SCIENCE MEET

How Brain and Evolutionary Studies
Alter Our Understanding of Religion

VOLUME 3
The Psychology of Religious Experience

Edited by Patrick McNamara

PRAEGER PERSPECTIVES

Psychology, Religion, and Spirituality

J. Harold Ellens, Series Editor

PRAEGER

Westport, Connecticut
London

Library of Congress Cataloging-in-Publication Data

Where God and science meet : how brain and evolutionary studies alter our understanding of religion / edited by Patrick McNamara.

p. cm. — (Psychology, religion, and spirituality, ISSN 1546-8070)

Includes index.

ISBN 0-275-98788-4 (set) — ISBN 0-275-98789-2 (v. 1) — ISBN 0-275-98790-6 (v. 2) — ISBN 0-275-98791-4 (v. 3)

1. Psychology, Religious. 2. Genetic psychology. 3. Evolutionary psychology. 4. Experience (Religion) 5. Neurology. I. McNamara, Patrick H.

BL53.W511 2006

200.1'9—dc22 2006021770

British Library Cataloguing in Publication Data is available.

Copyright © 2006 by Patrick McNamara

All rights reserved. No portion of this book may be reproduced, by any process or technique, without the express written consent of the publisher.

Library of Congress Catalog Card Number: 2006021770

ISBN: 0-275-98788-4 (set)

0-275-98789-2 (vol. 1)

0-275-98790-6 (vol. 2)

0-275-98791-4 (vol. 3)

ISSN: 1546-8070

First published in 2006

Praeger Publishers, 88 Post Road West, Westport, CT 06881

An imprint of Greenwood Publishing Group, Inc.

www.praeger.com

Printed in the United States of America



The paper used in this book complies with the Permanent Paper Standard issued by the National Information Standards Organization (Z39.48-1984).

10 9 8 7 6 5 4 3 2 1

CONTENTS

VOLUME 3 THE PSYCHOLOGY OF RELIGIOUS EXPERIENCE

<i>Series Foreword</i> by J. Harold Ellens	vii
<i>Acknowledgments</i>	xi
<i>Preface</i> by Patrick McNamara	xiii
CHAPTER 1 The Neuropharmacology of Religious Experience: Hallucinogens and the Experience of the Divine <i>David E. Nichols and Benjamin R. Chemel</i>	1
CHAPTER 2 The Relationship between Religion and Health <i>Andrew B. Newberg and Bruce Y. Lee</i>	35
CHAPTER 3 Religion, Meaning, and the Brain <i>Crystal L. Park and Patrick McNamara</i>	67
CHAPTER 4 The Darker Side of Religion: Risk Factors for Poorer Health and Well-Being <i>Gina Magyar-Russell and Kenneth Pargament</i>	91
CHAPTER 5 The Common Core Thesis in the Study of Mysticism <i>Ralph W. Hood, Jr.</i>	119

CHAPTER 6	Cross-Cultural Assessments of Shamanism as a Biogenetic Foundation for Religion <i>Michael Winkelman</i>	139
CHAPTER 7	Schizophrenia, Neurology, and Religion: What Can Psychosis Teach Us about the Evolutionary Role of Religion? <i>Steven A. Rogers and Raymond F. Paloutzian</i>	161
CHAPTER 8	Between Yang and Yin and Heaven and Hell: Untangling the Complex Relationship between Religion and Intolerance <i>Ian Hansen and Ara Norenzayan</i>	187
CHAPTER 9	The Origins of Dreaming <i>Kelly Bulkeley</i>	213
CHAPTER 10	Chemical Input, Religious Output— Entheogens: A Pharmatheology Sampler <i>Thomas B. Roberts</i>	235
CHAPTER 11	An Illusion of the Future: Temptations and Possibilities <i>Keith G. Meador</i>	269
	<i>Index</i>	283
	<i>About the Editor and Contributors</i>	295
	<i>About the Advisory Board</i>	301

SERIES FOREWORD

The interface between psychology, religion, and spirituality has been of great interest to scholars for a century. In the last three decades a broad popular appetite has developed for books which make practical sense out of the sophisticated research on these three subjects. Freud expressed an essentially deconstructive perspective on this matter and indicated that he saw the relationship between human psychology and religion to be a destructive interaction. Jung, on the other hand, was quite sure that these three aspects of the human spirit, psychology, religion, and spirituality, were constructively and inextricably linked.

Anton Boisen and Seward Hiltner derived much insight from both Freud and Jung, as well as from Adler and Reik, while pressing the matter forward with ingenious skill and illumination. Boisen and Hiltner fashioned a framework within which the quest for a sound and sensible definition of the interface between psychology, religion, and spirituality might best be described or expressed.¹ We are in their debt.

This series of General Interest Books, so wisely urged by Greenwood Press, and particularly by its editors, Deborah Carvalko and Suzanne I. Staszak-Silva, intends to define the terms and explore the interface of psychology, religion, and spirituality at the operational level of daily human experience. Each volume of the series identifies, analyzes, describes, and evaluates the full range of issues, of both popular and professional interest, that deal with the psychological factors at play (1) in the way religion takes shape and is expressed, (2) in the way spirituality functions within human persons and shapes both religious formation and expression, and (3) in the ways that

spirituality is shaped and expressed by religion. The interest is psycho-spiritual. In terms of the rubrics of the disciplines and the science of psychology and spirituality this series of volumes investigates the *operational dynamics* of religion and spirituality.

The verbs “shape” and “express” in the above paragraph refer to the forces which prompt and form religion in persons and communities, as well as to the manifestations of religious behavior (1) in personal forms of spirituality, (2) in acts of spiritually motivated care for society, and (3) in ritual behaviors such as liturgies of worship. In these various aspects of human function the psychological and/or spiritual drivers are identified, isolated, and described in terms of the way in which they unconsciously and consciously operate in religion, thought, and behavior.

The books in this series are written for the general reader, the local library, and the undergraduate university student. They are also of significant interest to the informed professional, particularly in fields corollary to his or her primary interest. The volumes in this series have great value for clinical settings and treatment models, as well.

This series editor has spent an entire professional lifetime focused specifically upon research into the interface of psychology in religion and spirituality. These matters are of the highest urgency in human affairs today when religious motivation seems to be playing an increasing role, constructively and destructively, in the arena of social ethics, national politics, and world affairs. It is imperative that we find out immediately what the psychopathological factors are which shape a religion that can launch deadly assaults upon the World Trade Center in New York and murder 3,500 people, or a religion that motivates suicide bombers to kill themselves and murder dozens of their neighbors weekly, and a religion which prompts such unjust national policies as pre-emptive defense; all of which are wreaking havoc upon the social fabric, the democratic processes, the domestic tranquility, the economic stability and productivity, and the legitimate right to freedom from fear, in every nation in the world today.

This present set of three volumes, the project on religion and the brain, is an urgently needed and timely work, the motivation for which is surely endorsed enthusiastically by the entire world today, as the international community searches for strategies that will afford us better and deeper religious self-understanding as individuals and communities. This project addresses the deep genetic and biological sources of human nature which shape and drive our psychology and spirituality. Careful strategies of empirical, heuristic, and phenomenological research have been employed to give this work a solid scientific foundation and formation. Never before has so much wisdom and intelligence been brought to bear upon the dynamic linkage between human physiology, psychology, and spirituality. Each of these three aspects

has been examined from every imaginable direction through the illuminating lenses of the other two.

For fifty years such organizations as the Christian Association for Psychological Studies and such Graduate Departments of Psychology as those at Boston University, Fuller, Rosemead, Harvard, George Fox, Princeton, and the like, have been publishing significant building blocks of empirical, heuristic, and phenomenological research on issues dealing with religious behavior and psycho-spirituality. In this present project the insights generated by such patient and careful research are synthesized and integrated into a holistic psycho-spiritual world view, which takes the phenomenology of religion seriously.

Some of the influences of religion upon persons and society, now and throughout history, have been negative. However, most of the impact of the great religions upon human life and culture has been profoundly redemptive and generative of great good. It is urgent, therefore, that we discover and understand better what the psychological and spiritual forces are which empower people of faith and genuine spirituality to give themselves to all the creative and constructive enterprises that, throughout the centuries, have made of human life the humane, ordered, prosperous, and aesthetic experience it can be at its best. Surely the forces for good in both psychology and spirituality far exceed the powers and proclivities toward the evil that we see so prominently perpetrated in the name of religion in our world today.

This series of Greenwood Press volumes is dedicated to the greater understanding of *Psychology, Religion and Spirituality*, and thus to the profound understanding and empowerment of those psycho-spiritual drivers which can help us transcend the malignancy of our earthly pilgrimage and enormously enhance the humaneness and majesty of the human spirit, indeed, the potential for magnificence in human life.

J. Harold Ellens

NOTE

1. Aden, L., & Ellens, J. H. (1990). *Turning points in pastoral care: The legacy of Anton Boisen and Seward Hiltner*. Grand Rapids, MI: Baker.

ACKNOWLEDGMENTS

I would like to thank Debbie Carvalko from Greenwood Press for her advocacy of this project, for her help at every step of the way, and for her advice and encouragement at critical junctures of the project. I would also like to thank J. Harold Ellens for his belief in the importance of this project and for his sage advice throughout. Our advisory board members—Ray Paloutzian, Kenneth Pargament, Harold Koenig, Andrew Newberg, Scott Atran, and Donald Capps—in addition to their help in identifying topics to be covered also helped us to find the best authors to cover them! Advisors also kept the editor from making mistakes that could have cost the project dearly. In short, these advisors have immeasurably increased the quality of these volumes. I would also like to thank Lena Giang, Pattie Johnson, Anna Kookoolis, Jocelyn Sarmiento, and Sarah Varghese for their help with editing and formatting the references for all the chapters in the series—a thankless task at best, but these assistants did it both conscientiously and carefully. Finally, I would like to thank Ms. Erica Harris, my head research assistant, who helped out on all aspects of this project. Her organizational help has meant all the difference throughout. She did yeoman’s work on the project Web site, kept track of correspondence with authors, and generally kept the project running smoothly and on schedule.

PREFACE

In recent years, several lines of evidence have converged on the conclusion that religiousness is associated with a specific and consistent set of biological processes. Religion appears to be a cultural universal. There may be a critical period (adolescence) during the life cycle of normally developing persons when religiousness is best transmitted from an older to a younger generation (see volume II, chapter 4). Individual differences in religiosity are associated with consistent health benefits (see volume I, chapter 7; volume III, chapter 2) as well as unique health risks (see volume III, chapters 4 and 8). Twin studies have shown that religiousness is moderately to highly heritable (see volume I, chapter 3). Genetic studies have implicated specific genes in religiousness (mostly genes that code for regulatory products of monoamine transmission in limbic-prefrontal networks; for reviews, see Comings, Gonzales, Saucier, Johnson, & MacMurray, 2000; D'Onofrio, Eaves, Murrelle, Maes, & Spilka, 1999; Hamer, 2004; see also volume I, chapter 3). Consistent with these preliminary genetic studies, neurochemical and neuropharmacologic studies have implicated limbic-prefrontal serotonergic and dopaminergic mechanisms in mediation of religious experiences (see volume II, chapters 1 and 2; volume III, chapters 1 and 10). Neuroimaging and neuropsychologic studies have implicated a consistent set of neurocognitive systems and brain activation patterns in religious activity (mostly limbic-prefrontal networks (see volume II, chapters 2, 3, 8, and 9; volume III, chapter 7). A cognitive psychology of religious belief has revealed both the unique aspects of religious cognition as well as its commonalities with other basic cognitive processing routines (see volume I, chapters 6, 9, and 10; volume II, chapter 10). Finally, changes in self-reported

religious experience by individuals suffering from obsessive-compulsive disorder; schizophrenia, Parkinson's disease, and temporal lobe epilepsy are in the expected direction if the previously mentioned neurocognitive networks (limbic-prefrontal) do in fact mediate core aspects of religiousness (see volume II, chapters 1 and 8; volume III, chapter 1).

Although the array of previously mentioned findings suggests to some investigators that it is reasonable to speak about potential neurocognitive specializations around religiosity, caution is in order when attempting to interpret the findings (see volume II, chapters 3, 5, 6, and 8; and all three commentaries). As in every other scientific enterprise, what is investigated in any given study is not the whole phenomenon of interest but rather only a small constituent part of the whole. The previously cited studies could not investigate "religion" *per se*. That is too vast a phenomenon to be studied in a single project. Instead, they tried to operationalize religiousness in various ways—with everything from a score on an inventory about religious practices to measurements on those practices themselves. Thus, we are reduced to making inferences about the nature of religiousness from data we collect via these questionnaire and observational/experimental methods. Making inferences about the nature of religion as a whole from neurobiologic correlations of one aspect of religiosity is, of course, fraught with danger (as all three commentators and several of our authors point out), but there is simply no other way to proceed. Inference and extrapolation from observations you collect on operationalized measures of the phenomenon you are interested in is necessary if you want to make progress. What is all-important, however, is to extrapolate, infer, and proceed with caution and humility. Constraints on incautious claims and inferences can often be obtained if you have a good theoretical framework from which to generate inferences about data meanings and from which you can develop falsifiable hypotheses. When it comes to biologic correlates of religiousness, the best available theory is evolution. Thus, several of the essays in these volumes discuss potential evolutionary and adaptive functions of religion.

Claims, however, about potential adaptive functions of religiousness also need to be treated with great caution and tested against the evidence. Several authors in these volumes address the question of whether religiousness can be considered an evolutionary adaptation (see volume I, chapters 1, 4, 5, 7, 8, and 10; volume II, chapter 4; volume III, chapter 6; and all three commentaries). For those scientists who think the evidence supports some variant of an adaptationist position (see volume I, chapters 4, 5, 7, and 10; volume II, chapter 4; volume III, chapter 6), the questions shift to what part of religiousness is actually adaptive and what functions might religiousness enact? Some theorists suggest that it is reasonable to speak about a "common core" religious experience fundamental to all forms of religiosity (see volume I, chapter 7; volume III, chapters 5 and 6). Some investigators suggest that the aspect of religiousness that was "selected" over evolutionary history was the

capacity for trance, placebo responding, or altered states of consciousness, or ASC (see volume I, chapters 5 and 7; volume III, chapter 6). The capacity for trance, placebo responding, and ASC, of course, would yield both health benefits and arational or even irrational belief states over time. Other theorists (see volume I, chapters 4 and 5; volume II, chapter 4) suggest that the aspect of religiousness that was selected over evolutionary history was its ability, primarily via ritual displays and other “costly signals” (see volume I, chapters 2, 4, and 5; volume II, chapter 10), to solve the free-rider problem (where unscrupulous individuals exploit the benefits of group cooperation without paying any of the costs of that cooperation) and thereby promote cooperation among individuals within early human groups. Other theorists who tilt toward some kind of adaptationist position emphasize both costly signaling theory as well as gene–culture interactions to explain particular associations of religiosity, such as its ability to promote character strengths (volume I, chapter 2), its ability to protect against death-related fears (volume I, chapter 9; volume III, chapter 8), its ability to generate life meanings (volume III, chapter 3), its ability to address attachment needs (volume I, chapter 8; volume II, chapter 6), its links with the sources and phenomenology of dreams (volume III, chapter 9), and its similarities with special perceptual capacities of the aesthetic sense (volume II, chapter 7).

Although it has to be admitted that all these investigators have marshaled an impressive array of evidence to support their claims concerning religion’s potential adaptive functions, all the authors of these theories realize that it is nearly impossible to demonstrate conclusively that some biopsychologic process is an adaptation, in the classical sense of that term. Several authors in these volumes have pointed out just how easy it is to get muddled when attempting to think through evolutionary approaches to a phenomenon as complex as religiousness (see volume I, chapters 1, 8 and 10; volume II, chapter 6; and all three commentaries). It is all too easy to overlook the harmful (and presumably nonadaptive) aspects of religiousness (see volume I, chapters 1 and 6; volume III, chapters 4 and 8). Ignorance of the complexity of religious phenomena, an underappreciation of the pervasive effects of social learning and cultural transmission on cognitive functions, and confusion around technical terms in evolutionary biology (such as adaptation, exaptation, and so forth) all militate against progress in this new science of the biology of religion.

To help think through problems of evolutionary change and adaptations in animals, the evolutionary biologist has often utilized the principles and methods of cladistics and phylogenetic analysis. Debates on potential adaptive functions of religion may benefit by taking a look at these methods. Cladistic methodology is used to analyze phylogenetic relationships in lineages that are recognized by the presence of shared and derived (advanced) characteristics. When cladistic methodology is supplemented with the advanced

statistical tools of “phylogenetic analysis,” you get precise and powerful techniques for reconstructing evolutionary history. These techniques have now been successfully used in the cultural arena, as in analyzing biocultural changes (e.g., language evolution). Scholars of ritual and religious practices have now amassed a huge amount of data on the historical development of ritual practices and on ritual practices in premodern human groups. There may therefore be enough data to reconstruct the evolutionary history of ritual practices in certain human lineages. If there is also enough data available on the history of various forms of healing practices of cooperative enterprises (e.g., farming or herding), it may be possible to assess change in ritual practices against change in these other forms of human activity. By superimposing phenotypic features (e.g., ritual practices) over accepted language phylogenies, one can reconstruct the history of evolutionary change in ritual practices as well as potential correlated change in health or in cooperative practices. Thus, hypotheses about potential adaptive functions of key aspects of religiousness may be tested quantitatively using these sorts of methods. With these sorts of methods, one could also potentially assess whether some aspect of religiousness (e.g., ritual practices) fit criteria for an adaptation or an exaptation. An adaptation involves the modification of a phenotypic feature (e.g., a particular ritual practice) that accompanies or parallels an evolutionary acquisition of a function (new healing practices or new forms of cooperation). However, in exaptation, the feature originates first rather than in parallel and only later is co-opted for the function in question. In short, because phylogenetic analysis involves quantitative reconstruction and analysis of histories of shared and derived traits, it provides powerful methods for identification of potential adaptive functions of religion. I draw attention to these techniques only to point out their potential. They have significant limitations, and they have not yet been applied to many problems in biocultural evolution. In particular, phylogenetic techniques have not yet been brought to bear on questions of the evolutionary history of religious practices. Nevertheless, they may be one way to shed some light on the problem of potential adaptive functions of religion.

The fact that reasonable speculations about potential adaptive functions of religion can be advanced at all is partly due to the startling consistency of the evidence summarized in these volumes on the neurobiologic correlates of religiousness. While tremendous progress has been made in identifying neurobiologic correlates of religiousness, it will be a challenge to place these findings in new theoretical frameworks that can do justice to the richness and complexity of the religious spirit. The essays in these volumes provide the necessary first tools to do just that.

Patrick McNamara

REFERENCES

- Comings, D. E., Gonzales, N., Saucier, G., Johnson, J. P., & MacMurray J. P. (2000). The DRD4 gene and the spiritual transcendence scale of the character temperament index. *Psychiatric Genetics, 10*, 185–189.
- D'Onofrio, B. M., Eaves, L. J., Murrelle, L., Maes, H. H., & Spilka, B. (1999). Understanding biological and social influences on religious attitudes and behaviors: A behavior genetic perspective. *Journal of Personality, 67*, 953–984.
- Hamer, D. (2004). *The God gene: How faith is hardwired into our genes*. New York: Doubleday.

CHAPTER 1

THE NEUROPHARMACOLOGY OF RELIGIOUS EXPERIENCE: HALLUCINOGENS AND THE EXPERIENCE OF THE DIVINE

David E. Nichols and Benjamin R. Chemel

INTRODUCTION AND DEFINITIONS

Despite the considerable diversity of the world's religions, at the core of each is a set of beliefs that defines the place of humans in the universe. These beliefs form the foundations of peoples' worldviews, and, in doing so, they provide a basis for relating to and interacting with the world around them. The beliefs, practices, dogma, and infrastructure of religious systems should ultimately be rooted in the primary transcendent experience of the divine. Accounts of these deeply spiritual experiences inspire the framework of religion and provide answers to the fundamental questions of human existence, such as "Who am I?" "Why are we here?" "What is morally right?" "Is there an afterlife?" The capacity for this type of experience seems to be an inherent trait of our species that can be traced back to prehistory. For much of human history, the exploration of spiritual realms was the domain of shamans, mystics, philosophers, monks, and poets, yet modern scientists are developing new experimental approaches to probe the biological nature of religious experiences. Considering the ubiquity and global impact of spiritual and religious tendencies, this knowledge is essential for a complete understanding of the mind, and of our species, in its totality.

The belief that science and religion are mutually exclusive has, until very recently, hindered the pursuit of research on the fundamental nature of religious experiences. In Western culture, there is a long history of dispute between the beliefs held by "the church" and discoveries of natural phenomena by scientists. Science is based on empirical exploration of the quantifiable

aspects of the world around us, whereas religion deals with the supernatural and relies on intuition rather than rationale. The worldviews promoted by science and religion are not always compatible, yet they do sometimes overlap.

The mind is one place where science and religion meet. Because the current paradigm of neuroscience considers the entire spectrum of human consciousness to be the result of complex events within the nervous system, it stands to reason that if research can help us to understand the neurochemical processes associated with memory and perception, it also should be able to shed light on the underlying causes and physiological nature of religious experiences. As far as we know, mystical states of consciousness depend on processes of neuronal translation that are similar, if not identical, to those responsible for converting stimuli from our everyday environment into conscious perception. This reductionist approach does not preclude the existence of a higher power, nor does it assume that religious episodes are all in the mind; rather, it simply states that the *experience* of a supernatural reality, like any other experience, is dependent on natural processes within the human body.

These reductionist approaches of modern neuroscience allow little or no room for faith and belief, and it seems likely that extensive scientific study of religious experience could lead to one of the next great confrontations between science and religion. Fortunately, or unfortunately, depending on the reader's perspective, significant funding is not likely to be available for such studies in the foreseeable future. Nevertheless, research results that bear on this question are beginning to appear as the tools of neuroscience become ever more sophisticated.

This chapter focuses on one main component of human spirituality—the primary experience of God or a higher reality. These so-called religious experiences seem to be the seeds from which the myriad manifestations of religion arose, and they are also arguably the aspect of religion that is best suited for empirical exploration. Although the supernatural aspects of these experiences may lie beyond the scope of science, there is increasing interest in exploring their biological nature and origin.

Defining the religious experience is a difficult task that often is likely to please only the defining party. The diversity of personally held religious beliefs and the variety of subjective states confound any attempt to create an all-encompassing description. In an effort to unify the many views of religion, Walter Houston Clark (1958), a highly respected religious scholar, has defined the religious experience as “the inner experience of an individual when he senses a beyond, especially as evidenced by the effect of this experience on his behavior when he actively attempts to harmonize his behavior with the Beyond” (p. 22). This broad definition is well suited for comparing the various forms of religious experiences, regardless of how they are produced.

Because of the spontaneous and usually nonreproducible nature of the religious experience, research exploring its neuropsychological basis is severely limited by the lack of an experimental model. For that reason, a condition or agent that is capable reliably of producing similar experiences becomes an invaluable tool for study. Thus, in an attempt to deepen our understanding of the mind, researchers have begun to examine the mental states associated with prayer, fasting, meditation, mental disorders such as epilepsy or schizophrenia, and the ingestion of psychoactive substances (Saver & Rabin, 1997). This latter topic is the central theme of this chapter.

PSYCHEDELIC/HALLUCINOGENIC AGENTS

We start this section with a definition of the substances we intend to discuss. Although these substances are generally known to modern science by the catchall name “hallucinogens,” they also have been referred to by the terms psychedelic, psychotomimetic, and entheogenic—generally taken to mean mind manifesting, mimicking psychosis, and generating the god within, respectively. We use these terms interchangeably. Curiously, these descriptors suggest that certain aspects of consciousness may be shared by mental illness, religious inspiration, and hallucinogen-induced mind states. The definition of these substances that best sets the stage for the ensuing discussion appeared in perhaps the most authoritative reference book on pharmacology known popularly as “Goodman and Gilman.” There one reads, “the feature that distinguishes psychedelic agents from other classes of drugs is their capacity reliably to induce or compel states of altered perception, thought, and feeling that are not (or cannot be) experienced otherwise except in dreams or at times of religious exaltation” (Jaffe, 1985, pp. 563–564). Readers should keep this unusual definition in mind as we proceed.

The complex range of phenomena produced by hallucinogens varies more so than for any other class of drugs and is highly influenced both by the mental state and expectations (“set”), and external environment (“setting”) of the user. As a result of these sources of variability, one of the most striking characteristics of the subjective effects produced by hallucinogens is that they differ considerably from person to person and even in the same individual on different occasions. Nevertheless, the following effects are commonly produced by hallucinogenic drugs: altered perception of reality and self; intensification of mood; visual or auditory hallucinations, including vivid eidetic imagery and synesthesia; distorted sense of time and space; enhanced profundity and meaningfulness; and a ubiquitous sense of novelty.

At higher doses, however (but sometimes even at lower doses), perception of ordinary reality may suddenly cease, and an alternate reality or “visionary state” can appear. Following the loss of an objective physical framework with which to compare this experience, such visionary states seem, for all intents

and purposes, completely real. Without external environmental cues to serve as reference points, they are perceived as outside the framework of time and space. Often referred to as a “peak experience,” it is this state, rather than simple alterations of sensory perceptions, that leads to the experience of transcendental or mystical states. These peak experiences do not routinely occur following hallucinogen ingestion, and in fact are relatively rare, but they are the type of drug effect that most closely mimics spontaneous visionary states and are of greatest relevance to our discussion.

The late Daniel X. Freedman (1968), one of the foremost pioneers of clinical LSD (d-lysergic acid diethylamide) research, gained the impression from his many studies that:

one basic dimension of behavior latently operative at any level of function and compellingly revealed in LSD states is “portentiousness”—the capacity of the mind to see more than it can tell, to experience more than it can explicate, to believe in and be impressed with more than it can rationally justify, to experience boundlessness and “boundaryless” events, from the banal to the profound. (p. 331)

Further, “The sense of truth is experienced as compellingly vivid but not the inclination to test the truth of the senses” (p. 331). In essence, Freedman is saying that LSD produces profound experiences, accompanied by a belief in their truth.

The idea that hallucinogens are capable of inducing religious experiences in those who ingest them is sure to be met with stiff resistance by some readers. For some, the notion of a drug-induced spiritual encounter is by definition invalid, inauthentic, or superficial; for them, only through spontaneous rapture can one truly experience the nature of the divine. The notable religious scholar, Huston Smith (1964), refuted such skeptics by stating:

refusal to admit that drugs can induce experiences descriptively indistinguishable from those which are spontaneously religious is the current counterpart of the seventeenth century theologians’ refusal to look through Galileo’s telescope or, when they did, their persistence in dismissing what they saw as machinations of the devil. When the fact that drugs can trigger religious experiences becomes incontrovertible, discussion will move to the more difficult question of how this new fact is to be interpreted. (p. 524)

THE IMPACT OF PSYCHEDELIC AGENTS ON RELIGIOUS THOUGHT

With that brief background, we examine how these substances have had an impact on religion. Throughout history, humans have ingested psychoactive

materials, principally plants and plant extracts, to provide altered states of consciousness (ASC). The contemporary shamanic uses of approximately 150 psychoactive plants have been verified by field research conducted early in the last century (Schultes & Hofmann, 1992). It seems quite probable that many eons ago, at the dawn of human existence, our early ancestors discovered the mind-altering potential of certain plants during the exploration of their environment for food. The psychological effects produced by the ingestion of these substances could have impacted the worldview of sentient ancient humans in profound ways. Although it must remain a matter for speculation, some believe that spiritual thought arose as a direct result of the prehistoric use of mind-altering plants.

The use of psychoactive plants in healing and spiritual practices is deeply rooted in numerous indigenous cultures around the globe. In many tribal societies that have retained their traditional ways, matters of health and spirit are considered inseparable. In contrast to the Western medical paradigm, those cultures commonly believe that various illnesses are the result of spiritual rather than physical causes. For this reason, shamans routinely ingest substances or practice rituals that enable them to access the “spirit world” in order to diagnose and cure. In many cases, these plants have been deified and revered for their unique impact on the human psyche.

Historical evidence suggests that the use of hallucinogens almost certainly predates written history and also may have played a role in the development of modern civilization. These theories were largely promoted by the amateur ethnomycologist, R. Gordon Wasson. He and others put forth the idea that a hallucinogenic brew was the basis of the Eleusinian mysteries of the classical Greeks (Wasson, Hofmann, & Ruck, 1978). This highly regarded cult inspired many of the most notable citizens of Greece for nearly two millennia. The secret of the mysteries was known only by a select few hierophants and was protected by threat of death. Despite this secrecy, a few historical accounts exist that suggest the mysteries were revealed to pilgrims after breaking a fast by drinking a brew called *kykeon*, the central component of which appears to have been barley. Wasson and colleagues presented a compelling case that this brew was made from grain that had been infected by the parasitic ergot fungus (*Claviceps purpurea*). The purple, finger-like dormant forms, or sclerotia, of this fungus contain ergot alkaloids that are capable of producing powerful LSD-like mind-altering effects.

Another ethnohistorical claim made by Wasson was that the mythical soma of the Aryan *Rig Veda* was a psychoactive species of mushroom, *Amanita muscaria*, or fly agaric (Wasson, 1968). During the second millennium B.C., in what now stretches from northern India to Iran, a plant and brew, both named soma, were regarded as a god. Hymns devoted to the sacred, and indisputably psychoactive soma fill an entire volume of the Vedic texts. Although the absolute identity of the substances that once formed the basis

of soma and the Eleusinian mysteries may be permanently lost, these ancient practices beg us to recognize that humankind has a longstanding relationship with psychoactive drugs.

More conclusive evidence of the ritualistic ingestion of hallucinogenic plants comes from the many explorers and anthropologists who have reported the intact use of psychoactive plants into present times. These indigenous uses seem to be vestiges of ancient traditions, which, until their rediscovery in the past century, largely existed in secrecy. Practitioners often suffered centuries of religious and political repression by Europeans, who displayed contempt for native shamanic practices, believing them to be inspired by the devil (Schultes & Hofmann, 1992). The most detailed contributions to this field of study come from the famed Harvard ethnobotanist, Richard Evans Schultes, as he built on the ethnobotanical work of his predecessors. By exhaustively studying the ethnographic uses of plants in Mexico and the Amazon Basin, he became the world's foremost expert on the anthropological use of psychoactive plants in the New World. His collections rekindled interest in these substances and formally introduced them to the modern world for the first time. Three of these shamanic plants will be briefly reviewed here to provide historical perspective on their ritual use.

Recent archaeological evidence suggests that peyote (*Lophophora williamsii*) has a history of use that can be traced more than three thousand years (Schultes & Hofmann, 1992). Spanish conquistadors in the sixteenth century reported the use of this cactus, called *peyotl* by the Aztecs, making peyote one of the first plant hallucinogens of the New World to be recognized by Europeans. This small spineless cactus grows in the desert regions of northern Mexico and southern Texas. In Mexico, the Huichol are the most prominent among the tribes who still practice the archaic shamanic use of peyote. To this day, the Huichol make annual pilgrimages over hundreds of miles to their ancestral homelands where they collect the tops of this cactus for ceremonial use. For these people, peyote forms a holy trinity with deer and corn. The symbolic imagery revealed by its ritual ingestion is reflected in their intricate artwork and inspires many aspects of tribal life (Furst, 1972).

In the latter part of the nineteenth century, the use of peyote spread throughout many tribes living on reservations in the United States. This practice was commonly met with opposition from local authorities and religious leaders, although the exclusive use of peyote by native peoples is now protected by the Religious Freedom Restoration Act of 1993. As many as two hundred thousand individuals from over forty different tribes belong to what is now known as the Native American Church (Stewart, 1987). Although customs and practices vary from tribe to tribe, ceremonies consist of syncretic elements that combine native spirituality and Christian religion. The use of peyote in this context has been a vital means of preserving tribal traditions

and customs in a world of rapidly encroaching modernization. By creating a social framework and a means of personal growth for its adherents, the use of peyote in the Native American Church provides a viable, nonaddictive alternative to alcohol (Stewart, 1987). Sven Liljeblad (1972), an American anthropologist, reported a belief commonly held by Native Americans that peyote "has come to the Indians to lead them to Him as Christ came to the whites. As God reveals Himself in Peyote, it becomes a sacrament whereby communion is established with Him or with the spiritual world in general" (p. 103).

The pre-Colombian use of hallucinogenic mushrooms was also recorded in the writings of Spanish chroniclers. In the language of the Aztecs, the name for these fungi was *teonanácatl*, meaning "God's flesh." The exact identity of this sacrament was a mystery until the middle of the last century, when, to the surprise of modern scholars, intact mushroom cults were discovered in Oaxaca, Mexico. There, and elsewhere in Mexico, many species of mushrooms, primarily from the genus *Psilocybe*, are still routinely ingested by shamans and other villagers during social occasions and nighttime ceremonies (Schultes & Hofmann, 1992). Under such influences, shamans are said to gain access to spirit realms and are thus able to act as liaisons between the human and supernatural worlds. It is worth noting that Wasson, in pursuing the ethnobotanical leads provided by Viktor and Pablo Reko, Robert Weitlaner, and Richard Evans Schultes, was probably the first white person ever to ingest the sacred *teonanácatl* in 1955 (Hofmann, 1978). An account of his experience captivated the world when it was published in a 1957 issue of *LIFE* magazine (Wasson, 1957).

Similar to the effects produced by peyote, hallucinogenic mushrooms provide a powerful spiritual experience. In the words of one contemporary healer:

The more you go inside the world of Teonanácatl, the more things are seen. And you also see our past and our future, which are there together as a single thing already achieved, already happened. . . . I knew and saw God: an immense clock that ticks, the spheres that go slowly around, and inside the stars, the earth, the entire universe, the day and the night, the cry and the smile, the happiness and the pain. He who knows to the end the secret of Teonanácatl can even see that infinite clockwork. (Schultes & Hofmann, 1992, p. 149)

Another sacred hallucinogen recorded by the Spanish was known by the name *ololiuqui*, which means "round things." This decoction, made from the ground seeds of various morning glory species (*Ipomoea violacea*, *Rivea corymbosa*, etc.), is administered for medicinal purposes and is ingested by shamans so that they may diagnose and treat illness. It was said to be substituted for *teonanácatl* when weather conditions were unfavorable for the mushrooms. In the sixteenth century, it was reported by a Spanish physician that shamans who ingested this plant could communicate with gods (Schultes, 1941). Like

teonanácatl, the true botanical identity of *ololiuqui* was forgotten to science, even though the use of this plant persisted in secrecy into modern times. It was conclusively identified less than a century ago by Richard Evans Schultes (1941), who collected and identified specimens of this legendary medicine.

The botanical work that Schultes performed in the deserts and jungles of the Americas was furthered in the laboratory of Swiss chemist Albert Hofmann, who was the first to isolate and identify the active components in many of the hallucinogenic plants used by shamans. After his accidental discovery of the potent hallucinogen, D-lysergic acid diethylamide (LSD; LSD-25), Hofmann became interested in natural products that shared the visionary potential of LSD. He demonstrated, through isolation from the plants, a certain degree of personal experimentation, and subsequent chemical synthesis that psilocybin and certain ergot alkaloids similar in structure and activity to LSD were the principal active components in *teonanácatl* and *ololiuqui*, respectively (Wasson, 1978). By doing so, he opened the door to scientific study of these substances.

EARLY SCIENTIFIC STUDY OF PSYCHEDELIC AGENTS

In the decades following this period of ethnobotanical discovery, hallucinogens fell out of the hands of shamans into the experimental designs of researchers in disciplines as varied as psychology, theology, neuroscience, and medicine. The discovery of the psychoactive properties of LSD in 1943 led to a new area of study of the mind, what might be called a “golden age” of psychedelic research. During the 1950s and early 1960s, hallucinogens, primarily LSD, were administered to thousands of volunteers in hundreds of clinical research applications, notably for psychotherapy, treatment of alcoholism, and to relieve suffering in terminally ill patients (Grinspoon & Bakalar, 1979).

Although most of this research was conducted in a manner that was appropriate for the times, a subset of primarily academic researchers, after experiencing the effects of these compounds firsthand, abandoned accepted research approaches. They adopted nontraditional methodologies of working with psychedelics and became outspoken advocates for their mass use. Knowing what we do about the profound effects of these substances, perhaps such a turn of events should not be too surprising. The widespread use of hallucinogens quickly became a highly charged political issue, accompanied by popularly held negative attitudes that were often promoted by the media and strengthened by the irresponsible use of psychedelics.

Scientific interest in human experiments with hallucinogens rapidly declined when commercial access to these chemicals was restricted in 1963. Concern over the safety and alleged risks to society posed by hallucinogens

eventually resulted in the passing of federal legislation in 1970 that outlawed the possession of many hallucinogens. Today, most hallucinogens are classified as schedule I controlled substances, which by legal definition have a high potential for abuse, a lack of demonstrated safety, and no accepted medical uses. These restrictions had profound effects on how society, science, and medicine approached these substances. The simple fact of being classified as illegal drugs has cast a heavy pall over any possible value they may be seen to have by ordinary citizens.

The 1960s and 1970s were decades marked by cultural revolution, which in various ways was intertwined with the use of psychedelic drugs. Many people used psychoactive plants and synthetic compounds recreationally, often citing reasons that included personal and spiritual exploration. Anecdotal reports of mystical experiences induced by hallucinogens were incorporated into the popular lore surrounding these compounds, which inspired both contempt and admiration.

Perhaps more reliable support for the idea that hallucinogens are capable of producing transcendent visionary or spiritual states has been provided as a by-product of several academic studies. One such study was designed to treat alcoholics with large doses of LSD. It was thought that a high-dose experience induced by LSD might resemble delirium tremens and could essentially frighten alcoholics into a reevaluation of their habits (Aaronson & Osmond, 1970). Although the efficacy of these treatments has been questioned by subsequent research (Ludwig, Levine, Stark, & Lazar, 1969), many subjects reported transcendent experiences of a mystical nature, and it has been reported that the greater the psychedelic experience, the greater and more lasting was the improvement (Fox, 1967). Additional, more generalized studies, which were designed to evaluate the range of effects produced by psychedelics (primarily LSD and mescaline), suggest that anywhere from 24 to 95 percent of the personal accounts included religious components (Batson & Ventis, 1982).

One of the more well-documented examples of the ability of psychedelics to provoke mystical experiences took place in the spring of 1962. Walter Pahnke, then a Harvard PhD student, conducted a groundbreaking scientific study designed to examine the similarities between psychedelic and spontaneous religious experiences. In what later came to be known as “the Good Friday experiment,” 20 graduate students of theology, who were naïve to psychedelic drug use, volunteered to participate in a double-blind, placebo-controlled experiment. Pahnke hypothesized that the hallucinogen psilocybin (from *teonanácatl*), when administered in a religious setting to those who were religiously inclined, could reliably induce experiences that were indistinguishable from spontaneous mystical experiences (Pahnke, 1963). In the basement chapel of a Boston University church, pills containing either an active placebo (nicotinic acid) or 30 mg of synthetic psilocybin were randomly

distributed to the test subjects. As the experiment proceeded, the subjects listened to the Good Friday church service that was being conducted directly above them. Following the service, the subjects were interviewed about their personal experiences. A written account, accompanied by an extensive questionnaire, was provided by each of the subjects in the days following the experiment. Similar techniques were used as means of evaluation six months after the experiment.

Using common characteristics of mystical experiences derived by reviewing either published accounts or reviews of spontaneous religious experiences, Pahnke trained objective evaluators to discriminate written descriptions of authentic mystical experiences (Pahnke & Richards, 1969). The personal accounts of the test and control subjects were then assessed by this method. Additionally, nine distinct characteristics were carefully chosen in an attempt to define universally the mystical experience. These were largely derived from the work of earlier religious scholars (notably William James and W. T. Stace) and guided the formation and evaluation of the questionnaire used in the short (one-week) and long-term (six-month) follow-up evaluations. The characteristics of religious experience used in this study were feelings of unity or ego-loss, transcendence of space and time, a deeply felt positive mood, sacredness, a noetic sense of an ultimate truth or reality, paradoxicality, ineffability, transiency, and a persistent integration of the experience into one's life. Pahnke (1963) reported that in every measure, the subjects who received psilocybin scored significantly higher on the mystical scale than the control group.

The difference between the two groups was even more apparent at the six-month follow-up. At that point, all but one of the experimental subjects, and none of the control subjects, reported having an experience that was decided to be indistinguishable from primary accounts of spontaneous experiences (the one experimental subject whose experience was not classified as such stated that he had intended that outcome) (Pahnke & Richards, 1969). Additionally, it appeared that the experimental group was much more likely to have integrated aspects of the experience into their lives in a beneficial way.

Although many scientists and theologians acknowledge the importance of this study, some important critiques have been made. Pahnke's evaluation technique employed a discrete method of classification whereby aspects of the subject's experiences were categorized as being either mystical or nonmystical. This dichotomy may have over-reported the incidence of mystical aspects, in that profound altered states of consciousness of a psychedelic rather than religious nature would have been classified as being mystical rather than ordinary (Batson & Ventis, 1982). Furthermore, the double-blind nature of the trial was surely compromised at the onset of the effects of psilocybin. Another important critique of the study is that Pahnke displayed a

tendency to overemphasize the positive aspects of the experimental subject's experiences and downplay the negative (Doblin, 1991).

More than two decades after the original experiment, follow-up interviews were performed on 16 of the original 20 subjects (Doblin, 1991). Although finding that none of the subjects displayed any long-term negative effects from their psychedelic experience, this follow-up demonstrated that positive effects of psilocybin had, in some cases, also been accompanied by psychological turmoil. This study suggests that the state induced by hallucinogens (if one can generalize) is not simply one of bliss and ecstasy, but also can be accompanied by intense psychological struggle. All seven of the experimental subjects in the psilocybin group who participated in the 20-year follow-up reported that they ultimately considered their experience to be positive and of a spiritual nature, despite any acute difficulties. This finding supports the commonly held belief that the outcome of such sessions can be largely mediated by attending to the set and setting of the individual. Doblin (1991) states that all of the seven psilocybin subjects reported positive, long-lasting contributions to their spiritual lives by what they considered to be authentic mystical states. A few of them even reported that their hallucinogenic experience was the strongest spiritual event of their lives. None of the placebo subjects reported similar impacts on their lives.

Religion is also concerned with the end of life and the possibility of existence beyond death. Here is another area where the therapeutic use of psychedelics has demonstrated spiritual implications. In the mid-1950s, a Chicago internist named Eric Kast was evaluating the analgesic effects of LSD compared to traditional opiates in dying patients. He found that LSD had an acute analgesic effect that was comparable to that of opiates. Surprisingly, however, in some patients he discovered that LSD had a persistent analgesic effect that extended for weeks beyond the acute effects of the drug. In one study of 80 patients, nearly 75 percent of them experienced "metaphysical reactions," with a happy, oceanic feeling that extended up to 12 days in some patients. Kast (1966) further noted that philosophical and religious attitudes toward death and dying changed as well, although those attitudinal changes were not captured in the data. There was a general improvement in the patient's feelings, and sleep patterns improved for approximately 12 to 14 days.

These early studies by Kast were expanded on in the late 1960s by a group of physicians at Maryland's Spring Grove state hospital that included Walter Pahnke, Al Kurland, Sandy Unger, Charles Savage, and Stanislav Grof. In a series of studies, this group reported on the effects of LSD in terminal cancer patients (Pahnke et al., 1969; Pahnke, Kurland, Unger, Savage, & Grof, 1970; Grof, Goodman, Richards, & Kurland, 1973). In the studies, LSD produced a positive change in scores of depression, emotional tension, psychological isolation, fear of death, and amount of pain medication required. In approximately

one-half of the patients, the improvement was dramatic, and patients who had the most profound experiences tended to show the most benefit.

Although the degree of response varied, it was clear that some patients experienced a positive transcendent state. One patient who experienced positive ego transcendence felt that

she had left her body, was in another world, and was in the presence of God which seemed symbolized by a huge diamond-shaped iridescent Presence. She did not see Him as a person but knew He was there. The feeling was one of awe and reverence, and she was filled with a sense of peace and freedom. (Pahnke et al., 1970, p. 70)

This type of encounter, noted earlier as what has been called a “peak experience,” led to the most profound improvement in quality of life.

Although we have made no attempt to provide a thorough review of all the studies employing hallucinogens in dying patients, it should suffice to say that this use is perhaps the most well-documented and successful modern application of these substances in medicine. As a result of his extensive experience conducting LSD sessions, including his work with the Spring Grove group, Stanislav Grof wrote a number of books and essays describing the effects of LSD. In particular, he proposed that a “confrontation with death in a ritual context” can both eliminate the fear of death and lead to personal transformation. The experiences of death and rebirth that can be induced by psychedelics can sometimes lead to radical changes in the patient’s attitude toward death and dying, resulting in relief of pain and distress and spiritual opening (Grof & Grof, 1980). These changes largely parallel those that are observed following a so-called near-death experience (Noyes, 1980) and further emphasize the potential similarity between an actual physical encounter with death and the perception of one that may be induced by a hallucinogen.

We have discussed how hallucinogens may be able to catalyze changes in consciousness that can lead to religious experiences, although their use alone is not sufficient to generate these effects reliably in every individual. As shown in Pahnke’s Good Friday experiment, suitable preparation and a proper environment are also essential. Under such conditions, these substances may help to regenerate the soul and transform personality, effects that are not without therapeutic implications. Nonetheless, despite the promise generated by research studies, exploration of the effects of hallucinogens in humans essentially ceased. In 1966, 70 active research projects investigating the clinical effects of hallucinogens were being conducted; by 1970 only six remained; by the 1980s they were virtually nonexistent. The focus of the few remaining hallucinogen research programs shifted from the clinic to the research laboratory, where these substances became pharmacological tools to explore brain neurochemistry.

HALLUCINOGENS AND CONSCIOUSNESS

We now shift the focus of this chapter from historical and psychological phenomena to the neuropharmacology of hallucinogens and, specifically, how transcendent or mystical experiences might be produced from a neurochemical perspective. We examine brain structure and neuropharmacology in an attempt to rationally explain how hallucinogens might evoke visionary experiences. We should caution readers, however, that the ice beneath our feet is thin as we move in that direction.

Unfortunately, most of what we know about the human pharmacology of hallucinogens dates from about 50 years ago, and almost none of that is mechanistic. Clinical trials were fairly rudimentary, cognitive science was nonexistent, and there were few pharmacologically specific drugs with which to probe the mechanistic basis for the effects of hallucinogens. The vast majority of mechanistic studies on hallucinogens have been carried out in rodents, but fortunately there are a number of parallels in brain function between humans and lower mammals. Although admittedly we are still in the dark with respect to our understanding of the mind, there are certain aspects of the brain that are well enough understood to discuss in this context.

The major problem that we confront at the very outset is understanding the nature of human consciousness. How can one possibly discover how drugs alter consciousness without an understanding of consciousness itself? Although the study of consciousness is now gaining vogue, there is still no clear understanding of what it is and how it originates out of brain structures. Nevertheless, there seems to be a consensus that an intact thalamocortical system is necessary for consciousness (Plum, 1991; Tononi, 2004). We use this idea as a basic foundation for the subsequent discussion.

Tononi (2004) has proposed that consciousness arises from the brain's ability to integrate information in a way that is contingent on the connectivity within functionally specialized regions of the thalamocortical system. He further argues that the *quality* of consciousness is determined by the informational relationships that causally link its elements and the distinct activity states of these elements at any given moment. Massimini and colleagues (2005) have recently provided evidence in support of this hypothesis by showing that the loss of consciousness that occurs during sleep may be related to a breakdown in cortical effective connectivity.

In largely parallel reasoning, Vollenweider and Geyer (2001) propose that hallucinogens disrupt information processing in cortico-striato-thalamo-cortical (CSTC) feedback loops, leading to an inability to screen out, or "gate," extraneous stimuli and to attend selectively to salient features of the environment—features that to some extent may parallel those seen in the very early stages of schizophrenia. They propose that nonphysiological disruptions of thalamic gating of sensory and cognitive information leads to an overload of

the processing capacity of the cortex and that hallucinogens may alter thalamocortical transmission by stimulation of 5-HT_{2A} receptors located in several components of the CSTC, including the prefrontal cortex, striatum, nucleus accumbens, and thalamus.

We extend this reasoning to suggest that a religious experience represents an altered, or qualitatively different, state of consciousness that results from changes in the activity states of the interacting elements. Thus, even if we do not understand how a thalamocortical network might generate consciousness, we can still discuss ways that hallucinogens may alter processing in interacting brain structures that impinge on the network, and from that knowledge perhaps construct a framework within which to relate what is known about the psychopharmacological effects of hallucinogens.

It is widely recognized that the complexity of the cortex is what sets humans apart from the great apes. It is in the frontal cortex that executive decisions are made and important elements of personality are determined. Incoming sensory information as well as affective tags and access to memories all converge in the frontal cortex, where the totality of incoming data is continuously integrated in some way to form what we experience as consciousness.

Earlier, we cited conclusions by Daniel Freedman on the effects of LSD in humans. Freedman (1968) also noted that one of the effects of these hallucinogens was to heighten the sense of witnessing one's own experience in the context of a lucid, unclouded awareness. In essence, the ego remains intact and is an observer of the experience as it unfolds; whereas during poisoning or a toxic psychosis, consciousness is clouded, confused, or disoriented, and there may be no memory of the events. Thus, we can draw one clear distinction between the effects of hallucinogens and other substances that may alter consciousness: the effects of hallucinogens are typically remembered quite clearly and vividly.

During a visionary experience, consciousness and the self also remain intact, memory continues to function, and one is aware of what is happening even if it lies outside the realm of ordinary experience. Afterward, during ordinary consciousness, the subject can remember and report on the subjective details. These characteristics apply irrespective of whether the experience is spontaneous or induced by a psychedelic. Based on Tononi's concepts, it seems reasonable to infer that the basic integrative process of consciousness has not been disrupted, but rather some of the interactive brain elements involved in producing consciousness have been altered.

In ordinary waking consciousness, the incoming sensory streams bring information about the external environment. We are hardwired to respond to changes in the environment that represent survival cues, threats, sexual opportunities, occasions to gather food, and so on. Adaptive responses to the environment are necessary for survival of the species, and, as such, we would

expect that coincident but irrelevant sensory cues will largely be absent at the level of our conscious awareness, having been filtered out of the information that is integrated into our consciousness. The nature of this filtering or gating process is of some interest as we discuss the actions of hallucinogens. We noted its importance in the ideas of Vollenweider and Geyer, cited above, and later we see that this gating concept is probably fundamental to religious experience.

How can we relate these functions to mystical states? First and foremost, one can anticipate that if the incoming information for integration into consciousness is diverted from environmental responses to interoceptive or subjective cues, then the nature of consciousness will change. The *quality* of consciousness will be altered because the informational relationships have changed that causally link the elements of the thalamocortical network (Tononi, 2004). That is, the quality of consciousness will change in a way that represents a shift from an external adaptive state of consciousness to one that is internally reflective and driven by hopes, feelings, dreams, memories, and imagination. We will remain conscious, but the *quality* of our consciousness will change.

Thus, if consciousness is normally focused on the everyday world, then any direct awareness of our subjective state, in place of its object, would be experienced as anomalous. A psychedelic model consistent with this reasoning would view altered states of consciousness as the subjective reflections or by-products of general mental activity, resulting when the “known object” of focal awareness is replaced by features of the “knowing medium” (Hunt & Chefurka, 1976). This point is reminiscent of the meditative techniques used by many Eastern religious traditions.

We posit that even if we alter the informational relationships of the elements involved in generating consciousness, what we experience may still be perceived as completely real. As a consequence of certain types of brain lesions, through the effects of pharmacological agents or in forms of psychiatric disorders such as schizophrenia, this reality may differ significantly from the nature of what might be called a “consensus” reality. Nevertheless, it may still be experienced as real by the subject, and indistinguishable from consensus reality because there is no objective relativistic framework with which to compare it.

Probably the only way that one might be able to recognize that an altered state of consciousness was being experienced at any given moment would be if there was an internal observer that remained objective and dissociated or unaffected by the processes that had changed the quality of consciousness. Such a postulate would require a sort of consciousness overseer that could retain a memory of what objective reality was like. This sort of dualism has been firmly rejected by modern cognitive neuroscience. Thus, one characteristic of a genuine mystical experience is that it must be perceived as being completely real.

If the memory of an altered-state experience remains intact during ordinary waking consciousness, the subject will be able to assess the extent to which the altered state differed from waking consciousness. A useful analogy would be to consider the memory of a dream. In the midst of a dream, no matter how real it may seem at the moment, we may not recognize that we are dreaming, but if we remember the dream when we awaken, we will clearly realize that we were dreaming. It might be added that, although lucid dreams are those in which subjects are aware they are dreaming, that recognition can only occur because they are not completely absorbed in the “reality” of the dream.

We have attempted to convey the idea that it is possible to alter one’s perception of reality through a variety of means, and that during the experience it may not be perceived as anything other than real. A visionary or transcendental state must be perceived as completely real for it to be considered authentic. It is important to accept this premise, because if a transcendent or religious experience did not have the quality of seeming completely real, it would be perceived as illusion or hallucination and would have no lasting impact.

Transcendental or visionary states have the quality of being ineffable; there is no language that can adequately convey the richness of the experience. Similarly, Daniel Freedman often focused on the fact that hallucinogens produce a feeling of portentousness. That is, psychedelics can produce a powerful and profound sense that something ominous or momentous is about to occur or is occurring, producing awe and amazement. These descriptors are the same as those we might attach to a visionary experience, and they resemble Rudolph Otto’s “numinous” (Otto, 1958).

We propose that a feeling of portentousness is a product of frontal cortical activity. It is well accepted that the behavior of other mammals (at least nonprimates) is driven primarily by reflexes and instincts, with little or no ability to make conscious choices. If we reject the Skinnerian notion that humans have no free will, then it is only in humans where reflection and introspection can occur and conscious decisions can be made to carry out specific behaviors. That is, the rationale for making complex decisions will be based on subjective comparisons of the predicted outcomes of different choices and a ranking of the acceptability of those outcomes in the context of one’s value systems. Some choices will have more profound implications than others, and it is through our understanding of those consequences that we make such decisions.

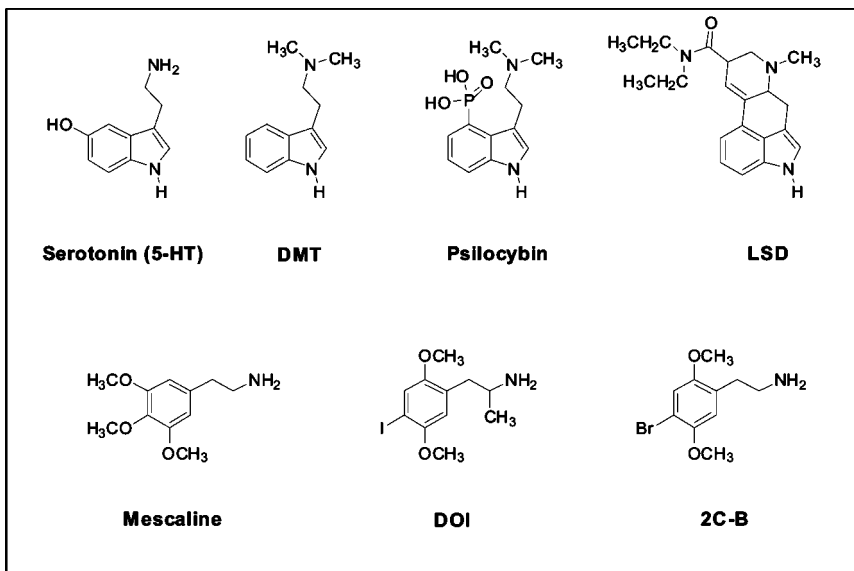
Therefore, if we assume that the ability to place experiential events into Freedman’s continuum, ranging from the banal to the profound, results from comparisons derived through cortical functions, it would then seem logical that attaching a sense of portentousness to an experience—a descriptor that must lie at the extreme end of the ranking system—must derive from processes that involve the frontal cortex.

From a neuropharmacology perspective, one can envision that exogenous substances such as psychedelics might alter cortical processing and sensory gating to produce experiences that are ineffable or are perceived as portentous. We can explore how this might happen by examining the targets of these molecules in mammalian systems and how these targets might affect relevant brain areas.

THE NEUROPHARMACOLOGY OF HALLUCINOGENS

Based on their chemical structures, hallucinogens are classified into three structural groups: tryptamines, phenethylamines, and ergolines. Tryptamines include psilocybin, psilocin, and *N,N*-dimethyltryptamine (DMT), and they bear a close structural similarity to serotonin (see Figure 1.1). LSD and related compounds are called ergolines and can be considered special cases of tryptamines because they have a tryptamine as their core framework. Mescaline, DOI, and 2-CB are examples of phenethylamines. Although these latter types do not resemble serotonin in structure, all three structural classes of hallucinogens seem to exert their effects on human consciousness by interacting with similar targets.

Figure 1.1 Chemical Structures of the Neurotransmitter Serotonin and Several Psychedelics



Note: DMT, psilocybin, and mescaline occur naturally in certain plants and fungi. LSD is semi-synthetic, being produced by chemical processes from ergot alkaloids. DOI and 2C-B are examples of totally synthetic psychedelic molecules.

It is not our objective here to provide a comprehensive review of neuropharmacology. Rather, we attempt to integrate what is known about the molecular effects of hallucinogens and their influence on particular brain circuits with how those actions could lead to mystical experiences. The neurotransmitter system of special importance to the present discussion involves serotonin as the chemical transmitter substance. Serotonin (5-hydroxytryptamine, or 5-HT) is an evolutionarily ancient neurotransmitter, occurring in snails and mollusks. In the mammalian brain, it originates from small groups of cells in a phylogenetically old area of the upper brain stem known as the raphe nuclei. These raphe cells send projections to higher brain centers, releasing serotonin into terminal fields of a variety of important structures.

At the molecular level, there is a fairly clear consensus that the key site for hallucinogen action is a particular type of serotonin receptor known as the 5-HT_{2A} subtype (Aghajanian & Marek, 1999; Branchek, Adham, Macchi, Kao, & Hartig, 1990; Ebersole, Visiers, Weinstein, & Sealfon, 2003; Egan, Herrick-Davis, Miller, Glennon, & Teitler, 1998; Krebs-Thomson, Paulus, & Geyer, 1998; McKenna & Saavedra, 1987; Nelson, Lucaites, Wainscott, & Glennon, 1999; Nichols, 1997, 2004; Pierce & Peroutka, 1989; Sadzot et al., 1989; Scruggs, Patel, Bubser, & Deutch, 2000; Smith, Barrett, & Sanders-Bush, 1999; Smith, Canton, Barrett, & Sanders-Bush, 1998; Titeler, Lyon, & Glennon, 1988). This conclusion was initially developed by, among other approaches, correlation of rat behavioral responses to hallucinogenic amphetamines with their affinities and efficacies at the 5-HT₂ receptor (Glennon, Titeler, & McKenney, 1984; Glennon, Titeler, & Young, 1986; Glennon, Young, & Rosecrans, 1983; Nichols & Glennon, 1984; Rasmussen, Glennon, & Aghajanian, 1986; Sanders-Bush, Burris, & Knoth, 1988). More compelling evidence for this conclusion recently has been provided by two clinical studies that demonstrated that the hallucinogenic effects of psilocybin could be blocked by preadministration of 5-HT_{2A}-selective antagonists (Carter et al., 2005; Vollenweider, Vollenweider-Scherpenhuyzen, Babler, Vogel, & Hell, 1998).

The earliest hypothesis for the cellular action of hallucinogens was based on the observation that LSD dramatically reduced the firing rate of raphe cells. One characteristic of these cells is that they fire in a regular rhythmic rate that is correlated with the level of vigilance. During sleep their firing rate decreases, and during REM sleep they cease firing altogether. Early experiments had shown that LSD potently suppressed the firing of cells in the dorsal raphe nucleus (Aghajanian, Foote, & Sheard, 1968, 1970; Aghajanian, Haigler, & Bloom, 1972). Other tryptamine hallucinogens, such as DMT, also inhibited dorsal raphe cell firing (Aghajanian et al., 1970; Aghajanian & Haigler, 1975; deMontigny & Aghajanian, 1977). Thus, Aghajanian and Haigler (1975) hypothesized that this

suppressant effect on raphe cells might be the underlying basis for the action of hallucinogens.

This idea was very attractive because the raphe cells send serotonergic projections throughout the forebrain and are the source of serotonin afferents in the prefrontal cortex (Moore, Halaris, & Jones, 1978). It was also inferred that the connection between reduced raphe firing and REM sleep was somehow related to the action of LSD.

Nevertheless, problems soon developed with this hypothesis, largely because the phenethylamine hallucinogens such as mescaline lacked this effect (Aghajanian et al., 1970; Haigler & Aghajanian, 1973). Furthermore, a nonhallucinogenic ergoline called lisuride also potently suppressed raphe cell firing (Rogawski & Aghajanian, 1979). Ultimately it was discovered that the suppression of raphe cell firing was mediated by stimulation of somatodendritic serotonin 5-HT_{1A} receptors. This hypothesis for the mechanism of action of hallucinogens was, therefore, not tenable.

Although the suppression of raphe cell firing may not be a primary mechanism for hallucinogens, one cannot conclude that it has no consequences at all. The firing of raphe cells is responsible for serotonin release in the cortex, and any change in firing rate would alter cortical serotonergic tone. The main effect of physiologically released serotonin in the prefrontal cortex is to inhibit pyramidal cells (Puig, Artigas, & Celada, 2005). Thus, a reduction in the rate of raphe cell firing would lead to increased excitability of cortical pyramidal cells, sensitizing them to 5-HT_{2A} receptor activation by hallucinogens.

The observations that raphe cell firing ceases during REM sleep and that LSD also suppresses raphe cell activity may have relevance to an interesting study reported nearly four decades ago that has been virtually forgotten. Clara Torda (1968) recorded EEGs and obtained dream records from two subjects during 11 consecutive nights. During control nights, the subjects received 10-minute intravenous saline infusions, which started 30 minutes after the onset of their third REM episode. On alternate nights, intravenous infusion of 5 micrograms per minute of LSD was given. Subjects were awakened during their fourth and fifth REM episodes and asked to report what was on their mind. In all cases, subjects reported they were dreaming. On control nights, the average latency to the fourth REM period and dreaming was about 90 minutes. With LSD infusion, however, the latency to this REM episode was 10 to 19 minutes.

Although this study was too small to reach significant conclusions, it does suggest that LSD, at least in small doses, can initiate REM sleep and dreaming. If similar neurochemical events are evoked by LSD in the waking state, it would certainly provide a basis for the belief that psychedelics can produce effects that resemble dreams. It may be that cessation of raphe cell firing is a contributing, but not sufficient, condition for an altered state to be perceived as dreamlike.

Most recent attention on the mechanism of action of hallucinogens has been focused on the frontal cortex. After *in vitro* and animal behavioral experiments indicated that serotonin 5-HT_2 sites might be the biological targets for these drugs, numerous anatomical localization studies demonstrated that 5-HT_{2A} receptors appear to be expressed most highly in cortical regions of rats and humans (e.g., McKenna & Saavedra, 1987; Pazos, Cortes, & Palacios, 1985; Pazos, Probst, & Palacios, 1987). In the rat prefrontal cortex, these receptors were primarily localized to pyramidal and local circuit interneurons (Miner, Backstrom, Sanders-Bush, & Sesack, 2003). Interestingly, 5-HT_{2A} receptors were also expressed on the surface of dendritic neuronal outgrowths in regions that did not form direct synaptic junctions. The authors suggested that serotonin within the prefrontal cortex may exert at least some of its actions through volume transmission mechanisms. That means simply that some serotonin axon terminals release serotonin into the fluid around the cells, and it diffuses throughout the adjacent region. Based on their results, and previous data, Miner et al. (2003) proposed that cortical 5-HT innervation is largely nonjunctional and that the entire cortical volume may be within reach of this neurotransmitter. Thus, it is hypothesized that some of the physiological actions of 5-HT in the cortex may be constantly exerted, with more or less efficacy at the various 5-HT receptors, providing widespread, global, and/or sustained influence in the neocortex. Electrophysiological studies have confirmed that 5-HT_{2A} receptors localized on cortical pyramidal cells have excitatory effects on projection neurons in the neocortex (Araneda & Andrade, 1991; Ashby, Edwards, & Wang, 1994). Hallucinogens increase both spontaneous and electrically evoked responses in cortical neurons, and they appear to affect primarily cortico-cortico interactions.

It is also becoming clear that hallucinogens enhance the release of the neurotransmitter glutamate in the cortex. Significant controversy still centers on the details of the mechanism whereby hallucinogens increase cortical glutamate following activation of 5-HT_{2A} receptors, but it is believed that the glutamate is released from thalamic afferents to the cortex. Following these lines of reasoning, Scruggs et al. (2000) hypothesized that hallucinogens exert a direct effect, by acting through 5-HT_{2A} receptors located on thalamocortical afferents to increase glutamate release onto nonpyramidal glutamatergic cells. Alternatively, Lambe and Aghajanian (2001) proposed an indirect role for 5-HT_{2A} receptor modulated glutamate release that involves the release of a retrograde messenger. Such a substance could be produced as a result of receptor activation, diffuse out from the postsynaptic membrane, and block K^+ channels on presynaptic terminals of glutamatergic neurons, leading to depolarization and glutamate release.

One of the two known major signaling events following 5-HT_{2A} receptor activation is stimulation of phospholipase A₂ (PLA₂), leading to mobilization and release of arachidonic acid. Behavioral effects of hallucinogens in rodents

do not correlate with the ability of 5-HT_{2A} receptor agonists to activate the other major 5-HT_{2A} receptor signaling pathway mediated by phospholipase C (PLC), and it has been suggested that the generation of arachidonic acid may be the more relevant second messenger for the actions of hallucinogens (Kurrasch-Orbaugh, Watts, Barker, & Nichols, 2003). It is interesting, therefore, that arachidonic acid is an extracellular blocker of K⁺ channels (Poling, Karanian, Salem, & Vicini, 1995; Poling, Rogawski, Salem, & Vicini, 1996). Thus, a plausible scenario is that hallucinogens activate postsynaptic 5-HT_{2A} receptors on pyramidal cells, leading to the formation of arachidonic acid, which diffuses to adjacent presynaptic glutamatergic thalamic afferents, causing depolarization and release of glutamate.

These cellular actions would stimulate activity in cortical cells and lead to increased demand for oxygen. As would be predicted by this discussion, hallucinogens have been shown to increase cerebral metabolic rate. In studies by Franz Vollenweider and his colleagues at the Psychiatric University Hospital Zurich, positron emission tomography studies with [¹⁸F]fluorodeoxyglucose were coupled with Dittrich's APZ questionnaire (Dittrich, 1998), a rating scale for altered states of consciousness. Various changes in mood and perception were correlated with changes in cerebral metabolic rate of glucose (CMRglu) (Vollenweider & Geyer, 2001; Vollenweider et al., 1997, 1998). Administration of psilocybin produced a global increase in CMRglu bilaterally in areas of the cortex that are known to express a high density of 5-HT_{2A} receptors. Their data indicate that 5-HT_{2A} receptor activation leads to a hyperfrontal metabolic pattern, which was correlated with a depersonalization/derealization syndrome, thought disturbances, and mania-like symptoms.

TRYING TO FIT ALL THE PIECES TOGETHER

How does all this information fit together in a model of hallucinogen effects on cortical function? Although the functional circuitry of the cortex is not yet well understood, results by Sanchez-Vives and McCormick (2000) from experiments using ferret prefrontal cortical slices have suggested that the basic operation of cortical networks is the generation of self-maintained depolarized states that are tightly regulated through interaction with local GABA-ergic neurons and intrinsic membrane conductances. They further postulated that the ability of cortical networks to generate persistent and recurring activities even in the absence of ongoing subcortical inputs could be a process that underlies perceptual influences on sensory information processing. Clearly, changes in cortical cell sensitivity induced by 5-HT_{2A} receptor activation, as well as glutamate release, whether by activation of presynaptic excitatory 5-HT_{2A} receptors or by retrograde release of a transmitter, would dramatically affect these cortical networks.

Serotonin 5-HT_{2A} receptors are also localized in areas of the thalamus, the reticular nucleus of the thalamus, and the ventral tegmental area. Although few functional studies with hallucinogens have been carried out in any of these areas, the thalamus may be the second most important site of action for hallucinogens. The thalamus, along with the amygdala, represents the major source of glutamate afferents innervating the neocortex, and, as we have seen, hallucinogens increase glutamate levels in the cortex. The thalamus processes not only somatosensory inputs, but also receives afferents from both the raphe nuclei and the locus coeruleus (Asanuma, 1992). A functioning thalamocortical network is essential for consciousness, and glutamate release from thalamic afferents in the cortex appears to be one of the salient features of hallucinogen pharmacology.

In rat brain, significant levels of 5-HT_{2A} receptor mRNA are found in the reticular nucleus of the thalamus (Cyr, Landry, & Di Paolo, 2000). This region of the thalamus is of particular interest here because it is thought to serve as a sort of gate for processing signals to the cortex. Synaptic inputs to the reticular nucleus arise from the other thalamic nuclei, and it sends inhibitory projections back into the thalamus, apparently serving a negative-feedback regulatory role in thalamic function. It has been proposed to be a sort of “searchlight” of attention (Crick, 1984; Sherman & Guillery, 1996) and to control elements of signal-to-noise or the quality of information being sent to the cortex (see Vollenweider & Geyer, 2001, and references therein). In particular, the thalamic reticular nucleus can direct “attention” through its inhibitory GABA-ergic input to all other thalamic nuclei and assists in organizing activity in specific thalamic nuclei according to characteristics of sensory input and attentional demands (Behrendt, 2003; Smythies, 1997). It is thus in the thalamus, and in particular the reticular nucleus of the thalamus, that we find what might be the gate or filter for determining which information is sent to the cortex. We have already noted that such a gate has been implicated in altered states of consciousness.

A number of studies have shown that 5-HT_{2A} receptors often activate inhibitory GABA interneurons, leading to speculation that 5-HT_{2A} receptor activation in the reticular thalamic nucleus might indeed increase the level of inhibitory input to relay cells. Dysfunction of the reticular nucleus would lead to loss of sensory-specific inhibition of specific thalamic nuclei and further impairment of the signal-to-noise ratio. Noise could then predominate over stimulus-specific activity, with relay cells being recruited into thalamocortical circuits without receiving adequate sensory input. The combination of increased thalamic relay cell excitability and reticular thalamic nucleus dysfunction could lead to activation of thalamocortical circuits and the formation of coherent assemblies of thalamocortical oscillations that would be independent of afferent sensory inputs, potentially giving rise to underconstrained perception, such as hallucinations or dream imagery (Behrendt, 2003).

Although mediodorsal thalamic projections would normally fire in response to sensory information processed by the thalamus, a direct action of hallucinogens on these terminals would evoke glutamate release in the absence of appropriate sensory input. Because pyramidal cells would now be hyperexcitable, the effects of extracellular glutamate would be potentiated.

In addition to many studies that point to the frontal cortex and thalamus as key sites for the action of hallucinogens, the locus coeruleus (LC) may also be an important player. This possibility is intriguing because the LC is a point of convergence for widely ranging somatosensory and visceral sensory inputs from all regions of the body. The LC has been likened to a "novelty detector" for salient external stimuli (Aston-Jones & Bloom, 1981; Cedarbaum & Aghajanian, 1978). This group of cells sends noradrenergic projections diffusely to all parts of the forebrain, as well as the cerebral cortex (Aghajanian & Marek, 1999), and is the sole source of norepinephrine in the cortex. Within the cortex, 5-HT_{2A} and α_1 -adrenergic receptors share a similar regional and laminar distribution (see Marek & Aghajanian, 1999, and references therein). Furthermore, activation of either 5-HT_{2A} or α_1 -adrenergic receptors modulates cortical pyramidal cells and interneurons in a parallel fashion (Marek & Aghajanian, 1994, 1996, 1999).

Systemic administration of LSD, mescaline, or other phenethylamine hallucinogens to anesthetized rats decreased spontaneous activity of LC cells, but enhanced the activation of LC neurons evoked by sensory stimuli (Aghajanian, 1980; Chiang & Aston-Jones, 1993; Rasmussen & Aghajanian, 1986; Rasmussen, Glennon, & Aghajanian, 1986). Suppression of LC firing was blocked by local infusion of GABA antagonists, and the enhanced responses to external stimuli were blocked by an NMDA antagonist. These results led Chiang and Aston-Jones (1993) to propose that systemic administration of 5-HT_{2A} agonists suppressed LC firing indirectly by tonic activation of an inhibitory GABA-ergic input to the LC. They proposed that the facilitating effect on sensory inputs was mediated through excitatory amino acid receptors in the LC.

In its role as a "novelty detector," the LC has been thought to enhance the signal-to-noise ratio in modulating postsynaptic activity throughout the brain, and the suppression of basal activity with enhanced responding to external sensory stimuli would amplify this effect (see Marek & Aghajanian, 1998, and references therein). Thus, hallucinogens might alter sensory processing in all parts of the brain, but their effects on LC neurons might suggest that sensory events ordinarily not considered unusual could be perceived as having increased novelty. Indeed, it is a well-known anecdote that under the influence of hallucinogens ordinary objects can seem new or novel, fascinating, and highly interesting.

Because the LC sends noradrenergic projections to the cortex, where α_1 -adrenergic and serotonin 5-HT_{2A} receptors have both a similar laminar distribution and similar actions on pyramidal cells, changes in LC firing would

also affect pyramidal cell excitability. Although the major site of action of hallucinogens may be 5-HT_{2A} receptors localized in prefrontal cortical areas, it would be very surprising if enhanced LC firing induced by hallucinogens did not also modulate the direct effects of 5-HT_{2A} agonists on cortical cells.

Another area where 5-HT_{2A} receptors are highly expressed is the ventral tegmental area (VTA), dopaminergic cell bodies that receive serotonergic afferents from the raphe nuclei (see Doherty & Pickel, 2000, and references therein). These dendrites commonly showed 5-HT_{2A} receptor immunoreactivity and tyrosine hydroxylase colocalization. Thus, 5-HT_{2A} receptor activation may directly affect local dendritic release of dopamine (DA) as well as release of DA in mesocortical and mesolimbic terminal fields. A substantial number of 5-HT_{2A} -labeled dendrites were also detected that did not contain tyrosine hydroxylase immunoreactivity, suggesting 5-HT_{2A} receptor modulation of other nondopaminergic, perhaps GABA-ergic, interneurons in the VTA.

A recent study by Nocjar, Roth, and Pehek (2002) suggested that activation of 5-HT_{2A} receptors by hallucinogens would be expected to modulate dopaminergic activity of VTA cells directly, or indirectly through nondopaminergic neurons, and affect DA release from projections in cortical and limbic structures. If, as recently suggested by Lisman and Grace (2005), there is a functional hippocampal-VTA loop designed to detect novelty that regulates entry of information into long-term memory, activation of the VTA would also affect memory and could contribute to the perception of novel states of consciousness induced by hallucinogens. This process also may be relevant to the fact that hallucinogen users typically have strong memories of their experiences.

To summarize, hallucinogens appear to exert their effects at the molecular level mainly by stimulating serotonin 5-HT_{2A} receptors. In the prefrontal cortex, these receptors are localized on the proximal portion of apical dendrites and dendritic spines on pyramidal cells. Activation of these receptors leads to membrane depolarization and increased sensitivity of cortical cells.

All serotonin in the brain is produced by the raphe nucleus, which sends serotonin projections to all forebrain structures, including the prefrontal cortex. Hallucinogens reduce firing of raphe cells either directly by stimulation of 5-HT_{1A} receptors or indirectly by 5-HT_{2A} receptor activation of inhibitory GABA interneurons. Cessation or reduction of raphe cell firing would lead to a disruption of normal serotonergic tone, which would include reduced activation of inhibitory cortical 5-HT_{1A} receptors, further enhancing cortical cell excitability.

Many thalamic nuclei as well as the reticular nucleus express 5-HT_{2A} receptors. Essentially all incoming sensory information is processed through the thalamus, with modulation by the reticular nucleus of the thalamus, which has afferents from specific thalamic nuclei and associated cortical areas. Alterations

in the firing mode of thalamic neurons are associated with dramatic changes in the neuron's responsiveness to peripheral stimuli (McCormick & Bal, 1997). The thalamus sends excitatory glutamate projections to the cortex. Hallucinogens not only perturb thalamic functioning, but also lead to increased release of glutamate from thalamic afferents to the cortex. Thus, hallucinogens reduce the signal-to-noise ratio in the information stream arriving at the cortex from thalamic terminals.

Both the LC and VTA express 5-HT_{2A} receptors and receive input from the raphe. The LC sends excitatory noradrenergic projections to both the thalamus and cortex. Hallucinogens potentiate burst firing in LC neurons in response to novel stimuli. Stimulation of α_1 -adrenergic receptors in the cortex enhances pyramidal cell sensitivity and appears to share a common molecular signaling pathway with 5-HT_{2A} receptors. VTA cells are depolarized by activation of 5-HT_{2A} receptors, which leads to enhanced DA release in the cortex.

One can now appreciate that the overall effect of hallucinogens on brain function is extremely complex, involving multiple interactive systems. We should also keep in mind that these discussions are at a very rudimentary level of understanding. But we can nevertheless conclude that hallucinogens produce marked alterations within all three of the ascending brain-stem monoamine activating systems, produce changes in cortical cell excitability and cortico-cortico interactions, perturb thalamic gating functions, and induce action potentials in cortical cells through increased glutamate release.

One could envision, therefore, that hallucinogens greatly enhance the sensitivity and excitability of cortical processing, while at the same time inducing glutamate release from thalamic afferents that normally signal incoming sensory information to be processed. That is, the signal-to-noise ratio in the cortex for incoming sensory inputs from the thalamus would be very low. Such reasoning is generally consistent with empirical observations that the low-dose effects of hallucinogens include greatly amplified or distorted incoming sensory stimuli.

In the context of a religious or transcendent experience, the most important idea to keep in mind is that the cortex is hyperexcitable, attempting to process and integrate information, while at the same time the normal sensory information that it should be processing has been reduced or, at high doses, possibly eliminated by changes in thalamic gating functions. We posit that the cortex will fill in or extrapolate missing information, creating sensory constructs where none exist. In contrast to a computer, where nothing will be processed without input, the brain remains conscious with full data integration capacity and processing functions. Indeed, these functions would seem to be more active and responsive than during ordinary consciousness. What quality of consciousness will be generated under these conditions?

We would propose that affective components derived from elements of the limbic system such as the hippocampus and amygdala will replace sensory information. Signals arising from introspective and interoceptive processes would normally be at a low level during waking consciousness, flooded by external sensory data, but with the effects of a hallucinogen will represent a significant portion of the incoming data available for processing. Memories, emotions, and ideas will rise to the level of conscious awareness. Indeed, the external world may be effectively shut out, creating a sensory vacuum. With the cortex in a hyperexcitable state but receiving data only from limbic structures, memory stores, and phylogenetically old brain structures in the core of the brain, what will fill this void?

We now arrive at the limits of our ability to speculate, and we reach a place of conflict between reductionist science and religion. Absolute reductionists may say that the perception of a god arises out of some primordial emotional need in our limbic system, a desire not to be alone in the universe. Or, reductionism may propose that the ego is so fixed on survival that when faced with annihilation of the ordinary world, manifested through the cessation of familiar sensory information, it creates another reality where it survives annihilation, seen constructed as an afterlife with physical attributes. If God does not exist, must humans invent one?

CONCLUSIONS

Science cannot say whether God exists any more than science can say what existed before the big bang. Science also cannot presently explain how a visionary experience occurs, either spontaneously or when induced by a psychedelic. What we can say, however, is that the two experiences appear to be very similar or identical. We can also be certain that psychedelics perturb the key brain structures that inform us about our world, tell us when to pay attention, and interpret what is real. Psychedelics activate ancient brain systems that project to all of the forebrain structures that are involved in memory and feeling; they sensitize systems that tell us when something is novel and when to remember it. We may not be able to explain how the neurochemical brain changes induced by psychedelics produce a visionary experience, but perhaps we should not be too surprised that they do.

The mind is truly one of the last great frontiers of science. It is unfortunate that hallucinogens cannot be more easily used in research to help elucidate the neurochemical basis of consciousness. Coupled with measures of subjective states, cognitive tests, and new brain scanning technologies, hallucinogens could be extremely powerful tools to help us understand who we are and how that identity is tied to the functions of our brains. Sadly, delving too deeply into these questions may provide knowledge that many people simply do not wish to know, and perhaps that is part of the fear of these substances.

When this chapter was being written, there was a case pending before the United States Supreme Court of a small syncretic Brazilian church with a branch in the United States that was fighting to be allowed to continue its use of a psychoactive substance known as hoasca. This church, the Centro Espirita Beneficente União do Vegetal, ingests a sacramental brew made of two Amazonian plants, one of which contains a hallucinogenic substance known as DMT. Followers fervently believe that hoasca is an essential link to the divine and that denying them the right to use it would certainly have destroyed their religion. Despite use of these substances for thousands of years and scientific studies demonstrating their relative safety when used properly, there was a chance that these believers would be denied the practice of their religion because of the misguided notion that hallucinogens are dangerous drugs under all circumstances and at all times. As this book is going to press, we now can say that the Court decided to allow this church to continue using its sacrament.

As a modern society we must be open to the possibilities presented by these substances, not only for research on consciousness, but also for their ability to reconnect us with primary spiritual experiences that are largely absent from modern religions. The recitation of ancient verses and the practice of formalized rituals will never have the power of a single visionary experience to inspire. This fact certainly represents a threat to most established religions, yet Walter Houston Clark, the noted religious scholar, believes that, "Millions of Americans, if they are ever to enjoy profound religious experience, will only do so through psychedelic drugs" (Clark, 1968, p. 91).

Decisions about the use of these substances should not be based on irrational fears and intimidation. Rather, the appreciation of their value must be based on honest information, free of distortions, and a willingness to accept the possibility that even though these substances have ancient origins, they still may have much to teach us about the mind and their ability to inspire religious faith. As a modern society, we have waited too long to explore these fascinating materials.

REFERENCES

- Aaronson, B.S., & Osmond, H. (1970). *Psychedelics: The uses and implications of hallucinogenic drugs*. Garden City, NY: Anchor Books.
- Aghajanian, G.K. (1980). Mescaline and LSD facilitate the activation of locus coeruleus neurons by peripheral stimuli. *Brain Research*, 186, 492–498.
- Aghajanian, G.K., Foote, W.E., & Sheard, M.H. (1968). Lysergic acid diethylamide: Sensitive neuronal units in the midbrain raphe. *Science*, 161, 706–708.
- Aghajanian, G.K., Foote, W.E., & Sheard, M.H. (1970). Action of psychotogenic drugs on single midbrain raphe neurons. *Journal of Pharmacology and Experimental Therapy*, 171, 178–187.

- Aghajanian, G. K., & Haigler, H. J. (1975). Hallucinogenic indoleamines: Preferential action upon presynaptic serotonin receptors. *Psychopharmacology Communication*, 1, 619–629.
- Aghajanian, G. K., Haigler, H. J., & Bloom, F. E. (1972). Lysergic acid diethylamide and serotonin: Direct actions on serotonin-containing neurons in rat brain. *Life Science International*, 11, 615–622.
- Aghajanian, G. K., & Marek, G. J. (1999). Serotonin and hallucinogens. *Neuropsychopharmacology*, 21, 16S–23S.
- Araneda, R., & Andrade, R. (1991). 5-Hydroxytryptamine₂ and 5-hydroxytryptamine_{1A} receptors mediate opposing responses on membrane excitability in rat association cortex. *Neuroscience*, 40, 399–412.
- Asanuma, C. (1992). Noradrenergic innervation of the thalamic reticular nucleus: A light and electron microscopic immunohistochemical study in rats. *Journal of Comparative Neurology*, 319, 299–311.
- Ashby, C. R., Jr., Edwards, E., & Wang, R. Y. (1994). Electrophysiological evidence for a functional interaction between 5-HT_{1A} and 5-HT_{2A} receptors in the rat medial prefrontal cortex: An iontophoretic study. *Synapse*, 17, 173–181.
- Aston-Jones, G., & Bloom, F. E. (1981). Norepinephrine-containing locus coeruleus neurons in behaving rats exhibit pronounced responses to non-noxious environmental stimuli. *Journal of Neuroscience*, 1, 887–900.
- Batson, C. D., & Ventis, W. L. (1982). *The religious experience: A social-psychological perspective*. New York: Oxford University Press.
- Behrendt, R. P. (2003). Hallucinations: Synchronisation of thalamocortical gamma oscillations underconstrained by sensory input. *Conscious Cognition*, 12, 413–451.
- Brancheck, T., Adham, N., Macchi, M., Kao, H. T., & Hartig, P. R. (1990). [³H]-DOB (4-bromo-2,5-dimethoxyphenylisopropylamine) and [³H] ketanserin label two affinity states of the cloned human 5-hydroxytryptamine₂ receptor. *Molecular Pharmacology*, 38, 604–609.
- Carter, O. L., Pettigrew, J. D., Hasler, F., Wallis, G. M., Liu, G. B., Hell, D., et al. (2005). Modulating the rate and rhythmicity of perceptual rivalry alternations with the mixed 5-HT_{2A} and 5-HT_{1A} agonist psilocybin. *Neuropsychopharmacology*, 30, 1154–1162.
- Cedarbaum, J. M., & Aghajanian, G. K. (1978). Activation of locus coeruleus neurons by peripheral stimuli: Modulation by a collateral inhibitory mechanism. *Life Science*, 23, 1383–1392.
- Chiang, C., & Aston-Jones, G. (1993). A 5-hydroxytryptamine₂ agonist augments gamma-aminobutyric acid and excitatory amino acid inputs to noradrenergic locus coeruleus neurons. *Neuroscience*, 54, 409–420.
- Clark, W. H. (1958). *The psychology of religion: An introduction to religious experience and behavior*. New York: Macmillan.
- Clark, W. H. (1968). Religious aspects of psychedelic drugs. *California Law Review*, 56, 86–115.
- Crick, F. (1984). Function of the thalamic reticular complex: The searchlight hypothesis. *Proceedings of the National Academy of Sciences*, 81, 4586–4590.
- Cyr, M., Landry, M., & Di Paolo, T. (2000). Modulation by estrogen-receptor directed drugs of 5-hydroxytryptamine_{2A} receptors in rat brain. *Neuropsychopharmacology*, 23, 69–78.

- de Montigny, C., & Aghajanian, G.K. (1977). Preferential action of 5-methoxytryptamine and 5-methoxydimethyltryptamine on presynaptic serotonin receptors: A comparative iontophoretic study with LSD and serotonin. *Neuropharmacology*, *16*, 811–818.
- Dittrich, A. (1998). The standardized psychometric assessment of altered states of consciousness (ASCs) in humans. *Pharmacopsychiatry*, *31*(Suppl. 2), 80–84.
- Doblin, R. (1991). Pahnke's "Good Friday experiment": A long-term follow-up and methodological critique. *Journal of Transpersonal Psychology*, *23*, 1–28.
- Doherty, M.D., & Pickel, V.M. (2000). Ultrastructural localization of the serotonin 2A receptor in dopaminergic neurons in the ventral tegmental area. *Brain Research*, *864*, 176–185.
- Ebersole, B.J., Visiers, I., Weinstein, H., & Sealton, S.C. (2003). Molecular basis of partial agonism: Orientation of indoleamine ligands in the binding pocket of the human serotonin 5-HT_{2A} receptor determines relative efficacy. *Molecular Pharmacology*, *63*, 36–43.
- Egan, C.T., Herrick-Davis, K., Miller, K., Glennon, R.A., & Teitler, M. (1998). Agonist activity of LSD and lisuride at cloned 5HT_{2A} and 5HT_{2C} receptors. *Psychopharmacology Berlin*, *136*, 409–414.
- Fox, R. (1967). Is LSD of value in treating alcoholics? In H. A. Abramson (Ed.), *The use of LSD in psychotherapy and alcoholism* (pp. 477–495). New York: Bobbs-Merrill.
- Freedman, D.X. (1968). On the use and abuse of LSD. *Archives of General Psychiatry*, *18*, 330–347.
- Furst, P.T. (1972). Peyote among the Huichol Indians of Mexico. In P.T. Furst (Ed.), *Flesh of the Gods: The ritual use of hallucinogens* (pp. 180–181). New York: Praeger.
- Glennon, R.A., Titeler, M., & McKenney, J.D. (1984). Evidence for 5-HT₂ involvement in the mechanism of action of hallucinogenic agents. *Life Science*, *35*, 2505–2511.
- Glennon, R.A., Titeler, M., & Young, R. (1986). Structure-activity relationships and mechanism of action of hallucinogenic agents based on drug discrimination and radioligand binding studies. *Psychopharmacology Bulletin*, *22*, 953–958.
- Glennon, R.A., Young, R., & Rosecrans, J.A. (1983). Antagonism of the effects of the hallucinogen DOM and the purported 5-HT agonist quipazine by 5-HT₂ antagonists. *European Journal of Pharmacology*, *91*, 189–196.
- Grinspoon, L., & Bakalar, J.B. (1979). *Psychedelic drugs reconsidered*. New York: Basic Books.
- Grof, S., Goodman, L.E., Richards, W.A., & Kurland, A.A. (1973). LSD-assisted psychotherapy in patients with terminal cancer. *International Pharmacopsychiatry*, *8*, 129–144.
- Grof, S., & Grof, C. (1980). *Beyond death: The gates of consciousness*. London: Thames and Hudson.
- Haigler, H.J., & Aghajanian, G.K. (1973). Mescaline and LSD: Direct and indirect effects on serotonin-containing neurons in brain. *European Journal of Pharmacology*, *21*, 53–60.
- Hofmann, A. (1978). History of the basic chemical investigations on the sacred mushrooms of Mexico. In J. Ott & J. Bigwood (Eds.), *Teonanacatl hallucinogenic mushrooms of North America* (pp. 47–64). Seattle: Madrona.

- Hunt, H. T., & Chefurka, C. M. (1976). A test of the psychedelic model of altered states of consciousness. The role of introspective sensitization in eliciting unusual subjective reports. *Archives of General Psychiatry*, *33*, 867–876.
- Jaffe, J. H. (1985). Drug addiction and drug abuse. In A. G. Gilman, L. S. Goodman, T. W. Rall, & F. Murad (Eds.), *Goodman and Gilman's the pharmacological basis of therapeutics* (7th ed., pp. 532–581). New York: Macmillan.
- Kast, E. (1966). LSD and the dying patient. *Chicago Medical School Quarterly*, *26*, 80–87.
- Krebs-Thomson, K., Paulus, M. P., & Geyer, M. A. (1998). Effects of hallucinogens on locomotor and investigatory activity and patterns: Influence of 5-HT_{2A} and 5-HT_{2C} receptors. *Neuropsychopharmacology*, *18*, 339–351.
- Kurrasch-Orbaugh, D. M., Watts, V. J., Barker, E. L., & Nichols, D. E. (2003). Serotonin 5-hydroxytryptamine 2A receptor-coupled phospholipase C and phospholipase A2 signaling pathways have different receptor reserves. *Journal of Pharmacology and Experimental Therapy*, *304*, 229–237.
- Lambe, E. K., & Aghajanian, G. K. (2001). The role of Kv1.2-containing potassium channels in serotonin-induced glutamate release from thalamocortical terminals in rat frontal cortex. *Journal of Neuroscience*, *21*, 9955–9963.
- Liljeblad, S. (1972). *The Idaho Indians in transition, 1805–1960*. Pocatello: Idaho State University.
- Lisman, J. E., & Grace, A. A. (2005). The hippocampal-VTA loop: Controlling the entry of information into long-term memory. *Neuron*, *46*, 703–713.
- Ludwig, A., Levine, J., Stark, L., & Lazar, R. (1969). A clinical study of LSD treatment in alcoholism. *American Journal of Psychiatry*, *126*, 59–69.
- Marek, G. J., & Aghajanian, G. K. (1994). Excitation of interneurons in piriform cortex by 5-hydroxytryptamine: Blockade by MDL 100,907, a highly selective 5-HT_{2A} receptor antagonist. *European Journal of Pharmacology*, *259*, 137–141.
- Marek, G. J., & Aghajanian, G. K. (1996). Alpha 1B-adrenoceptor-mediated excitation of piriform cortical interneurons. *European Journal of Pharmacology*, *305*, 95–100.
- Marek, G. J., & Aghajanian, G. K. (1998). Indoleamine and the phenethylamine hallucinogens: Mechanisms of psychotomimetic action. *Drug and Alcohol Dependence*, *51*, 189–198.
- Marek, G. J., & Aghajanian, G. K. (1999). 5-HT_{2A} receptor or α_1 -adrenoceptor activation induces excitatory postsynaptic currents in layer V pyramidal cells of the medial prefrontal cortex. *European Journal of Pharmacology*, *367*, 197–206.
- Massimini, M., Ferrarelli, F., Huber, R., Esser, S. K., Singh, H., & Tononi, G. (2005). Breakdown of cortical effective connectivity during sleep. *Science*, *309*, 2228–2232.
- McCormick, D. A., & Bal, T. (1997). Sleep and arousal: Thalamocortical mechanisms. *Annual Review of Neuroscience*, *20*, 185–215.
- McKenna, D. J., & Saavedra, J. M. (1987). Autoradiography of LSD and 2,5-dimethoxyphenylisopropylamine psychotomimetics demonstrates regional, specific cross-displacement in the rat brain. *European Journal of Pharmacology*, *142*, 313–315.

- Miner, L. A., Backstrom, J. R., Sanders-Bush, E., & Sesack, S. R. (2003). Ultrastructural localization of serotonin_{2A} receptors in the middle layers of the rat prelimbic prefrontal cortex. *Neuroscience*, *116*, 107–117.
- Moore, R. Y., Halaris, A. E., & Jones, B. E. (1978). Serotonin neurons of the midbrain raphe: Ascending projections. *Journal of Comparative Neurology*, *180*, 417–438.
- Nelson, D. L., Lucaites, V. L., Wainscott, D. B., & Glennon, R. A. (1999). Comparisons of hallucinogenic phenylisopropylamine binding affinities at cloned human 5-HT_{2A}, 5-HT_{2B} and 5-HT_{2C} receptors. *Naunyn Schmiedebergs Archives of Pharmacology*, *359*, 1–6.
- Nichols, D. E. (1997). Role of serotonergic neurons and 5-HT receptors in the action of hallucinogens. In H. G. Baumgarten & M. Gothert (Eds.), *Serotonergic neurons and 5-HT receptors in the CNS* (pp. 563–585). Berlin Heidelberg: Springer-Verlag.
- Nichols, D. E. (2004). Hallucinogens. *Pharmacology and Therapeutics*, *101*, 131–181.
- Nichols, D. E., & Glennon, R. A. (1984). Medicinal chemistry and structure-activity relationships of hallucinogens. In B. L. Jacobs (Ed.), *Hallucinogens: Neurochemical, behavioral, and clinical perspectives* (pp. 95–142). New York: Raven Press.
- Nocjar, C., Roth, B. L., & Pehek, E. A. (2002). Localization of 5-HT_{2A} receptors on dopamine cells in subnuclei of the midbrain A10 cell group. *Neuroscience*, *111*, 163–176.
- Noyes, R., Jr. (1980). Attitude change following near-death experiences. *Psychiatry*, *43*, 234–242.
- Otto, R. (1958). *The idea of the holy: An inquiry into the non-rational factor in the idea of the divine and its relation to the rational* (J. W. Harvey, Trans.). New York: Oxford University Press.
- Pahnke, W. N. (1963). *Drugs and mysticism. An analysis of the relationship between psychedelic drugs and the mystical consciousness*. Unpublished doctoral dissertation, Harvard University, Cambridge, MA.
- Pahnke, W. N., Kurland, A. A., Goodman, L. E., & Richards, W. A. (1969). LSD-assisted psychotherapy with terminal cancer patients. *Current Psychiatric Therapies*, *9*, 144–152.
- Pahnke, W. N., Kurland, A. A., Unger, S., Savage, C., & Grof, S. (1970). The experimental use of psychedelic (LSD) psychotherapy. *Journal of the American Medical Association*, *212*, 1856–1863.
- Pahnke, W. N., & Richards, W. A. (1969). Implications of LSD and experimental mysticism. In C. T. Tart (Ed.), *Altered states of consciousness* (pp. 399–428). New York: Wiley.
- Pazos, A., Cortes, R., & Palacios, J. M. (1985). Quantitative autoradiographic mapping of serotonin receptors in the rat brain. II. Serotonin-2 receptors. *Brain Research*, *346*, 231–249.
- Pazos, A., Probst, A., & Palacios, J. M. (1987). Serotonin receptors in the human brain—IV. Autoradiographic mapping of serotonin-2 receptors. *Neuroscience*, *21*, 123–139.

- Pierce, P. A., & Peroutka, S. J. (1989). Hallucinogenic drug interactions with neurotransmitter receptor binding sites in human cortex. *Psychopharmacology Berlin*, 97, 118–122.
- Plum, F. (1991). Coma and related global disturbances of the human conscious state. In A. Peters & E. G. Jones (Eds.), *Normal and altered states of function* (pp. 359–425). New York: Plenum Press.
- Poling, J. S., Karanian, J. W., Salem, N., Jr., & Vicini, S. (1995). Time- and voltage-dependent block of delayed rectifier potassium channels by docosahexaenoic acid. *Molecular Pharmacology*, 47, 381–390.
- Poling, J. S., Rogawski, M. A., Salem, N., Jr., & Vicini, S. (1996). Anandamide, an endogenous cannabinoid, inhibits shaker-related voltage-gated K⁺ channels. *Neuropharmacology*, 35, 983–991.
- Puig, M. V., Artigas, F., & Celada, P. (2005). Modulation of the activity of pyramidal neurons in rat prefrontal cortex by raphe stimulation in vivo: Involvement of serotonin and GABA. *Cerebral Cortex*, 15, 1–14.
- Rasmussen, K., & Aghajanian, G. K. (1986). Effect of hallucinogens on spontaneous and sensory-evoked locus coeruleus unit activity in the rat: Reversal by selective 5-HT₂ antagonists. *Brain Research*, 385, 395–400.
- Rasmussen, K., Glennon, R. A., & Aghajanian, G. K. (1986). Phenethylamine hallucinogens in the locus coeruleus: Potency of action correlates with rank order of 5-HT₂ binding affinity. *European Journal of Pharmacology*, 132, 79–82.
- Rogawski, M. A., & Aghajanian, G. K. (1979). Response of central monoaminergic neurons to lisuride: Comparison with LSD. *Life Science*, 24, 1289–1297.
- Sadzot, B., Baraban, J. M., Glennon, R. A., Lyon, R. A., Leonhardt, S., Jan, C. R., & Titeler, N. (1989). Hallucinogenic drug interactions at human brain 5-HT₂ receptors: Implications for treating LSD-induced hallucinogenesis. *Psychopharmacology Berlin*, 98, 495–499.
- Sanchez-Vives, M. V., & McCormick, D. A. (2000). Cellular and network mechanisms of rhythmic recurrent activity in neocortex. *Nature Neuroscience*, 3, 1027–1034.
- Sanders-Bush, E., Burris, K. D., & Knoth, K. (1988). Lysergic acid diethylamide and 2,5-dimethoxy-4-methylamphetamine are partial agonists at serotonin receptors linked to phosphoinositide hydrolysis. *Journal of Pharmacology and Experimental Therapy*, 246, 924–928.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *Journal of Neuropsychiatry and Clinical Neuroscience*, 9, 498–510.
- Schultes, R. E. (1941). *A contribution to our knowledge of Rivea corymbosa: The narcotic ololiuqui of the Aztecs*. Cambridge, MA: Harvard Botanical Museum.
- Schultes, R. E., & Hofmann, A. (1992). *Plants of the gods: Their sacred, healing, and hallucinogenic powers*. Rochester, VT: Healing Arts Press.
- Scruggs, J. L., Patel, S., Bubser, M., & Deutch, A. Y. (2000). DOI-induced activation of the cortex: Dependence on 5-HT_{2A} heteroreceptors on thalamocortical glutamatergic neurons. *Journal of Neuroscience*, 20, 8846–8852.
- Sherman, S. M., & Guillery, R. W. (1996). Functional organization of thalamocortical relays. *Journal of Neurophysiology*, 76, 1367–1395.
- Smith, H. (1964). Do drugs have religious import? *Journal of Philosophy*, 61, 517–530.

- Smith, R. L., Barrett, R. J., & Sanders-Bush, E. (1999). Mechanism of tolerance development to 2,5-dimethoxy-4-iodoamphetamine in rats: Down-regulation of the 5-HT_{2A}, but not 5-HT_{2C}, receptor. *Psychopharmacology Berlin*, 144, 248–254.
- Smith, R. L., Canton, H., Barrett, R. J., & Sanders-Bush, E. (1998). Agonist properties of N,N-dimethyltryptamine at serotonin 5-HT_{2A} and 5-HT_{2C} receptors. *Pharmacology Biochemistry and Behavior*, 61, 323–330.
- Smythies, J. (1997). The functional neuroanatomy of awareness: With a focus on the role of various anatomical systems in the control of intermodal attention. *Consciousness and Cognition*, 6, 455–481.
- Stewart, O. C. (1987). *Peyote religion: A history*. Norman: University of Oklahoma Press.
- Titeler, M., Lyon, R. A., & Glennon, R. A. (1988). Radioligand binding evidence implicates the brain 5-HT₂ receptor as a site of action for LSD and phenylisopropylamine hallucinogens. *Psychopharmacology Berlin*, 94, 213–216.
- Tononi, G. (2004). An information integration theory of consciousness. *BMC Neuroscience*, 5, 42.
- Torda, C. (1968). Contribution to serotonin theory of dreaming (LSD infusion). *New York State Journal of Medicine*, 68, 1135–1138.
- Vollenweider, F. X., & Geyer, M. A. (2001). A systems model of altered consciousness: Integrating natural and drug-induced psychoses. *Brain Research Bulletin*, 56, 495–507.
- Vollenweider, F. X., Leenders, K. L., Scharfetter, C., Maguire, P., Stadelmann, O., & Angst, J. (1997). Positron emission tomography and fluorodeoxyglucose studies of metabolic hyperfrontality and psychopathology in the psilocybin model of psychosis. *Neuropsychopharmacology*, 16, 357–372.
- Vollenweider, F. X., Vollenweider-Scherpenhuyzen, M. F., Babler, A., Vogel, H., & Hell, D. (1998). Psilocybin induces schizophrenia-like psychosis in humans via a serotonin-2 agonist action. *NeuroReport*, 9, 3897–3902.
- Wasson, R. G. (1957). Seeking the magic mushroom teonanacatl. *Life*, 42, 100–120.
- Wasson, R. G. (1968). *Soma: Divine mushroom of immortality*. New York: Harcourt Brace Jovanovich.
- Wasson, R. G. (1978). The hallucinogenic fungi of Mexico: An inquiry into the origins of the religious idea among primitive peoples. In J. Ott & J. Bigwood (Eds.), *Teonanacatl hallucinogenic mushrooms of North America* (pp. 65–84). Seattle: Madrona.
- Wasson, R. G., Hofmann, A., & Ruck, C. A. P. (1978). *The road to Eleusis: Unveiling the secret of the mysteries*. New York: Harcourt Brace Jovanovich.

CHAPTER 2

THE RELATIONSHIP BETWEEN RELIGION AND HEALTH

Andrew B. Newberg and Bruce Y. Lee

INTRODUCTION

The relationship between religion and health care has cycled between cooperation and antagonism throughout history. Some of the most advanced civilizations of ancient times (such as the Assyrians, Chinese, Egyptians, Mesopotamians, and Persians) attributed physical illnesses to evil spirits and demonic possessions, and treatment was aimed at banishing these spirits. Since then, physicians and other health care providers have been viewed by religious groups as everything from evil sorcerers to conduits of God's healing powers. Conversely, religion, from the perspective of physicians, scientists, and health care providers, has been viewed with interest, disinterest, and disdain.

In recent years, there has been a growing interest in understanding the effects of religion on health among the medical and scientific communities (Levin, 1996). Popular news magazines such as *Time* and *Newsweek* and television shows have devoted substantial coverage to the interplay of religion and health (Alternative Medicine, 2001; Begley, 2001a, 2001b; Woodward, 2001). Many spiritual activities aimed at improving or maintaining health such as yoga have become very popular (Corliss, 2001). Moreover, studies have clearly shown that many patients consider religion to be very important and would like their physicians to discuss religious issues with them. We will review what is currently known about clinical effects of religious and spiritual practices, and the challenges that researchers and health care practitioners may face in designing appropriate studies and translating results to

clinical practice. We also will discuss future directions in the roles of religion and spirituality in health care.

THE IMPORTANCE OF RELIGION AND SPIRITUALITY TO PATIENTS AND PHYSICIANS

Studies have confirmed that religion and spirituality play significant roles in many people's lives. Over 90 percent of Americans believe in God or a higher power, 90 percent pray, 67–75 percent pray on a daily basis, 69 percent are members of a church or synagogue, 40 percent attend a church or synagogue regularly, 60 percent consider religion to be very important in their lives, and 82 percent acknowledge a personal need for spiritual growth (Bezilla, 1993; Gallup Report, 1994; Miller & Thoresen, 2003; Poloma & Pendleton, 1991; Shuler, Gelberg, & Brown, 1994). Studies have also suggested that patients are interested in integrating religion with their health care. Over 75 percent of surveyed patients want physicians to include spiritual issues in their medical care, approximately 40 percent want physicians to discuss their religious faith with them, and nearly 50 percent would like physicians to pray with them (Daaleman & Nease, 1994; King & Bushwick, 1994; King, Hueston, & Rudy, 1994; Matthews & Clark, 1998). Many physicians agree that spiritual well-being is an important component of health and that it should be addressed with patients, but only a minority (less than 20%) do so with any regularity (MacLean et al., 2003; Monroe et al., 2003). When physicians have been surveyed, they frequently blamed lack of time, inadequate training, discomfort in addressing the topics, and difficulty in identifying patients who want to discuss spiritual issues for this discrepancy (Armbruster, Chibnall, & Legett, 2003; Chibnall & Brooks, 2001; Ellis, Vinson, & Ewigman, 1999).

Educators have responded by offering courses, conferences, and curricula in medical schools, postgraduate training, and continuing medical education (Pettus, 2002). However, some question the relevance and appropriateness of discussing religion and spirituality in the health care setting, fearing that it gives health care workers the opportunity to impose personal religious beliefs on others. In addition, there is concern that necessary medical interventions may be replaced by religious interventions. A number of scholars have cautioned that it could be harmful if patients come to believe that their illnesses are due to poor faith (Sloan, Bagiella, & Powell, 1999). Others have cautioned that religion should not be considered to be an intervention because it is to be pursued for spiritual, not health-related, purposes. Moreover, there is considerable debate over how religion should be integrated with health care and who should be responsible, especially when health care providers are agnostic or atheist (Levin, Larson, & Puchalski, 1997).

THE ROLE OF RELIGION IN HEALTH CARE

Despite this controversy, there are many signs that the role of religion in health care is increasing. For instance, the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, recognizes religion and spirituality as relevant sources of either emotional distress or support (Kutz, 2002; Lukoff, Lu, & Turner, 1992; Turner, Lukoff, Barnhouse, & Lu, 1995). Also, the guidelines of the Joint Commission on Accreditation of Healthcare Organizations require hospitals to meet the spiritual needs of patients (La Pierre, 2003; Spiritual Assessment, 2003). The literature has reflected this trend as well. The frequency of studies on religion and spirituality and health has increased over the past decade (Levin et al., 1997). Stefanek and colleagues reported a 600 percent increase in spirituality and health publications and a 27 percent increase in religion and health publications from 1993 to 2002 (Stefanek, McDonald, & Hess, 2004).

Some have recommended that physicians and other health care providers routinely take religious and spiritual histories of their patients to better understand their patients' religious background, determine how they may be using religion to cope with illness, open the door for future discussions about spiritual or religious issues, and help detect potentially deleterious side effects from religious and spiritual activities (Kuhn, 1988; Lo, Quill, & Tulsky, 1999; Lo et al., 2002; Matthews & Clark, 1998). It may also be a way of detecting spiritual distress (Abraham, 2001). It is also important to understand whether there are religious beliefs that may affect how a person makes decisions about his or her health care. There also has been greater emphasis on integrating various religious resources and professionals into patient care, especially when the patient is near the end of life (Lo et al., 2002). Some effort has been made to train health care providers to listen appropriately to patients' religious concerns, perform clergy-like duties when religious professionals are not available, and better understand spiritual practices (Morse & Proctor, 1998; Proctor, Morse, & Khonsari, 1996).

METHODOLOGICAL ISSUES WITH CLINICAL STUDIES

The study of religion and health has faced the same challenges that most nascent research areas have had to confront: lacks of adequate funding, institutional support, and training for investigators. This is part of the reason why a large percentage of the literature consists of anecdotes and editorials, which are helpful in generating discussions, formulating ideas, and fueling future studies but do not establish causality or scientific support of specific interventions. Of the scientific studies that have been performed, many have been correlational and have demonstrated interesting associations, but they have not always adjusted for all possible confounding variables such as socioeconomic

status, ethnicity, and different life-styles or diets and as a result have not clearly established causality. In some cases, religious variables were included in a larger study that did not focus on the effects of religion. Because these studies were not necessarily designed and powered to primarily study the religious variables, results must be considered cautiously. There have been a limited number of randomized controlled trials (RCTs). For example, in a systematic review of studies from 1966 to 1999, Townsend and colleagues counted nine RCTs. But as the study of religion and health progresses, the number and sophistication of scientific studies should continue to grow.

There also are challenges inherent in the clinical study of religion. Understanding these challenges is crucial in designing appropriate studies and interpreting the results. Otherwise, inappropriate conclusions may be drawn, unnecessary and even dangerous interventions may be initiated, and further necessary research may be curtailed. Moreover, these challenges will help guide investigators in choosing areas needing further study. Several of these challenges are described below.

Defining Religion and Spirituality

Investigators have struggled to agree on formal definitions of religion and spirituality, two distinct and yet overlapping terms that have often been mistakenly used synonymously (Powell, Shahabi, & Thoresen, 2003; Tanyi, 2002). Even if universal definitions were established, which specific practices would be classified as either or neither? For example, where does one draw the line between religions and cults? In fact, the Merriam Webster dictionary defines a cult as “a religion regarded as unorthodox or spurious.” What, then, is the criterion for being unorthodox and spurious? In fact, as history has often demonstrated, what formerly was considered a cult and spurious can eventually become a major religion, and vice versa.

Designing Studies with Sufficient Numbers of Subjects and Adequate Controls

It is difficult to control for the many possible confounders, as well as recruit and randomize subjects, because they may not be willing or able to alter their religious beliefs and practices for the study. In other words, one cannot simply take 100 religious individuals and assign half to maintain their religious practices and half to not maintain their religious practices. No one would be willing to participate. Since prayer and other religious activities can be private, silent, or disguised as social interactions, investigators may have trouble monitoring and ensuring that subjects comply with study requirements. Inadvertent noncompliance can easily occur, as patients may be influenced by visitors or their environment.

Measuring Religiousness and Spirituality

Religiousness can be measured in many different dimensions, and patients who score high in one dimension may not necessarily score high in others. For example, just because an individual feels that he or she is very religious (high *subjective religiosity*) does not mean he or she would score high on more objective measures (low *religious commitment/motivation*). An individual may not participate significantly in formal church, synagogue, or temple activities (low *organizational religiosity*) but may regularly perform private religious activities such as praying, reading religious scriptures, and watching religious television (high *nonorganizational religiosity*). A number of other potential measures exist, including how closely an individual's beliefs conform to the established doctrines of a religious body (*religious belief*), how knowledgeable or informed an individual is about his or her religion's doctrines (*religious knowledge*), and how well his or her actions, such as working for the church and acts of altruism, support his or her religion (*religious consequences*). Studies should always clearly state the exact measures used and avoid making claims about measures not used.

Determining Reliability and Validity of Measures

Some measures of religiousness may be determined by direct observation. For example, organizational religiosity can be established by noting over a period of time the frequency of church attendance, reading religious scriptures, and prayer. Measuring such activities can be challenging because quantity and quality might be difficult to differentiate. Subtle religious displays may be missed. Moreover, it is unclear how each activity should be counted. Is reading scriptures every day for one hour equivalent to reading scriptures five days a week for four hours? To establish a true cause-and-effect relationship, it would be helpful to determine whether increased religiosity corresponds to better health. Many studies simply divide patients into dichotomous groups (e.g., church membership or nonmembership), which does not account for significant variation within each of the two groups. Should certain religious activities be considered more important than others? Someone who does not belong to a church but regularly prays and follows religious doctrine may, in fact, have greater religious commitment than a person who belongs to a church but does not believe in or care to comprehend religious doctrine.

When direct observation is not possible, investigators must rely on self-report questionnaires or interviews. Therefore, the quality of the data depends on the quality of the instrument, and, unfortunately, many studies do not indicate whether and how their questionnaires or interviews were validated. Even well-validated instruments may be susceptible to a number of potential biases. For instance, patients may forget or be unwilling to admit lapses in religiousness.

Many existing measures are based on Western perspectives of religion and may not be applicable to traditions such as Buddhism or Hinduism.

Accounting for the Positive Externalities of Religion

Religion can provide many “positive externalities” that are potentially beneficial to health. Church groups can provide a social support network, and church activities may offer exercise and reprieves from unhealthy environments. People can meet future spouses, physicians, and other health care workers through church. Religious activities can offer retreats that take individuals away from daily stressors and provide time for reflection. Many religious doctrines suggest that participants observe specific dietary habits and avoid promiscuity, alcohol, and other high risk behaviors. Thus, when a study shows a positive effect of religion, it is not always clear what is responsible for the effect.

Determining the Direction of Causality

Is a patient’s religious activity causing the observed effects on his or her health, or is the patient’s health status affecting his or her religious activity? If an association is seen in a study, it may not be clear which side is the cause. In some cases, poor health can prevent or discourage patients from participating in religious and spiritual activities. In other cases, serious health problems may motivate patients to attend religious activities. Perhaps more importantly, health outcomes should never be tied to religion or spirituality. A person should not feel that health is related only to his or her religious behaviors, and religions should not be evaluated based on their potential for health benefits.

Accounting for Variations in Practices and Doctrines among and within Different Religions

Practices and doctrines vary significantly both within and across traditions. For example, prayers may be silent or vocal. Behaviors connoting minimum levels of religious commitment differ from one religion to another. For example, what may be proper dress in one denomination may be evidence of inadequate religious commitment in more orthodox denominations. A person’s sense of well-being may depend on the degree of hierarchy in a religion and his or her place in that hierarchy. Moreover, a person’s socioeconomic status, gender, and ethnicity can affect his or her acceptance by a given religious group.

Evaluating Effects of the Local Environment

Different religions hold different social statuses in different countries during different times. Practically all religions have been persecuted and deprived

of resources at some time and place during history. Members of the dominant religion in a society may be more accepted, enjoy a stronger and more extensive social network, and have greater access to resources. All of these can have subtle psychological and physical consequences. In some severe cases, physical punishment may be inflicted on minority religious sects. Moreover, minority or fringe religious sects who are unable to convince mainstream individuals to join their cause may have to recruit among societal outcasts, many of whom could have psychological or physical illness. Therefore, any study of a specific religious sect should account for the location of the study group and the sect's relationship with the ambient society.

Determining the Proper Time Frame for the Study

How long should individuals or populations be observed before effects are expected to occur? Some spiritual activities such as prayer, yoga, and meditation have been found to have immediate effects on physical parameters such as heart rate and blood pressure. But these practices can also have long-term consequences that lead a person's spiritual journey. Furthermore, some religious experiences last for several moments and affect a person over a lifetime, and some experiences require a lifetime to occur. Therefore, studies that observe subjects over only a short period of time may miss findings. However, the longer the follow-up, the more costly and difficult the study is to perform, and the greater the chance that more confounders will enter the picture.

Bridging the Divide between Health Researchers and Religion Researchers

While interdisciplinary fields have the benefits of bringing together people with diverse interests, experiences, perspectives, and abilities, they also must confront communication hurdles. Health researchers and religion researchers often are not familiar with important publications in each others' specialty journals. Separate meetings, separate departments, different methodologies, and different lexicons have hindered collaboration. However, the emergence of interdisciplinary journals and conferences has begun to alleviate this problem.

THE POSITIVE EFFECTS OF RELIGION ON HEALTH

Disease Incidence and Prevalence

Various systematic reviews and meta-analyses demonstrate that religious involvement correlates with decreased morbidity and mortality (Ball, Armstead, & Austin, 2003; Braam, Beekman, Deeg, Smit, & Van Tilburg, 1999;

Brown, 2000; Kark, Carmel, Sinnreich, Goldberger, & Friedlander, 1996; Kune, Kune, & Watson, 1993; McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000; McCullough & Larson, 1999; Oman, Kurata, Strawbridge, & Cohen, 2002), and high levels of religious involvement may be associated with up to seven years of longer life expectancy (Helm, Hays, Flint, Koenig, & Blazer, 2000; Hummer, Rogers, Nam, & Ellison, 1999; Koenig et al., 1999; Oman & Reed, 1998; Strawbridge, Cohen, Shema, & Kaplan, 1997). A study by Kark and colleagues over a 16-year period found that belonging to a religious collective in Israel was associated with lower mortality (Kark et al., 1996). In Comstock and Partridge's analysis of 91,000 people in a Maryland county, those who regularly attended church had a lower prevalence of cirrhosis, emphysema, suicide, and death from ischemic heart disease (Comstock & Partridge, 1972). Several studies have implied that religious participation and higher religiosity may have a beneficial effect on blood pressure (Armstrong, Van Merwyk, & Coates, 1977; Hixson, Gruchow, & Morgan, 1998; Koenig et al., 1998b; Walsh, 1998).

Some research findings have suggested that mortality and morbidity vary by religion, even when adjusting for major biological, behavioral, and socioeconomic differences (Rasanen, Kauhansen, Lakka, Kaplan, & Salonen, 1996; Van Poppel, Schellekens, & Liefbroer, 2002). However, as mentioned previously, the experience of individuals within a given religion can depend significantly on the local environment, so the results of such comparisons should be viewed guardedly. For instance, a study of contemplative monks in the Netherlands showed that their mortality compared with the general population varied with time during the 1900s (de Gouw, Westendorp, Kunst, Mackenbachh, & Vandenbroucke, 1995). Greater morbidity and mortality have been reported among Irish Catholics in Britain, which may be related to their disadvantaged socioeconomic status in that country (Abbotts, Williams, & Ford, 2001; Abbotts, Williams, Ford, Hunt, & West, 1997). A study in Holland suggested that smaller religious groups may be less susceptible to infectious disease because of social isolation (Van Poppel et al., 2002). In general, not enough studies have examined how mortality and morbidity for different religions vary over time and place. Moreover, many religions and religious sects have received little attention from investigators. Consequently, the body of literature comparing morbidity and mortality rates among religions is not large enough to draw any definitive conclusions. However, the results to date suggest that, under the right circumstances, religion can have a beneficial impact on health.

Disease and Surgical Outcomes

Studies also have reported that religiousness correlates with better outcomes after major illnesses and certain medical procedures. In Oxman and colleagues' analysis of 232 patients following elective open heart surgery,

lack of participation in social or community groups and absence of strength and comfort from religion were consistent predictors of mortality (Oxman, Freeman, & Manheimer, 1995). Another study evaluated 30 elderly women after hip repair and found that religious belief was associated with lower levels of depressive symptoms and better ambulation status after surgery (Pressman, Lyons, Larson, & Strain, 1990). Contrada and colleagues found that in patients who underwent heart surgery, stronger religious beliefs were associated with shorter hospital stays and fewer complications, but attendance at religious services predicted longer hospitalizations (Contrada et al., 2004). On the other hand, Hodges and colleagues did not find spiritual beliefs to significantly affect recovery from spinal surgery (Hodges, Humphreys, & Eck, 2002).

Research has studied whether religiosity improves the survival of patients with different illnesses as well. In a study of African American women with breast cancer, patients who did not belong to a religion tended to have shorter survival rates (Van Ness, Kasl, & Jones, 2003). In a study by Zollinger and colleagues, Seventh Day Adventists had better breast cancer survival than non-Seventh Day Adventists, but this was likely due to earlier diagnosis and treatment (Zollinger, Phillips, & Kuzma, 1984). Several other studies of various cancers including colorectal, lung, and breast cancer showed no statistically significant effect of religious involvement on cancer survival (Kune, Kune, & Watson, 1992; Loprinzi et al., 1994; Ringdal, Gotestam, Kaasa, Kvinnsland, & Ringdal, 1996; Yates, Chalmer, St. James, Follansbee, & McKegney, 1981).

Behavior and Life-styles

Life-style differences may account for some of the observed effects in research on religion and health. Studies in Israel showed that secular residents had diets higher in total fat and saturated fatty acids (Friedlander, Kark, Kaufmann, & Stein, 1985) and higher plasma levels of cholesterol, triglyceride, and low-density lipoprotein (Friedlander, Kark, & Stein, 1987) than religious subjects. Oleckno and Blacconiere's study on college students revealed an inverse correlation between religiosity and behaviors that adversely affect health (Oleckno & Blacconiere, 1991). Religious involvement has been shown to be associated with greater use of seat belts (Oleckno & Blacconiere, 1991) and preventative services (Comstock & Partridge, 1972). Compared to the general population, Mormons and Seventh Day Adventists have been found to have a lower incidence of and mortality rates for cancers linked to tobacco and alcohol (Fraser, 1999; Grundmann, 1992).

Religion can affect alcohol and substance use at several stages. It may affect whether a person initiates use, how significant the use becomes, how the use affects the person's life, and whether the person is able to quit and

recover (Miller, 1998). The attitudes of religions toward alcohol and substance use vary considerably. Some religious sects strictly prohibit alcohol and substance use, some allow the use of alcohol and incorporate drinking wine into their rituals, and others use psychoactive substances such as peyote, khat, and hashish to achieve spiritual goals (Lyttle, 1988). Most investigators study Judeo-Christian religious sects, which may allow the use of alcohol but tend to denounce alcohol abuse and illicit substance use. Therefore, conclusions from these studies may not apply to all religions.

Individuals involved in religion may be less likely to use alcohol and other substances (Heath et al., 1999; Luczak, Shea, Carr, Li, & Wall, 2002; Stewart, 2001). Even among those who use alcohol and drugs, religiously involved individuals are more likely to use them moderately and not heavily (Gorsuch & Butler, 1976; Miller, 1998). In a nationally representative sample of adolescents, Miller and colleagues determined that personal devotion (which they defined as a personal relationship with the divine) and affiliation with more fundamentalist denominations were inversely associated with alcohol and illicit drug use (Miller, Davies, & Greenwald, 2000). This effect was seen outside the United States as well, in Latin American regions (Chen, Dormitzer, Bejarano, & Anthony, 2004). A number of possible reasons exist for these findings. Religions can play a role in educating people about the dangers of alcohol and drugs and recommending against their use (Stylianou, 2004). Fear of violating religious principles and doctrines can have a powerful effect. Religious involvement and the accompanying positive externalities may keep people occupied and prevent idleness and boredom that can lead to substance abuse. There may be peer pressure from other members of the church to remain abstinent, and an absence of peer pressure to try alcohol and other substances. Moreover, religious involvement could be the effect rather than the cause. It may be that individuals less likely to engage in substance abuse are inherently more likely to be religious. Also, substance abuse may prevent religious involvement. Larson and Wilson noted that alcoholics compared to nonalcoholic subjects had less involvement in religious practices, less exposure to religious teachings, and fewer religious experiences (Larson & Wilson, 1980).

Many clinicians and researchers, as well as patients, feel that spirituality should play a large role in cessation programs (Arnold, Avants, Margolin, & Marcotte, 2002; Dermatis, Guschwan, Galanter, & Bunt, 2004). Indeed, spiritual ideas already permeate many established programs such as Alcoholics Anonymous (Brush & McGee, 2000; Forcehimes, 2004; Li, Feifer, & Strohm, 2000; Moriarity, 2001). Studies have suggested that religious and spiritual practices may aid recovery (Aron & Aron, 1980; Avants, Warburton, & Margolin, 2001; Carter, 1998). A significant number of recovering intravenous drug abusers turn toward religious healing, relaxation techniques, and meditation (Manheimer, Anderson, & Stein, 2003). Data suggest that patients

often experience spiritual awakenings or religious conversion during recovery (Green, Fullilove, & Fullilove, 1998). However, not all studies have shown that religiously involved patients have better outcomes. The first RCTs failed to demonstrate sufficient clinical benefit from meditation (Murphy, Pagano, & Marlatt, 1986) or intercessory prayer (Walker, Tonigan, Miller, Corner, & Kahlich, 1997). In a study by Tonigan and colleagues, while subjects self-labeled as religious were more likely than agnostics and atheists to initiate and continue attending Alcoholics Anonymous meetings, their outcomes were not clearly better (Tonigan, Miller, & Schermer, 2002).

Religion may play a role in preventing risky sexual behavior that could potentially lead to sexually transmitted diseases and human immunodeficiency virus (HIV). In a study of African American adolescent females, religiosity correlated with more frank discussions about the risks of sex and avoidance of unsafe sexual situations (McCree, Wingood, DiClemente, Davies, & Harrington, 2003). Miller and Gur's study of over 3,000 adolescent girls found positive associations between personal devotion and fewer sexual partners outside a romantic relationship, religious event attendance and proper birth control use, and religious attendance and a better understanding of HIV or pregnancy risks from unprotected intercourse (Miller & Gur, 2002). But these findings are not universal. Some have found no relationship between religiosity and sexual practices (Dunne, Edwards, Lucke, Donald, & Raphael, 1994; McCormick, Izzo, & Folcik, 1985). In fact, religious traditions or environments may suppress open discussion of sex and contraception. Lefkowitz and colleagues found that adolescents who discussed safe sex with their mothers tended to be less religious (Lefkowitz, Boone, Au, & Sigman, 2003).

Some studies have looked at how religion and spirituality can promote exercise. Among Utah residents, people who attended church weekly were more likely to regularly exercise. However, differences in smoking and general health status seemed to account for this effect (Merrill & Thygeson, 2001). A study by McLane and colleagues suggested that incorporating faith-based practices in exercise programs may be attractive to certain people and improve participation in physical activity (McLane, Lox, Butki, & Stern, 2003).

Access to Health Care Resources

Along with encouraging healthy life-styles, religious groups may promote or provide access to better health care and sponsor health improvement programs (e.g., blood pressure screening, blood drives, soup kitchens, and food drives) (Heath et al., 1999; Koenig et al., 1998a; Stewart, 2001; Zaleski & Schiaffino, 2000). Groups such as the Catholic Church have substantial resources and positions that allow them to positively influence people in

ways that many secular organizations cannot. Additionally, many hospitals and health care clinics are supported by, affiliated with, or owned by religious groups.

General Well-Being

A large number of studies have explored the relationship between religion and mental health. Studies have demonstrated religiosity to be positively associated with feelings of well-being in white American, Mexican American (Markides, Levin, & Ray, 1987), and African American populations (Coke, 1992). Krause (2003) observed that older African Americans were more likely than similarly aged white Americans to derive life satisfaction from religion. Religious service attendance was predictive of higher life satisfaction among elderly Chinese Hong Kong residents (Ho et al., 1995) and elderly Mexican American women (Levin & Markides, 1988). Members of religious kibbutzes in Israel reported a higher sense of coherence and less hostility and were more likely to engage in volunteer work than nonmembers (Kark et al., 1996). Similar findings were reported in a population of nursing home residents (House, Robbins, & Metzner, 1982). Hope and optimism were higher among religious individuals than nonreligious individuals in some study populations (Idler & Kasl, 1997a, 1997b; Raleigh, 1992). Using religious attendance as one of the markers of social engagement, Bassuk and colleagues determined that social disengagement was linked with cognitive decline in the noninstitutionalized elderly (Bassuk, Glass, & Berkman, 1999).

A few studies have compared different religions. For example, one study showed that among elderly women in Hong Kong, Catholics and Buddhists enjoyed better mental health status than Protestants (Boey, 2003). However, not enough data exist to generate any definitive conclusions.

Depression

Several investigators have studied the effects of religion on depression. Prospective cohort studies have shown religious activity to be associated with remission of depression in Protestants and Catholics in the Netherlands (Braam et al., 1999) and in ill older adults (Koenig, George, & Peterson, 1998). Prospective studies have also found religious activity to be strongly protective against depression in Protestant and Catholic offspring who share the same religion as their mother (Miller, Warner, Wickramaratne, & Weissman, 1997) and weakly protective against depression in female twins (Kennedy, Kelman, Thomas, & Chen, 1996). Cross-sectional studies have yielded significant (Koenig et al., 1997) and nonsignificant (Bienenfeld, Koenig, Larson, & Sherrill, 1997; Koenig, 1998; Musick, Koenig, Hays, & Cohen, 1998)

associations between different indicators of religiosity and a lower prevalence of depression in various populations.

Studies also have suggested an inverse correlation between religiosity and suicide. This was found to be the case in an analysis of the 1993 National Mortality Followback Survey data (Nisbet, Duberstein, Conwell, & Seidlitz, 2000) and also in an analysis of cross-sectional data of Judeo-Christian older adults from 26 countries (Neeleman & Lewis, 1999). Suicide may be less acceptable to people with high religious devotion and orthodox religious beliefs (Neeleman, Halpern, Leon, & Lewis, 1997; Neeleman, Wessely, & Lewis, 1998). But again, it is unclear whether suicidal individuals are less likely to hold strong religious beliefs, or individuals with strong religious beliefs are less likely to be suicidal.

Several RCTs have evaluated specific spiritual interventions and their impact on depression. One RCT demonstrated that directed and nondirected intercessory prayer correlated favorably with multiple measures of self-esteem, anxiety, and depression, but this study did not clearly state the randomization technique and did not account for multiple confounders (O'Laoire, 1997). Another RCT suggested that using religion-based cognitive therapy had a favorable impact on Christian patients with clinical depression, but the study may have contained too many comparison groups for strong cause-and-effect relationships to be established (Propst, Ostrom, Watkins, Dean, & Mashburn, 1992). Three RCTs suggest that religious (Islamic-based) psychotherapy speeds recovery from anxiety and depression in Muslim Malays, but the studies did not control for the use of antidepressants and benzodiazepines (Azhar & Varma, 1995; Azhar, Varma, & Dharap, 1994; Razali, Hasanah, Aminah, & Subramaniam, 1998). Thus, additional studies will be required to better elucidate the effects of spiritual practices on depression.

Coping with Medical Problems

Religious belief may provide meaning to and, in turn, help patients better cope with their diseases (Autiero, 1987; Foley, 1988; Patel, Shah, Peterson, & Kimmel, 2002). Although many major religions have deemed illness and suffering the result of sin, many believe that pain and suffering can be strengthening, enlightening, and purifying. According to various religious teachings, pain and suffering are inevitable and can be cleansing, test virtue, educate, readjust priorities, stimulate personal growth, and define human life (Amundsen, 1982).

Religions differ in how they confront suffering. Although generalizations are difficult to draw because considerable variability exists within and across religious traditions, many Buddhists believe in enduring pain matter-of-factly (Tu, 1980), many Hindus stress understanding and detachment from pain

(Shaffer, 1978), many Muslims and Jews favor resisting or fighting pain (Bowker, 1978), and many Christians stress seeking atonement and redemption (Amundsen, 1982).

Evidence suggests that religion provides more than just a distraction from suffering. The *diverting attention* and *praying* factors on the Coping Strategies Questionnaire have correlated with pain levels (Geisser, Robinson, & Henson, 1994; Swartzman, Gwadry, Shapiro, & Teasell, 1994; Swimmer, Robinson, & Geisser, 1992). The social network and support provided by religions may be associated with lower pain levels, and religious belief may improve self-esteem and sense of purpose (Hays et al., 1998; Musick et al., 1998; Swimmer et al., 1992). After following 720 adults, Williams and colleagues concluded that religious attendance buffered the effects of stress on mental health (Williams, Larson, Buckler, Heckmann, & Pyle, 1991). In another study of 107 women with advanced breast cancer, spirituality appeared to improve emotional well-being (Coward, 1991). Thus, religion and spirituality can provide important avenues toward coping.

THE NEGATIVE EFFECTS OF RELIGION ON HEALTH

Although most studies have shown positive effects, religion and spirituality also may negatively impact health. For example, religious groups may directly oppose certain health care interventions, such as transfusions or contraception, and convince patients that their ailments are due to noncompliance with religious doctrines rather than organic disease (Donahue, 1985). Asser and colleagues demonstrated that a large number of child fatalities could have been prevented had medical care not been withheld for religious reasons (Asser & Swan, 1998). After interviewing 682 North Carolina women, Mitchell and colleagues concluded that belief in religious interventions may delay African American women from seeing their physicians for breast lumps (Mitchell, Lannin, Mathews, & Swanson, 2002). In addition, religions can stigmatize those with certain diseases to the point that they do not seek proper medical care (Lichtenstein, 2003; Madru, 2003).

As history has shown, religion can be the source of military conflicts, prejudice, violent behaviors, and other social problems. Religions may ignore or ostracize those who do not belong to their church. Those not belonging to a dominant religion may face obstacles to obtaining resources and may experience hardships and stress that deleteriously affect their health (Bywaters, Ali, Fazil, Wallace, & Singh, 2003; Walls & Williams, 2004). Religious leaders may abuse church members physically, emotionally, or sexually (Rossetti, 1995; Tieman, 2002). And religious laws or dictums may be invoked to justify harmful, oppressive, and injurious behavior (Kernberg, 2003).

Additionally, perceived religious transgressions can cause emotional and psychological anguish, manifesting as physical discomfort. This religious or spiritual pain can be difficult to distinguish from physical pain (Satterly, 2001). In extreme cases, spiritual abuse (convincing people that they are going to suffer eternal purgatory) and spiritual terrorism (an extreme form of spiritual abuse) can occur either overtly or insidiously—that is, it can be implied, though not actually stated, that a patient will be doomed (Purcell, 1998a, 1998b). When a mix of religious, spiritual, and organic sources is causing physical illness, treatment can become complicated. Health care workers must properly balance treating each source.

THE EFFECTS OF SPECIFIC RELIGIOUS AND SPIRITUAL PRACTICES

Religious and spiritual practices have become highly prevalent and may be practiced in either religious or secular settings. Although many of these activities have been correctly or incorrectly linked to specific religions, practicing them does not necessarily connote certain beliefs. In fact, hundreds of variations of each spiritual activity exist, because many have been altered and combined with other nonreligious activities such as aerobics to develop hybrid techniques. As a result, some forms barely resemble the original versions. Thus, investigators must be very specific in describing the technique or activity that they are examining. Results from one form of meditation or yoga may not apply to other forms. A review of the literature shows that many studies do not clearly describe the form of spiritual activity under investigation.

Prayer

In Eisenberg and colleagues' survey of alternative medicine usage among Americans, one-fourth of respondents used prayer to cope with physical illness (Eisenberg et al., 1998). Evidence has been found that prayer may be associated with less muscle tension, improved cardiovascular and neuroimmunologic parameters, psychologic and spiritual peace, a greater sense of purpose, enhanced coping skills, less disability, and better physical function in patients with knee pain (Rapp, Rejeski, & Miller, 2000) and a lower incidence of coronary heart disease (Gupta, 1996; Gupta, Prakash, Gupta, & Gupta, 1997).

Poloma and Pendleton (1991) found that petitionary and ritualistic prayers were associated with lower levels of well-being and life satisfaction, while colloquial prayers were associated with higher levels. Leibovici (2001) reported on a double-blind RCT that showed remote, retroactive intercessory prayer was associated with shorter length of fever and hospital stay in patients with

bloodstream infection. A very small, double-blind study showed that intercessory prayer used as adjunct therapy decreased mortality among children with leukemia (Collipp, 1969). In Byrd and colleagues' well-known double-blind study of patients admitted to a coronary care unit, intercessory prayer was linked to significantly more "good" outcomes (163 versus 147) than "bad" outcomes (27 versus 44) (Byrd, 1988). Harris and colleagues (1999) found similar outcomes with remote intercessory prayer. However, subsequent studies were not able to replicate these findings (Aviles et al., 2001; Matthews, Conti, & Sireci, 2001; Matthews, Marlowe, & MacNutt, 2000; Townsend, Kladder, Ayele, & Mulligan, 2002). Another issue arises in the interpretation of such studies. If prayer does work, does it prove that God exists; and if prayer does not work, does it prove that God does not exist? Perhaps these studies are evaluating something other than religion, such as the effects of human consciousness. Regardless, the effect of such distant prayer or distant intentionality is controversial.

Meditation

Meditation and meditation-related practices are widely used as alternative therapy for physical ailments (Eisenberg et al., 1998). Many physicians routinely recommend meditation techniques to their patients and include them as part of integrated health programs such as Dean Ornish's popular heart disease programs and a Stanford arthritis self-care course. Meditative and relaxation techniques are often part of childbirth preparation classes.

Although evidence is not yet definitive, preliminary studies suggest that meditation may have a number of health benefits, such as helping people achieve a state of restful alertness with improved reaction time, creativity, and comprehension (Domino, 1977; Solberg, Berglund, Engen, Ekeberg, & Loeb, 1996) and decreasing anxiety, depression, irritability, and moodiness and improving learning ability, memory, self-actualization, feelings of vitality and rejuvenation, and emotional stability (Astin, 1997; Astin et al., 2003; Bitner, Hillman, Victor, & Walsh, 2003; Solberg et al., 1996; Walton, Pugh, Gelderloos, & Macrae, 1995). Preliminary studies suggest that meditative practices may benefit and provide acute and chronic support for patients with a variety of health problems such as hypertension, psoriasis, irritable bowel disease, anxiety, and depression (Barrows & Jacobs, 2002; Carlson, Ursuliak, Goodey, Angen, & Specca, 2001; Castillo-Richmond et al., 2000; Kabat-Zinn et al., 1992; Kabat-Zinn et al., 1998; Kaplan, Goldenberg, & Galvin-Nadeau, 1993; Keefer & Blanchard, 2002; King, Carr, & D'Cruz, 2002; Manocha, Marks, Kenchington, Peters, & Salome, 2002; Reibel, Greeson, Brainard, & Rosenzweig, 2001; Williams, Kolar, Reger, & Pearson, 2001). Evidence also exists that meditation can improve chronic pain (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985). In a study by Kaplan and colleagues, all 77 men and women with fibromyalgia who

completed a 10-week stress-reduction program using meditation had symptom improvement (Kaplan et al., 1993). Moreover, in several studies, meditators had better respiratory function (vital capacity, tidal volume, expiratory pressure, and breath holding), cardiovascular parameters (diastolic blood pressure and heart rate), and lipid profiles than nonmeditators (Cooper & Aygen, 1979; Wallace, Silver, Mills, Dillbeck, & Wagoner, 1983; Wenneberg et al., 1997).

Unfortunately, many studies did not specify or describe the type of meditation used. A wide variety of methods may be used, including some in which the body is immobile (e.g., Zazen, Vipassana), others in which the body is left free (e.g., Siddha yoga, the Latihan, the chaotic meditation of Rajneesh), and still others in which the person participates in daily activities while meditating (e.g., Mahamudra, Shikan Taza, Gurdjieff's "self-remembering"). So it is not clear which forms may be beneficial and what aspects of meditation are providing the benefits.

Although physically noninvasive, meditation can be harmful in patients with psychiatric illness, potentially aggravating and precipitating psychotic episodes in delusional or strongly paranoid patients and heightening anxiety in patients with overwhelming anxiety. Moreover, it can trigger the release of repressed memories. Therefore, all patients using meditative techniques should be monitored, especially when beginning to use meditation.

Yoga

Contrary to popular misconception, yoga predates Hinduism by several centuries, and, as the American Yoga Association emphasizes, because yoga practice does not specify particular higher powers or religious doctrines, it can be compatible with all major religions. In fact, many religions, including many Christian denominations, have adopted yoga techniques. Yoga is also widely used by the general public, often for regular exercise.

Yoga is based on a set of theories that have not been scientifically proven. Yoga practitioners believe that blockages or shortages of the life force can cause disease or decreased resistance to disease and that yoga can restore the flow of the life force to different parts of the body. They use a series of stretching, breathing, and relaxation techniques to prepare for meditation and use stretching movements or postures (*asanas*) that aim to increase blood supply and *prana* (vital force) as well as increase the flexibility of the spine, which is thought to improve the nerve supply. Yoga practices also incorporate breathing techniques (*pranayamas*) to improve brain function, eliminate toxins, and restore energy reserves in the solar plexus region.

The few limited clinical studies on yoga have been encouraging, showing reduced serum total cholesterol, low-density lipids, and triglyceride levels and improved pulmonary function tests in yoga practitioners (Arambula, Peper, Kawakami, & Gibney, 2001; Birkel & Edgren, 2000; Schell, Allolio, &

Schonecke, 1994; Selvamurthy et al., 1998; Stancak, Kuna, Srinivasan, Dostalek, & Vishnudevananda, 1991; Stanescu, Nemery, Veriter, & Marechal, 1981; Udupa, Singh, & Yadav, 1973). Studies have also suggested that yoga may be associated with acute and long-term decreases in blood pressure (Murugesan, Govindarajulu, & Bera, 2000; Sundar et al., 1984) and may benefit patients with asthma, hypertension, heart failure, mood disorders, and diabetes (Jain, Uppal, Bhatnagar, & Talukdar, 1993; Malhotra, Singh, Singh, et al., 2002; Malhotra, Singe, Tandon, et al., 2002; Manocha et al., 2002; van Montfrans, Karemaker, Wieling, & Dunning, 1990). Two small controlled but non-double-blind studies showed Hatha yoga to significantly alleviate pain in osteoarthritis of the fingers and in carpal tunnel syndrome (Garfinkel, Schumacher, Husain, Levy, & Reshetar, 1994; Garfinkel et al., 1998). However, yoga is not completely benign, because certain *asanas* may be strenuous and cause injury. In fact, yoga practitioners believe some *asanas* can cause disease.

More studies are needed to determine the benefits (and potential dangers) of yoga. Like meditation, many forms of yoga have emerged. Some involve significant aerobic exercise. Others involve significant strength and conditioning work. Many yoga practices include changes in diet and life-styles. Thus, it is difficult to distinguish between yoga and other practices that have established health benefits such as exercise. Therefore, future studies should focus on specific yoga forms and movements and avoid making general conclusions about all yoga practices.

Faith Healing

Faith healers use prayer or other religious practices to combat disease. Surveys have found that a substantial number of patients in rural (21%) and inner-city (10%) populations have used faith healers, and many physicians (23%) believe that faith healers can heal patients (McKee & Chappel, 1992). Despite numerous anecdotes of healing miracles, no consistent and convincing scientific proof has been reported that faith healers are effective (King & Bushwick, 1994). Additionally, it has not been determined whether faith healers affect patients psychologically or physiologically and what factors may make them effective. Conclusions cannot be drawn until further research is performed.

CONCLUSIONS AND FUTURE DIRECTIONS

In general, clinical studies of religion and spirituality on health are fraught with challenges. Designing studies that are able to establish cause-and-effect relationships is difficult. This is especially true in the study of religion and health, where many confounding factors abound. However, there is evidence

that religion can provide health benefits. It is clear that religion can bring social and emotional support, motivation, healthy life-styles, and health care resources. Clinical studies are valuable in identifying possible associations, raising further questions, and guiding subsequent research. Clinical studies can also confirm possible cause-and-effect relationships elucidated by physiologic studies.

There are a number of future directions for research. Many of the accompanying and confounding factors need to be isolated to determine their relative roles. The clinical impact of findings from physiologic studies needs further investigation. Many diseases have not been studied. Many religious groups and sects have not been included in the early studies, and hence a broader impact of religion and religious behaviors needs to be surveyed. The effect of varying demographic parameters such as age, gender, and location also deserves further inquiry. Moreover, religious and spiritual activities may serve as adjunct therapy in various disease and addiction treatment programs. In the future, additional specific spiritual interventions may prove beneficial.

The findings to date have clinical implications. Religion is clearly important to many patients, and their religious concerns may need to be better addressed in the health care setting. Health care providers must be aware of how religious involvement can affect symptoms, quality of life, and patients' willingness to receive treatment. Perhaps more importantly, health care providers need to better understand how to manage these issues and deal with patients in which such issues play a prominent role.

The study of religion and health, as well as the integration of religion into the health care setting, is likely to grow. At the same time, new ways of researching this discipline may emerge and provide a substantial challenge to existing scientific methodologies. Unless the relationship between religion and health care cycles back to antagonism, many exciting new findings and approaches may appear.

REFERENCES

- Abbotts, J., Williams, R., & Ford, G. (2001). Morbidity and Irish Catholic descent in Britain: Relating health disadvantage to socio-economic position. *Social Science Medicine*, 52(7), 999–1005.
- Abbotts, J., Williams, R., Ford, G., Hunt, K., & West, P. (1997). Morbidity and Irish Catholic descent in Britain: An ethnic and religious minority 150 years on. *Social Science Medicine*, 45(1), 3–14.
- Abraham, J. (2001). Pain management for dying patients. How to assess needs and provide pharmacologic relief. *Postgraduate Medicine*, 110(2), 99–100, 108–109, 113–104.
- Alternative medicine: A new breed of healers. (2001). *Time*, 157(15), 62–65, 68–69.
- Amundsen, D. W. (1982). Medicine and faith in early Christianity. *Bulletin of Historical Medicine*, 56(3), 326–350.

- Arambula, P., Peper, E., Kawakami, M., & Gibney, K.H. (2001). The physiological correlates of Kundalini yoga meditation: A study of a yoga master. *Applied Psychophysiological Biofeedback*, 26(2), 147–153.
- Armbruster, C.A., Chibnall, J.T., & Legett, S. (2003). Pediatrician beliefs about spirituality and religion in medicine: Associations with clinical practice. *Pediatrics*, 111(3), 227–235.
- Armstrong, B., van Merwyk, A.J., & Coates, H. (1977). Blood pressure in Seventh-day Adventist vegetarians. *American Journal of Epidemiology*, 105(5), 444–449.
- Arnold, R., Avants, S.K., Margolin, A., & Marcotte, D. (2002). Patient attitudes concerning the inclusion of spirituality into addiction treatment. *Journal of Substance Abuse Treatment*, 23(4), 319–326.
- Aron, A., & Aron, E.N. (1980). The transcendental meditation program's effect on addictive behavior. *Addictive Behaviors*, 5(1), 3–12.
- Asser, S.M., & Swan, R. (1998). Child fatalities from religion-motivated medical neglect. *Pediatrics*, 101(4 Pt. 1), 625–629.
- Astin, J.A. (1997). Stress reduction through mindfulness meditation. Effects on psychological symptomatology, sense of control, and spiritual experiences. *Psychotherapy and Psychosomatics*, 66(2), 97–106.
- Astin, J.A., Berman, B.M., Bausell, B., Lee, W.L., Hochberg, M., & Forsys, K.L. (2003). The efficacy of mindfulness meditation plus Qigong movement therapy in the treatment of fibromyalgia: A randomized controlled trial. *Journal of Rheumatology*, 30(10), 2257–2262.
- Autiero, A. (1987). The interpretation of pain: The point of view of Catholic theology. *Acta Neurochirurgica Supplementum*, 38, 123–126.
- Avants, S.K., Warburton, L.A., & Margolin, A. (2001). Spiritual and religious support in recovery from addiction among HIV-positive injection drug users. *Journal of Psychoactive Drugs*, 33(1), 39–45.
- Aviles, J.M., Whelan, S.E., Hernke, D.A., Williams, B.A., Kenny, K.E., O'Fallon, W.M., et al. (2001). Intercessory prayer and cardiovascular disease progression in a coronary care unit population: A randomized controlled trial. *Mayo Clinic Proceedings*, 76(12), 1192–1198.
- Azhar, M.Z., & Varma, S.L. (1995). Religious psychotherapy in depressive patients. *Psychotherapy and Psychosomatics*, 63(3–4), 165–168.
- Azhar, M.Z., Varma, S.L., & Dharap, A.S. (1994). Religious psychotherapy in anxiety disorder patients. *Acta Psychiatrica Scandinavia*, 90(1), 1–3.
- Ball, J., Armistead, L., & Austin, B.J. (2003). The relationship between religiosity and adjustment among African-American, female, urban adolescents. *Journal of Adolescence*, 26(4), 431–446.
- Barrows, K.A., & Jacobs, B.P. (2002). Mind-body medicine. An introduction and review of the literature. *Medical and Clinical North America*, 86(1), 11–31.
- Bassuk, S.S., Glass, T.A., & Berkman, L.F. (1999). Social disengagement and incident cognitive decline in community-dwelling elderly persons. *Annals of International Medicine*, 131(3), 165–173.
- Begley, S. (2001a). Religion and the brain. *Newsweek*, 137(19), 50–57.
- Begley, S. (2001b). Searching for the God within. *Newsweek*, 137(5), 59.

- Bezilla, R. (Ed.). (1993). *Religion in America, 1992–1993*. Princeton, NJ: Princeton Religious Center (Gallup Organization).
- Bienenfeld, D., Koenig, H. G., Larson, D. B., & Sherrill, K. A. (1997). Psychosocial predictors of mental health in a population of elderly women: Test of an explanatory model. *American Journal of Geriatric Psychiatry, 5*(1), 43–53.
- Birkel, D. A., & Edgren, L. (2000). Hatha yoga: Improved vital capacity of college students. *Alternative Therapy and Health Medicine, 6*(6), 55–63.
- Bitner, R., Hillman, L., Victor, B., & Walsh, R. (2003). Subjective effects of antidepressants: A pilot study of the varieties of antidepressant-induced experiences in meditators. *Journal of Nervous and Mental Disorders, 191*(10), 660–667.
- Boey, K. W. (2003). Religiosity and psychological well-being of older women in Hong Kong. *International Journal of Psychiatric Nurse Residents, 8*(2), 921–935.
- Bowker, D. (1978). Pain and suffering—Religious perspective. In W. T. Reich (Ed.), *Encyclopedia of bioethics* (pp. 1185–1189). New York: Free Press.
- Braam, A. W., Beekman, A. T., Deeg, D. J., Smit, J. H., & Van Tilburg, W. (1999). Religiosity as a protective factor in depressive disorder. *American Journal of Psychiatry, 156*(5), 809; author reply 810.
- Brown, C. M. (2000). Exploring the role of religiosity in hypertension management among African Americans. *Journal of Health Care Poor Underserved, 11*(1), 19–32.
- Brush, B. L., & McGee, E. M. (2000). Evaluating the spiritual perspectives of homeless men in recovery. *Applied Nursing Research, 13*, 181–186.
- Byrd, R. C. (1988). Positive therapeutic effects of intercessory prayer in a coronary care unit population. *Southern Medical Journal, 81*(7), 826–829.
- Bywaters, P., Ali, Z., Fazil, Q., Wallace, L. M., & Singh, G. (2003). Attitudes towards disability amongst Pakistani and Bangladeshi parents of disabled children in the UK: Considerations for service providers and the disability movement. *Health and Social Care in the Community, 11*(6), 502–509.
- Carlson, L. E., Ursuliak, Z., Goodey, E., Angen, M., & Specca, M. (2001). The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6-month follow-up. *Support Care Cancer, 9*(2), 112–123.
- Carter, T. M. (1998). The effects of spiritual practices on recovery from substance abuse. *Journal of Psychiatric and Mental Health Nursing, 5*(5), 409–413.
- Castillo-Richmond, A., Schneider, R. H., Alexander, C. N., Cook, R., Myers, H., Nidich, S., et al. (2000). Effects of stress reduction on carotid atherosclerosis in hypertensive African Americans. *Stroke, 31*(3), 568–573.
- Chen, C. Y., Dormitzer, C. M., Bejarano, J., & Anthony, J. C. (2004). Religiosity and the earliest stages of adolescent drug involvement in seven countries of Latin America. *American Journal of Epidemiology, 159*(12), 1180–1188.
- Chibnall, J. T., & Brooks, C. A. (2001). Religion in the clinic: The role of physician beliefs. *Southern Medical Journal, 94*(4), 374–379.
- Coke, M. M. (1992). Correlates of life satisfaction among elderly African Americans. *Journal of Gerontology, 47*(5), 316–320.
- Collipp, P. J. (1969). The efficacy of prayer: A triple-blind study. *Medical Times, 97*(5), 201–204.

- Comstock, G. W., & Partridge, K. B. (1972). Church attendance and health. *Journal of Chronic Disorders, 25*(12), 665–672.
- Conrada, R. J., Goyal, T. M., Cather, C., Rafalson, L., Idler, E. L., & Krause, T. J. (2004). Psychosocial factors in outcomes of heart surgery: The impact of religious involvement and depressive symptoms. *Health Psychology, 23*(3), 227–238.
- Cooper, M. J., & Aygen, M. M. (1979). A relaxation technique in the management of hypercholesterolemia. *Journal of Human Stress, 5*(4), 24–27.
- Corliss, R. (2001). The power of yoga. *Time, 157*(16), 54–63.
- Coward, D. D. (1991). Self-transcendence and emotional well-being in women with advanced breast cancer. *Oncology Nursing Forum, 18*, 857–863.
- Daaleman, T. P., & Nease, D. E., Jr. (1994). Patient attitudes regarding physician inquiry into spiritual and religious issues. *Journal of Family Practices, 39*(6), 564–568.
- de Gouw, H. W., Westendorp, R. G., Kunst, A. E., Mackenbach, J. P., & Vandenbroucke, J. P. (1995). Decreased mortality among contemplative monks in The Netherlands. *American Journal of Epidemiology, 141*(8), 771–775.
- Dermatis, H., Guschwan, M. T., Galanter, M., & Bunt, G. (2004). Orientation toward spirituality and self-help approaches in the therapeutic community. *Journal of Addictive Disorders, 23*(1), 39–54.
- Domino, G. (1977). Transcendental meditation and creativity: An empirical investigation. *Journal of Applied Psychology, 62*(3), 358–362.
- Donahue, M. J. (1985). Intrinsic and extrinsic religiousness: Review and meta-analysis. *Journal of Personality and Social Psychology, 48*, 400–419.
- Dunne, M. P., Edwards, R., Lucke, J., Donald, M., & Raphael, B. (1994). Religiosity, sexual intercourse and condom use among university students. *Australian Journal of Public Health, 18*(3), 339–341.
- Eisenberg, D. M., Davis, R. B., Ettner, S. L., Appel, S., Wilkey, S., Van Rompay, M., et al. (1998). Trends in alternative medicine use in the United States, 1990–1997: Results of a follow-up national survey. *Journal of the American Medical Association, 280*(18), 1569–1575.
- Ellis, M. R., Vinson, D. C., & Ewigman, B. (1999). Addressing spiritual concerns of patients: Family physicians' attitudes and practices. *Journal of Family Practices, 48*(2), 105–109.
- Foley, D. P. (1988). Eleven interpretations of personal suffering. *Journal of Religion and Health, 27*, 321–328.
- Forcehimes, A. A. (2004). De profundis: Spiritual transformations in Alcoholics Anonymous. *Journal of Clinical Psychology, 60*(5), 503–517.
- Fraser, G. E. (1999). Associations between diet and cancer, ischemic heart disease, and all-cause mortality in non-Hispanic white California Seventh-day Adventists. *American Journal of Clinical Nutrition, 70*(3 Suppl.), 532–538.
- Friedlander, Y., Kark, J. D., Kaufmann, N. A., & Stein, Y. (1985). Coronary heart disease risk factors among religious groupings in a Jewish population sample in Jerusalem. *American Journal of Clinical Nutrition, 42*(3), 511–521.
- Friedlander, Y., Kark, J. D., & Stein, Y. (1987). Religious observance and plasma lipids and lipoproteins among 17-year-old Jewish residents of Jerusalem. *Preventive Medicine, 16*(1), 70–79.

- The Gallup Report: Religion in America: 1993–1994.* (1994). Princeton, NJ: Gallup Poll.
- Garfinkel, M. S., Schumacher, H. R., Jr., Husain, A., Levy, M., & Reshetar, R. A. (1994). Evaluation of a yoga based regimen for treatment of osteoarthritis of the hands. *Journal of Rheumatology*, *21*(12), 2341–2343.
- Garfinkel, M. S., Singhal, A., Katz, W. A., Allan, D. A., Reshetar, R., & Schumacher, H. R., Jr. (1998). Yoga-based intervention for carpal tunnel syndrome: A randomized trial. *Journal of the American Medical Association*, *280*(18), 1601–1603.
- Geisser, M. E., Robinson, M. E., & Henson, C. D. (1994). The Coping Strategies Questionnaire and chronic pain adjustment: A conceptual and empirical reanalysis. *Clinical Journal of Pain*, *10*(2), 98–106.
- Gorsuch, R. L., & Butler, M. C. (1976). Initial drug abuse: A review of predisposing social psychological factors. *Psychology Bulletin*, *83*(1), 120–137.
- Green, L. L., Fullilove, M. T., & Fullilove, R. E. (1998). Stories of spiritual awakening: The nature of spirituality in recovery. *Journal of Substance Abuse Treatment*, *15*(4), 325–331.
- Grundmann, E. (1992). Cancer morbidity and mortality in USA Mormons and Seventh-day Adventists. *Archives of Anatomy, Cytology, and Pathology*, *40*(2–3), 73–78.
- Gupta, R. (1996). Lifestyle risk factors and coronary heart disease prevalence in Indian men. *Journal of the Association of Physicians of India*, *44*(10), 689–693.
- Gupta, R., Prakash, H., Gupta, V. P., & Gupta, K. D. (1997). Prevalence and determinants of coronary heart disease in a rural population of India. *Journal of Clinical Epidemiology*, *50*(2), 203–209.
- Harris, W. S., Gowda, M., Kolb, J. W., Strychacz, C. P., Vacek, J. L., Jones, P. G., et al. (1999). A randomized, controlled trial of the effects of remote, intercessory prayer on outcomes in patients admitted to the coronary care unit. *Archives of Internal Medicine*, *159*(19), 2273–2278.
- Hays, J. C., Landerman, L. R., George, L. K., Flint, E. P., Koenig, H. G., Land, K. C., et al. (1998). Social correlates of the dimensions of depression in the elderly. *Journal of Gerontology Series B: Psychological Science and Social Science*, *53*(1), 31–39.
- Heath, A. C., Madden, P. A., Grant, J. D., McLaughlin, T. L., Todorov, A. A., & Bucholz, K. K. (1999). Resiliency factors protecting against teenage alcohol use and smoking: Influences of religion, religious involvement and values, and ethnicity in the Missouri Adolescent Female Twin Study. *Twin Research*, *2*(2), 145–155.
- Helm, H. M., Hays, J. C., Flint, E. P., Koenig, H. G., & Blazer, D. G. (2000). Does private religious activity prolong survival? A six-year follow-up study of 3,851 older adults. *Journal of Gerontology Series A: Biological Science and Medical Science*, *55*(7), 400–405.
- Hixson, K. A., Gruchow, H. W., & Morgan, D. W. (1998). The relation between religiosity, selected health behaviors, and blood pressure among adult females. *Preventive Medicine*, *27*(4), 545–552.
- Ho, S. C., Woo, J., Lau, J., Chan, S. G., Yuen, Y. K., Chan Y. K., et al. (1995). Life satisfaction and associated factors in older Hong Kong Chinese. *Journal of American Geriatric Society*, *43*(3), 252–255.
- Hodges, S. D., Humphreys, S. C., & Eck, J. C. (2002). Effect of spirituality on successful recovery from spinal surgery. *Southern Medical Journal*, *95*(12), 1381–1384.

- House, J. S., Robbins, C., & Metzner, H. L. (1982). The association of social relationships and activities with mortality: Prospective evidence from the Tecumseh Community Health Study. *American Journal of Epidemiology*, *116*(1), 123–140.
- Hummer, R. A., Rogers, R. G., Nam, C. B., & Ellison, C. G. (1999). Religious involvement and U.S. adult mortality. *Demography*, *36*(2), 273–285.
- Idler, E. L., & Kasl, S. V. (1997a). Religion among disabled and nondisabled persons I: Cross-sectional patterns in health practices, social activities, and well-being. *Journal of Gerontology Series B: Psychological Science and Social Science*, *52*(6), 294–305.
- Idler, E. L., & Kasl, S. V. (1997b). Religion among disabled and nondisabled persons II: Attendance at religious services as a predictor of the course of disability. *Journal of Gerontology Series B: Psychological Science and Social Science*, *52*(6), 306–316.
- Jain, S. C., Uppal, A., Bhatnagar, S. O., & Talukdar, B. (1993). A study of response pattern of non-insulin dependent diabetics to yoga therapy. *Diabetes Research and Clinical Practices*, *19*(1), 69–74.
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry*, *4*(1), 33–47.
- Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine*, *8*(2), 163–190.
- Kabat-Zinn, J., Massion, A. O., Kristeller, J., Peterson, L. G., Fletcher, K. E., Pbert, L., et al. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry*, *149*(7), 936–943.
- Kabat-Zinn, J., Wheeler, E., Light, T., Skillings, A., Scharf, M. J., Cropley, T. G., et al. (1998). Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosomatic Medicine*, *60*(5), 625–632.
- Kaplan, K. H., Goldenberg, D. L., & Galvin-Nadeau, M. (1993). The impact of a meditation-based stress reduction program on fibromyalgia. *General Hospital Psychiatry*, *15*(5), 284–289.
- Kark, J. D., Carmel, S., Sinnreich, R., Goldberger, N., & Friedlander, Y. (1996). Psychosocial factors among members of religious and secular kibbutzim. *Israeli Journal of Medical Science*, *32*(3–4), 185–194.
- Kark, J. D., Shemi, G., Friedlander, Y., Martin, O., Manor, O., & Blondheim, S. H. (1996). Does religious observance promote health? Mortality in secular vs. religious kibbutzim in Israel. *American Journal of Public Health*, *86*(3), 341–346.
- Keefer, L., & Blanchard, E. B. (2002). A one year follow-up of relaxation response meditation as a treatment for irritable bowel syndrome. *Behavioral Research and Therapy*, *40*(5), 541–546.
- Kennedy, G. J., Kelman, H. R., Thomas, C., & Chen, J. (1996). The relation of religious preference and practice to depressive symptoms among 1,855 older adults. *Journal of Gerontology Series B: Psychological Science and Social Science*, *51*(6), 301–308.
- Kernberg, O. F. (2003). Sanctioned social violence: A psychoanalytic view. Part II. *International Journal of Psychoanalysis*, *84*(Pt. 4), 953–968.

- King, D. E., & Bushwick, B. (1994). Beliefs and attitudes of hospital inpatients about faith healing and prayer. *Journal of Family Practice, 39*(4), 349–352.
- King, D. E., Hueston, W., & Rudy, M. (1994). Religious affiliation and obstetric outcome. *Southern Medical Journal, 87*(11), 1125–1128.
- King, M. S., Carr, T., & D'Cruz, C. (2002). Transcendental meditation, hypertension and heart disease. *Australian Family Physician, 31*(2), 164–168.
- Koenig, H. G. (1998). Religious attitudes and practices of hospitalized medically ill older adults. *International Journal of Geriatric Psychiatry, 13*(4), 213–224.
- Koenig, H. G., George, L. K., Cohen, H. J., Hays, J. C., Larson, D. B., & Blazer, D. G. (1998a). The relationship between religious activities and cigarette smoking in older adults. *Journal of Gerontology Series A: Biological Science and Medical Science, 53*(6), 426–434.
- Koenig, H. G., George, L. K., Hays, J. C., Larson, D. B., Cohen, H. J., & Blazer, D. G. (1998b). The relationship between religious activities and blood pressure in older adults. *International Journal of Psychiatry and Medicine, 28*(2), 189–213.
- Koenig, H. G., George, L. K., & Peterson, B. L. (1998c). Religiosity and remission of depression in medically ill older patients. *American Journal of Psychiatry, 155*(4), 536–542.
- Koenig, H. G., Hays, J. C., George, L. K., Blazer, D. G., Larson, D. B., & Landerman, L. R. (1997). Modeling the cross-sectional relationships between religion, physical health, social support, and depressive symptoms. *American Journal of Geriatric Psychiatry, 5*(2), 131–144.
- Koenig, H. G., Hays, J. C., Larson, D. B., George, L. K., Cohen, H. J., McCullough, M. E., et al. (1999). Does religious attendance prolong survival? A six-year follow-up study of 3,968 older adults. *Journal of Gerontology Series A: Biological Science and Medical Science, 54*(7), 370–376.
- Krause, N. (2003). Religious meaning and subjective well-being in late life. *Journal of Gerontology Series B: Psychological Science and Social Science, 58*(3), 160–170.
- Kuhn, C. C. (1988). A spiritual inventory of the medically ill patient. *Psychiatric Medicine, 6*(2), 87–100.
- Kune, G. A., Kune, S., & Watson, L. F. (1992). The effect of family history of cancer, religion, parity and migrant status on survival in colorectal cancer. The Melbourne Colorectal Cancer Study. *European Journal of Cancer, 28A*(8–9), 1484–1487.
- Kune, G. A., Kune, S., & Watson, L. F. (1993). Perceived religiousness is protective for colorectal cancer: Data from the Melbourne Colorectal Cancer Study. *Journal of the Royal Society of Medicine, 86*(11), 645–647.
- Kutz, I. (2002). Samson, the Bible, and the DSM. *Archives of General Psychiatry, 59*(6), 565; author reply 565–566.
- La Pierre, L. L. (2003). JCAHO safeguards spiritual care. *Holistic Nursing Practices, 17*(4), 219.
- Larson, D. B., & Wilson, W. P. (1980). Religious life of alcoholics. *Southern Medical Journal, 73*(6), 723–727.
- Lefkowitz, E. S., Boone, T. L., Au, T. K., & Sigman, M. (2003). No sex or safe sex? Mothers' and adolescents' discussions about sexuality and AIDS/HIV. *Health Education and Resources, 18*(3), 341–351.

- Leibovici, L. (2001). Effects of remote, retroactive intercessory prayer on outcomes in patients with bloodstream infection: Randomized controlled trial. *British Medical Journal*, *323*(7327), 1450–1451.
- Levin, J. S. (1996). How religion influences morbidity and health: Reflections on natural history, salutogenesis and host resistance. *Social Science and Medicine*, *43*(5), 849–864.
- Levin, J. S., Larson, D. B., & Puchalski, C. M. (1997). Religion and spirituality in medicine: Research and education. *Journal of the American Medical Association*, *279*(9), 792–793.
- Levin, J. S., & Markides, K. (1988). Religious attendance and psychological well-being in middle-aged and older Mexican Americans. *Sociological Analysis*, *49*, 66–72.
- Li, E. C., Feifer, C., & Strohm, M. (2000). A pilot study: Locus of control and spiritual beliefs in alcoholics anonymous and smart recovery members. *Addictive Behaviors*, *25*(4), 633–640.
- Lichtenstein, B. (2003). Stigma as a barrier to treatment of sexually transmitted infection in the American Deep South: Issues of race, gender and poverty. *Social Science and Medicine*, *57*(12), 2435–2445.
- Lo, B., Quill, T., & Tulsky, J. (1999). Discussing palliative care with patients. ACP-ASIM end-of-life care consensus panel. American College of Physicians-American Society of Internal Medicine. *Annals of Internal Medicine*, *130*(9), 744–749.
- Lo, B., Ruston, D., Kates, L. W., Arnold, R. M., Cohen, C. B., Faber-Langendoen, K., et al. (2002). Discussing religious and spiritual issues at the end of life: A practical guide for physicians. *Journal of the American Medical Association*, *287*(6), 749–754.
- Loprinzi, C. L., Laurie, J. A., Wieand, H. S., Krook, J. E., Novotny, P. J., Kugler, J. W., et al. (1994). Prospective evaluation of prognostic variables from patient-completed questionnaires. North Central Cancer Treatment Group. *Journal of Clinical Oncology*, *12*(3), 601–607.
- Luczak, S. E., Shea, S. H., Carr, L. G., Li, T. K., & Wall, T. L. (2002). Binge drinking in Jewish and non-Jewish white college students. *Alcoholism: Clinical and Experimental Research*, *26*(12), 1773–1778.
- Lukoff, D., Lu, F., & Turner, R. (1992). Toward a more culturally sensitive DSM-IV. Psychoreligious and psychospiritual problems. *Journal of Nervous Mental Disorders*, *180*(11), 673–682.
- Lyttle, T. (1988). Drug based religions and contemporary drug taking. *Journal of Drug Issues*, *18*, 271–284.
- MacLean, C. D., Susi, B., Phifer, N., Schultz, L., Bynum, D., Franco, M., et al. (2003). Patient preference for physician discussion and practice of spirituality. *Journal of General Internal Medicine*, *18*(1), 38–43.
- Madru, N. (2003). Stigma and HIV: Does the social response affect the natural course of the epidemic? *Journal Association Nurses AIDS Care*, *14*(5), 39–48.
- Malhotra, V., Singh, S., Singh, K. P., Gupta, P., Sharma, S. B., Madhu, S. V., et al. (2002). Study of yoga asanas in assessment of pulmonary function in NIDDM patients. *Indian Journal of Physiology and Pharmacology*, *46*(3), 313–320.
- Malhotra, V., Singh, S., Tandon, O. P., Madhu, S. V., Prasad, A., & Sharma, S. B. (2002). Effect of yoga asanas on nerve conduction in type 2 diabetes. *Indian Journal of Physiological Pharmacology*, *46*(3), 298–306.

- Manheimer, E., Anderson, B.J., & Stein, M.D. (2003). Use and assessment of complementary and alternative therapies by intravenous drug users. *American Journal of Drug and Alcohol Abuse, 29*(2), 401–413.
- Manocha, R., Marks, G. B., Kenchington, P., Peters, D., & Salome, C. M. (2002). Sahaja yoga in the management of moderate to severe asthma: A randomized controlled trial. *Thorax, 57*(2), 110–115.
- Markides, K. S., Levin, J. S., & Ray, L. A. (1987). Religion, aging, and life satisfaction: An eight-year, three-wave longitudinal study. *Gerontologist, 27*(5), 660–665.
- Matthews, D. A., & Clark, C. (1998). *The faith factor: Proof of the healing power of prayer*. New York: Viking (Penguin-Putnam).
- Matthews, D. A., Marlowe, S. M., & MacNutt, F. S. (2000). Effects of intercessory prayer on patients with rheumatoid arthritis. *Southern Medical Journal, 93*(12), 1177–1186.
- Matthews, W. J., Conti, J. M., & Sireci, S. G. (2001). The effects of intercessory prayer, positive visualization, and expectancy on the well-being of kidney dialysis patients. *Alternative Therapy & Health Medicine, 7*(5), 42–52.
- McCormick, N., Izzo, A., & Folcik, J. (1985). Adolescents' values, sexuality, and contraception in a rural New York county. *Adolescence, 20*(78), 385–395.
- McCree, D.H., Wingood, G. M., DiClemente, R., Davies, S., & Harrington, K. F. (2003). Religiosity and risky sexual behavior in African-American adolescent females. *Journal of Adolescent Health, 33*(1), 2–8.
- McCullough, M. E., Hoyt, W. T., Larson, D. B., Koenig, H. G., & Thoresen, C. (2000). Religious involvement and mortality: A meta-analytic review. *Health Psychology, 19*(3), 211–222.
- McCullough, M. E., & Larson, D. B. (1999). Religion and depression: A review of the literature. *Twin Research, 2*, 126–136.
- McKee, D.D., & Chappel, J. N. (1992). Spirituality and medical practice. *Journal of Family Practice, 35*(2), 201, 205–208.
- McLane, S., Lox, C. L., Butki, B., & Stern, L. (2003). An investigation of the relation between religion and exercise motivation. *Journal of Perceptive Motor Skills, 97*(3 Pt. 2), 1043–1048.
- Merrill, R. M., & Thygeson, A. L. (2001). Religious preference, church activity, and physical exercise. *Preventive Medicine, 33*(1), 38–45.
- Miller, L., Davies, M., & Greenwald, S. (2000). Religiosity and substance use and abuse among adolescents in the National Comorbidity Survey. *Journal of the American Academic Child Adolescent Psychiatry, 39*(9), 1190–1197.
- Miller, L., & Gur, M. (2002). Religiousness and sexual responsibility in adolescent girls. *Journal of Adolescent Health, 31*(5), 401–406.
- Miller, L., Warner, V., Wickramaratne, P., & Weissman, M. (1997). Religiosity and depression: Ten-year follow-up of depressed mothers and offspring. *Journal of the American Academic Child Adolescent Psychiatry, 36*(10), 1416–1425.
- Miller, W. R. (1998). Researching the spiritual dimensions of alcohol and other drug problems. *Addiction, 93*(7), 979–990.
- Miller, W. R., & Thoresen, C. E. (2003). Spirituality, religion, and health. An emerging research field. *American Psychology, 58*(1), 24–35.
- Mitchell, J., Lannin, D. R., Mathews, H. F., & Swanson, M. S. (2002). Religious beliefs and breast cancer screening. *Journal of Women's Health, 11*(10), 907–915.

- Monroe, M. H., Bynum, D., Susi, B., Phifer, N., Schultz, L., Franco, M., et al. (2003). Primary care physician preferences regarding spiritual behavior in medical practice. *Archives of International Medicine*, *163*(22), 2751–2756.
- Moriarty, J. (2001). The spiritual roots of AA. *Minnesota Medicine*, *84*(4), 10.
- Morse, J. M., & Proctor, A. (1998). Maintaining patient endurance. The comfort work of trauma nurses. *Clinical Nursing Research*, *7*(3), 250–274.
- Murphy, T. J., Pagano, R. R., & Marlatt, G. A. (1986). Lifestyle modification with heavy alcohol drinkers: Effects of aerobic exercise and meditation. *Addictive Behaviors*, *11*(2), 175–186.
- Murugesan, R., Govindarajulu, N., & Bera, T. K. (2000). Effect of selected yogic practices on the management of hypertension. *Indian Journal of Physiological Pharmacology*, *44*(2), 207–210.
- Musick, M. A., Koenig, H. G., Hays, J. C., & Cohen, H. J. (1998). Religious activity and depression among community-dwelling elderly persons with cancer: The moderating effect of race. *Journal of Gerontology Series B: Psychological Science and Social Science*, *53*(4), 218–227.
- Neeleman, J., Halpern, D., Leon, D., & Lewis, G. (1997). Tolerance of suicide, religion and suicide rates: An ecological and individual study in 19 Western countries. *Psychological Medicine*, *27*(5), 1165–1171.
- Neeleman, J., & Lewis, G. (1999). Suicide, religion, and socioeconomic conditions: An ecological study in 26 countries, 1990. *Journal of Epidemiology and Community Health*, *53*(4), 204–210.
- Neeleman, J., Wessely, S., & Lewis, G. (1998). Suicide acceptability in African- and white Americans: The role of religion. *Journal of Nervous Mental Disorders*, *186*(1), 12–16.
- Nisbet, P. A., Duberstein, P. R., Conwell, Y., & Seidltz, L. (2000). The effect of participation in religious activities on suicide versus natural death in adults 50 and older. *Journal of Nervous Mental Disorders*, *188*(8), 543–546.
- O'Laoire, S. (1997). An experimental study of the effects of distant, intercessory prayer on self-esteem, anxiety, and depression. *Alternative Therapies in Health and Medicine*, *3*(6), 38–53.
- Oleckno, W. A., & Blacconiere, M. J. (1991). Relationship of religiosity to wellness and other health-related behaviors and outcomes. *Psychological Reports*, *68*(3 Pt. 1), 819–826.
- Oman, D., Kurata, J. H., Strawbridge, W. J., & Cohen, R. D. (2002). Religious attendance and cause of death over 31 years. *International Journal of Psychiatry and Medicine*, *32*(1), 69–89.
- Oman, D., & Reed, D. (1998). Religion and mortality among the community-dwelling elderly. *American Journal of Public Health*, *88*(10), 1469–1475.
- Oxman, T. E., Freeman, D. H., Jr., & Manheimer, E. D. (1995). Lack of social participation or religious strength and comfort as risk factors for death after cardiac surgery in the elderly. *Psychosomatic Medicine*, *57*(1), 5–15.
- Patel, S. S., Shah, V. S., Peterson, R. A., & Kimmel, P. L. (2002). Psychosocial variables, quality of life, and religious beliefs in ESRD patients treated with hemodialysis. *American Journal of Kidney Diseases*, *40*(5), 1013–1022.
- Pettus, M. C. (2002). Implementing a medicine-spirituality curriculum in a community-based internal medicine residency program. *Academic Medicine*, *77*(7), 745.

- Poloma, M., & Pendleton, B. (1991). The effects of prayer and prayer experience on measures of general well being. *Journal of Psychology & Theology, 10*, 71–83.
- Powell, L. H., Shahabi, L., & Thoresen, C. E. (2003). Religion and spirituality. Linkages to physical health. *American Psychology, 58*(1), 36–52.
- Pressman, P., Lyons, J. S., Larson, D. B., & Strain, J. J. (1990). Religious belief, depression, and ambulation status in elderly women with broken hips. *American Journal of Psychiatry, 147*(6), 758–760.
- Proctor, A., Morse, J. M., & Khonsari, E. S. (1996). Sounds of comfort in the trauma center: How nurses talk to patients in pain. *Social Science and Medicine, 42*(12), 1669–1680.
- Propst, L. R., Ostrom, R., Watkins, P., Dean, T., & Mashburn, D. (1992). Comparative efficacy of religious and nonreligious cognitive-behavioral therapy for the treatment of clinical depression in religious individuals. *Journal of Consulting and Clinical Psychology, 60*(1), 94–103.
- Purcell, B. C. (1998a). Spiritual abuse. *American Journal of Hospital Palliative Care, 15*(4), 227–231.
- Purcell, B. C. (1998b). Spiritual terrorism. *American Journal of Hospital Palliative Care, 15*(3), 167–173.
- Raleigh, E. D. (1992). Sources of hope in chronic illness. *Oncology Nursing Forum, 19*(3), 443–448.
- Rapp, S. R., Rejeski, W. J., & Miller, M. E. (2000). Physical function among older adults with knee pain: The role of pain coping skills. *Arthritis Care and Research, 13*(5), 270–279.
- Rasanen, J., Kauhanen, J., Lakka, T. A., Kaplan, G. A., & Salonen, J. T. (1996). Religious affiliation and all-cause mortality: A prospective population study in middle-aged men in eastern Finland. *International Journal of Epidemiology, 25*(6), 1244–1249.
- Razali, S. M., Hasanah, C. I., Aminah, K., & Subramaniam, M. (1998). Religious-socio-cultural psychotherapy in patients with anxiety and depression. *Australian and New Zealand Journal of Psychiatry, 32*(6), 867–872.
- Reibel, D. K., Greeson, J. M., Brainard, G. C., & Rosenzweig, S. (2001). Mindfulness-based stress reduction and health-related quality of life in a heterogeneous patient population. *General Hospital Psychiatry, 23*(4), 183–192.
- Ringdal, G. I., Gotestam, K. G., Kaasa, S., Kvinnsland, S., & Ringdal, K. (1996). Prognostic factors and survival in a heterogeneous sample of cancer patients. *British Journal of Cancer, 73*(12), 1594–1599.
- Rossetti, S. J. (1995). The impact of child sexual abuse on attitudes toward God and the Catholic Church. *Child Abuse and Neglect, 19*(12), 1469–1481.
- Satterly, L. (2001). Guilt, shame, and religious and spiritual pain. *Holistic Nursing Practices, 15*(2), 30–39.
- Schell, F. J., Allolio, B., & Schonecke, O. W. (1994). Physiological and psychological effects of Hatha-yoga exercise in healthy women. *International Journal of Psychosomatics, 41*(1–4), 46–52.
- Selvamurthy, W., Sridharan, K., Ray, U. S., Tiwary, R. S., Hegde, K. S., Radhakrishnan, U., et al. (1998). A new physiological approach to control essential hypertension. *Indian Journal of Physiology and Pharmacology, 42*(2), 205–213.
- Shaffer, J. A. (1978). Pain and suffering: Philosophical perspectives. In W. T. Reich (Ed.), *Encyclopedia of bioethics* (pp. 1181–1185). New York: Free Press.

- Shuler, P.A., Gelberg, L., & Brown, M. (1994). The effects of spiritual/religious practices on psychological well-being among inner city homeless women. *Nurse Practitioners Forum*, 5(2), 106–113.
- Sloan, R.P., Bagiella, E., & Powell, T. (1999). Religion, spirituality, and medicine. *Lancet*, 353(9153), 664–667.
- Solberg, E.E., Berglund, K.A., Engen, O., Ekeberg, O., & Loeb, M. (1996). The effect of meditation on shooting performance. *British Journal of Sports Medicine*, 30(4), 342–346.
- Spiritual assessment required in all settings. (2003). *Hospital Peer Reviews*, 28(4), 55–56.
- Stancak, A., Jr., Kuna, M., Srinivasan, Dostalek, C., & Vishnudevananda, S. (1991). Kapalabhati-yogic cleansing exercise II. EEG topography analysis. *Homeostasis in Health and Disease*, 33(4), 182–189.
- Stanescu, D.C., Nemery, B., Veriter, C., & Marechal, C. (1981). Pattern of breathing and ventilatory response to CO₂ in subjects practicing hatha-yoga. *Journal of Applied Physiology*, 51(6), 1625–1629.
- Stefanek, M., McDonald, P.G., & Hess, S.A. (2004). Religion, spirituality and cancer: Current status and methodological challenges. *Psychooncology*, 14(6), 450–463.
- Stewart, C. (2001). The influence of spirituality on substance use of college students. *Journal of Drug Education*, 31(4), 343–351.
- Strawbridge, W.J., Cohen, R.D., Shema, S.J., & Kaplan, G.A. (1997). Frequent attendance at religious services and mortality over 28 years. *American Journal of Public Health*, 87(6), 957–961.
- Stylianou, S. (2004). The role of religiosity in the opposition to drug use. *International Journal of Offender Therapy and Comparative Criminology*, 48(4), 429–448.
- Sundar, S., Agrawal, S.K., Singh, V.P., Bhattacharya, S.K., Udupa, K.N., & Vaish, S.K. (1984). Role of yoga in management of essential hypertension. *Acta Cardiology*, 39(3), 203–208.
- Swartzman, L.C., Gwadry, F.G., Shapiro, A.P., & Teasell, R.W. (1994). The factor structure of the Coping Strategies Questionnaire. *Pain*, 57(3), 311–316.
- Swimmer, G.I., Robinson, M.E., & Geisser, M.E. (1992). Relationship of MMPI cluster type, pain coping strategy, and treatment outcome. *Clinical Journal of Pain*, 8(2), 131–137.
- Tanyi, R.A. (2002). Towards clarification of the meaning of spirituality. *Journal of Advanced Nursing*, 39(5), 500–509.
- Tieman, J. (2002). Priest scandal hits hospitals. As pedophilia reports grow, church officials suspend at least six hospital chaplains in an effort to address alleged sexual abuse. *Modern Healthcare*, 32(19), 6–7, 11, 14.
- Tonigan, J.S., Miller, W.R., & Schermer, C. (2002). Atheists, agnostics and Alcoholics Anonymous. *Journal of Studies on Alcohol*, 63(5), 534–541.
- Townsend, M., Kladder, V., Ayele, H., & Mulligan, T. (2002). Systematic review of clinical trials examining the effects of religion on health. *Southern Medical Journal*, 95(12), 1429–1434.
- Tu, W. (1980). A religiophilosophical perspective on pain. In L.Y. Terenius (Ed.), *Pain and society* (pp. 63–78). Weinheim-Deerfield Beach, FL: Verlag Chemie.

- Turner, R. P., Lukoff, D., Barnhouse, R. T., & Lu, F. G. (1995). Religious or spiritual problem. A culturally sensitive diagnostic category in the DSM-IV. *Journal of Nervous Mental Disorders*, 183(7), 435–444.
- Udupa, K. N., Singh, R. H., & Yadav, R. A. (1973). Certain studies on psychological and biochemical responses to the practice in Hatha yoga in young normal volunteers. *Indian Journal of Medical Research*, 61(2), 237–244.
- van Montfrans, G. A., Karemaker, J. M., Wieling, W., & Dunning, A. J. (1990). Relaxation therapy and continuous ambulatory blood pressure in mild hypertension: A controlled study. *British Medical Journal*, 300(6736), 1368–1372.
- Van Ness, P. H., Kasl, S. V., & Jones, B. A. (2003). Religion, race, and breast cancer survival. *International Journal of Psychiatry and Medicine*, 33(4), 357–375.
- Van Poppel, F., Schellekens, J., & Liefbroer, A. C. (2002). Religious differentials in infant and child mortality in Holland, 1855–1912. *Population Studies*, 56(3), 277–289.
- Walker, S. R., Tonigan, J. S., Miller, W. R., Corner, S., & Kahlich, L. (1997). Intercessory prayer in the treatment of alcohol abuse and dependence: A pilot investigation. *Alternative Therapy and Health Medicine*, 3(6), 79–86.
- Wallace, R. K., Silver, J., Mills, P. J., Dillbeck, M. C., & Wagoner, D. E. (1983). Systolic blood pressure and long-term practice of the Transcendental Meditation and TM-Sidhi program: Effects of TM on systolic blood pressure. *Psychosomatic Medicine*, 45(1), 41–46.
- Walls, P., & Williams, R. (2004). Accounting for Irish Catholic ill health in Scotland: A qualitative exploration of some links between “religion”, class and health. *Sociology of Health and Illness*, 26(5), 527–556.
- Walsh, A. (1998). Religion and hypertension: Testing alternative explanations among immigrants. *Behavioral Medicine*, 24(3), 122–130.
- Walton, K. G., Pugh, N. D., Gelderloos, P., & Macrae, P. (1995). Stress reduction and preventing hypertension: Preliminary support for a psychoneuroendocrine mechanism. *Journal of Alternative and Complementary Medicine*, 1, 263–283.
- Wenneberg, S. R., Schneider, R. H., Walton, K. G., MacLean, C. R., Levitsky, D. K., Salerno, J. W., et al. (1997). A controlled study of the effects of the Transcendental Meditation program on cardiovascular reactivity and ambulatory blood pressure. *International Journal of Neuroscience*, 89(1–2), 15–28.
- Williams, D. R., Larson, D. B., Buckler, R. E., Heckmann, R. C., & Pyle, C. M. (1991). Religion and psychological distress in a community sample. *Social Science and Medicine*, 32, 1257–1262.
- Williams, K. A., Kolar, M. M., Reger, B. E., & Pearson, J. C. (2001). Evaluation of a wellness-based mindfulness stress reduction intervention: A controlled trial. *American Journal of Health Promotion*, 15, 422–432.
- Woodward, K. L. (2001). Faith is more than a feeling. *Newsweek*, 137(19), 58.
- Yates, J. W., Chalmer, B. J., St. James, P., Follansbee, M., & McKegney, F. P. (1981). Religion in patients with advanced cancer. *Medical and Pediatric Oncology*, 9, 121–128.
- Zaleski, E. H., & Schiaffino, K. M. (2000). Religiosity and sexual risk-taking behavior during the transition to college. *Journal of Adolescence*, 23, 223–227.
- Zollinger, T. W., Phillips, R. L., & Kuzma, J. W. (1984). Breast cancer survival rates among Seventh-day Adventists and non-Seventh-day Adventists. *American Journal of Epidemiology*, 119, 503–509.

CHAPTER 3

RELIGION, MEANING, AND THE BRAIN

Crystal L. Park and Patrick McNamara

INTRODUCTION

If you ask religious people why they believe in God or in many of the counter-intuitive or seemingly irrational tenets of religion, they will provide many and various reasons or justifications. Appeals to “meaning” and “purpose,” however, will often be at the top of the list (Silberman, in press; Spilka, Hood, Hunsberger, & Gorsuch, 2003). Humans, for better or worse, require meaning and purpose in their lives, and religion addresses that fundamental need. The need for meaning may be a direct result of the large and complex brains that humans possess. Because of this complex brain, meaning is a central concern of humans. The brain evolved to process complex information and needs this kind of information so badly that, if deprived of information, it will produce information itself in order to process it. We contend that religion is a great source of complex information in the form of “meaning,” which we describe more thoroughly below. In this restricted sense, then, the function of religion flows directly from the structure and complexity of the brain.

We take the notion that humans need meaning and purpose as a given (see Baumeister, 1991, and Wong & Fry, 1998, for detailed reviews of this contention). Thus, this chapter uses this claim as a starting point. What we seek to explore is how the mind/brain facilitates the extraction of meaning both with and without religion. By comparing the two operations we hope to shed some light on the unique contribution of religion to meaning.

The chapter begins with a description of what we mean by *meaning* and then summarizes why religion may be a particularly potent source of meanings. We need to set aside the problem of how people arrive at purpose in their lives, but we assume that our discussion of how people arrive at meanings will ultimately shed some light on the question of purpose. Next we consider the ways in which the mind/brain integrates and creates new meanings on a daily basis. We then illustrate how functional and potent these meanings are to the individual by reviewing cases of breakdown in the meaning system due to selective brain damage. Interestingly, we find some overlap in the neural networks that mediate meaning processes and those that are thought to mediate religious phenomena. After a brief comparison of the meanings created with and without religion, we conclude with a theory of how evolutionary forces might yield a form of religious ritual that would reliably produce surplus meanings that people rely on to function mentally from day to day and also, in many cases, to grow and flourish.

MEANING OF MEANING

Although the history of thought has oscillated between realist and nominalist approaches to meaning and concept formation, we take a practical approach by casting the problem of meaning construction alongside the problem of memory processing. A realist claims that the meanings of words and events are exhausted by their links to something real in the world. Nominalists, on the other hand, claim that the meanings of words are not exhausted by their links to the real world. Instead, words and concepts create new meanings of potential objects and states of affairs that may never have any link to the real world—think of all the imaginary beings that populate a child's or an artist's mind. Most people today believe that both the realists and the nominalists were correct in their own ways and that there is no essential contradiction between the two points of view. For real-world events, everyday meanings are extracted by a process of apprehension of the event and then an appraisal process of the significance of that event. For imaginary events, meaning construction proceeds without necessary reference to everyday constraints or rules. But even here the author of and the recipient (say, a reader of fiction) of the imaginary story/scenario will likely appraise the significance of the imaginary story according to some internal set of values and beliefs (Lazarus & Folkman, 1984). Thus, the appraisal process is central to meaning construction, as the transactional stress and coping perspective has been demonstrating for the past 40 years (see Aldwin, in press, for a review).

At least one part of meaning construction involves the integration, consolidation, and construction of new memories. Memories then act as filters or conceptual and schematic models through which any event is evaluated

or appraised. Thus, memory is fundamental to meaning. If we can treat one piece of the meaning puzzle as part and parcel of the memory puzzle, we can bring into the discussion the enormous amount of scientific work done on the problem of memory during the last century as well as the breakthroughs occurring in the twenty-first century.

Meaning Is Constrained by a Hierarchy of Motivational Goals and Overarching Beliefs

The meaning or significance of an event always takes place within a previously given conceptual framework that is, in turn, built from innate preparatory or conceptual schemas and from memories. Innate schemas are the desires and propensities we are born with. They need to be triggered by the environment and are certainly shaped by the environment, but few will argue that a child is born with the same innate propensities as a rat. Humans come prepared to apprehend a three-dimensional world of objects and a caretaker's face, milk, warmth, and so forth. As the child grows and accumulates memories of significant experiences, these memories are shaped into concepts/frameworks and schemas of things that are highly important and significant and those that are less so. This memory-based conceptual framework, therefore, is determined largely by a hierarchy of motivational constructs (or what an organism desires and needs). Global meaning consists of a person's hierarchy of motivational goals, values, and ultimate sense of purpose within a global framework of order (Park & Folkman, 1997). Global meaning also influences which events we decide are relevant on a daily basis and the meaning or significance of those events (e.g., whether those occurrences are threats, losses, or challenges; Aldwin, in press). Further, global meaning influences appraisal of and coping with traumatic events, which involves reappraising both global meaning and the meaning of the event (i.e., searching for meaning) (Baumeister, 1991; Park, 2005).

Meaning Construction Occurs on a Moment-to-Moment Basis as an Appraisal Process

Moment-to-moment tagging of events as meaningful, while constrained or guided by a global, hierarchical meaning framework, proceeds psychologically as situation-specific "appraisals." An appraisal is a more or less immediate "online" or "on-the-spot" evaluation of the significance of an event to the well-being of the organism (Aldwin, in press). If the appraisal consists of a negative evaluation (that is, that the event is threatening or potentially harmful), defensive maneuvers (e.g., defense mechanisms, coping efforts) are initiated (Lazarus & Folkman, 1984), and if these maneuvers are unsuccessful, the organism may suffer serious physiological decline—regardless of

the reality of the situation; such is the potency of the appraisal process. For example, if a young monkey is separated from its mother for even a day or two, it will conclude that its caretaker has disappeared and will not return, and the monkey will suppress its REM sleep, stop moving about, and stop eating (Reite, Kaemingk, & Boccia, 1989; Reite, Seiler, & Short, 1978).

Appraisals are not always veridical or accurate reflections of reality, nor do they need to be—even delusions can be helpful or adaptive under certain circumstances (e.g., when faced with extremely adverse situations, it may help to believe one will survive or flourish even if that is objectively unlikely). The placebo effect is a classic example of the beneficial effects of a nonveridical appraisal process yielding significant physiologic benefits for the organism. When a doctor gives a patient a sugar pill but tells him or her it is a special medication and assures the patient that it will help, the patient often does, in fact, feel better, at least for a little while (e.g., Sauro & Greenberg, 2005). Given the significant physiological impact of appraised meanings (e.g., that the sugar pill is real medicine) on health, we must assume that the brain/mind systems that support belief, appraisal, and meaning construction are wired directly into immunologic, autonomic, and central nervous systems. Overwhelming evidence now exists for such direct functional links between these three systems, including the existence of receptors for neurotransmitters on immune system molecules and the projection of modulatory tracts that descend from the orbitofrontal cortex to hypothalamic and brain stem nuclei regulating autonomic nervous system responding. In other words, the thinking and feeling areas of the brain are directly connected to other centers and systems in the body that are directly responsible for maintaining health (Maier & Watkins, 2002). Thus, if one's thinking turns bad, his or her health often follows the downward spiral. There is now abundant evidence that pessimism is related to many aspects of poor health, including mortality (e.g., Maruta, Colligan, Malinchoc, & Offord, 2000; Schulz, Bookwala, Knapp, Scheier, & Williamson, 1996).

HOW DOES RELIGION PRODUCE MEANING?

To have a complete account of the religion-meaning-brain relationship, we need to investigate how religion is involved in producing meaning. In fact, religion can produce meaning in many different ways: (1) Religion provides an interpretive framework with which to assess the significance of events and thus guides the appraisal processes of many people. (2) Religion provides an interpretive framework that is comprehensive and ultimate, so religion allows for a greater number and range of appraisals of both mundane everyday events and events of rare significance, such as the death of a loved one. (3) Religion encompasses doctrines that are nonfalsifiable (thus, although many religious claims may seem contrary to reality, they cannot be proven false. For example, there

is no way to measure the existence or actions of spiritual beings). (4) Religion uses mythopoetic imagery in its texts and rituals; such images, metaphors, and myths carry powerful affective meanings better than do abstract words and feelings. (5) Religion often relies on rituals, which are potent behavioral enactments of religious meaning systems. Each of these meaning-producing processes of religion is elaborated below.

Interpretative Framework

Religion often serves as an interpretative framework, a lens through which people's lives are experienced and understood. It can function as a kind of deductive top-down explanation for why things are the way they are. Why is there suffering? "Because God gave us free will and we often choose unwisely." Why do we choose unwisely? "Because original sin corrupted our mental faculties and to some extent our will" might be the answers proffered by a religious person. Such explanations that call on the divine or metaphysical can provide meaningful answers to any baffling or seemingly irredeemable experience, such as heinous crimes, painful illness and suffering, mental anguish, and profound loss.

Comprehensiveness

Of course, most religious explanations may not stand up to rigorous logical analysis. However, religious explanations can and often do appeal to an ultimate cause or purpose. Why did humans commit the original sin in the first place? Rational analysis would suggest that we must have already been somewhat corrupt or stupid to begin with (after all, who would rationally choose suffering over paradise and God?). The ultimate reasons for the "fall" and suffering are said to lie in the mysteries of free will and God's providence. Here we see the limitlessness of religious frameworks. In order for lower levels of these frameworks to work, they can appeal to ultimately comprehensive explanations for the ways things are (Emmons, 1999; Spilka, Shaver, & Kirkpatrick, 1997). Not only are these larger religious frameworks comprehensive, but they tend to be much more "existentially satisfactory" than secular explanations such as the hard, cold objectivity of science (Emmons, 1999; Pargament, Ano, & Wachholtz, 2005).

Nonfalsifiability of Religious Doctrine and Scriptures

Not only are religious frameworks able to accommodate and explain a wide variety of phenomena, they are capable of handling virtually any input or problem due to the flexibility of the system. From the scientific point of view, most religious tenets cannot be tested with standard scientific techniques,

and thus the tenets are nonfalsifiable (e.g., Atran & Norenzayan, 2004). At the very least, one can refer to the ultimately inscrutable will of God. Beliefs that cannot be challenged or disproven are likely to be powerful influences on the appraisal process. Except for an exceptional few personalities, most people are uncomfortable with paradox and ambiguity (Loevinger, 1976; Loevinger, Wessler & Redmore, 1970), and they prefer some definite evaluation system to a system that is unreliable. To the extent that religion claims access to eternal truths (or at least truths that cannot be falsified), then religion will function as a powerful meaning framework.

Mythopoetic Imagery

As important as rational and verbal meaning making is to humans, it is important to note that humans simultaneously process information using a second system as well—this one primarily emotional and experiential (see Chaiken & Trope, 1999, for a review). Religious meaning frameworks also provide for these very human needs for a deeper, less articulated but more impactful connection with the sacred and transcendent, much of which is conveyed through religion's mythopoetic imagery. Laughlin and Throop (2001) note that "mythopoetic imagery keeps the interpretive process in experience closer to the actual nature of reality than the rational faculties operating alone are able to do" (p. 709).

Rituals

The final source of religion's ability to produce meanings is in its behavioral manifestation: ritual. We turn now to a partial analysis of ritual as an unconscious process designed to produce meanings. We do not claim that ritual's only function is to produce meaning. Rather, we propose that looking at ritual from a "meaning" point of view may shed light on both religion and meaning.

Ritual has been defined as "the performance of more or less invariant sequences of formal acts and utterances not entirely encoded by the performers" (Rappaport, 1999, p. 24). According to anthropologists who study them, religious rituals exhibit the following features:

- a. apparently meaningless acts (e.g., walking around a temple seven times; sacrificing an animal; repetitious prayers or mantras)
- b. repetition (rituals are repeated in the same sequence over and over, sometimes daily for a worshipper and for thousands of years for a culture)
- c. intended purposes (can be propitiatory, commemorative, therapeutic, or some kind of rite of passage)
- d. may induce receptive attitude or trance states

Roy Rappaport's (1999) *Ritual and Religion in the Making of Humanity* provides a masterful summary of how religious ritual creates personal meanings for its practitioners as it links humans in cooperative groups and to a transcendent order. In his definition of ritual, the phrase "acts and utterances not encoded by the performers themselves" refers to the fact that the forms of the ritual were not invented by the people participating in the ritual. Instead they were handed down by ancestors or gods. Thus, participants in a ritual are linking themselves to an order (as inscribed in the acts and utterances of the ritual) that is ancient or even timeless and sanctioned by tradition and the highest authority.

Rappaport (1999) emphasizes that one does not need to believe in the truth value or claims of the ritual utterances in order to gain the benefits of ritual. Participation is all that is required (although belief can sometimes help). Participation implies some amount of acceptance of the ancient order referred to in the ritual performance. The connection to ancient inherited traditions carries with it access to meanings acquired from past generations.

Rappaport presents a detailed and nuanced view of the ritual processes that yield meaning. He begins by distinguishing between two kinds of messages that ritual conveys. The first is self-referential and concerns the current physical, psychic, or social states of the performers of the ritual. Most importantly, their presence at the ritual informs everyone present (including themselves) that they accept the invisible and sacred order referred to in the ritual. One's presence at the ritual, then, to some extent, delivers a message that he or she is open to the possibility of a transcendent order and all the other meanings of the ritual. Thus, one's presence at the ritual is said to be self-referential. In short, participation in ritual sends a message to oneself and the others present, and that message is something like this: "We have here a group of people gathered in a sacred space all of whom at least provisionally choose to entertain the idea that a transcendent and ancient order might exist and that that order can potentially impart meaning to daily life." That is a very powerful, almost unconscious, effect of religious ritual: It raises the question—the hope, really—that transcendent order exists and that that order will give meaning and purpose to daily life.

The second type of message encoded in ritual underlines this fact and the timeless order conveyed by ritual. These are the canonical messages such as sacred texts, prayers, incantations, and pronouncements. They are not encoded or created by the participants but are, instead, the relatively invariant messages about the nature of the world that participants take from the liturgy of the rite. Thus, in addition to the benefits of mere participation in the rite, religious participants also obtain the added benefit of the meanings conveyed by sacred texts, music, and prayers.

Rappaport notes that some terms and categories used in the field of linguistics might also profitably be put to use in the field of ritual studies. Two

of these terms—"performatives" and "perlocutionary"—come from speech act theory. This is a branch of linguistics that deals with utterances that accomplish some action simply by pronouncing the utterance. For example, when a minister or priest utters the phrase "I now pronounce you man and wife" in the appropriate ritual context, the couple literally becomes man and wife. The utterance of the presiding minister is a performative, and the effect of the utterance on the couple is a perlocutionary. Or if someone says "I promise to . . .", he or she in the act of uttering those words binds him- or herself to accomplish the act promised and thus utters a performative. The motivation to fulfill the promise is the perlocutionary effect on the person who made the promise.

Rappaport points out that rituals exhibit some of the properties of performatives. As performatives, rituals and their messages (self-referential and canonical) produce specific kinds of public signs that all can see and receive, and these signs, in turn, produce predictable kinds of perlocutionary effects on both the participants and observers. Because rituals, in their performative capacity, cause certain states to exist, those states become indexical signs (an indexical sign is an index of some other event; for example, smoke indicates fire, a footprint indicates a person has passed by). In contrast to symbols and icons, indexical signs are very reliable means of conveying accurate information about the persons in the ritual (i.e., that they are attempting to adhere to and accept a certain transcendent order). Ritual performance indexes information about the participants. For example, it can communicate that a couple has become married, that a boy has become a man, or that two groups have made peace.

By their participation in a ritual display, participants also to some extent display commitment to its outcome. This is a hard-to-fake signal of commitment to a given outcome and order. Thus, participation in ritual protects against free-riders and promotes trust among the participants in the group. Free-riders are people who want to enjoy the benefits of group participation without paying any of the costs associated with membership. A sincere religious believer can be seen at religious services and can expound indefinitely on religious doctrine and so forth. No free-rider would be willing to learn all of that doctrine. By publicly obligating or committing people and conveying information about the obligation indexically, ritual protects the group from free-riders (because free-riders will not pay the costs of attending the rituals). We discuss the issue of costly signals and free-riders further below. In addition to being a costly signal, rituals help individuals link their personal goals into a hierarchy of values that are linked to a transcendent order.

Interestingly, Rappaport points out that canonical messages are most often not indexical but rather are symbolic. These symbols give the self-referential messages their meaning by specifying that they are linked to a transcendent order or to what it is that the ritual achieves (e.g., a marriage

or an initiation). It is the canon that defines the nature of the order it confers upon the participants.

In performing a ritual, Rappaport argues, a person accepts the canonical scheme governing the ritual and agrees to be bound by the obligations the ritual puts in place. A marriage is created, an initiation occurs, and so on, and all agree to be bound to the consequences of these newly established social orders. Crucially, this acceptance to be bound by the new order is not only something performers do in performing a ritual but also something they indexically convey to others, who can from then on consider them persons who have accepted that order.

In sum, Rappaport's explanation of how self-referential and canonical messages interact in ritual to produce new meanings illustrates a behavioral and often very social way that religion can produce meaning. Participation in religious rituals among other things sends messages to self and others about commitments, beliefs, and values of the participants. These messages are packed with guides regarding how to construct conceptual frameworks to engage in life-giving appraisals of both everyday and rare occurrences. Rappaport's description of how self-referential and canonical messages interact in ritual to virtually automatically produce new meanings illustrates a behavioral and often very social way that religion can generate meaning.

MIND/BRAIN CREATION OF MEANING

While religion is involved in the creation of meaning through a myriad of processes, this creation of meaning ultimately is mediated through the mind/brain. At this level, meaning is created largely through neural networks dedicated to (1) construction of the sense of self, (2) language, (3) concept formation, and, (4) surprisingly, sleep states. Interestingly, all of these functional domains (with the partial exception of sleep states) crucially involve the frontal lobes, so our review focuses on the role of the frontal lobes in meaning construction. A fair amount of information on how meaning is made by the mind/brain has accumulated. Where possible, we describe the potential religious correlates of this mind/brain construction, but, unfortunately, this cutting-edge research area of the confluence of religion, meaning, and the brain is still very new, and much remains unexplored (see Newberg & Newberg, 2005).

Self and Meaning

One of the most complex appraisal filters through which the brain evaluates events for their significance is the construct we call the Self. Virtually every event is evaluated in reference to the self: does it advance or hinder the aims of the self? It thus behooves us to briefly investigate brain mechanisms of this self.

Study of the self is important for the question of religion and meaning specifically because each self is unique and irreplaceable, and thus human dignity is linked with the sense of self we each experience. In addition, modern cognitive neuroscientific studies of the self indicate that virtually every higher cognitive function is influenced by the self: memories are encoded more efficiently when referred to the self; feelings and affective responses always include the self; fundamental attributions of intentionality, agency, and mind all concern selves in interaction with other selves and so on. Finally, study of the self is crucial for understanding many clinical disorders that involve breakdowns in the sense of self, including alterations in one's premorbid religious practices and religious orientation. Schizophrenia, obsessive-compulsive disorder, and some forms of temporal lobe epilepsy, for example, may heighten the sense of religiosity and may be associated with religious delusions. Parkinson's disease, on the other hand, may dampen the religious sense—at least in patients with frontal dysfunction. These disorders also involve dramatic breakdowns in the sense of self. More common disorders of self, such as depression or anxiety, can be accompanied by dramatic religious changes as well. In its capacity as "strength of character" or as a locus of virtues such as temperance, honesty, integrity, and trustworthiness (see below for further discussion of the role of character in religiousness), the self is intimately linked with religiosity insofar as religiosity is focused on building these character strengths. What, then, can neuroscience tell us about the roots and functions of the self?

The problem of the self has been somewhat intractable to analysis because the sense of self is so complex. The sense of self appears to draw on several psychological and neuropsychological domains such as autobiographical memory, emotional and evaluative systems, agency or the sense of being the cause of some action, self-monitoring, bodily-awareness, mind-reading or covert mimicking of other's mental states, subjectivity or perspective in perception, and, finally, the sense of unity conferred on consciousness when it is invested with the subjective perspective (Churchland, 2002; Gallagher, 2000; Metzinger, 2003; Northoff & Bermpohl, 2004). Any account of the psychology of self should at least be consistent with most or all of these properties.

In the absence of a theory that can account for all of the above properties of self, we argue that carefully considering the neuropsychological correlates of the sense of self will help narrow down key aspects of the self (see also LeDoux, 2002; Northoff & Bermpohl, 2004; Vogeley & Fink, 2003) that might help us identify links between self, religion, and meaning.

A number of investigators have suggested that the human sense of self depends crucially on prefrontal cortex (Craik, Moroz, & Moscovitch, 1999; McNamara et al., 1995; Miller et al., 2001; Vogeley, Kurthen, Falkai, & Maier, 1999). A review of the behavioral effects of prefrontal leucotomies led Weingarten (1999) to suggest that prefrontal lobes mediate some aspects of

social sense of self and autonomy. Families of persons who sustain traumatic brain injury with orbitofrontal lesions invariably report that their relative's identity is profoundly altered, if not destroyed (Schnider & Gutbrod, 1999). Similarly, when a dementing process begins to invade basal forebrain and medial frontal sites, personality changes become marked and striking. Miller et al. (2001) reported that 7 of 72 patients with probable frontal-temporal dementing disorders exhibited a dramatic change in self. In 6 of these 7 patients, the selective dysfunction involved the right frontal region. In contrast, only one of the other 65 patients without selective right frontal dysfunction showed a change in self.

Experimental and functional imaging studies have pointed to the frontal lobes as crucial for the sense of self. Right frontal activation has been associated with experience of the self (Craig et al., 1999). Craig et al. showed that right frontal sites were activated whenever subjects processed or memorized materials referring to the self. Similarly, Fink et al. (1996) reported selective activation of right prefrontal cortical regions in subjects engaged in recall of personal versus impersonal long-term episodic memories. In a more recent functional imaging study, Kelley et al. (2002) confirmed that self-referential processing could be functionally dissociated from other forms of semantic processing within the human brain. Volunteers were imaged while making judgments about trait adjectives under three experimental conditions (self-relevance, other relevance, or case judgment). Relevance judgments, when compared to case judgments, were accompanied by activation of the left inferior frontal cortex and the anterior cingulate. A separate region of the medial prefrontal cortex was selectively engaged during self-referential processing, implying that medial prefrontal sites support self-related information-processing functions. In a seminal review of positron emission tomography (PET) studies on episodic encoding and retrieval processes, Wheeler, Stuss, and Tulving (1997; see also Nyberg et al., 1996) concluded that episodic retrieval of personal memories is associated with an increased blood flow in the right frontal cortex with no increased blood flow in the left frontal cortex; while episodic encoding is associated with the opposite pattern—that is, increased flow in left frontal cortex and no increased flow in right frontal cortex. They call this set of findings HERA, for hemispheric encoding/retrieval asymmetry.

Keenan, Nelson, O'Connor, and Pascual-Leone (2001) presented a series of pictures to a group of patients undergoing an intracarotid amobarbital test. The pictures represented faces generated by morphing the image of a famous person with the patient's own face, and participants were asked to remember what picture was shown during selective anesthesia of the right and the left hemispheres. Results indicated that most patients were unable to remember seeing their own face following an inactivation of the right hemisphere, whereas anesthesia of the left hemisphere did not interfere with

recall of the self face. These results once again implicate right frontal cortex in support of the self.

The right frontal cortex (both at the orbito- and dorsolateral poles) differs from its left-sided counterpart in that it receives a more dense set of afferents coursing from the neostriatal and limbic systems, and it may also receive greater innervation from serotonergic and noradrenergic cell groups in the brain stem (Bruder, 2003; Ongur & Price, 2000). Dopaminergic cell groups that project to the right prefrontal cortex display a more enhanced response to stress than dopaminergic cell groups projecting to the left prefrontal cortex (Berridge, Espana, & Stalnaker, 2003). These intriguing anatomical peculiarities suggest that the right frontal cortex is ideally positioned to integrate the wealth of emotional information delivered to it from subcortical limbic sites with high-level intentional and communicative functions of the frontal cortex.

In summary, a number of clinical, neuroimaging, and experimental studies of brain systems that contribute to the sense of self point to the frontal lobes as key. Right frontal cortex appears to be particularly important. Little is currently known about how religious aspects of the self are stored in the brain, but it is likely that the frontal lobes hold these representations of the religious self as well.

Language Networks and Meaning

Although meaning does not require language to function (after all, animals and humans who have lost core aspects of the language faculty nevertheless compute meanings), the development of language surely facilitated the expansion of the human meaning-making capacity. How do brain networks mediate core aspects of the language faculty? These core aspects include a lexicon, a grammar, and a set of rules linking lexical, grammatical, and semantic modules to produce sentences and utterances. Every sentence, for instance, assigns basic thematic roles (who did what to whom) to sentence constituents, and this theta role assignment process must, to some extent, intersect with the appraisal process discussed above.

Evidence for brain mediation of language function comes primarily from the clinic and from neuroimaging studies (Kertesz, 1999). We cannot review this vast field of studies here. Suffice it to say that left-sided frontal networks appear to mediate grammatical aspects of language, and left-sided posterior sites are important for language comprehension. Right-sided frontal networks are important for producing and understanding language in context, the pragmatic aspects of language use, including the appropriate use of speech acts mentioned above. Right-sided posterior sites are important for mediating prosodic aspects of speech or the emotional tone of a person's voice. These language functions are likely intimately tied to individuals'

meaning-making processes, including those involving religious construals (Atran & Norenzayan, 2004).

Concept Formation

Much of our understanding of how the brain mediates concept formation comes from performances of brain-damaged subjects' performances on the Wisconsin Card Sort Test (WCST) of concept formation (Lezak, 1995, p. 61). In the basic setup of the WCST, the patient is given a pack of 60 cards on which are printed one to four symbols (e.g., a triangle or two stars or four circles). The symbols can also vary in color (red, green, yellow). The patient's task is to sort the 60 cards under four category cards (one red triangle; two green stars; three yellow crosses, and four blue circles). As the patient is attempting to guess what the sorting rule is for each category, the examiner informs him or her about whether each move is correct or incorrect. With enough trial and error sorts, the patient begins to form a concept of the rule that the examiner is using and, thus, what the correct rule is (e.g., "match all cards to the color of the category card and ignore the fact that it is also a triangle"). After 10 trials, the examiner secretly shifts the sort rule, and the patient must begin again to learn the correct sorting rule and thus learn the new concept the examiner is using as a rule. After six sorting trials, the examiner has a pretty good idea of how well the patient learns new concepts as well as the flexibility displayed by the patient in unlearning an old sorting rule and switching to a new one. Decades of use of the WCST suggests that patients with frontal lesions have the most difficulty with the test.

This process of concept formation, then, which occurs primarily in the frontal lobes, is a central component of meaning making. Concepts comprise the broad outlines of global meaning, discussed above. Regarding the links between religion, meaning, and the brain, the concepts more related to the supernatural—such as God, causality, morality, sin, suffering, and afterlife—clearly depend on these basic frontal lobe processes. Such concepts are apparently formed early (Boyatzis, 2005) but are subject to change throughout life as individuals confront experiences that may challenge their understanding of how the world works (Park, 2005).

Sleep-Associated Consolidation of Memories

We have argued that meaning is produced by the brain primarily via the accumulation of memories over time. It turns out that the sleeping brain plays a critical role in this process. Information gathered during the wake state appears to depend on hippocampal-cortical interactions that occur during both NREM (non-rapid eye movement) slow wave sleep (SWS) and REM (rapid eye movement) sleep and involve some sort of replay during REM sleep

of learned associations acquired while awake (Buzsaki, 1996; Plihal & Born, 1997; Smith, 1995; Wilson & McNaughton, 1994). Wilson and McNaughton (1994), for example, showed that hippocampal cells that are active when rats learn a new maze are also active during subsequent sleep. Using PET and other scanning techniques, similar effects (re-activation of brain sites activated during learning) have been reported in humans (Laureys et al., 2001). Stickgold, Scott, Fosse, and Hobson (2001) have reported that learning a visual discrimination task was disrupted by selective deprivation of both REM and NREM. Similarly, Plihal and Born (1997) have reported that learning of paired associates and mental rotation tasks but not procedural memory tasks is dependent on subsequent NREM (early sleep) rather than REM (late morning sleep) periods for their consolidation. Although these studies are impressive, caution is required in interpreting many of the putative effects of sleep on memory systems. The role of REM sleep in memory consolidation, in particular, appears to have been somewhat overestimated. Nevertheless, the cumulative results from genetic, molecular, neuroimaging, and cognitive studies (Hairston & Knight, 2004; Hobson & Pace-Schott, 2002; Laureys et al., 2001; Maquet, Smith, & Stickgold, 2003; Walker, Brakefield, Hobson, & Stickgold, 2003) converge on the conclusion that sleep may be crucial for facilitating certain components of the processes of neural plasticity and for learning and memory.

Many authors have proposed that the hippocampus provides a rapidly encoded, but sparse, memory storage system ideal for the formation of distinct episodic memories. In contrast, the neocortex offers a slowly consolidating, dense memory storage system. Formation of independent memories within the neocortex results from frequent reactivation of the memory trace, either by reenactment of a sensorimotor pattern, as in most procedural learning paradigms, or by activation of a hippocampal representation of the memory, which would reactivate the cortical pattern. By using slow, automatic replay from the hippocampus (over days, weeks, or even years), high-density overlapping storage becomes feasible. Such replay may occur during SWS, when information is believed to flow from the hippocampus to the cortex and when there would be no competition from external sensory inputs. Such a model is supported by the findings of Plihal and Born (1997) noted above, suggesting a role for SWS in declarative memory consolidation.

While information appears to flow from hippocampus to cortex during SWS, theta rhythms are thought to support transfer of information in the opposite direction during REM sleep. Theta waves enhance hippocampal long-term potentiation (LTP), a candidate mechanism for memory formation. Interestingly, this synchronization with theta wave activity during REM sleep appears to shift from in-phase (i.e., correlating with the peak activity of the theta wave) to out-of-phase (correlated with the troughs of inactivity) over four to seven days of daily exposure to a new environment.

Such a shift could produce a switch from LTP and memory consolidation to memory erasure.

Together, these findings suggest a model of sequential memory processing in which different types or aspects of memories, including emotional memories, are processed progressively over the course of the night. In this model, specific memories from the recent past could be identified at sleep onset for subsequent reprocessing, and then stabilized or strengthened, possibly during NREM sleep, and integrated into cortical networks during REM. The model also suggests that meaning construction takes about seven days to coalesce. For episodic and emotional memories, cortical traces could be reactivated by hippocampal inputs during NREM and then linked in cortex during REM. The alternating REM and NREM periods would then permit several cycles of stabilization and integration, where the first cycle processes the memories reactivated at sleep onset and each subsequent cycle takes the products of memory integration from the preceding cycle as its starting point. The shift from predominantly SWS early in the night to REM late in the night would then reflect an underlying shift from an emphasis on stabilization and strengthening of waking memories early in the night toward the integration and establishment of new associative connections later in the night.

This knowledge of the mapping of the processes of memory consolidation and repeated elaboration and processing onto neurological substrates has not yet been applied to the meaning-making literature, but it clearly has important implications. In particular, the meaning-making literature notes that processes of repeated exposure and cognitive reappraisal are necessary to incorporate stressful events into one's global meaning system, sometimes over a period of years (Park & Folkman, 1997). Through this process of reappraisal, individuals are able to gain a new and more consistent understanding of the event (e.g., coming to see it as less aversive or problematic) or, sometimes, to change their global meaning system to accommodate the new information (e.g., changing their global beliefs in invulnerability or control) (Park, 2005). Although some of the intrusions and reappraisals occur during waking hours, it is likely that some important processing of this information also occurs during the processes of sleep. People with post-traumatic stress disorder, for example, often complain of intense dreams in which they essentially replay certain aspects of their original traumas. Hartmann (1998) has presented data that suggest that this replay of traumatic memories represents a process of slow integration of these unpleasant events into the long-term memory systems that ultimately serve as the basis of the meaning-making systems.

SYNDROMES OF MEANING LOSS

The brain is a pattern-detection device that operates on meaning; if no pattern is detectable, the brain seeks to create one. This is a truism throughout

psychology, but neuropsychological syndromes provide particularly vivid illustrations of this search for meaning (e.g., Anton's syndrome, in which the patient is blind but does not believe he or she is blind, or confabulation syndrome after frontal lobe injury, in which the patient compulsively invents elaborate stories whenever unable to answer a simple question due to loss of memory).

Persons with right frontal lobe deficits, for example, may cling to an erroneous belief no matter how much evidence to the contrary is available (see articles in Christodoulou, 1986). In Capgras syndrome, for example, the patient believes his wife has been duplicated in every physical respect and thus is an imposter. He realizes it is a fantastic belief but he cannot shake it. In Othello syndrome, the patient is convinced of the infidelity of the spouse, and no amount of evidence to the contrary (often presented by a despairing family) will shake the belief. McNamara and Durso (1991) showed that the delusional belief system in one patient with Othello's syndrome was associated with catecholaminergic dysfunction in the frontal lobe. In *folie à deux*, two closely related persons—usually a mother and child or an adult couple—hold a delusional belief about their environment despite overwhelming evidence to the contrary. Theorists of these syndromes usually suggest a disconnect between frontal and temporal lobes such that mnemonic information from temporal sites cannot be integrated with control processes in the frontal lobe. In order to persist, beliefs must be protected from the effects of interference or countervailing evidence. This protection probably depends on insulating the belief from evaluation by insight systems (anteriorly located cortical systems). These syndromes illustrate both the overwhelming need for individuals to create and maintain a sense of meaning despite great obstacles to this creation and maintenance and the dependence of this meaning creation and maintenance on neural functioning.

OVERLAP OF BRAIN NETWORKS MEDIATING MEANING AND RELIGION

We have elsewhere (McNamara, 2000, 2001; McNamara, Durso, & Brown, 2003) reviewed the evidence for participation of the frontal lobes in religiosity and in functions likely to be related to religiosity. Recent neuroimaging studies (Newberg et al., 2001; Newberg, Pourdehnad, Alavi, & d'Aquili, 2003) confirm participation of frontal lobes in prayer and meditation. This should not be surprising when one considers what is required to pray to a God conceived as a personal being with paradoxical properties. To communicate with such a being, we would employ all those capacities we have developed to communicate with persons we interact with on a daily basis. The frontal lobes, for example, mediate processes of agency, theory of mind, prosocial behaviors of empathy and moral insight, belief fixation, self-awareness, and emotional processing (Damasio, 2005). The right frontal cortex, in particular, appears

to mediate the sense of self, crucial mind-reading abilities, inferences about social interactions, discourse, autobiographical recall, and delusional belief fixation (see review of right frontal functions in Edwards-Lee & Saul, 1999). Thus, it is clear that the frontal lobes must be critically involved in fundamental aspects of religious cognition.

We have seen that neural networks that mediate meaning construction are widely distributed across brain regions but crucially involve the right frontal cortex. Our earlier reviews of religion-related cognitive functions also implicated the right frontal cortex. We make no claims about the significance of this overlap, but merely note it for future investigation.

EVOLUTIONARY FORCES

The above discussion has focused on the question of *how* religion (in contrast to the brain) produces meaning. At a minimum, religion appears to rely heavily on production and comprehension of messages in ritual contexts (self-referential, performative, indexical, and canonical in Rappaport's scheme) to make a multitude of meanings available to recipients of the messages. The brain, on the other hand, appears to rely on various types of memories to provide conceptual frameworks with which to evaluate or appraise all kinds of events and experiences. From the point of view of survival, it is not clear why people would need a system such as the messages encoded in religious rituals to produce meanings when the system based on memories seems more than adequate.

In this final section, we attempt to address *why* humans want to produce meanings via religious rituals. We argue that religious ritual might have functional components linked to its capacity to produce meaning. Several of the chapters in this volume advance a costly signaling theory (CST) of religious ritual (see chapters by Sosis [Vol. 1, chap. 4], Alcorta [Vol. 2, chap. 4], & Bubulia [Vol. 1, chap. 5] and the contributions of Sosis, 2005; Sosis & Alcorta, 2003). We therefore offer the following in the spirit of these other chapters. Our reading of the implications of CST for religion and meaning starts from the paradoxical observation that rituals seem nonsensical and empty of meaning rather than full of meanings as we argued above. CST is perfectly comfortable with apparently empty and meaningless practices and behaviors because these practices and behaviors can be considered "costly" to the individual who engages in them. CST likes costly practices because they can function as honest or hard-to-fake signals. The costlier the signal, the better it is (up to a point). Using these CST-related assumptions, religion and religious practices (including rituals) may be designed to signal commitment to the group with which the sender wants to cooperate. It is as though the person is saying, "I am willing to adopt all these crazy [costly] practices and participate in these meaningless rituals, and do all this consistently over time. Therefore,

I am not a fake or a free-rider. Costly signals are hard to fake; therefore you can conclude that I am truly committed to the group. No fake or free-rider would be willing to incur the costs of all of these practices and rituals and restrictions, so this proves I am trustworthy, so allow me to be a member in good standing and get all the benefits of cooperation with other group members." In other words, costly signals (or costly behaviors) function to identify the sender as honest and committed and not a free-rider (Fehr & Rockenbach, 2004). Humans, therefore, need to develop techniques to advertise their honesty, integrity, and non-free-rider status. They also need costly signals to advertise their "good genes"—analogous to the peacock's tail, wherein the more wasteful and flamboyant the tail, the better the prospects for attracting the attention of the peahen. The peacock's message is, "Look at my elaborate and wasteful tail. This tail proves that my genes are good enough to sustain wasteful metabolic gambits. Even though I have this useless tail I can still function perfectly well; therefore I must have great genes." Examples of these types of advertisements in humans might be the wealthy men in traditional societies who exhibit conspicuous consumption.

How does all this apply to the meaning-making capacities of religion? In the context of religion, how can one send a signal that he or she is truly committed to the religious group? The answer is to become a "true believer" and passionately convince oneself that the doctrines are true. The best example is the professional religionist, such as a clergy person or theologian. Who else can afford to spend so much time on arcane religious doctrines? Therefore, the ability to derive meaning from apparently meaningless rituals and practices may be an indicator of true commitment or "good genes," because it is a costly, hard-to-fake signal of commitment to the religion. Also the willingness to spend a lifetime on arcane rituals and doctrinal study signals someone who can extract meaning from the most obscure or seemingly meaningless texts and rituals. In a chaotic world, we need people who are proficient at finding meaning and patterns where no such patterns appear to exist. People who are professional pattern-detectors or meaning-extractors are likely better able to survive under adverse circumstances than those who are unable to find patterns in apparent chaos (or, to put it negatively, to delude themselves). The victims in the concentration camps who were able to maintain a belief in a good god despite the overwhelming evidence to the contrary were, indeed, the ones who survived.

CONCLUDING COMMENTS

This chapter provides a broad and brief overview of the convergence of religion, meaning, and the mind/brain processes that underlie them both. Researchers have been busy defining and exploring the making of meaning and its implications for psychological and physical well-being. Further,

researchers have been paying increasing attention to the roles of religion in this meaning making (e.g., Park, 2005). Meanwhile, neuroscience work proliferates, and scientists are working to link religious phenomena with the brain (d'Aquili & Newberg, 1999; McNamara, 2001; Newberg & Newberg, 2005; and see other chapters in these volumes). However, bringing together religion, meaning, and the brain is relatively uncharted territory. This chapter summarized the meaning of *meaning* and reviewed the reasons that religion may be a particularly potent source of meanings. We also examined the ways in which the mind/brain integrates and creates new meanings on a day-to-day basis, relying particularly on memory, and illustrated the critical nature of these meanings by highlighting what happens when the meaning system breaks down due to brain damage. In pulling these notions together, we are frustrated with the lack of integrative theories or empirical findings, but we also feel quite optimistic that, as this field advances, the religious involvements in making meaning will receive increasing emphasis and that brain scientists will find it worthwhile to map these meaning-making processes onto brain systems.

REFERENCES

- Aldwin, C.M. (in press). *Stress, coping, and development* (2nd ed.). New York: Guilford Press.
- Atran, S., & Norenzayan, A. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences*, 27(6), 713–770.
- Baumeister, R. F. (1991). *Meanings of life*. New York: Guilford Press.
- Berridge, C. W., Espana, R. A., & Stalnaker, T. A. (2003). Stress and coping: Asymmetry of dopamine efferents within the prefrontal cortex. In B. K. Hugdahl & R. J. Davidson (Eds.), *The asymmetrical* (pp. 69–104). Cambridge, MA: MIT Press.
- Boyatzis, C. J. (2005). Religious and spiritual development in childhood. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 123–143). New York: Guilford Press.
- Bruder, G. E. (2003). Frontal and parietotemporal asymmetries in depressive disorders: Behavioral electrophysiologic and neuroimaging findings. In B. K. Hugdahl & R. J. Davidson (Eds.), *The asymmetrical* (pp. 719–742). Cambridge, MA: MIT Press.
- Buzsaki, G. (1996). The hippocampo-neocortical dialogue. *Cerebral Cortex*, 6(2), 81–92.
- Chaiken, S., & Trope, Y. (1999). *Dual-process theories in social psychology*. New York: Guilford Press.
- Christodoulou, G. N. (1986). The delusional misidentification syndromes. *Basel: Bibliotheca Psychiatrica*, 164, 143–148.
- Churchland, P. S. (2002). Self-representation in nervous systems. *Science*, 296, 308–310.
- Craik, F. I. M., Moroz, T. M., & Moscovitch, M. (1999). In search of the self: A positron emission tomography study. *Psychological Science*, 10, 129–178.
- Damasio, A. (2005). The frontal lobes. In K. Heilman & E. Valenstein (Eds.), *Clinical neuropsychology* (4th ed., pp. 404–446). Cambridge, England: Cambridge University Press.

- d'Aquili, E. G., & Newberg, A. B. (1999). *The mystical mind: Probing the biology of religious experience*. Minneapolis: Augsburg Fortress Press.
- Edwards-Lee, T. A., & Saul, R. (1999). Neuropsychiatry of the right frontal lobe. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorder* (pp. 304–320). New York: Guilford Press.
- Emmons, R. A. (1999). *The psychology of ultimate concerns*. New York: Guilford Press.
- Fehr, E., & Rockenbach, B. (2004). Human altruism: Economic, neural and evolutionary perspectives. *Current Opinion in Neurobiology*, *14*, 784–790.
- Fink, G. R., Markowitsch, H. J., Reinkemeier, M., Bruckbauer, T., Kessler, J., & Heiss, W. D. (1996). Cerebral representation of one's own past: Neural networks involved in autobiographical memory. *Journal of Neuroscience*, *16*(13), 4275–4282.
- Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive science. *Trends in Cognitive Science*, *4*, 14–21.
- Hairston, I. S., & Knight, R. T. (2004). Neurobiology: Sleep on it. *Nature*, *430*(6995), 27–28.
- Hartmann, E. (1998). *Dreams and nightmares: The new theory on the origin and meaning of dreams*. New York: Plenum Press.
- Hobson, J. A., & Pace-Schott, E. F. (2002). The cognitive neuroscience of sleep: Neuronal systems, consciousness and learning. *Nature Reviews Neuroscience*, *3*(9), 679–693.
- Keenan, J. P., Nelson, A., O'Connor, M., & Pascual-Leone, A. (2001). Self-recognition and the right hemisphere. *Nature*, *409*, 305.
- Kelley, W. M., Macrae, C. N., Wyland, C. L., Caglar, S., Inati, S., & Heatherton, T. F. (2002). Finding the self? An event-related fMRI study. *Journal of Cognitive Neuroscience*, *14*, 785–794.
- Kertesz, A. (1999). Language and the frontal lobes. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 261–276). New York: Guilford Press.
- Laughlin, C. D., & Throop, C. J. (2001). Imagination and reality: On the relations between myth, consciousness, and the quantum sea. *Zygon*, *36*, 709–736.
- Laureys, S., Peigneux, P., Phillips, C., Fuchs, S., Degueldre, C., Aerts, J., et al. (2001). Experience-dependent changes in cerebral functioning connectivity during human rapid eye movement sleep. *Neuroscience*, *105*, 521–525.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, coping, and appraisal*. New York: Springer.
- LeDoux, J. E. (2002). *Synaptic self: How our brains become who we are*. New York: Viking Press.
- Lezak, N. D. (1995). *Neuropsychological assessment* (3rd ed.). New York: Oxford University Press.
- Loevinger, J. (1976). *Ego development: [Conceptions and theories]*. San Francisco: Jossey-Bass.
- Loevinger, J., Wessler, R., & Redmore, B. (1970). *Measuring ego development*. San Francisco: Jossey-Bass.
- Maier, S. F., & Watkins, L. R. (2002). Cytokines for psychologists: Implications of bidirectional immune to brain communication for understanding behavior mood and cognition. In J. T. Caciopo, G. G. Bernstrom, R. Adolphs, C. Carter, R. Davidson,

- M. McClintock, B. McEwen, M. Meaney, D. Shachter, E. Sternberg, S. Suomi, & S. Taylor (Eds.), *Foundations in social neuroscience* (pp. 1141–1182). Cambridge, MA: MIT Press.
- Maquet, P., Smith, C., & Stickgold, R. (2003). *Sleep and brain plasticity*. Oxford, England: Oxford University Press.
- Maruta, T., Colligan, R. C., Malinchoc, M., & Offord, K. P. (2000). Optimists vs. pessimists: Survival rate among medical patients over a 30-year period. *Mayo Clinic Proceedings*, 75(2), 140–143.
- McNamara, P. (2000). The frontal lobes, social intelligence, and religious worship. Ideas for creative research in neurobiology. John Templeton Foundation. http://www.templeton.org/pdf/creative_research.pdf, pp. 50–60.
- McNamara, P. (2001). Frontal lobes and religion. In J. Andresen (Ed.), *Religion in mind* (pp. 237–256). Cambridge, England: Cambridge University Press.
- McNamara, P., & Durso, R. (1991). Reversible Othello syndrome in a man with Parkinson's disease. *American Journal of Geriatric Neurology and Psychiatry*, 4(3), 157–159.
- McNamara, P., Durso, R., & Brown, A. (2003). Relation of "sense of self" to executive function in Parkinson's disease. *Cognitive and Behavioral Neurology*, 14, 139–148.
- McNamara, P., von Harscher, H., Scioli, T., Krueger, M., Lawson, D., & Durso, R. (1995). The sense of self after brain damage: Evidence from aphasics and individuals with Parkinson's disease. *Journal of Cognitive Rehabilitation*, November/December, 16–23.
- Metzinger, T. (2003). *Being no one: The self-model theory of subjectivity*. Cambridge, MA: MIT Press.
- Miller, B., Seeley, W. W., Mychack, P., Rosen, H. J., Mena, I., & Boone, K. (2001). Neuroanatomy of the self: Evidence from patients with frontotemporal dementia. *Neurology*, 57(1), 817–821.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research: Neuroimaging*, 106, 113–122.
- Newberg, A. B., & Newberg, S. K. (2005). The neuropsychology of religious and spiritual experience. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 199–215). New York: Guilford Press.
- Newberg, A., Pourdehnad, M., Alavi, A., & d'Aquili, E. (2003). Cerebral blood flow during meditative prayer: Preliminary findings and methodological issues. *Perceptual and Motor Skills*, 97, 625–630.
- Northoff, G., & Bermpohl, F. (2004). Cortical midline structures and the self. *Trends in Cognitive Sciences*, 8(3), 102–107.
- Nyberg, L., McIntosh, A. R., Cabeza, R., Nilsson, L. G., Houle, S., Habib, R., et al. (1996). Network analysis of positron emission tomography regional cerebral blood flow data: Ensemble inhibition during episodic memory retrieval. *Journal of Neuroscience*, 16(11), 3753–3759.
- Ongur, D., & Price, J. L. (2000). The organization of networks within the orbital and medial prefrontal cortex of rats, monkeys and humans. *Cerebral Cortex*, 10, 206–219.
- Pargament, K. I., Ano, G. G., & Wachholtz, A. B. (2005). The religious dimension of coping: Advances in theory, research, and practice. In R. F. Paloutzian & C. L. Park

- (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 479–495). New York: Guilford Press.
- Park, C.L. (2005). Religion and meaning. In R.F. Paloutzian & C.L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 295–314). New York: Guilford Press.
- Park, C.L., & Folkman, S. (1997). Meaning in the context of stress and coping. *General Review of Psychology, 1*, 115–144.
- Plihal, W., & Born, J. (1997). Effects of early and late nocturnal sleep on declarative and procedural memory. *Journal of Cognitive Neuroscience, 9*(4), 534–547.
- Rappaport, R. (1999). *Ritual and religion in the making of humanity*. Cambridge, England: Cambridge University Press.
- Reite, M., Kaemingk, K., & Boccia, M.L. (1989). Maternal separation in bonnet monkey infants: Altered attachment and social support. *Child Development, 60*(2), 473–480.
- Reite, M., Seiler, C., & Short, R. (1978). Loss of your mother is more than loss of a mother. *American Journal of Psychiatry, 135*(3), 370–371.
- Sauro, M.D., & Greenberg, R.P. (2005). Endogenous opiates and the placebo effect: A meta-analytic review. *Journal of Psychosomatic Research, 58*(2), 115–120.
- Schnider, A., & Gutbrod, K. (1999). Traumatic brain injury. In B.L. Miller & J.L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 487–508). New York: Guilford Press.
- Schulz, R., Bookwala, J., Knapp, J.E., Scheier, M., & Williamson, G.M. (1996). Pessimism, age, and cancer mortality. *Psychology and Aging, 11*(2), 304–309.
- Silberman, I. (in press). Religion as a meaning system: Implications for the new millennium. *Journal of Social Issues*.
- Smith, C. (1995). Sleep states and memory processes. *Behavioural Brain Research, 69*(1–2), 137–145.
- Spilka, B., Hood, R.W., Jr., Hunsberger, B., & Gorsuch, R. (2003). *The psychology of religion: An empirical approach* (3rd ed.). New York: Guilford Press.
- Spilka, B., Shaver, P.P., & Kirkpatrick, L.A. (1997). A general attribution theory for the psychology of religion. In B. Spilka & D.N. McIntosh (Eds.), *The psychology of religion: Theoretical approaches* (pp. 153–170). Boulder, CO: Westview Press.
- Sosis, R. (2005). Does religion promote trust? The role of signaling, reputation, and punishment. *Interdisciplinary Journal of Research on Religion, 1*, 1–30.
- Sosis, R., & Alcorta, C. (2003). Signaling, solidarity, and the sacred: The evolution of religious behavior. *Evolutionary Anthropology, 12*, 264–274.
- Stickgold, R., Scott, L., Fosse, R., & Hobson, J.A. (2001). Brain-mind states: I. Longitudinal field study of wake-sleep factors influencing mentation report length. *Sleep, 24*(2), 171–179.
- Vogel, K., & Fink, G.R. (2003). Neural correlates of the first-person perspective. *Trends in Cognitive Sciences, 7*, 38–42.
- Vogel, K., Kurthen, M., Falkai, P., & Maier, W. (1999). Essential functions of the human self model are implemented in the prefrontal cortex. *Consciousness and Cognition, 8*(3), 343–363.
- Walker, M.P., Brakefield, T., Hobson, J.A., & Stickgold, R. (2003). Dissociable stages of human memory consolidation and reconsolidation. *Nature, 425*(6958), 616–620.

- Weingarten, S. M. (1999). Psychosurgery. In B. L. Miller & J. L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 446–460). New York: Guilford Press.
- Wheeler, M. A., Stuss, D. T., & Tulving, E. (1997). Toward a theory of episodic memory: The frontal lobes and autonoetic consciousness. *Psychological Bulletin*, *121*(3), 331–354.
- Wilson, M. A., & McNaughton, B. L. (1994). Reactivation of hippocampal ensemble memories during sleep. *Science*, *265*, 676–679.
- Wong, P. T. P., & Fry, P. S. (1998). *The human quest for meaning*. Mahwah, NJ: Erlbaum.

THE DARKER SIDE OF RELIGION: RISK FACTORS FOR POORER HEALTH AND WELL-BEING

Gina Magyar-Russell and Kenneth Pargament

INTRODUCTION

Although the founders of psychology believed that religion represented a critical topic of interest for the newly emerging field, empirical studies of religion lost favor for much of the twentieth century, perhaps because psychodynamic theories cast it in a negative light or perhaps because behaviorally oriented psychologists were eager to establish the discipline as a hard science and had little interest in a phenomenon as “soft” as religion. In the latter part of the century, this picture changed. An upsurge of religious study occurred within the health and social sciences, and, in contrast to critical depictions of religion within some major theoretical traditions, the mass of evidence from these empirical studies suggested that religion is generally linked to better health and well-being (e.g., Koenig, McCullough, & Larson, 2001).

Much of this research, however, has relied on global indicators of religiousness. Operationally, religion is defined by how often an individual attends religious services, how often he or she prays or meditates, whether the person belongs to a particular religious denomination, and how the individual rates him- or herself on a scale of religiousness. As a whole, these studies indicate that a greater degree of religious involvement among people in the United States is generally beneficial. Yet, because religion has been measured in such global ways, these studies provide little information about the specifics of religious life. In particular, this broad approach to religious study obscures the possibility that certain specific forms of religiousness have different, even deleterious, implications for health and well-being.

In fact, there are theoretical reasons to suggest that some religious expressions may be harmful rather than helpful. Consistent with this theory, a small but growing body of empirical study has begun to identify “religious risk factors” for poorer health. In this chapter, we review theory and evidence relevant to these religious risk factors, consider some of the factors that may help explain the links between these risk factors and poorer health, and conclude with a discussion of the clinical and empirical implications of this emerging line of study. Before beginning, however, we would like to emphasize that, in focusing on religious risk factors, we are not suggesting that religion is on-the-whole harmful or more destructive than constructive. To the contrary, we believe the weight of evidence underscores the generally positive value of religiousness for health and well-being. Nevertheless, it is important to move from the general to the specific. In the interest of a balanced and complete understanding of religious life, it is incumbent on researchers and health professionals to learn about religion in all of its forms, the harmful as well as the helpful. We begin with a definition of religion.

DEFINING RELIGION

Elsewhere, Pargament (1997) has defined religion as a search for significance in ways related to the sacred. Three terms are critical to this definition: significance, search, and sacred. First, this definition rests on the assumption that people are goal-directed beings, motivated to attain value or significance in life (Klinger, 1998). Objects of significance vary from person to person; they may be material (e.g., money, possessions), physical (e.g., appearance, health), psychological (e.g., self-esteem, meaning and purpose), or social (e.g., intimacy, friendship). People can be defined, in part, by the distinctive configuration of significant objects that provide motivation and direction to their lives.

Second, this definition assumes that people are involved in a search for significance. Every search refers to an ultimate destination, “significance,” and a pathway to reach that destination. Pathways consist of thoughts, feelings, practices, and relationships that are designed to serve three interrelated purposes: to discover significance; to conserve or hold on to significance once it has been found; and to transform significance when required by internal or external changes and transitions.

The sacred element of religion includes concepts of God and the divine. The sacred also encompasses other aspects of life that take on transcendent character and significance by virtue of their association with, or representation of, divinity (Pargament & Mahoney, 2002). Through this process of sanctification, many seemingly secular parts of life can be perceived as sacred: time and space (the Sabbath, churches); events and transitions (birth, death); materials (wine, crucifix); cultural products (music, literature); people

(saints, cult leaders); psychological attributes (self, meaning); social attributes (compassion, community); and, roles (marriage, parenting, work).

People can pursue the sacred as one class of significant destinations in life. For example, they may seek to know God, build a holy marital bond, experience the transcendent, or bring the world into greater alignment with a divine vision. People can also integrate the sacred in the pathways they take to significance, through religious study, religious practice, religious experience, and involvement in religious community. But regardless of its particular expression, the involvement of the sacred in the search for significance is what distinguishes religion from other phenomenon.

Religion, from this perspective, is not a static set of beliefs or practices. It is instead a process by which the sacred becomes a part of the pathways people take in search of whatever they hold significant, including the sacred itself. This process is complex, multiform, and individualized. Why? Because there are innumerable pathways, because pathways shift and change over life, because people seek out many different destinations in living, and because the sacred can take so many different forms in people's pathways and destinations.

With this definition in mind, we consider some of the theoretical reasons that certain forms of religiousness may pose risks to health and well-being, and we review empirical studies that have begun to test these theories. We focus on four theories: motivational theory, attachment theory, process theory, and coping theory. Because much of the evidence for religious risk factors comes from coping theory, we pay particular attention to this area of research. The list below summarizes the religious risk factors that have been generated from these areas of theory and research.

RELIGIOUS RISK FACTORS FOR POORER HEALTH

Motivation Theory

- Idolatry

- Extrinsic Religious Motivation

- Religious Introjection (i.e., Guilt-Based, Externally Based Motivation)

Attachment Theory

- Avoidant Attachment to God

- Anxious Attachment to God

Process Theory

- Poor Fit between Religion and the Situation

- Religious Rigidity

- Lack of Religious Breadth and Depth

- Religious Extremism
- Coping Theory
 - Appraisals of Sacred Loss and Desecration
 - Religious Struggles
 - Divine Struggles
 - Intrapsychic Struggles
 - Interpersonal Struggles

MOTIVATIONAL THEORY AND RESEARCH

According to motivational theory, it matters “both what you pursue and why you pursue it” (Sheldon, Ryan, Deci, & Kasser, 2004). This point applies well to the religious realm. Initial empirical research suggests that people who devote more of their energy to the pursuit of spiritual ends experience emotional benefits. Emmons, Cheung, and Tehrani (1998) asked samples of college and community-based adults to generate their personal strivings and found that those who reported more spiritual strivings (e.g., seeking God’s will; seeking to deepen a relationship with God; attempting to live by one’s spiritual beliefs in daily life) manifested greater purpose in life and marital and overall life satisfaction. Furthermore, the correlations between these spiritual strivings and measures of subjective well-being were stronger than the correlations between all other strivings and well-being. On the other hand, people can sanctify destructive as well as constructive spiritual ends, and, as Parker Palmer (1998) wrote, “There are real dangers involved when the sacred gets attached to the wrong things” (p. 25). Drugs, alcohol, consumerism, and self-worship are a few of the ways in which people attempt to fill a spiritual vacuum. Consider how one man confused his thirst for God with a thirst for alcohol:

As my alcoholism progressed my thirst for God increasingly became transmuted into a thirst for the seemingly godlike experiences that alcohol induced. Alcohol gave me a sense of well-being and connectedness—and wasn’t that an experience of God? Alcohol released me from the nagging sense that I was never good or competent enough—and wasn’t that God’s grace? (Nelson, 2004, p. 31)

Unfortunately, there is little research on false gods. Yet there is no shortage of dramatic cases that point to the destructive implications of idolatry for health and well-being, from those who devote themselves to abusive spouses or despotic authority figures to those who center their lives around food, drugs, and alcohol. For example, commenting on the prevalence of self-worship among Nazis in World War II, Carl Jung (1945/1964) wrote:

caricature of man, and this inhuman mask is so unendurable, such a torture to wear, that he tortures others. He is split in himself, a prey to inexplicable contradictions. (p. 215)

Motivational theory also underscores the importance of why people involve themselves in religion. In a classic work, Gordon Allport compared intrinsically motivated religious individuals, those who approach their religion as an end in itself, favorably to extrinsically motivated people, those who “use their religion” for personal or social ends (Allport & Ross, 1967). Higher levels of extrinsic religiousness have been linked to poorer mental health in a number of studies (e.g., Donahue, 1985). Similarly, Ryan, Rigby, and King (1993) distinguished between religious motivation based on personal choice (i.e., “identification”) from religious motivation based on guilt, anxiety, and external pressures (i.e., “introjection”). In an empirical study of several Christian samples, they found that religious introjection was associated with poorer mental health, while religious identification was related to better mental health. These studies suggest that people may be at greater risk for problems when religiousness is pursued for reasons other than personal conviction.

ATTACHMENT THEORY AND RESEARCH

In his efforts to explain why institutionalized children often failed to thrive, psychiatrist John Bowlby (1969) developed a theory of attachment that has important implications for the psychology of religion. Bowlby proposed that an attachment system evolved in humans and other primates to protect helpless infants from internal and external dangers. He noted that infants and young children engage in a variety of attachment behaviors (e.g., crying, outstretched arms, clinging) to gain closer proximity to the caregiver in times of stress. Infants who develop a secure attachment to their parents achieve a safe haven from dangers and a secure base for exploration at other times. Not all children, however, attain secure attachments to their parents. Through observational studies of infant and parents, Ainsworth and her colleagues identified two types of insecure attachments: avoidant infants who appeared to be indifferent to separation and reunion with their parents, and anxious/ambivalent infants who showed a great deal of distress when separated from their parents and fearfulness in exploring the environment (Ainsworth, Blehar, Waters, & Wall, 1978). A large body of empirical evidence indicates that a person’s attachment system has important implications for his or her health and well-being (Maunder & Hunter, 2001).

Lee Kirkpatrick (2005) has argued persuasively that God can also be understood as an attachment figure. The parallels with parents are

numerous and striking, he concludes from his review of a diverse literature. First, as they do with parents, people often seek proximity to God in stressful situations. Second, like a parent, God can provide a haven of safety in dangerous times and a secure base from which to explore the world with confidence in safer conditions. In some sense, God may be the most ideal of attachment figures because, unlike parents, God can be perceived as immune to danger and continually available regardless of time or situation. Third, people who report that they have been separated from God often react with distress similar to children separated from their parents. Fourth, as with their parents, people can form insecure as well as secure attachments to God. In fact, Kirkpatrick (2005) cites a number of studies that show a correspondence between the nature of a child's attachment to his or her parents and the child's attachment to God. Finally, like the attachment to parents, an individual's attachment to God is tied to his or her health and well-being.

In support of this latter assertion, a growing body of literature suggests that people with insecure attachments to God experience poorer health and well-being (see Kirkpatrick, 2005, for a review). For example, Rowatt and Kirkpatrick (2002) found that college students with more anxious attachments to God reported greater neuroticism and negative affect, and less positive affect. Similarly, working with a community sample responding to a newspaper survey, Kirkpatrick and Shaver (1992) found that individuals with avoidant attachments to God (e.g., perceiving that God is distant and uncaring) manifested greater depression, psychosomatic symptoms, loneliness, and less life satisfaction than respondents who described secure or anxious attachments to God. Consistent with these findings, higher levels of religious strain and conflict (e.g., feeling distant from God, difficulty trusting God, feelings one's sins are too big to be forgiven, feeling guilt for wavering faith) have been associated with depression and suicidality (Exline, Yali, & Sanderson, 2000) and greater likelihood of panic disorder (Trenholm, Trent, & Compton, 1998) in samples of adult psychotherapy outpatients. Overall, this literature suggests that an insecure religious attachment represents a risk factor for the individual's well-being.

PROCESS THEORY AND RESEARCH

For the most part, theorists and researchers have attempted to identify specific forms of religiousness that might be helpful or harmful, such as church attendance, prayer, meditation, fundamentalism, and so on. In contrast, several theorists suggest that the efficacy of religion may depend not on specific types of religious beliefs and practices, but rather on the degree to which the individual's religion is well integrated or poorly integrated

(Allport, 1950; Pargament, 1997). Integration is not easy to describe, for it has to do with the workings of the whole rather than its parts. Perhaps for that reason, writers have often turned to metaphors to capture the meaning of a well-integrated religion. For example, writing about religion at its best, Allport (1950) put it this way: "It is a rich pudding, smooth and simple in its blend, but intricate in ingredients. Or to dignify the metaphor, it is a white light in personality which, though luminous and simple, is in reality multi-colored in composition" (p. 9). In contrast, a poorly integrated religion has been described as a system that "loses its balance, its synchrony. The fault here lies not with any one element of the process, but with the system itself" (Pargament, 1997, p. 316).

Mental health professionals and clergy appear to attend to integration in their evaluations of the efficacy of religion. In one study, Butter and Pargament (2003) presented these groups with vignettes that varied in their degree of religious integration. For example, one well-integrated vignette described the case of one man with an incurable physical illness who defers the responsibility for his health to God. A second poorly integrated vignette described the case of another man with a treatable illness who engages in the exact same form of religious deferral. While religious deferral is a reasonable response to an uncontrollable illness, it fits less well with an illness that calls for an active response on the part of the patient. Both clergy and mental health professionals rated religion as more harmful in the poorly integrated vignettes than in the well-integrated vignettes. It is important to stress that the religious behavior of the individuals was identical in these vignettes; what varied was the degree of integration of religion with other dimensions of life, in this case, the fit between the religious approach to problem solving and the controllability of the situation.

Theorists and researchers have examined other elements of religious integration and dis-integration, including religious rigidity and inflexibility, the lack of religious breadth and depth, and religious extremism. Mature faith, Allport (1950) asserted, is heuristic, a "working hypothesis . . . it can act whole-heartedly even without absolute certainty. It can be sure without being cocksure" (p. 81). In contrast, poorly integrated religion is rigid and inflexible, unable to respond to changing individual needs, times, and circumstances. Although rigid systems of belief can provide people with a sense of absolute certainty and conviction, they may also lead people to take extreme steps when they feel their beliefs are threatened. In this vein, Altemeyer and Hunsberger (1992) found that people who reported a less flexible religious faith demonstrated greater prejudice toward homosexuals as well as other minority groups. For example, religious inflexibility was linked to more agreement with the belief that "the AIDS disease currently killing homosexuals is just what they deserve" (p. 123).

Theorists have also generally agreed that mature systems of religious belief and practice have breadth and depth. They are capable of providing overarching frameworks of meaning that help people come to terms with the full range of life experiences. In contrast, poorly integrated religious systems lack comprehensiveness. Perhaps the most common example involves religious systems of belief that account for the positive dimensions of life but founder when confronted with suffering, pain, and injustice. The notion that there is a higher power who ensures that good things will happen to good people can be of great comfort in stress-free times of life. More difficult periods, however, can throw individuals into a crisis of meaning in which they must face serious questions about their own goodness or the goodness and power of God. William James (1902) described this kind of faith as “healthy-minded religion” but criticized it for its narrowness:

There is no doubt that healthy-mindedness is inadequate as a philosophical doctrine, because the evil facts which it refutes positively to account for are a genuine portion of reality; and they may after all be the best key to life’s significance, and possibly the only openers of our eyes to the deepest levels of truth. (p. 160)

Conversely, some systems of religious belief focus on the dark side of life and allow no place for atonement or redemption, as we hear in John Bunyan’s account of his religious melancholy:

I was more loathsome in my own eyes than was a toad; and I thought I was so in God’s eyes too. Sin and corruption, I said, would as naturally bubble out of my heart as water would bubble out of a fountain. . . . I thought none but the Devil himself could equal me for inward wickedness and pollution of mind. (cited in James, 1902, p. 155)

In a study that speaks to the negative implications of narrow systems of religious belief, Watson, Morris, and Hood (1988) found that Christian college students who reported higher levels of religious guilt experienced more depression and anxiety. However, these effects were reduced when a measure of grace (e.g., “My sins are forgiven”) was entered into the equation.

Finally, theorists have spoken of the dangers of religious extremism, the problem that arises when religious means become disproportionate to religious ends. Religious extremism can take the form of violence in the name of the sacred, self-degradation in the pursuit of sacred goals, or scrupulosity that interferes with the attainment of religious ends. For example, Greenberg, Witztum, and Pisante (1987) recounted the case of one scrupulous, orthodox Jewish man who was tremendously fearful of violating the religious injunction to be “clean at all orifices.” To avoid the risk of this transgression, he would spend 20 minutes cleaning and checking his anal area before each

of his three daily periods of prayer. As a result of the scrupulous attention to his cleanliness, however, he was often late to prayer and failed to fulfill a religious obligation of greater importance than the cleanliness of orifices. Unfortunately, even though it is a central topic of concern today, religious extremism has received little research attention.

COPING THEORY AND RESEARCH

Few people, if any, go through their lives without being impacted by significant life stressors. And yet, empirical studies have shown that the relationship between exposure to major life stressors and subsequent physical and mental health is relatively modest (Rabkin & Streuning, 1976). Coping theorists, such as Richard Lazarus and Susan Folkman, explain these modest links by noting that people do not simply react to critical life events; they appraise these events in terms of their implications for well-being, and they cope with these events in ways to maximize the sense of significance in life (Hopfoll, 1988; Lazarus & Folkman, 1984). It follows that the impact of life stressors on health and well-being depends at least in part on how people appraise and cope with critical events. A considerable body of research has supported this assertion (e.g., Aldwin, 1994; Mullen & Suls, 1982). Depending on how events are understood and handled, the effects of major life stressors may be mitigated or exacerbated.

Religion also can be involved in how people understand and deal with life events. This is, by no means, unusual. In fact, a number of studies have shown that many people turn to religion for help in their most difficult moments (e.g., Conway, 1985–1986; McCrae, 1984). Pargament (1997) has described how religion can be a critical part of both appraisals and coping. Life events, he points out, affect people not only psychologically, socially, and physically, but spiritually as well. Take, for example, the crisis of clergy sexual abuse. For many survivors, the trauma is first and foremost spiritual in nature. One survivor put it bluntly: “I don’t think I’ll ever step foot in a church again. . . . I lost my religion, faith, and ability to trust adults and institutions” (Matchan, 1992, p. 8). People appraise life events according to their implications for their spirituality as well as their other aspects of well-being. To put it another way, events are evaluated with an eye to whatever people hold sacred.

Religion is also part and parcel of the ways many people choose to cope with critical life events (Pargament, 1997). The major religious traditions of the world provide their adherents with a variety of coping resources that can be accessed in stressful times. They take the form of religious rituals (e.g., rites of passage, purification), religious beliefs (e.g., life after death, a loving God), religious experiences (e.g., prayer, meditation), and religious relationships (e.g., support from congregation and clergy). Not all forms of religious coping are necessarily positive, however. In some instances, life

stressors may threaten or destabilize the individual's orientation of religious beliefs and practices. A religious struggle may follow in which the individual attempts to conserve a religious framework or, if necessary, transform it (Pargament, Murray-Swank, Magyar, & Ano, 2005).

Although empirical studies have shown that religious involvement in coping is, by and large, beneficial (Ano & Vasconcelles, 2005; Pargament, 1997), a growing body of studies identifies religious risk factors on the coping process. We focus on two of these risk factors: appraisals of life events as losses or violations of the sacred and religious struggles.

Appraisals of Sacred Loss and Desecration

Recently, researchers have begun to investigate explicit spiritual appraisals of negative events that may relate to poor health outcomes (Magyar, Pargament, & Mahoney, 2000; Magyar-Russell, 2005; Pargament, Magyar, Benore, & Mahoney, 2005). Two spiritual appraisals in particular appear to be problematic: the perception that a sanctified object has been lost (sacred loss) and the perception that a sanctified object has been violated (desecration).

In an initial study of desecration, Magyar et al. (2000) examined the psychological, physical, and spiritual implications of perceiving that a past or current romantic relationship had been spiritually violated (i.e., desecrated). Working with a sample of college men and women ($n = 344$) from a mid-sized Midwestern university, the researchers found that desecration was associated with more negative affect (e.g., feeling distressed, nervous, scared, irritable, upset), more negative physical health symptoms (e.g., nausea or upset stomach, headaches, loss of appetite), and more symptoms of intrusive and avoidant thoughts and behaviors related to the desecration event(s). Importantly, the links between desecration and outcomes were not reduced by controlling for traditional religious variables, the number of offenses committed in the desecration event, and the negativity of the impact of the betrayals. Thus, perceptions that a violation of a spiritual nature had taken place impacted the participants on emotional, physical, and psychological levels.

In a second study of spiritual appraisals of negative life events, Pargament, Magyar, Benore, and Mahoney (2005) examined perceptions of sacred loss and desecration in a community sample in northwest Ohio. Participants recounted the most significant negative life event that took place in their lives in the past two years. Hierarchical regression analyses were conducted that controlled for traditional religious variables, the belief that another person caused the negative event, and the number of objects perceived as lost or violated by the event. Sacred loss was uniquely predictive of intrusive thoughts, avoidant behaviors, and feelings of depression linked to the event. Desecration was uniquely predictive of more avoidant behaviors related to

the desecration event, greater feelings of anger related to the event, and less post-traumatic growth from experiencing the event.

Another study explored the spiritual appraisals of desecration following the September 11, 2001, terrorist attacks. In samples of college students in New York City and a Midwest town, Mahoney et al. (2002) found that greater perceptions of desecration were linked to higher levels of post-traumatic stress and depressive symptoms following the attacks, as well as more days of missed work or school.

A final longitudinal study of spiritual appraisals was conducted by Magyar-Russell (2005) with medical rehabilitation inpatients who had experienced stroke, spinal cord injury, lower-limb amputations, and other unexpected physical traumas. Participants who experienced their accident, illness, or injury as a sacred loss reported greater depression and anxiety, after controlling for age, impact of the event, the number of objects viewed as lost or violated, and global religiosity. Additionally, appraisals of sacred loss at admission significantly predicted depression at discharge and six weeks after discharge from inpatient rehabilitation. Greater appraisals of desecration at admission were predictive of higher levels of anxiety at admission and greater depressive symptoms six weeks after discharge. At the six-week follow-up period, greater perception of both sacred loss and desecration were significant predictors of decreased spiritual well-being. The findings from this study demonstrate that appraisals of sacred loss and desecration are relevant in situations of personal physical health challenges and that these spiritual appraisals continue to exert a negative emotional, psychological, and spiritual impact over time.

Two additional points are important to stress. First, appraisals of sacred loss and desecration are common. For example, 80 percent of the students in the college sample reported a desecration in a romantic relationship. In the adult community sample, 72 percent appraised their negative life event as a sacred loss, and 50 percent appraised it as a desecration. Among medical rehabilitation patients, 69 percent reported a sacred loss, and 43 percent reported a desecration. Furthermore, these appraisals were common among both men and women of all ages. Second, appraisals of sacred loss and desecration should not be confused with indicators of general religiousness. Indeed, Magyar-Russell (2005) noted that indices of global religiousness were not significantly correlated with appraisals of sacred loss or desecration at any of three assessment periods in her work with rehabilitation patients. One participant in this study was a 21-year-old African American woman who suffered an unexpected and inexplicable stroke. Her global religiousness score was a standard deviation below the sample mean, and her sacred loss and desecration scores were well over one standard deviation above the sample means. During a research interview, this participant supplemented her responses to the psychological and spiritual questionnaires by emphatically remarking, "Damn it, I had a stroke and I'm only 21! Why did God let

this happen to me?" Her story illustrates how assessing the spiritual appraisals linked to a specific life event may lead to a better understanding of the intimate connections between religion and health. Her story also illustrates how particular types of spiritual appraisal can contribute to adverse mental, physical, and spiritual health following unexpected and distressing life events.

Religious Struggles

Researchers have shown that individuals are vulnerable to spiritual challenges that overwhelm their spiritual resources in times of stress (Fitchett, Rybarczyk, DeMarco, & Nicholas, 1999; Koenig, Pargament, & Nielson, 1998; Pargament, 1997; Pargament, Koenig, Tarakeshwar, & Hahn, 2001; Pargament, Smith, Koenig, & Perez, 1998). Unexpected negative life events, loss, and trauma often shatter previously held assumptions about the benevolence, fairness, and meaningfulness of the world (Janoff-Bulman, 1992). For many, this shattering of assumptions extends to the spiritual dimension of their lives. In response to this "spiritual upheaval," they may experience religious struggles, including struggles with the divine, intrapsychic struggles, and interpersonal struggles. These struggles are not unusual. For example, in a survey of over 5,000 college students, 25 percent reported considerable distress related to their religious and spiritual concerns (Johnson & Hayes, 2003). In a study of patients with diabetes mellitus, congestive heart failure outpatients, and oncology inpatients, 15 percent of the total sample reported moderate to high levels of spiritual struggle (Fitchett et al., 2004).

Divine Struggles

Major life stressors can challenge an individual's understanding of the divine, triggering fundamental questions about the benevolence of God, the limits of God's powers, and feelings of divine abandonment, anger toward God, and demonic forces at large in the world. In a series of studies, Pargament and his colleagues examined the impact of these divine struggles on physical health and mental health among people coping with a variety of stressors. Divine struggles were measured by the negative religious coping subscale of the RCOPE (Pargament et al., 1998; Pargament, Koenig, & Perez, 2000). The findings have been consistent. Negative religious coping has been linked through cross-sectional studies to a variety of indicators of poorer health, including poorer physical health, poorer quality of life, and greater depression (Koenig et al., 1998); greater psychological distress among victims of the 1993 Midwest floods (Smith, Pargament, Brant, & Oliver, 2000); and more symptoms of PTSD among members of churches near the Oklahoma City bombing (Pargament et al., 1998). Other researchers have generated similar

findings. For example, in a large sample of racially diverse female trauma survivors, Falloot & Heckman (2005) reported that negative religious coping was linked to more symptoms of post-traumatic stress and overall severity of mental health problems. Exline and her colleagues (2000) found that both college students and adults in outpatient psychotherapy who reported higher levels of alienation from God also indicated higher levels of depression. College students who expressed difficulty forgiving God reported higher levels of depression, anxiety, trait anger, and difficult forgiving oneself and others (Exline, Yali, & Lobel, 1999).

Physical health problems that threaten ones' sense of mortality can create especially powerful conditions for spiritual vulnerability, conflict, and questions of meaning and purpose. For example, Sherman, Simonton, Latif, Spohn, and Tricot (2005) studied 213 multiple myeloma patients and found that negative religious coping was associated with a variety of indices of poorer health: fatigue, pain, clinician and self-rated depression, distress, and mental health. Interestingly, measures of general religious involvement and positive religious coping were unrelated to these outcomes. Manning-Walsh (2005) reported that spiritual struggle, as measured by the negative religious coping subscale of the Brief RCOPE, was significantly linked to lower quality of emotional and spiritual life and lower life satisfaction in a sample of women who had recently undergone surgical intervention for breast cancer. In a sample of men diagnosed with prostate cancer, Gall (2004a, 2004b) found that religious discontent and attributing the cause of the cancer to God's anger contributed unique variance in the prediction of greater role limitation and decreased emotional functioning after controlling for age, illness characteristics, and general coping resources. Rippentrop, Altmaier, Chen, Found, and Keffala (2005) reported similar adverse health effects in a sample of chronic musculoskeletal pain patients. These researchers found that negative religious coping was linked to greater pain intensity, poorer mental health status, and greater use of disability compensation programs (e.g., social security disability, disability insurance, worker's compensation).

A few longitudinal studies have shown negative religious coping to be a significant predictor of declines in health. For example, working with 96 medical rehabilitation inpatients, Fitchett (1999) found that negative spiritual coping was predictive of poorer physical recovery (limited recovery in activities of daily living such as walking, cooking, bathing) over a four-month follow-up period, even after controlling for demographic factors, social support, depression, and level of independent functioning at admission. One type of negative spiritual coping, feeling anger toward God, was a particularly powerful predictor of compromised physical recovery in this patient sample. Similarly, in the longitudinal study of rehabilitation patients, Magyar-Russell (2005) found that negative religious coping was significantly linked to anxiety, depression, and less spiritual well-being at admission, discharge, and six

weeks after discharge from inpatient hospitalization. In a longitudinal study of religious struggles among 596 medically ill patients age 55 and over, negative religious coping at baseline predicted increases in depressed mood and declines in physical functional status and quality of life over a two-year period after controlling for selective attrition, mortality, demographic factors, and baseline physical and mental health (Pargament, Koenig, Tarakeshwar, & Hahn, 2004). Further analyses revealed that elders who demonstrated high levels of negative religious coping at both baseline and follow-up periods (i.e., chronic religious strugglers) were at greatest risk for declines in health. Negative religious coping also held significant implications for mortality. After accounting for selective attrition, demographic variables, and physical and mental health variables in this sample, higher religious struggle scores at baseline were predictive of 22–33 percent greater risk of dying over the two-year follow-up period (Pargament, Koenig, Tarakeshwar, & Hahn, 2001). Religious struggles in this study included patients wondering whether God had abandoned them, questioning God's love for them, feeling that the devil played a role in their illness, and feeling punished by God. Thus, these types of struggles not only heightened health problems, but also increased the risk of death.

Intrapsychic Struggles

Other struggles center on questions and doubt about religion and matters of faith. As one adolescent described her struggles:

Is Christianity a big sham, a cult? If an organization were to evolve in society, it would have to excite people emotionally, it would have to be self-perpetuating, it would need a source of income, etc. Christianity fits all of these. How do I know that I haven't been sucked into a giant perpetual motion machine? (Kooistra, 1990, p. 95)

Religious doubts such as these have been associated with psychological distress, including greater anxiety and negative affect among adolescents and church members (Kooistra & Pargament, 1999; Pargament et al., 1998), higher levels of depression and less positive affect among Presbyterian leaders and members (Krause, Ingersoll-Dayton, Ellison, & Wulff, 1999), and less life satisfaction and happiness in a national sample of adults (Ellison, 1991).

Interpersonal Struggles

Another class of struggles focuses on religious conflicts and tensions with family, friends, congregation, or community. Krause, Chatters, Meltzer, and Morgan (2000) conducted focus groups with older adults and identified several

types of negative interactions among the members of the church, such as gossiping, cliquishness, and hypocrisy. One church member complained:

They get off in a corner and talk about you and you're the one that's there on Saturday working with their children and ironing the priest's vestments and doing all that kind of thing and washing the dishes on Sunday afternoon after church. But they don't have the Christian spirit. (p. 519)

Perhaps because these types of experiences violate expectations about how religious people should enact their spiritual values with each other, they are especially painful. Interpersonal religious conflicts have been associated with psychological distress in several studies. For example, interpersonal religious conflicts among church members and college students were associated with greater anxiety, more negative mood, and lower self-esteem (Pargament et al., 1998). Similarly, negative church interactions among clergy and leaders in the Presbyterian Church were associated with higher levels of psychological distress (Krause, Ellison, & Wulff, 1998). Sorenson, Grindstaff, and Turner (1995) studied a sample of young adolescent mothers who varied in their level of involvement in their religious institutions. Unlike the married mothers, religious involvement among unmarried mothers was associated with higher levels of depression. The authors suggest that out-of-wedlock pregnancy creates conflicts with the church that can induce emotional distress among unmarried adolescents. In a longitudinal study, medically ill elderly patients who reported more religious conflicts with family, congregation members, and clergy were more likely to become depressed over a two-year period (Pargament, Koenig, Tarakeshwar, & Hahn, 2001). Finally, in a meta-analysis of marital research, Mahoney and her colleagues found an indicator of interpersonal struggle, religious heterogamy (i.e., different religious beliefs, affiliations, and practices) was linked to higher rates of divorce, more frequent disagreements, and lower marital satisfaction (Mahoney, Pargament, Tarakeshwar, & Swank, 2001).

Overall, the associations between religious struggles and poorer health appear to be robust. Recent meta-analyses of empirical studies pointing to significant relationships between indicators of religious struggle, depression, and other indicators of health and well-being lend further support to this conclusion (Ano & Vasconcelles, 2005; Smith, McCullough, & Poll, 2003).

HOW MIGHT RELIGION HARM HEALTH?

Identifying the mechanisms through which religion and spirituality exert their impact on health and well-being is one of the most critical areas of inquiry for social scientists who study associations between religion and health. Although evidence is limited, especially with regard to the manner in

which specific forms of religiousness lead to negative health effects, recent empirical and theoretical work has begun to shed some light on these fundamental questions.

A number of researchers suggest that social and psychological variables may act as mediators between religion and health (Ellison & Levin, 1998; George, Ellison, & Larson, 2002). Religious and spiritual communities have generally been shown to provide positive social resources for their members (Bradley, 1995; Ellison & George, 1994). Nevertheless, in some cases, the relation between religious involvement and adverse health may be due to members feeling judged or castigated when their actions and attitudes place them at odds with church teachings and ideals. Similarly, members may experience profound anger toward and disappointment in the behavior of other members of their religious or spiritual communities who fail to live up to sacred ideals. It is equally plausible that the religious risk factors lead to fundamental cognitive and emotional disorientation that leads, in turn, to poorer health outcomes. For example, certain forms of religious involvement could result in low self-confidence and self-worth; lack of meaning in life; hopelessness; and feelings of guilt, shame, and fear. Some evidence suggests that personality traits may act as mediators as well. For instance, in their study with college students, Exline et al. (1999) found that trait anger linked difficulty forgiving God with negative emotion.

A number of studies have yielded evidence that suggests that proximal religious variables may be strong mediators of the relationships between more general measures of religiousness and health outcomes (Pargament, 1997; Pargament, Magyar, & Murray-Swank, in press). Some of this evidence is indirect. As noted above, several studies have shown that the relationships between various religious risk factors and poorer health are not eliminated when controls for potentially mediating psychological and social variables are introduced. For example, Trenholm et al. (1998) found that religious conflict was a unique predictor of panic disorder, even after taking into account state anxiety, hypochondriacal beliefs and abnormal illness behavior, and irrational thinking. Indirect as they are, findings such as these suggest that religion may have some direct links to poorer health. A few studies offer stronger empirical evidence proximal religious variables mediate the relationship between religious risk factors and health. For instance, in their studies of spiritual appraisals, Pargament and colleagues (Magyar et al., 2000; Magyar-Russell, 2005; Pargament, Magyar, Benore, et al., 2005) consistently found that the method of religious coping used in response to appraisals of sacred loss and desecration partially mediated the relation between outcomes. More specifically, perceptions of sacred loss and desecration were more likely to predict negative mental and physical health when negative religious coping strategies were used. Conversely, participants were more likely to report personal and spiritual growth and positive affect when they engaged in

positive religious coping strategies in response to appraisals of sacred loss and desecration.

In keeping with theory and research that points to the key roles appraisals and coping play in affecting the outcomes of negative life events (Lazarus & Folkman, 1984; Pargament, 1997), the manner in which individuals respond to matters of a sacred nature may be predictive of outcomes. Pargament et al. (in press) reviewed literature supportive of the notion that religion and spirituality can add unique benefits, as well as unique forms of distress, to the coping process. Negative religious reframing and coping efforts may link more gross measures of religion to decreased health and well-being by exacerbating the effects of stressful experiences in ways that lead to more adverse mental and physical health problems, more negative affect, more spiritual discontent, and less positive personal and spiritual growth from the experience. In other words, one of the pathways through which religion may lead to negative health is by interacting with stressors to magnify their harmful effects. For instance, religious involvement intensified the effects of family stressors on depression among community dwelling adults (Strawbridge, Shema, Cohen, Roberts, & Kaplan, 1998), and poorly integrated personal spirituality among college students increased the effects of stressors on low levels of life satisfaction (Fabricatore, Handel, & Fenzel, 2000). Additionally, self-directed religious coping style exacerbated the effects of high levels of stress on depressive affect in a sample of Presbyterian church members (Bickel et al., 1998), and the use of deferring religious coping methods among college students intensified the detrimental effects of high stress on affect and life satisfaction (Fabricatore, Handel, Rubio, & Gilner, 2004).

Religion has also been found to exert its impact on health through physiological and biological mechanisms. Improvements in technology and the sophistication of measurement of physiological parameters in the past decade have allowed for studies that demonstrate a positive relation between religious functioning and the immune system, blood pressure, neuroendocrine functioning, and regional brain activity (see Koenig & Cohen, 2002, and Seeman, Dubin, & Seeman, 2003, for reviews). Virtually all of the research carried out in this area has indicated that religion is associated with physiology and biology in health-promoting ways (Ironson et al., 2002; Koenig et al., 1998; Koenig & Cohen, 2002; Sephton, Koopman, Schaal, Thoresen, & Spiegel, 2001; Woods, Antoni, Ironson, & Kling, 1999). Illustrative studies include Ironson and colleagues' (2002) finding that the relation between religion and long-term survival in AIDS patients was mediated by lower urinary cortisol concentrations and Lazar et al.'s (2000) finding that neural structures in the brain involved in attention and control of the autonomic nervous system were activated in individuals versed in meditation. Just as researchers have begun to uncover adverse effects of certain types of religious involvement in other domains, it is likely that negative physiological and health consequences

can result from religious engagement. Internal religious conflict, distressing interpersonal interactions, and struggles with the divine may increase psychological and physiological stress, thereby stimulating the autonomic nervous system and the production of stress hormones, which, over time, may lead to decreased immune functioning and increased susceptibility to disease (Koenig et al., 2001). Future research that examines the physiological, biological, and neurological mechanisms of action between specific forms of religiousness and adverse health outcomes will undoubtedly advance the pursuit of greater scientific understanding of the religion-health connection.

IMPLICATIONS, CONCLUSIONS, AND FUTURE DIRECTIONS

Much of the research in the scientific study of religion and health has relied on global measures of religiousness. Most of these studies demonstrate that religious involvement is largely beneficial, enhancing health and promoting well-being. Yet when assessed more closely, in some forms, in some situations, and in some people, a darker side of religion and spirituality can be identified. In this chapter, we have focused on religious risk factors for poorer health and well-being. Our objective is not to challenge the positive role of religion and spirituality. Indeed, we believe religion is largely helpful. Instead, our intent is to identify aspects of religiousness that may be problematic. Researchers and clinicians must first be aware of the potential for negative implications stemming from religiousness in order to appreciate its power; continue to study it in innovative and useful ways; and work effectively with people who express the full range of religious thought, feeling, and behavior.

Working from different theoretical frameworks, we have articulated a variety of religious risk factors for reduced health. Empirical studies provide increasing support for the assertion that religion can heighten risks for psychological, physical, and spiritual distress. The methodological quality, strength of associations, and types of religiousness assessed among the studies reviewed varies. The strongest support comes from studies of religious struggle (e.g., negative religious coping) and religious motivation, though there have been no empirical investigations on the health consequences of idolatry. Studies of religious attachment and process theory are still emerging and represent promising areas for further investigation.

Least clear at this point are the explanatory mechanisms that might account for the links between these religious risk factors and poorer health. This is an area ripe for innovative and exciting programs of research. Studying the impact of religious risk factors on measures of psychological and social functioning that have already been linked to poorer health (e.g., pessimism; hopelessness;

and low levels of control, meaning, self-esteem, coherence, and social support); conducting brain imaging studies of individuals in the midst of spiritual conflict; assessing and comparing the immune functioning of individuals who do, and do not, engage in negative religious coping following a negative life event; and continuing to develop more proximal measures of religiousness and spirituality are imperative to the progression of knowledge in this area of study. It will also be important to learn more about predictors of religious risk that increases the vulnerability of people to religious struggles during times of stress. These predictors include personality variables (Ano & Pargament, 2003; Exline et al., 1999), family-related problems (Kooistra & Pargament, 1999), stage of life (Fitchett et al., 2004; Magyar-Russell, 2005; Manning-Walsh, 2005), childhood abuse (Fallot & Heckman, 2005), and psychopathology (Fallot & Heckman, 2005; Trenholm et al., 1998).

Even though it remains unclear why religion may pose threats to health and well-being, there are a number of important practical implications of these findings. First, risky forms of religiousness appear to occur at relatively high rates in the populations studied (approximately 10% to 20%). Recalling that chronic religious strugglers appear to be at greatest risk for declines in health status (Pargament et al., 2001), these findings underscore the need for early identification of religious risk factors before they become chronic and contribute to poorer health. It cannot be assumed that this group will seek resources on their own to address their religious concerns. Fitchett (1999) studied 200 newly admitted medical and surgery patients and found that those who were high in need of spiritual intervention and had few spiritual resources were less likely to request spiritual assistance in comparison to those with less need and greater spiritual resources. Thus, active screening of people for "spiritual risk" is needed in health care settings and religious congregations. Unfortunately, this is a seldom-implemented strategy for identifying individuals who are more vulnerable to poor health outcomes as a result of "underdeveloped, conflicted, overwhelmed, or negative spirituality" (Fitchett, 1999, p. 4). Fitchett and colleagues (1999, 2004) recommend brief and direct screening questions that address anger at God, fear of punishment by God, disappointments in faith or religious institutions, and lifetime changes in the importance of spiritual or religious faith to determine whether an in-depth spiritual assessment may be warranted (see Fitchett, 1999, for a discussion of spiritual screening versus spiritual assessment). Clinicians who have not received training in assessing or addressing religious and spiritual issues, or who feel uncomfortable doing so, should consider referring patients with spiritual needs to a chaplain or pastoral counselor.

The empirical studies reviewed in this chapter suggest that religion, even potentially destructive forms, plays a significant role in lives of many people. Mental health professionals may be able to intervene effectively at the level of cognitive and spiritual appraisals, as well as assist patients in modifying

potentially maladaptive religious coping strategies in response to adversity. For instance, several widely practiced cognitive techniques could be successfully applied to spiritual appraisals, such as gaining an understanding of patients' idiosyncratic religious and spiritual meaning systems through guided association, helping patients identify the origin of their religious assumptions and automatic thoughts, and challenging absolute or dichotomous thinking when appropriate (Nielsen, Johnson, & Ellis, 2001; Richards & Bergin, 1997; Shafranske, 1996; Worthington, Kurusu, McCullough, & Sandage, 1996). Behavioral strategies could also be effectively adapted to assist patients in their religious coping process (Miller & Martin, 1988; Propst, 1988, 1996). Techniques such as activity scheduling may be used to plan times for contemplation, meditation, or prayer, and relaxation and breathing exercises could be integrated into these religious and spiritual activities as well. Bibliotherapy with religious works, as well as "behavioral experiments" in which patients practice asking for spiritual support from loved ones or clergy (e.g., prayers; requests for religious rituals or sacraments; engage in discussions about God, spirituality, or meaning), may also be options in clinical interventions aimed at modifying maladaptive religious and spiritual coping methods (Miller, 1999; Miller & Martin, 1988).

Spiritually integrated interventions (see Pargament et al., 2005; Pargament, Murray-Swank, & Tarakeshwar, 2005, for reviews) in which religious issues and concerns are the focus of clinical attention have just begun to be scientifically developed, empirically tested, and practiced in applied settings. One intervention that addresses intrapsychic religious conflict is interreligious encounter groups in which members express, listen to, and discuss their internal religious struggles in a format that is open to and inclusive of various faith traditions (Genia, 1990). This group intervention focuses on enhancing religious development through the exploration of religious conflict, the resolution of internal distress, solidification of a spiritual sense of identity and meaning, and the development of personal spiritual goals. The majority of interventions for religious struggles with the divine have been developed with particular life experiences in mind. For instance, Cole and Pargament (1999) implemented an intervention to address feelings of spiritual disconnection and conflict with God for cancer survivors. Pargament and colleagues (2004) carried out an eight-week psychospiritual intervention designed to help women draw on their spiritual resources in coping with the challenges of HIV, including spiritual struggles. Similarly, Murray-Swank and Pargament (2005) developed a spiritually integrated intervention to help survivors of sexual abuse come to terms with the psychological, social, and spiritual concerns raised by their trauma. The development of interventions for interpersonal religious conflict represents an important area for future research. Forgiveness interventions may be especially promising for helping people deal with the profound distress and disillusionment

that is triggered by religious and spiritual violations occurring within faith communities (e.g., abuse of privileges, power, and money and clergy sexual abuse; McCullough, Pargament, & Thoresen, 2000). Continued basic and applied research in this area is necessary to further the development of effective and appropriate interventions for people of various religious faiths and spiritually oriented belief systems.

Finally, no discussion of the darker side of religion would be complete without noting that, according to most traditions, a period of intense religious struggle is often a prelude to growth and transformation. Virtually every tradition presents its adherents with great religious exemplars—from Moses and Buddha to Jesus and Muhammed—who experienced their own “dark nights of the soul,” only to come through the process strengthened and steeled. Likewise, people may grow through their own periods of religious conflict and turmoil. In a few of the empirical studies cited above, religious risk factors were linked not only to indices of physical and psychological distress, but also to measures of stress-related growth (e.g., Magyar et al., 2000; Pargament et al., 1998). Reviewing this line of study, Exline and Rose (2005) conclude: “Perhaps then, the opportunity for struggle is actually one of the greatest gifts that religion and spirituality have to offer” (p. 325). Thus, it is important to recognize that religious stress and turmoil offers the possibility of growth. Nevertheless, even though some studies suggest positive links between religious struggles and growth, the weight of the evidence is clear and leads to a straightforward conclusion: certain forms of religion can pose a significant risk to health and well-being. We leave researchers and practitioners with some intriguing questions. Are periods of religiously related decline followed by periods of religious growth? If so, what factors determine whether religion will lead to decline followed by growth, decline without growth, or growth without decline? And how best do we facilitate growth rather than decline among people in their encounters with the darker side of religion?

REFERENCES

- Ainsworth, M.D.S., Blehar, M.C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation*. Hillsdale, NJ: Erlbaum.
- Aldwin, C.M. (1994). *Stress, coping, and development: An integrative perspective*. New York: Guilford Press.
- Allport, G.W. (1950). *The individual and his religion: A psychological interpretation*. New York: Macmillan.
- Allport, G.W., & Ross, J.M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, 5, 432–443.
- Altemeyer, B., & Hunsberger, B. (1992). Authoritarianism, religious fundamentalism, quest, and prejudice. *International Journal for the Psychology of Religion*, 2, 113–133.

- Ano, G. G., & Pargament, K. I. (2003). *Correlates of religious struggles: An exploratory study*. Unpublished master's thesis, Bowling Green State University.
- Ano, G. G., & Vasconcelles, E. B. (2005). Religious coping and psychological adjustment to stress: A meta-analysis. *Journal of Clinical Psychology, 61*, 461–480.
- Bickel, C. O., Ciarrocchi, J. W., Sheers, N. J., Estadt, B. K., Powell, D. A., & Pargament, K. I. (1998). Perceived stress, religious coping styles, and depressive affect. *Journal of Psychology and Christianity, 17*(1), 33–42.
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. New York: Basic Books.
- Bradley, D. E. (1995). Religious involvement and social resources: Evidence from the data set "Americans Changing Lives." *Journal for the Scientific Study of Religion, 34*, 259–267.
- Butter, E. A., & Pargament, K. I. (2003). Development of a model for clinical assessment of religious coping: Initial validation of the Process Evaluation Model. *Mental Health, Religion, and Culture, 6*, 175–194.
- Cole, B., & Pargament, K. I. (1999). Re-creating your life: A spiritual/psychotherapeutic intervention for people diagnosed with cancer. *Psycho-Oncology, 8*, 395–407.
- Conway, K. (1985–1986). Coping with the stress of medical problems among black and white elderly. *International Journal of Aging and Human Development, 21*, 39–48.
- Donahue, M. J. (1985). Intrinsic and extrinsic religiousness: Review and meta-analysis. *Journal of Personality and Social Psychology, 48*, 400–419.
- Ellison, C. G. (1991). Religious involvement and subjective well-being. *Journal of Health and Social Behavior, 32*, 80–99.
- Ellison, C. G., & George, L. K. (1994). Religious involvement, social ties, and social support in a Southeastern community. *Journal for the Scientific Study of Religion, 33*, 4–61.
- Ellison, C. G., & Levin, J. S. (1998). The religion–health connection: Evidence, theory, and future directions. *Health Education and Behavior, 25*(6), 700–720.
- Emmons, R. A., Cheung, C., & Tehrani, K. (1998). Assessing spirituality through personal goals: Implications for research on religion and subjective well-being. *Social Indicators Research, 45*, 391–422.
- Exline, J. J., & Rose, E. (2005). Religious and spiritual struggles. In R. Paloutzian & C. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 295–314). New York: Guilford Press.
- Exline, J. J., Yali, A. M., & Lobel, M. (1999). When God disappoints: Difficulty forgiving God and its role in negative emotion. *Journal of Health Psychology, 4*, 365–380.
- Exline, J. J., Yali, A. M., & Sanderson, W. C. (2000). Guilt, discord, and alienation: The role of religious strain in depression and suicidality. *Journal of Clinical Psychology, 56*, 1481–1496.
- Fabricatore, A. N., Handel, P. J., & Fenzel, L. M. (2000). Personal spirituality as a moderator of the relationship between stressors and subjective well-being. *Journal of Psychology and Theology, 28*(3), 221–228.
- Fabricatore, A. N., Handel, P. J., Rubio, D. M., & Gilner, F. H. (2004). Stress, religion, and mental health: Religious coping in mediating and moderating roles. *International Journal for the Psychology of Religion, 14*(2), 91–108.

- Fallot, R.D., & Heckman, J.P. (2005). Religious/spiritual coping among women trauma survivors with mental health and substance use disorders. *Journal of Behavioral Health Services and Research, 32*(2), 214–226.
- Fitchett, G. (1999). Screening for spiritual risk. *Chaplaincy Today, 15*(1), 2–12.
- Fitchett, G., Murphy, P.E., Kim, J., Gibbons, J., Cameron, J.R., & Davis, J.A. (2004). Religious struggle: Prevalence, correlates and mental health risks in diabetic, congestive heart failure, and oncology patients. *International Journal of Psychiatry in Medicine, 34*(2), 179–196.
- Fitchett, G., Rybarczyk, B.D., DeMarco, G.A., & Nicholas, J.J. (1999). The role of religion in medical rehabilitation outcomes: A longitudinal study. *Rehabilitation Psychology, 44*, 1–22.
- Gall, T.L. (2004a). The role of religious coping in adjustment to prostate cancer. *Cancer Nursing, 27*(6), 454–461.
- Gall, T.L. (2004b). Relationship with God and the quality of life of prostate cancer survivors. *Quality of Life Research, 13*, 1357–1368.
- Genia, V. (1990). Interreligious encounter groups: A psychospiritual experience for faith development. *Counseling and Values, 35*, 39–51.
- George, L.K., Ellison, C.G., & Larson, D.B. (2002). Explaining the relationships between religious involvement and health. *Psychological Inquiry, 13*(3), 190–200.
- Greenberg, D., Witztum, E., & Pisante, J. (1987). Scrupulosity: Religious attitudes and clinical presentations. *British Journal of Medical Psychology, 60*, 29–37.
- Hopfl, S.E. (1988). *The ecology of stress*. New York: Hemisphere.
- Ironson, G., Solomon, G.F., Balbin, E.G., O'Cleirigh, C., George, A., Kumar, M., et al. (2002). The Ironson-Woods Spirituality/Religiosity Index is associated with long survival, health behaviors, less distress, and low cortisol in people with HIV/AIDS. *Annals of Behavioral Medicine, 24*(1), 34–48.
- James, W. (1902). *The varieties of religious experience: A study in human nature*. New York: Modern Library.
- Janoff-Bulman, R. (1992). *Shattered assumptions: Towards a new psychology of trauma*. New York: Free Press.
- Johnson, C.V., & Hayes, J.A. (2003). Troubled spirits: Prevalence and predictors of religious and spiritual concerns among university students and counseling center clients. *Journal of Counseling Psychology, 50*, 409–419.
- Jung, C.G. (1964). *After the catastrophe*. In C. Jung (Ed.), *Collected works* (Vol. 10, pp. 194–217). Princeton, NJ: Princeton University Press. (Original work published 1945)
- Kirkpatrick, L.A. (2005). *Attachment, evolution, and the psychology of religion*. New York: Guilford Press.
- Kirkpatrick, L.A., & Shaver, P.R. (1992). An attachment-theoretical approach to romantic love and religious belief. *Personality and Social Psychology Bulletin, 18*, 266–275.
- Klinger, E. (1998). The search for meaning in evolutionary perspective and its clinical implications. In P.T.P. Wong & P.S. Fry (Eds.), *The human quest for meaning* (pp. 27–50). Mahwah, NJ: Erlbaum.
- Koenig, H.G., & Cohen, H.J. (2002). *The link between religion and health: Psychoneuroimmunology and the faith factor*. New York: Oxford University Press.

- Koenig, H. G., George, L. K., Hays, J. C., Larson, D. B., Cohen, H. J., & Blazer, D. G. (1998). The relationship between religious activities and blood pressure in older adults. *International Journal of Psychiatry in Medicine*, 28, 189–213.
- Koenig, H. G., McCullough, M. E., & Larson, D. B. (2001). *Handbook of religion and health*. New York: Oxford University Press.
- Koenig, H. G., Pargament, K. I., & Nielsen, J. (1998). Religious coping and health status in medically ill hospitalized older adults. *Journal of Nervous and Mental Disease*, 186, 513–521.
- Kooistra, W. P. (1990). *The process of religious doubting in adolescents raised in religious environments*. Unpublished doctoral dissertation, Bowling Green State University.
- Kooistra, W. P., & Pargament, K. I. (1999). Predictors of religious doubting among Roman Catholic and Dutch Reformed high school students. *Journal of Psychology and Theology*, 27, 33–42.
- Krause, N., Chatters, L. M., Meltzer, T., & Morgan, D. L. (2000). Negative interaction in the church: Insights from focus groups with older adults. *Review of Religious Research*, 41, 510–533.
- Krause, N., Ellison, C. G., & Wulff, K. M. (1998). Church-based support, negative interaction, and psychological well-being: Findings from a national sample of Presbyterians. *Journal for the Scientific Study of Religion*, 37, 725–741.
- Krause, N., Ingersoll-Dayton, B., Ellison, C. G., & Wulff, K. M. (1999). Aging, religious doubt and psychological well-being. *The Gerontologist*, 39, 525–533.
- Lazar, S. W., Bush, G., Gollub, R. L., Fricchione, G. L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *NeuroReport*, 11, 1581–1585.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Magyar, G. M., Pargament, K. I., & Mahoney, A. (2000). Violating the sacred: A study of desecration among college students. Paper presented at the 108th Annual Convention of the American Psychological Association, Washington, DC.
- Magyar-Russell, G. M. (2005). *Sacred loss and desecration: A longitudinal study of spiritual appraisals among patients in rehabilitation hospitals*. Unpublished doctoral dissertation, Bowling Green State University.
- Mahoney, A., Pargament, K. I., Ano, G., Lynn, Q., Magyar, G. M., McCarthy, S., et al. (2002). *The devil made them do it: Desecration and demonization and the 9/11 attacks*. Paper presented at the annual meeting of the American Psychological Association, Chicago, Illinois.
- Mahoney, A., Pargament, K., Tarakeshwar, N., & Swank, A. B. (2001). Religion in the home in the 1980's and 90's: A review and conceptual integration of empirical links between religion, marriage, and parenting. *Journal of Family Psychology*, 15, 559–596.
- Manning-Walsh, J. (2005). Spiritual struggle: Effect on quality of life and life satisfaction in women with breast cancer. *Journal of Holistic Nursing*, 23(2), 120–140.
- Matchan, L. (1992, 8 June). Ex-priest's accusers tell of the damage. *Boston Globe*, 1–8.
- Mauder, R. G., & Hunter, J. J. (2001). Attachment and psychosomatic medicine: Developmental contributions to stress and disease. *Psychosomatic Medicine*, 63, 556–567.

- McCrae, R. R. (1984). Situational determinants of coping response: Loss, threat, and challenge. *Journal of Personality and Social Psychology*, *46*, 919–928.
- McCullough, M. E., Pargament, K. I., & Thoresen, C. E. (Eds.). (2000). *Forgiveness: Theory, research, and practice*. New York: Guilford Press.
- Miller, W. R. (Ed.). (1999). *Integrating spirituality into treatment: Resources for practitioners*. Washington, DC: American Psychological Association.
- Miller, W. R., & Martin, J. E. (Eds.). (1988). *Behavior therapy and religion: Integrating spiritual and behavioral approaches to change*. Newbury Park, CA: Sage.
- Mullen, B., & Suls, J. (1982). The effectiveness of attention and retention as coping styles: A meta-analysis of temporal differences. *Journal of Psychosomatic Research*, *26*, 43–49.
- Murray-Swank, N. A., & Pargament, K. I. (2005). God, where are you?: Evaluating a spiritually-integrated intervention for sexual abuse. *Mental Health, Religion, and Culture*, *8*(3), 191–203.
- Nelson, J. B. (2004). *Thirst: God and the alcoholic experience*. Louisville, KY: Westminster John Knox Press.
- Nielsen, S. L., Johnson, W. B., & Ellis, A. (2001). *Counseling and psychotherapy with religious persons: A rational emotive behavior therapy approach*. Mahwah, NJ: Erlbaum.
- Palmer, P. J. (1998, September). The grace of great things: Reclaiming the sacred in knowing, teaching, and learning. *The Sun*, 24–28.
- Pargament, K. I. (1997). *The psychology of religion and coping: Theory, research, practice*. New York: Guilford Press.
- Pargament, K. I., Koenig, H. G., & Perez, L. M. (2000). The many methods of religious coping: Initial development and validation of the RCOPE. *Journal of Clinical Psychology*, *56*, 519–543.
- Pargament, K. I., Koenig, H. G., Tarakeshwar, N., & Hahn, J. (2001). Religious struggle as a predictor of mortality among medically ill elderly patients: A two-year longitudinal study. *Archives of Internal Medicine*, *161*, 1881–1885.
- Pargament, K. I., Koenig, H. G., Tarakeshwar, N., & Hahn, J. (2004). Religious coping methods as predictors of psychological, physical, and spiritual outcomes among medically ill elderly patients: A two-year longitudinal study. *Journal of Health Psychology*, *9*, 713–730.
- Pargament, K. I., Magyar, G. M., Benore, E., & Mahoney, A. (2005). Sacrilege: A study of sacred loss and desecration and their implications for health and well-being in a community sample. *Journal for the Scientific Study of Religion*, *44*(1), 59–78.
- Pargament, K. I., Magyar, G. M., & Murray-Swank, N. (in press). The sacred and the search for significance: Religion as a unique process. *Journal of Social Issues*.
- Pargament, K. I., & Mahoney, A. (2002). Spirituality: Discovering and conserving the sacred. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 646–659). Oxford, England: Oxford University Press.
- Pargament, K. I., Murray-Swank, N., Magyar, G. M., & Ano, G. (2005). Spiritual struggle: A phenomenon of interest to psychology and religion. In W. R. Miller & H. D. Delaney (Eds.), *Judeo-Christian perspectives on psychology*. Washington, DC: American Psychological Association.
- Pargament, K. I., Murray-Swank, N., & Tarakeshwar, N. (Eds.). (2005). Spiritually-integrated psychotherapy. *Mental Health, Religion, and Culture*, *8*, 155–238.

- Pargament, K. I., Smith, B. W., Koenig, H. G., & Perez, L. (1998). Patterns of positive and negative religious coping with major life stressors. *Journal for the Scientific Study of Religion, 37*, 710–724.
- Pargament, K. I., Zinnbauer, B. J., Scott, A. B., Butter, E. M., Zerowin, J., & Stanik, P. (1998). Red flags and religious coping: Identifying some religious warning signs among people in crisis. *Journal of Clinical Psychology, 54*, 77–89.
- Propst, L. R. (1988). *Psychotherapy in a religious framework: Spirituality in the emotional healing process*. New York: Human Sciences Press.
- Propst, L. R. (1996). Cognitive-behavioral therapy and the religious person. In E. P. Shafranske (Ed.), *Religion and the clinical practice of psychology* (pp. 391–407). Washington, DC: American Psychological Association.
- Rabkin, J. G., & Streuning, E. L. (1976). Life events, stress, and illness. *Science, 194*, 1013–1020.
- Richards, P. S., & Bergin, A. E. (1997). *A spiritual strategy for counseling and psychotherapy*. Washington, DC: American Psychological Association.
- Rippentrop, A. E., Altmaier, E. M., Chen, J. J., Found, E. M., & Keffala, V. J. (2005). The relationship between religion/spirituality and physical health, mental health, and pain in a chronic pain population. *Pain, 116*, 311–321.
- Rowatt, W. C., & Kirkpatrick, L. A. (2002). Dimensions of attachment to God and their relation to affect, religiosity, and personality constructs. *Journal for the Scientific Study of Religion, 41*, 637–651.
- Ryan, R. M., Rigby, S., & King, K. (1993). Two types of religious internalization and their relations to religious orientation and mental health. *Journal of Personality and Social Psychology, 65*, 586–596.
- Seeman, T. E., Dubin, L. F., & Seeman, M. (2003). Religiosity/spirituality and health: A critical review of the evidence for biological pathways. *American Psychologist, 58*(1), 53–63.
- Sephton, S. E., Koopman, C., Schaal, M., Thoresen, C., & Spiegel, D. (2001). Spiritual expression and immune status in women with metastatic breast cancer: An exploratory study. *Breast Journal, 7*(5), 345–353.
- Shafranske, E. P. (Ed.). (1996). *Religion and the clinical practice of psychology*. Washington, DC: American Psychological Association.
- Sheldon, K. M., Ryan, R. M., Deci, E. L., & Kasser, T. (2004). The independent effects of goal contents and motives on well-being: It's both what you pursue and why you pursue it. *Personality and Social Psychology Bulletin, 30*, 475–486.
- Sherman, A. C., Simonton, S., Latif, U., Spohn, R., & Tricot, G. (2005). Religious struggle and religious comfort in response to illness: Health outcomes among stem cell transplant patients. *Journal of Behavioral Medicine, 28*, 1–9.
- Smith, B. W., Pargament, K. I., Brant, C., & Oliver, J. M. (2000). Noah revisited: Religious coping by church members and the impact of the 1993 midwest flood. *Journal of Community Psychology, 28*, 169–186.
- Smith, T. B., McCullough, M. E., & Poll, J. (2003). Religiousness and depression: Evidence for a main effect and the moderating influence of stressful life events. *Psychological Bulletin, 129*, 614–636.
- Sorenson, A. M., Grindstaff, C. F., & Turner, R. J. (1995). Religious involvement among unmarried adolescent mothers: A source of emotional support? *Sociology of Religion, 56*, 71–81.

- Strawbridge, W.J., Shema, S.J., Cohen, R.D., Roberts, R.E., & Kaplan, G.A. (1998). Religiosity buffers effects of some stressors on depression but exacerbates others. *Journal of Gerontology Series B: Social Sciences*, *53*(3), S118–S126.
- Trenholm, P., Trent, J., & Compton, W.C. (1998). Negative religious conflict as a predictor of panic disorder. *Journal of Clinical Psychology*, *54*, 59–65.
- Watson, P.J., Morris, R.J., & Hood, R.W., Jr. (1988). Sin and self-functioning: Part 3. The psychology and ideology of irrational beliefs. *Journal of Psychology and Theology*, *16*, 348–361.
- Woods, T.E., Antoni, M.H., Ironson, G.H., & Kling, D.W. (1999). Religiosity is associated with affective and immune status in symptomatic HIV-infected gay men. *Journal of Psychosomatic Research*, *46*, 165–176.
- Worthington, E.L., Kurusu, T.A., McCullough, M.E., & Sandage, S.J. (1996). Empirical research on religion and psychotherapeutic processes and outcomes: A 10-year review and research prospectus. *Psychological Bulletin*, *119*, 448–487.

CHAPTER 5

THE COMMON CORE THESIS IN THE STUDY OF MYSTICISM

Ralph W. Hood, Jr.

Two extreme poles have defined the psychology of religion since its inception. On one extreme are psychologists convinced of the falsity of religious beliefs and committed to a naturalistic reductive interpretation of religious phenomena. Perhaps most illustrative of this view is Freud's assertion that religion is not only an illusion (motivated by desire) but ultimately a *delusion*, fated to be abandoned as humankind progresses in its scientific understanding of the natural world, the only one there is (Hood, 1992, 1997b). On the other extreme are psychologists committed to a religious worldview who seek to defend the ontological claims of religion in what Beit-Hallahmi (1985) has identified as essentially a religious apologetics disguised as scientific psychology. In Beit-Hallahmi's terms, the former psychologists perform a legitimate function in developing a psychology of religion that is necessarily reductive, and the latter distort the science of psychology, cloaking it in a religious psychology that cannot ultimately be valid as a scientific psychology.

Although the extremes are worthy of note, a well-established middle ground is open to a dialogue between various psychological and religious claims. It was best defined by William James, who is most noted to psychologists of religion for his *Varieties of Religious Experience* (1902/1985) continuously in print since its initial publication and universally acclaimed as the one true classic in the psychology of religion. However, few psychologists of religion make reference to James's first and also classic text, *The Principles of Psychology* (1890/1981). Over a decade in the writing and published at the turn of the previous century, it made the case for a psychology bound by no

other metaphysics than those that support a natural science framework. Yet struggle as James did to reject the necessity of religious concepts in that text (for instance, the soul), he eventually concluded that psychology was far from an established science; nor did he think it could become one in purely naturalistic terms. Thus, as I have argued elsewhere, the *Varieties* can be read as a sequel to the *Principles* (Hood, 1995, 2002). The *Varieties* resolves issues left hanging in the *Principles* insofar as religious experience was ignored in that text (as it still is in most general psychological texts unconcerned with religion). We learn from the *Varieties* that when religious experience is taken seriously, the methods and scope of psychology must be extended (Hood, 2002). In the first section of this chapter, I note several assumptions that define the range and scope of this extension in order to form the basis for my defense of the common core thesis in the study of mysticism. These assumptions leave open the ontological issue of the reality of what is experienced in mysticism. Thus, the assumptions are neither a priori apologetic nor reductionistic. These six assumptions do, however, lay the foundation for my defense of what is the common core thesis in mysticism.

BASIC ASSUMPTIONS

In what many identify as a postmodern world, claims to foundational realities can be perpetually problematic. Hence, I will not debate these assumptions but simply identify them explicitly as foundational to the frame of my discussion of the common core thesis. These six assumptions can be the focus of philosophical debate that is not without merit, yet on a purely cognitive level can be interminable. Yet this applies to any other set of assumptions and so, in a postmodern sense, does not differentially apply to our own view (Rosenau, 1992).

The first assumption is that in James's language, personal religious experience has "its root and centre in mystical states" (1902, p. 301). The claim is that, within all religious traditions, a mystical stream flows. Further, it is that stream that gives life and, for many, is an essential sustenance to faith traditions. As Katz (1983) and others have noted, those for whom religion is a powerful life-sustaining presence have had a troubled but passionate commitment to the particulars of their religious faith. We must explore the basis for the troublesome presence of mysticism *within* faith traditions and note as well the emergence of mysticism *outside* of faith traditions. The irony, as James knew well, is that faith traditions draw their strength from the very presence of those whose experience troubles what James referred to as secondhand believers—those for whom mystical experience is foundational to their faith but lurks as a threat to the dogmatic defense of the particulars of the tradition. James's words are worth quoting here, for they imply a theory of religious development that is not unrelated to the emergence of mysticism independent

of faith traditions—something that is of recent historical development. Here James waxes poetic as he provides both a description and a theory of mystical development from what he terms a “genuine first hand experience,” which, he claims,

is bound to be heterodoxy to its witness, the prophet appearing as a mere lonely madman. If his doctrine prove contagious enough to spread to any others, it becomes a definite and labeled heresy. But, if it then still prove contagious enough to triumph over persecution, it becomes itself an orthodoxy, and when a religion has become an orthodoxy its day of inwardness is over: the spring is dry; the faithful live at second hand exclusively and stone prophets in their turn. The new church, in spite of whatever goodness it may foster, can be henceforth counted on as a staunch ally in every attempt to stifle the spontaneous religious spirit, and to stop all later bubblings of the fountain from which in purer days it drew its own supply of inspiration. (1902/1985, p. 270)

The second assumption follows from the first and is sympathetic to James’s lack of concern with religious orthodoxy. James does not go quite as far as Scharfstein (1973) does in dismissing the noetic claims based on mystical experience as “ontological fairy-tales” (p. 45), but his dismissal of them as “over beliefs” (James, 1902/1985, p. 402) comes close. It is the priests, not the prophets, who defend orthodoxies. Orthodoxies are fashioned second-hand and weight the interpretation of experience more than the experience itself. To defend the common core thesis, I too focus on the inwardness of religious experience and not its outward expression in interpretation and belief that tends to reify into orthodoxy. I recognize this is a controversial issue, especially among those who assert that some form of constructionist thesis has trumped all other options. By constructionism is meant the crucial, even definitive, role interpretation is claimed to play in constructing experience, and not simply its interpretation. This dominant and dominating view (e.g., Katz, 1978b, 1992; Proudfoot, 1985) essentially takes a neo-Kantian turn and argues that experience is always mediated (phenomena) and that unmediated experience of whatever is ultimate (noumena) is neither possible nor describable. However, as Parsons (1999) has noted, to make this claim is simply to assert what many mystics deny based on their own experience and to take a curiously Western neo-Kantian perspective that is not accepted as nonproblematic in Eastern modes of thought. Eastern philosophies have long accepted that unmediated experiences of reality are possible. However, part of the persuasion is in the level of illumination of those who make the claim. As Huxley (1944) rightly noted long ago, “Kant was right only as regards minds that have not yet come to enlightenment and deliverance. . . . The thing in itself *can* be perceived—but only by one, who, in himself, is no-thing” (pp. 223–224, emphasis in original).

A caveat is that we acknowledge that any claim to experience is partly an interpretation. To identify anything as if it could be pulled from the stream of consciousness in bucketfuls (to paraphrase James) is to confuse the water in the bucket with the stream from which it came. It is interpretation that is the bucket that pulls water from the stream that continues on. It is not merely metaphor when mystics fumble to describe their experience as if a river flowing into the sea or as a drop of water from the ocean of life. The ability to discount the description of experience in favor of experience itself is essential to any understanding of mysticism and to our support of the common core thesis. Thus, there is no description of experience that involves no interpretation whatsoever (Stace, 1960, p. 203). Even if mystical experiences are unmediated, neither their recollection nor their description can be. This is the basis for Stace's (1960) claim that mystical experiences are "allegedly ineffable" (p. 79).

A third assumption follows closely. Mystical experiences are ineffable. The experience itself is ineffable, and absolutely so. Royce, James's great friend and adversary to whom the *Varieties* was largely addressed, once quipped something to the effect that mystics have experiences that are ineffable, and that is all they should say. However, the irony is that mystics write volumes. Among religious studies scholars, an almost exclusive emphasis on mystical texts accentuates the influence of language on mystical experience (Katz, 1978, 1992; McGinn, 1994). However, rather than a study of mystical texts, left as skins shed by serpents who have moved on, we seek the experience referenced by such texts, available to everyone disciplined or fortunate enough to be graced with experiences that, although ineffable, can be referenced in language and used to evoke what it cannot describe. The language of the mystics is many faceted, often used to evoke experience in the reader rather than describe the experience of the author (Katz, 1978a, 1992, pp. 5–15; Scholem, 1941, pp. 59–60). The language of the mystics is not to be taken as literally descriptive of an experience for which language is ill equipped by its very nature of subject/object distinctions to describe. In the tradition of the Sufi mystics, those who say do not know; those who know do not say.

A fourth assumption is that mystical experiences are neither simply emotive states nor are they simply cognitive recollections of truths available to the discursive intellect (to paraphrase James again). Yet they are noetic. The noetic claim of the mystic is to have known reality, often elevated to Reality or God. Both in personal (God) and impersonal (Godhead; Reality; One) terms, mystics provide us with hypotheses that must be explored as possible ontological claims regarding the nature of God or Reality. The knowledge is not as much *about* reality as *of* reality, in which the unity of the subject and the object is noesis. In James's (1902/1985, p. 332) succinct phrasing, "In mystic states we both become one with the Absolute and we become aware of our oneness." It is this that Stace (1960) refers to as the "dissolution of individuality" (pp. 111–113) actually experienced by mystics and by its very nature ineffable.

The fifth assumption is that, in order to adequately explore mystical experience, one must include phenomenological methods. As Staal (1975) has persuasively argued, if one wants to know what it is like to experience reality as the mystics do, one must experience it directly. Likewise, as James says in the *Principles* (1981/1890), “*Introspective observation is what we have to rely on first and foremost and always*” (p. 185, emphasis in original). If modern psychology has denied this proposition, it is, in the words of Stace (1960), “their loss and their folly” (p. 58). The mystical claim to unmediated experience of reality can with only little profit be studied from the outside. Investigators who do explore mysticism from the “outside” can at best produce correlational or causal claims to phenomena that remain obscure to those who have not had the experience (Hood, 1994; Staal, 1975). Again from the Sufi tradition we are reminded that only those who taste know. Likewise, as noted above, the assertion that all experience is mediated experience can be directly refuted by those whose experience of reality is unmediated. The skeptic can attempt to experience the same or to simply rest assured with the dogmatic assertion that “*There are NO pure (i.e. unmediated) experiences*” (Katz, 1978a, p. 26, emphasis and italics in original). In this sense, Wulff (2000) is more than merely suggestive when he states that the study of mysticism may be best acknowledged as leading to a change in the methods by which such experiences are investigated.

A sixth and final assumption is what Stace (1960) has referred to as “causal indifference” (pp. 29–31). This phrase is meant to include any and all mystical experiences regardless of the proximate context or conditions that precede the experience. Most controversial is the possibility that entheogens (formerly called psychedelics) can facilitate mystical experience. One cannot discount the reality of the experience as genuinely mystical because it was facilitated by a chemical or any other proximate cause. As James long ago noted, one cannot dismiss an experience because one can identify the physiological conditions that may accompany it. James’s (1902) discussion of “medical materialism” (pp. 11–29) reminds us that, even if experience is both embodied and contextualized, neither condition can be used to dismiss the validity of the experience nor determine its existential value. Furthermore, identifying triggers of an experience cannot be used to reduce the experience to a causal claim that it was the trigger that caused the experience. Triggers may allow one to move beyond mediation to unmediated experience of reality, the lasting claim of the mystics of all faith traditions. It may be that entheogens are one such set of triggers (see Spilka, Hood, Hunsberger, & Gorsuch, 2003, pp. 283–288).

EXAMPLES OF MYSTICISM: INTROVERTIVE AND EXTROVERTIVE

Having stated our assumptions explicitly, we can now identify what is meant by mysticism. The term is of recent coinage, and for the vast majority

of recorded history it is unlikely that anyone would identify him- or herself as a “mystic” (McGinn, 1994; Troeltsch, 1931). However, within and eventually outside of the great faith traditions, mysticism has flourished. A common assumption of many social scientists is that mysticism is like suicide: difficult to study because of its rarity and the limited ability of social scientists to identify the presuicidal person. Social scientists are not able to predict with any accuracy who will report mystical experiences, but survey studies of the report of mystical experiences reveal that as much as one-third of British and American people report having had such experiences (see Spilka et al., 2003, pp. 300–314). Scharfstein (1973) notes that social scientists have likely grossly underestimated the frequency of mystical experiences and goes so far as to talk of a common everyday mysticism—so common that the reader of this chapter has likely had such an experience. An easy way to “measure” this is simply to record the mystical experiences of others and to ask people to rate themselves on the degree to which they have had a similar experience.

Because the focus of this chapter is on the empirical study of mysticism, it will be helpful to give an example what is being measured. A widely cited mystical experience from the English poet John Symonds is one of three examples chosen by David Wulff (2000, pp. 399–400) and is favorably cited by Stace as well (1960, pp. 91–93). Both identify the original description in James’s *Varieties* (1902/1985, p. 306) in which James took the description from a biography of Symonds. My example is taken from the Religious Episodes Measure, which is composed of descriptions of religious experiences culled from James’s *Varieties*:

I would suddenly feel the mood coming when I was at church, or with people or reading, but only when my muscles were relaxed. It would irresistibly take over my mind and will, last what seemed like forever, and disappear in a way resembling waking up from anesthesia. One reason that I disliked this kind of trance was that I could not describe it to myself; even now I can’t find the right words. It involved the disappearance of space, time, feeling, and all the things I call my self. As ordinary consciousness disappeared, the sense of underlying or essential consciousness grew stronger. At last nothing remained but a pure, absolute, abstract self. (in Burris, 1999b, p. 224)

This description of a mystical experience contains the essentials of what Stace called introvertive mysticism. Here, an experience of union timeless and spaceless and devoid of any content defines what mystics claim to be an unmediated union with reality. A dissolution of individuality into a universal consciousness identified as God, Reality, One, or Pure Consciousness. In a phrase not quoted above, but part of Symond’s original description, Symonds concludes what is the essential introvertive mystical claim: “*The universe*

became without form and void of content. But self persisted" (Stace, 1960, p. 91; emphasis in original).

It is important to note that this claim violates neo-Kantian assumptions and is not argued for as much as it is declared to be an unmediated experience of reality. At this point, rather than argue the case for or against mediated realities, I simply note that the report of such unmediated claims can be reliably measured. Of course, the measurement is of the reports of such experiences and not of the experiences themselves. However, before explicitly discussing this thesis, I will cite another example of a mystical experience—one that Stace refers to as extrovertive mysticism. Here the experience is more like sense perception and looks "outward" rather than "inward."

In extrovertive mysticism, the experience of unity is perceived through the multiplicity of the objects of perception. A common phrase that describes this type of experience is "all is one." An example cited by Stace has both beauty and simplicity. Stace took it from Otto's *Mysticism East and West* (1932). The quote is from Meister Eckhart: "All that a man has here externally is intrinsically One. Here all blades of grass, wood, and stone, all things are One" (in Stace, 1960, p. 63). Likewise, from Abulafia's *Book on Untying Knots* from the thirteenth century, we have:

All the inner forces and the hidden souls in man are distributed and differentiated in the bodies. It is, however, in the nature of all of them that when their knots are untied they return to their origin, which is one without any duality and which comprises the multiplicity. (in Scholem, 1961, p. 131)

Both Eckhart's and Abulafia's quotes are presented as declarations but are obviously based on personal experiences. The unity that is One also suggests the same described in Symond's introvertive experience noted above. The claim that there are two unities (Stace, 1960, p. 133) is logically refuted on the simple basis that with an undifferentiated experience of unity there is no *principium individuationis* (Stace, 1960, pp. 133, 153).

Having established the nature of these two experiences at the purely descriptive level, it is time to consider the claim to a common core that can be found within various faith traditions. The common core is quite simply mysticism, whether introvertive or extrovertive.

MYSTICAL EXPERIENCE: THE COMMON CORE

Scholem's (1961, p. 5) claim that there is no such thing as mysticism in the abstract reminds us that mysticism has historically been found *within* the great faith traditions. However, his claim that "There is no mysticism as such, there is only the mysticism of a particular religious system" (p. 6) goes too far, as we will see in the discussion of the emergence of mysticism as an

independent type. Further, neither does Scholem's claim mean that one cannot identify mysticisms that share a common unity in the particulars of various faith traditions. It is this unity that forms the common core thesis. Although expressed within various faith traditions, this common core simultaneously transcends them. James (1902/1985) expressed the thesis directly:

In Hinduism, in Neoplatonism, in Sufism, in Christian Mysticism, in Whitmanism, we find the same recurring note, so that there is about mystical utterances and eternal unanimity which ought to make a critic stop and think and which brings about that the mystical classics have as has been said, neither birthday nor native land. (p. 332)

James's "essential unanimity" does not entail a common set of higher-order beliefs and practices shared by all religious traditions. It is decidedly not a perennial philosophy (Huxley, 1944) nor a perennial psychology (Forman, 1998). What it does entail is the claim that, *at the experiential level*, there is a common experience of unity (either extrovertive or introvertive) that is the firsthand basis on which mystics of diverse faith traditions provided the basic experiential fodder that different religious dogmas, rituals, and practices both protect and give expression to. Religions move far beyond what experience alone provides. However, we can ignore much of religion since our focus is on the nature of mystical experience that transcends any particular interpretation. Even if Scharfstein (1973) is correct in claiming that most interpretations of mystical experience are "ontological fairy-tales" (p. 45), the experience remains what it is, in itself (Kant notwithstanding)

Although James is often cited favorably in defense of the common core thesis, it is Stace (1960) who has been most often the target of criticism in the conceptual literature (Gimello, 1978, p. 195). Much of this criticism is contained in two texts edited by Katz (1978a, 1992). The claim to unmediated experience noted above has been declared invalid, as if the authority Western philosophy has granted Kant was absolute. Yet, as noted above, the claim to unmediated contact with reality is commonplace enough in mysticism to be its central defining feature. The issue to be engaged is why scholars deny the possibility of unmediated experience that is the essence of the experience of the dissolution of individuality reported in mystical experience. As Parsons (1999, p. 121) notes, it is an open possibility that one could develop a post-Kantian epistemology congruent with the mystical noesis. And to this I add that one could develop a post-Kantian psychology that is congruent with this noesis as well. To do this, I reaffirm my assumptions stated at the beginning of this chapter by noting my opposition to a too-strongly constructionist position insofar as constructionism demands that all experience be mediated experience.

First, it is an open question as to whether a post-Kantian epistemology and a psychology derived from it can be developed that supports the mystic claim

to unmediated experience. Although I agree with James that the authority of mystical experience is only absolute for those who have the experience, it also must be accepted that the report of mystical experience is a valid source of hypothesis-testing for researchers. One hypothesis to be tested is whether there are unmediated experiences, and suggestions have been made on how to do this (Almond, 1982). My position leaves the ontological issues open and accepts that mystics may be correct in the report of their experiences as simple empirical fact, introspectively or phenomenologically revealed.

Second, I accept that both mystical texts and their contexts must be respected. The claim to a common core is not simply a reductive assertion of identity that ignores differences in reports of experience. It is not a perennial philosophy or psychology that claims a higher-order interpretation common to all faith traditions. Mystics have supported a wide range of interpretations of their experience, from monism to dualism and from theism to pantheism and even atheism. But the brute phenomenological fact remains that an experience of undifferentiated unity is just that. Matilal (1992) has rightly noted that a salient feature of mysticism, however interpreted, is that it “promotes a special type of human experience that is at once unitive and nondiscursive, at once self-fulfilling and self-effacing” (p. 143). Why this particular experience is so often reported within various faith traditions must be explored as well as its emergence independent and outside of faith traditions.

If Katz has marshaled authors critical of Stace, others have begun to marshal authors to support the common core thesis. In two edited works, Forman (1990, 1998) has essentially argued that introversive mysticism, which he identifies as pure consciousness experience (PCE) necessarily lacks content and as such is independent of both culture and person. The fact that PCEs are variously interpreted after the fact can account for much of the diversity that is only apparent across mystical traditions. Again, the differences in mystical experience are at the interpretative, not experiential, level.

While the debate about whether mystical experiences share a common core is largely based on texts in the conceptual literature, it has become apparent that there are four significant literatures on mysticism, each unfortunately isolated from the other. McGinn (1994) refers to an “unrealized conversation” (p. 343) between three literatures that he has identified: the theological, the philosophical, and the comparative-psychological. Like Katz, McGinn focuses on texts and their interpretation for his illumination of mysticism. However, to these largely textually based literatures, I add a fourth: the empirical study of mysticism. Particularly useful is the empirical study of mysticism that links the phenomenological investigation of mysticism with measurement-based studies of contemporary persons reporting these experiences (Hood, 1997b). It is the fourth area that has lent considerable support to the common core thesis and to which we now turn.

PSYCHOMETRIC SUPPORT FOR THE COMMON CORE THESIS

The most common measurement scale for the study of mysticism is the Mysticism scale or M-Scale (Burris, 1999a). For purposes of this chapter, it is important to note that the 32 items of the M-scale were specifically derived from Stace's delineation of the common core that he derived phenomenologically (Hood, 1997b, 2001, in press). Thus, the M-scale is directly linked to the phenomenological (and hence conceptual) literatures. However, what it adds to our understanding of mysticism is its ability to assess the report of mystical experience among contemporary persons.

The M-scale consists of 32 items, two positively worded and two negatively worded items, all but one (paradoxicality) of the original common core criteria of mysticism proposed by Stace. Independent investigators have supported Hood's original work, indicating that the M-scale contains at least two factors (Caird, 1988; Reinert & Stifler, 1993). For our purposes, it is important to note that Factor I consists of items assessing an experience of unity (introvertive or extrovertive), while Factor II consists of items referring both to religious and knowledge claims. This is compatible with Stace's claim that a common experience (mystical experience of unity) may be variously interpreted. Other factor analyses of the M-scale by Caird (1988) and Reinert and Stifler (1993) support the original two-factor solution to the M-scale. Reinert and Stifler also suggest the possibility that religious items and knowledge items emerge as separate factors. This splits the interceptive factor into religious and other modes of interpretation, a possibility not inconsistent with Stace's phenomenological classification. This would allow for an even greater range of interpretation of experience, a claim to knowledge that can be either religiously or nonreligiously based. This is consistent with the distinction between spirituality and religion discussed below. However, the factor analytic studies cited above are far from definitive and suffer from inadequate subject-to-items ratios. Overall, they are consistent in demonstrating two stable factors: one an experience factor associated with minimal interpretation, the other an interpretative factor, probably heavily religiously influenced. However, two-factor analyses collapse introvertive and extrovertive mysticisms and do not permit independent identification.

LANGUAGE AND THE M-SCALE

A persistent problem with the M-scale is that it attempts to be neutral with respect to religious language (Hood, 2001). For instance, the scale refers to experience with ultimate reality, not to experience of union with God. However, the language of neutrality is perplexing as emphasized by theorists that oppose the common core thesis (Katz, 1992). How do we know

that union with God is the same experience as union with ultimate reality? Two issues are empirically relevant.

First, no language is neutral. Hence, an attempt to speak of union with “God” or “Christ” in language that references only “ultimate reality” suggests to some conservative religionists a “New Age” connotation. Likewise, to reference “God” or “Christ” is itself problematic for secularists. While the distinction between experience and interpretation acknowledges that language is an important interpretive issue, it also forces one to focus on the experiential basis from which genuine differences in interpretation can arise. Like texts, measurement scales use particular language and thus confound the distinction between interpretation and experience. However, empirical methods are available to suggest how this confound can be clarified. One method is to show similar factor structure despite different language use (Hood & Williamson, 2000).

Second, some individuals demand that profound experiences be interpreted. In Barnard’s (1997) extended treatment of James’s theory of mysticism, mystical experience is defined as one that is necessarily transformative with respect to contact with some transpersonal reality. Although I do not accept this definition of mysticism as properly Jamesean, it does indicate that intense, transformative experiences will be acknowledged in some language that identifies, defines, and expresses what the experienced transpersonal reality is. In Jamesean terms, this language is less constructionist of the experience than descriptive of it. Therefore, those who have experienced ultimate reality may not wish to claim it as God. Moreover, Christians may want that reality to be identified as Christ, something that non-Christian mystics may eschew. Thus, the claim of what is experienced is important as part of the social construction of the expression of experience. However, differently expressed experiences may have similar structures if confounds with language issues can be avoided.

Hood and Williamson (2000) created two additional versions of the M-scale. Each paralleled the original M-scale but, where appropriate, made reference to either God or Christ. Both the original M-scale and either the God-language version or the Christ-language version was given to relevant Christian committed samples. The scales were then factor-analyzed to see if similar structures emerged. Basically, whether the language of the M-scale referenced God, Christ, or simply reality, the factor structures were identical. Furthermore, the common factor structure for all three versions matched Stace’s phenomenologically derived model quite well. For all versions of the scale, clear introvertive, extrovertive, and interpretation factors emerged. The exception is that, as anticipated, ineffability emerged as part of the introvertive factor in all samples and not part of the interpretation factor as suggested by Stace. However, as Hood and Williamson note, an experience devoid of content is inherently “ineffable,” because there is no content to describe. This is also Stace’s (1960) claim with respect to the introvertive experience in that

he claims the experience itself is ineffable but the recollection of it is not (pp. 297–298).

In additional studies directly testing Hood’s modification of Stace’s phenomenological classification, confirmatory factor analysis was used. Hood and his colleagues translated the M-scale into Persian and administered this scale to a sample of Iranian Muslims (Hood et al., 2001). The scale in its original English version was also administered to a sample of Americans. Confirmatory factor analysis was then used to directly test Hood’s model of mysticism in both samples (with ineffability as part of introvertive mysticism) to other possible models, including Stace’s (where ineffability was part of the interpretative factor). Results showed that, overall, both Stace’s and Hood’s models were better than any other models and that, overall, Hood’s model of mysticism was better than Stace’s. Thus, empirically, there is strong support for the claim that, as operationalized from Stace’s criteria, mystical experience is identical as measured across diverse samples, whether expressed in “neutral language” in either English or Persian or in specific religious language uses “God” or “Christ” references with appropriate samples. Furthermore, three factor solutions that do not collapse introvertive and extrovertive experiences

Table 5.1 Phenomenologically Derived (Stace) and Empirically Derived (Hood) Models of Mystical Experience

Phenomenologically Derived Model of the Common Core

Introvertive mysticism

- A Undifferentiated pure consciousness
- B. Timeless/spaceless

Extrovertive mysticism

- A. The perception of unity in diversity
- B. Inner subjectivity to all

Interpretation

- A. Noetic
- B. Religious
- C. Positive affect
- D. Paradoxicality (not measured in M-scale)
- E. Ineffability (alleged)

Empirically Derived Model of the Factor Structure of the M-Scale

Introvertive mysticism (12 items)

- A. Pure consciousness items
- B. Time/space items
- C. Ineffability items

Extrovertive mysticism (8 items)

- A. Unity in diversity items
- B. Inner subjectivity items

Interpretation (12 items)

- A. Noetic items
 - B. Religious items
 - C. Positive affect items
-

of unity fit well with Stace's model (Hood, Morris, & Watson, 1993; Hood & Williamson, 2000; Hood et al., 2001). The basic structure of mysticism that emerges from empirically based measurement studies is directly compared to Stace's phenomenological classification shown in Table 5.1.

Three factor solutions to the M-scale are not simply the most adequate overall measure of mysticism in psychometric terms, but they offer strong empirical support for Stace's common core thesis. Both introvertive and extrovertive mysticism can be clearly identified with ineffability as a defining component of the actual experience of introvertive mysticism. Likewise, regardless of the language of the M-scale, the basic structure of the experience remains constant across diverse samples and cultures. This is a way of stating Stace's common core thesis in measurement-based terms. It also allows us to return to the issue raised by James's view of religious experience. The possibility that mysticism emerges within religious traditions which then come to oppose this primary source from which they derive their existence can be explored empirically. The common core thesis, supported by measurement studies, makes clear that the interpretation of mystical experience can be religious but it need not be.

MYSTICISM WITHIN AND OUTSIDE RELIGION: TROELTSCH'S MODEL

The unfortunate fact of an unrealized conversation between literatures noted by McGinn can partly account for the fact that psychological studies of mysticism have ignored a powerful theory of mysticism embedded in the work of Troeltsch (1931), usually referenced only in the sociological literature (Hood, 2003).

Troeltsch, like Bouyer (1980), saw mysticism as an inherent tendency to seek personal piety and an emotional realization that serves to intensify commitment to a religious tradition. This is mysticism that is inherent and foundational to any and all faith traditions. It is a religion infused with spirituality. Troeltsch classified the traditions into ideal types. The church type is open to all who profess belief, while the sect type is more exclusive as it seeks to purify a church tradition that has been perceived to have strayed from the rigors and pure demands of the faith tradition. The sect thus demands firmer criteria for membership and opposes a strict exclusiveness to the universality and openness of the church type. Both churches and sects are defined as much by their beliefs and rituals that, as noted above, are not directly derivable from mystical experiences. Here is the essence of James's claim that the faithful live by criteria that are far removed from and only indirectly related to firsthand religious experiences, including mystical ones. If churches or sects cannot keep this inward spirituality alive, some seek it elsewhere. Likewise, if either the church or sect closes off the possibility of such experiences, some will seek their spiritual nourishment from other sources.

Only when mysticism emerges as an independent religious principle as a reaction to the church and the sect type does it become a new social force and seeks an independent philosophical or psychological justification. This is mysticism as a third ideal type. This justification can be outside of the faith tradition, and indeed, as noted above, mystical experiences need not be religiously justified at all. Thus, there are two forms of mysticism: one integral to any and all faith traditions and another that can emerge out of and be independent of any faith tradition. These two forms of the mystical type must be clearly distinguished; something social scientists have failed to do. Garrett simply identifies these as M1 and M2 (Garrett, 1975; Troeltsch, 1931, pp. 214–215).

In the widest sense, mysticism is simply a demand for an inward appropriation of a direct inward and present religious experience (Bouyer, 1980; Troeltsch, 1931, p. 730). It takes the objective characteristics of its tradition for granted and either supplements them with a profound inwardness or reacts against them as it demands to bring them back “into the living process” (Troeltsch, 1931, p. 731). This is Garrett’s M₁, or Troeltsch’s “wider mysticism.” We identify this as *religious mysticism* because it is a mysticism that Troeltsch (1931, p. 732) and Bouyer (1980, p. 51) assert is found within all religious systems as a universal phenomena. Thus, as an empirical fact, it entered Christianity partly from *within* insofar as Christianity entails the same logical form as all traditions relative to this type and partly from *without* from other sources that were “eagerly accepted” by Christianity (Troeltsch, 1931, p. 732). Concentrating among the purely interior and emotional side of religious experience, it creates a spiritual interpretation of every objective side of religion such that mystics typically stay within their tradition (Katz, 1983). However, Troeltsch (1931) also identifies a “narrower, technically concentrated sense” of mysticism (p. 734). This is Garrett’s M₂. It is a mysticism that has become independent in principle and contrasted with religion. It gives rise to persons who identify themselves as “spiritual but not religious.” It claims to be the true inner principle of all religious faith but is not contained within any particular tradition. This we refer to as *spiritual mysticism*, but the term “spiritual” is redundant. Mysticism now breaks away from religion which it disdains. It accepts no constraint or community other than self-selected and realized. It is a spiritual religion with the term “religion” as redundant here as “mysticism” was above. It is what many today profess to be spirituality as opposed to religion. It is a mysticism not linked to the interpretative mandates of any one faith tradition.

EMPIRICAL EXAMPLES OF RELIGIOUS AND SPIRITUAL MYSTICISM

Pargament and his students have taken the lead in descriptive and correlational work identifying distinctions between religious and spiritual

self-identification (Zinnbauer et al., 1997). I focus on one study to illustrate the conceptual distinction between the two mysticisms noted above. One motivation for this study was to paraphrase part of the title of the article in which these data are presented—to “unfuzzy the fuzzy” (a phrase first coined by Spilka). If critics of religion find it too constraining, critics of spirituality find it is not constrained enough. Using an essentially forced-choice procedure, participants were asked to endorse one of the following five options: (1) Religiousness and spirituality overlap, but they are not the same concept. (2) Spirituality is a broader concept than religiousness, and includes religiousness. (3) Religiousness is a broader concept than spirituality and includes spirituality. (4) Religiousness and spirituality are the same concept and overlap completely. (5) Religiousness and spirituality are different and do not overlap. In addition, participants rated themselves on spirituality and religion on a five-point scale. Participants also identified themselves as either *religious*, *spiritual*, *both*, or *neither*, in a forced-choice context. Finally, a content analysis was performed on the participant’s personal definitions of religiousness and spirituality.

Data were solicited from 11 small convenience samples, ranging from “conservative Christian college students” to “New Age groups.” Most of the 364 participants were either college students or members of some religious group. Exceptions included small samples of residents of a nursing home ($n = 20$) and of mental health workers ($n = 27$). Overall, 78 percent of participants identified themselves as religious, while 93 percent identified themselves as spiritual. Most religious persons considered themselves to be spiritual (74%). Overall, few persons thought religiousness and spirituality to be identical concepts (2.6%) or entirely nonoverlapping concepts (6.7%). Thus, for most, religiousness and spirituality are somehow and variously intertwined. Nearly identical percentages identify themselves as religious but not spiritual (4%) or as neither (3%). Very few people consider themselves religious but not spiritual. Hence, for most, religion is inherently involved with spirituality.

Content analysis for personal definitions of spirituality and religiousness revealed a fact consistent with our discussion of the interview data above: the most common categories for spirituality were *experiential* while those for religion were *belief*. For all groups, self-rated spirituality equals or exceeds self-rated religiousness. Not surprisingly, the greatest differences between self-ratings are among participants who are members of religious groups distant from traditional expressions of faith, such as New Age groups and Unitarians. While members of more traditional faith groups differ in levels of self-rated religiousness and spirituality, within specific groups (such as Roman Catholics) there is no significant difference. Among New Age groups, self-rated spirituality greatly exceeds self-rated religiousness. Furthermore, conservative religious groups make less distinction between spirituality and religiousness (Zinnbauer et al., 1997, pp. 554–567).

These data are congruent with previous empirical work. In particular, the finding that mental health workers are more spiritual than religious replicates previous work on mental health professionals. Shafranske (1996) reviewed the empirical research on the religious beliefs, associations, and practices of mental health professionals. Focusing primarily on samples of clinical and counseling psychologists who are members of the American Psychological Association, Shafranske noted that psychologists are less likely to believe in a personal God or to affiliate with religious groups than other professionals or the general population. In addition, while the majority of psychologists report that spirituality is important to them, a minority report that religion is important to them (p. 153). Shafranske summarizes his own data and the work of others to emphasize that psychologists are more like the general population than previously assumed. However what Shafranske lumps together by various indices as the "religious dimension" (p. 154) can be misleading. Psychologists are not like the general population. In fact, psychologists neither believe, practice, nor associate with the institutional aspects of faith ("religion") as much as they endorse what Shafranske properly notes are "noninstitutional forms of spirituality" (p. 154). One could predict that, in forced-choice contexts, they are most likely to be "spiritual but not religious." Empirically, three facts about religious and spiritual self-identification ought to be clear.

First, most persons identify themselves as both religious and spiritual. These are largely persons sampled from within faith traditions for which it is reasonable to assume that spirituality is at least one expression of and motivation for their religion (e.g., institutional participation). Hence, many measures of spirituality simply operate like measures of religion (Gorsuch & Miller, 1999). Here is a mysticism that is comfortable within the bounds of a specific faith tradition. This is religious mysticism.

Second, a significant minority of individuals use spirituality as a means of rejecting religion. However, what is rejected is religious belief and claims to exclusiveness, not the mysticism contained within the tradition. This is particularly obvious in qualitative studies in which individuals identify their spirituality in defiant opposition to religion. They oppose various aspects of the institution of religion such as its authority, its more specific ("closed") articulation of beliefs ("dogma") and practices ("ritual"), and they seek to move away from religion to be "more developed" spiritually. The move is from belief to experience, as Day (1994) has perceptively noted. To this I add that experience need not seek explicit interpretation. The common core of mysticism can break free of any interpretative bounds.

Third, religiousness and spirituality overlap considerably, at least in American populations. The majority of the population is religious *and* spiritual, both in terms of self-identification and in terms of self-representations. Exceptions are easy to identify, but one ought not to lose sight of the fact

that they are *exceptions*. Significantly, they include not only scientists in general but psychologists in particular (Beit-Hallahmi, 1977; Shafranske, 1996). Among these people, a hostility to religion as thwarting or even falsifying spirituality is evident. This hostility is readily revealed in qualitative studies in which there is some degree of rapport between interviewer and respondents (see Hood, for review). These persons report mystical experiences without the need for faith-bound interpretations. Indeed, persons within and outside religious traditions who report mystical experiences seldom refute the experiential claims of one another. As Stace (1960) has perhaps overstated the case, "There is no instance of a person who has been illumined denying or disputing the teachings of another who has passed through the same experience" (p. 33). Neither are they bound by each other's interpretation of what the experience might mean. There emerges no perennial philosophy from the common experiential core.

SUMMARY AND CONCLUSION

This allows us to come full circle with the common core thesis. Religions are much more than efforts to confront mystical experience. However, there is little doubt that mystical experiences, whether introvertive or extrovertive, share a common core. They can elicit a sense of the sacred that demands some form of religious interpretation. Most mystics struggle within their faith tradition to give expression to this primary experience. Huxley (1944, p. 132) reminds us that mystics both make theology and are made by it. However, as religions emerge with some hostility toward these experiences or demand a too-constrictive dogmatic interpretation, mystics can break away from churches and sects, become indifferent or hostile to religion, and identify themselves as simply "spiritual" or indeed as simply "mystics." They may seek secular interpretations of their experience or be satisfied with the experience itself. This dynamic process can be found throughout mystical traditions in all cultures. The tension is always between an experience that is ineffable and the claims to describe it. Stace (1960) noted this as well. His common core thesis led him to conclude, as did Huxley (1944), that the link between mysticism and religion exists only insofar as each claim to acknowledge a transcendence that is both sacred and holy. However, as noted above, mysticism may be both a self-fulfilling and a self-effacing experience of oneness—or perhaps, as the common core thesis suggests, it is also self-authenticating. While the fascination with the issue of unity and diversity, the one and the many, has largely been linked in the history of thought with a religious sensitivity (Copleston, 1982), mysticism has emerged independent of religion and can exist without it. Whether mysticism persists depends much on how the issues of religion and spirituality play out. Regardless, mystical experience remains what it is, self-authenticating for the mystic in all its ineffability.

REFERENCES

- Almond, P. (1982). *Mystical experience and religious doctrine*. Berlin: Mouton.
- Barnard, G. W. (1997). *Exploring unseen worlds: William James and the philosophy of mysticism*. Albany: State University of New York Press.
- Beit-Hallahmi, B. (1977). Curiosity, doubt and devotion: The beliefs of psychologists and the psychology of religion. In H. N. Malony (Ed.), *Current perspectives in the psychology of religion* (pp. 381–391). Grand Rapids, MI: Eerdmans.
- Beit-Hallahmi, B. (1985). Object relations theory and religious experience. In R. W. Hood, Jr. (Ed.), *Handbook of religious experience* (pp. 254–268). Birmingham, AL: Religious Education Press.
- Bouyer, L. (1980). Mysticism: An essay in the history of the word. In R. Woods (Ed.), *Understanding mysticism* (pp. 42–55). Garden City, NY: Image.
- Burris, C. T. (1999a). The Mysticism scale: Research form D (M-scale). In P. C. Hill & R. W. Hood, Jr. (Eds.), *Measures of religiosity* (pp. 363–367). Birmingham, AL: Religious Education Press.
- Burris, C. T. (1999b). The Religious Experience Episodes Measure (REEM). In P. C. Hill & R. W. Hood, Jr. (Eds.), *Measures of religiosity* (pp. 220–224). Birmingham, AL: Religious Education Press.
- Caird, D. (1988). The structure of Hood's Mysticism scale: A factor analytic study. *Journal for the Scientific Study of Religion*, 27, 122–127.
- Copleston, F. (1982). *Religions and the one*. New York: Crossroad.
- Day, J. M. (1994). Moral development, belief and unbelief: Young adult accounts of religion in the process of moral growth. In J. Corveleyn & D. Hutsebaut (Eds.), *Belief and unbelief* (pp. 155–173). Amsterdam: Rodopi.
- Forman, R. K. C. (Ed.). (1990). *The problem of pure consciousness*. New York: Oxford University Press.
- Forman, R. K. C. (Ed.). (1998). *The innate capacity*. New York: Oxford University Press.
- Garrett, W. R. (1975). Maligned mysticism: The maledicted career of Troeltsch's third type. *Sociological Analysis*, 36, 205–223.
- Gimello, R. M. (1978). Mysticism and mediation. In S. Katz (Ed.), *Mysticism and philosophical analysis* (pp. 170–199). New York: Oxford University Press.
- Gorsuch, R. L., & Miller, W. R. (1999). Assessing spirituality. In W. R. Miller (Ed.), *Integrating spirituality into treatment* (pp. 47–64). Washington, DC: American Psychological Association.
- Hood, R. W., Jr. (1992). Mysticism, reality, illusion and the Freudian critique of religion. *International Journal for the Psychology of Religion*, 2, 141–159.
- Hood, R. W., Jr. (1994). Self and self-loss in mystical experience. In T. M. Briunthauptm & R. P. Likas (Eds.), *Changing the self* (pp. 279–303). Albany: State University of New York Press.
- Hood, R. W., Jr. (1995). The soulful self of William James. In D. Capps & J. L. Jacobs (Eds.), *The struggle for life: A companion to William James' the varieties of religious experience* (pp. 209–219). Newton, KS: Mennonite Press.
- Hood, R. W., Jr. (1997a). The empirical study of mysticism. In B. Spilka & D. N. McIntosh (Eds.), *The psychology of religion* (pp. 222–232). Boulder, CO: Westview Press.

- Hood, R. W., Jr. (1997b). Psychoanalysis and fundamentalism: Lessons from a feminist critique of Freud. In J. L. Jacobs & D. Capps (Eds.), *Religion, psychoanalysis and society* (pp. 42–67). Boulder, CO: Westview Press.
- Hood, R. W., Jr. (2001). *Dimensions of mystical experience: Empirical studies and psychological links*. Amsterdam: Rodopi.
- Hood, R. W., Jr. (2002). The mystical self: Lost and found. *International Journal for the Psychology of Religion*, 1, 1–24.
- Hood, R. W., Jr. (2003). Spirituality and religion. In A. L. Griel & D. Bromley (Eds.), *Defining religion: Investigating the boundaries between sacred and secular* (Vol. 10 of *Religion and the social order*, pp. 241–262). Oxford, England: Elsevier.
- Hood, R. W., Jr. (in press). The empirical study of mysticism. In D. Wulff (Ed.), *Handbook of the psychology of religion*. New York: Oxford University Press.
- Hood, R. W., Jr., Ghorbani, N., Watson, P. J., Ghramaleki, A. F., Bing, M. B., Davison, H. R., et al. (2001). Dimensions of the mysticism M-scale: Confirming the three factor structure in the United States and Iran. *Journal of the Scientific Study of Religion*, 40(4), 691–705.
- Hood, R. W., Jr., Morris, R. J., & Watson, P. J. (1993). Further factor analysis of Hood's mysticism-scale. *Psychological Reports*, 73, 1176–1178.
- Hood, R. W., Jr., Spilka, B., Hunsberger, B., & Gorsuch, R. (2003). *The psychology of religion: An empirical approach* (3rd ed.). New York: Guilford Press.
- Hood, R. W., Jr., & Williamson, W. P. (2000). An empirical test of the unity thesis: The structure of mystical descriptors in various faith samples. *Journal of Christianity and Psychology*, 19, 222–244.
- Huxley, A. (1944). *The perennial philosophy*. New York: Harper Colophon.
- James, W. (1981). *The principles of psychology*. Cambridge, MA: Harvard University Press. (Original manuscript published 1890.)
- James, W. (1985). *The varieties of religious experience*. Cambridge, MA: Harvard University Press. (Original manuscript published 1902.)
- Katz, S. T. (1978a). Language, epistemology, and mysticism. In S. T. Katz (Ed.), *Mysticism and philosophical analysis* (pp. 22–74). New York: Oxford University Press.
- Katz, S. T. (Ed.). (1978b). *Mysticism and philosophical analysis*. New York: Oxford University Press.
- Katz, S. T. (Ed.). (1983). *Mysticism and religious traditions*. New York: Oxford University Press.
- Katz, S. T. (Ed.). (1992). *Mysticism and language*. New York: Oxford University Press.
- Matilal, B. K. (1992). Mysticism and ineffability: Some issues of logic and language. In S. T. Katz (Ed.), *Mysticism and language* (pp. 143–157). New York: Oxford University Press.
- McGinn, B. (1994). The presence of God: A history of Christian mysticism. *The foundations of mysticism* (Vol. 1). New York: Crossroads.
- Otto, R. (1932). *Mysticism east and west* (B. L. Bracey & R. C. Payne, Trans.). New York: Macmillan.
- Parsons, W. B. (1999). *The enigma of the oceanic feeling: Revisioning the psychoanalytic theory of mysticism*. New York: Oxford University Press.
- Proudfoot, W. (1985). *Religious experience*. Berkeley: University of California Press.
- Reinert, D. F., & Stifler, K. R. (1993). Hood's Mysticism-scale revisited: A factor analytic replication. *Journal for the Scientific Study of Religion*, 32, 383–388.

- Rosenau, P.M. (1992). *Postmodernism and the social sciences: Insights, inroads, and intrusions*. Princeton, NJ: Princeton University Press.
- Scharfstein, B.A. (1973). *Mystical experience*. Indianapolis, IN: Bobbs-Merrill.
- Scholem, G.G. (1941). *Major trends in Jewish mysticism*. New York: Schocken Books.
- Shafranske, E. (1996). Religious beliefs, practices and affiliations of clinical psychologists. In E. Shafranske (Ed.), *Religion and the clinical practice of psychology* (pp.149–164). Washington, DC: American Psychological Association.
- Spilka, B., Hood, R. W., Jr., Hunsberger, B., & Gorsuch, R. (2003). *The psychology of religion: An empirical approach* (3rd ed.). New York: Guilford Press.
- Staal, F. (1975). *Exploring mysticism: A methodological essay*. Berkeley: University of California Press.
- Stace, W. T. (1960). *Mysticism and philosophy*. Philadelphia: Lippincott.
- Troeltsch, E. (1931). *The social teaching of the Christian churches* (2 vols., O. Wyon, Trans.). New York: Macmillan.
- Wulff, D.M. (2000). Mystical experience. In E. Cárdena, S.J. Lynn, & S.S. Krippner (Eds.), *Varieties of anomalous experience* (pp. 397–440). Washington DC: American Psychological Association.
- Zinnbauer, B.J., Pargament, K. I., Cole, B., Rye, M. S., Butter, E. M., Belavich, T. G., et al. (1997). Religion and spirituality: Unfuzzifying the fuzzy. *Journal for the Scientific Study of Religion*, 36, 549–584.

CHAPTER 6

CROSS-CULTURAL ASSESSMENTS OF SHAMANISM AS A BIOGENETIC FOUNDATION FOR RELIGION

Michael Winkelman

The concept of the shaman has been widely applied but remains problematic for a number of reasons. The underlying issues are whether the concept of the shaman is strictly emic, related to a particular culture; or whether shamanism constitutes an etic or universal phenomenon, with cross-cultural applicability and commonalities derived from underlying features of human biology. The central contentions include whether shamans are specific to particular cultures or areas (e.g., Paleosiberia), whether they constitute a human universal found in all societies, or whether they are a widely distributed phenomena found in specific kinds of societies (e.g., hunter-gatherer). Cross-cultural investigations are indispensable methods for empirically addressing these questions and for establishing the nature of shamanism. This article summarizes cross-cultural studies (Winkelman, 1985, 1986a, 1986b, 1990, 1992, 1996; Winkelman & White, 1987, Winkelman & Winkelman, 1991) establishing the cross-cultural nature of shamanism and the universal distribution of shamanistic healers who share biological roots with shamanism. These studies also differentiate shamans from shamanistic healers—practitioners who share similarities with shamans in their common biogenetic foundations involving the use of altered states of consciousness (ASCs) in community rituals involving interaction with spirits and as the basis for training and healing activities. The relationship of various types of shamanistic healers to subsistence, social, and political characteristics provides evidence of the evolutionary transformation of a hunter-gatherer shamanism into other types of religious practitioners. The principal universals of shamanistic healers are assessed to identify their biogenetic structural bases involving: integrative

functions of consciousness; sociophysiological mechanisms involving the attachment and bonding mechanisms; and forms of metaphoric self and other reference allowing for development of personal and social identity.

DEFINITIONAL VERSUS CROSS-CULTURAL APPROACHES TO SHAMANISM

Questions regarding the nature of shamanism have been problematic because of the general lack of systematic cross-cultural empirical investigations by those who wish to generalize about shamans. The term "shaman" has been used to refer to many different magico-religious practitioners, generally with the presumption that, despite the apparent diversity of the practices referred to by the term, they are nonetheless in some sense essentially the same. Some researchers have specified what they viewed as the commonalities of shamans (e.g., Eliade, 1964; Hultkrantz, 1973), but many authors have failed to explicate the commonalities they presume and establish that they are, in fact, universals of shamanism. Those who purport that there are universals of shamanism have generally based this on a haphazard synthesis of data from select cultures. Most studies, however, have employed a definitional approach, specifying the particular characteristics they consider to define the shaman (e.g., see Jakobsen, 1999; Townsend, 1997). Some generalize shamans to any practitioners using trances (Peters & Price-Williams, 1981), while others wish to restrict the term regionally (e.g., Siikala, 1978).

Arbitrary definitional approaches do not establish the characteristics of shamans, nor explain cross-cultural similarities and differences in shamanistic practices. A cross-cultural or holocultural method (e.g., see Murdock & White, 1969) is required to answer these questions regarding the issue of the universality of shamans and their characteristics. An empirical approach needs to be based in culturally derived criteria for recognizing practitioners in order to derive a true etic structure rather than an arbitrarily imposed structure. This article reports on such cross-cultural studies that identify the features associated cross-culturally with shamanism, their characteristic and differences from other religious healing practitioners, and the biological bases underlying shamanic universals.

Cross-Cultural Studies of Magico-Religious Practitioners

An empirical determination of the cross-cultural status of shamans and other magico-religious practitioners and their characteristics is provided by a cross-cultural research project (Winkelman, 1985, 1986a, 1986b, 1990, 1992; see Winkelman & White, 1987, for data). This study was based on the Standard Cross-Cultural Sample (SCCS) (Murdock & White, 1969), which is representative of the geographic, social, and cultural regions of the world

and a time span of approximately 4,000 years. Winkelman's study focused on the culturally recognized magico-religious practitioners in a stratified 47-society subset of the SCCS. Other studies of the SCCS provided the subsistence and social variables used to identify the associated conditions.

In each of these societies, all of the culturally recognized positions (statuses or roles) involving interaction with supernatural entities or power were individually assessed in terms of a large number of variables (see Winkelman, 1985). These culturally recognized magico-religious practitioners (see Winkelman, 1992; Winkelman & White, 1987) were assessed in terms of their characteristics and irrespective of their labels (i.e., shaman, priest, witch), using a common set of variables reflecting magico-religious activities that were developed from the descriptions of these practices as provided in the ethnographic literature. These variables included, but were not limited to, the practitioners': selection procedures; training conditions; "trance" (altered state of consciousness) induction techniques and procedures; sources of power; relationships to spirits; psychological, social, and economic characteristics; life cycle rituals; social context of and motives for professional activities; sociopolitical powers and activities; and healing, divination, malevolent, propitiation, seasonal, and other rituals. The coded variables for the characteristics of these magico-religious practitioners were submitted to coding reliability checks (Winkelman & White, 1987).

This empirically derived and independently validated cross-cultural data were submitted to statistical analysis to empirically determine the similarities in practitioners from diverse societies. These empirical similarities were used as the basis for deriving distinct groups or types of magico-religious practitioners that have cross-cultural validity. Cluster analyses procedures were used for mathematical assessments of the shared characteristics across practitioners and for determination of the different etic types of practitioners, which were subjected to independent validation (for methods and analysis, see Winkelman, 1986a, 1990, 1992; see Winkelman & White, 1987, for data). I have labeled these empirically derived groups with the terms shaman, shaman/healer, healer, and medium (collectively constituting shamanistic healers); priest; and sorcerer/witch (see Winkelman, 1992, for coverage of priests and sorcerers/witches).

This empirically derived typology provided a basis for establishing the etic status of shamans and other types of magico-religious practitioners and for determining their characteristics.¹ The findings show that some religious practitioners found in Eurasia, the Americas, and Africa are more similar to one another *across* these different regions than they are to other magico-religious practitioners found *within* the regions. Restated, practitioners from different societies and different regions of the world are more similar to each other, based on empirically shared characteristics, than they are to geographically more proximate practitioners, including other practitioners in their

own culture. This empirical similarity is more relevant than geographical location or definitions. These findings include an empirically derived group of magico-religious healers that correspond closely to classic characteristics attributed to the shaman. This indicates that the term shaman should be used on the basis of empirically shared characteristics. It is noteworthy that some of the magico-religious practitioners that are labeled as shamans by ethnographers are significantly different from the characteristics of the empirically derived group that is labeled shamans. Instead, these practitioners may be empirically classified as mediums or other types of shamanistic healers, providing support for the contention that the term shaman is overextended in its applications.

These cross-cultural findings (Winkelman, 1986a, 1990, 1992) suggest the use of the term shaman to refer to healers of hunter-gatherer and other simple societies who are trained through ASC for healing and divination and share other characteristics (see below). These shamans are distinguished from other magico-religious healers (mediums, healers, and shaman/healers) found in more complex societies who also use ASC but have other characteristics that distinguish them from shamans. The universal features of shamanism reflect biogenetic foundations of human nature and structural principles of the organism and its brain. The foundations of these biological features are addressed in the final section of this chapter. Although the characteristics of shamanism are principally manifested in hunter-gatherer societies, some of the core features of the shaman—altered states of consciousness, community rituals, and spirit interactions—are a human universal. These characteristics are associated with other religious healing practitioners in advanced agricultural societies, particularly those with political integration and social stratification. This reflects the fundamental role of ecological and social factors as determinants in the form of religious practices, even those with a biogenetic structural basis. These social influences modify the original forms of shamanism, giving rise to a variety of other socially structured forms of shamanistic healers, practitioners who use the principles of shamanism in more complex societies. Shamanistic healers and their similarities and differences described in the subsequent section are based on Winkelman's research (1985, 1986a, 1986b, 1990, 1992; Winkelman & White, 1987).

Cross-Cultural Characteristics of Shamans

Cross-cultural research illustrates empirically similar magico-religious practitioners found in hunter-gatherer and simple agricultural and pastoral societies. Harner (1990) refers to this worldwide phenomenon as "core shamanism." These empirically derived shamans were found in societies in regions around the world, with the exception of the Circum-Mediterranean; this absence is related to the lack of hunter-gatherer societies from this region in the sample

used (Winkelman, 1986a). Shamans are found worldwide in nomadic or semi-nomadic hunter-gather, horticultural, and pastoral societies, and are statistically associated with nomadism and a lack of political integration beyond the local community. These predictors maintain significance independent of controls for diffusion, indicating independent origins (Winkelman, 1986a, 1992).

The practitioners empirically clustered in the group labeled shaman included characteristics core to Eliade's description of shamans as individuals who use ecstasy to interact with the spirit world on behalf of the community. Shamans are also charismatic social leaders who engage in spirit-mediated healing and divination for the local community. Shamans' all-night ceremonies are the major religious activity, involving the entire local community in dancing, drumming, and chanting. Shamans also lead raiding parties, organize communal hunts, and direct group movement. Shamans engage in activities on behalf of a client, but generally with the entire local community (the band) participating. Shamans also may engage in malevolent magical acts designed to harm others.

Shamans tend to come from shaman families whose ancestors provided spirit powers. Shamans' selection may result from the desires of a deceased shaman relative who provides spirit allies, but in most shamanic cultures anyone may become a shaman if he or she is selected by the spirits, undergoes training, and is successful in practice. Shamans are selected through a variety of procedures, including involuntary visions, receiving signs from spirits, and serious illness. In most cultures, shamans are predominantly male; however, most cultures also allow females to become shamans, but typically limit their practice to before or after childbearing years. Shamans' developmental experiences might include an attack by spirits that results in death and rebirth. This dismemberment and reconstruction by the spirits provides shamans with powers, especially animal allies, that provide assistance in healing, divination, hunting, and the ability to use sorcery to harm others.

Shamanic training involves induction of an altered state of consciousness and seeking contact with the spirits, often an extension of vision quest experiences undertaken by the entire population (or all males) as a part of adult development. Shamans' ASCs are induced through a variety of procedures: auditory driving (e.g., drumming and chanting), fasting and water deprivation, exposure to temperature extremes, extensive exercise such as dancing, hallucinogens, painful austerities, sleep deprivation, and social and sensory deprivation. A central aspect of the shaman's experience involves the shaman's "soul journey" or "magical flight," during which an aspect of the shaman departs the body and travels to other places. Shamans' ASCs are generally labeled as involving soul flight, journeys to the underworld, and/or transformation into animals. Shamans are not normally possessed by spirits; rather they control spirits and are believed to accomplish their feats

through the actions of their spirit allies. A characteristic feature of shamans' ASC is a visionary experience (Noll, 1983) during which they contact the spirit world; animal spirits are central to shamans' powers.

Shamans therapeutic processes involve removal of objects or spirits sent by other shamans through sorcery and soul journeys to recover lost souls and power animals—aspects of the patient's personal essence and powers. Shamanic soul recovery involves a soul journey to do battle with the spirits to rescue the patient's lost soul. Therapeutic processes involve community participation, healing through enhancing social bonding processes, restoring a sense of identity and emotional well-being, and restoring and transforming self (see Halifax, 1979; Ingerman, 1991).

Associated with shamans worldwide are:

- community ritual with chanting, drumming, and dancing;
- an ASC experience characterized as a soul journey or magical flight;
- shamanic training with ASC to produce visionary experiences;
- an initiatory crises involving a death and rebirth experience;
- abilities of divination, diagnosis, and prophecy;
- therapeutic processes focused on soul loss and recovery;
- disease caused by spirits, sorcerers, and the intrusion of objects or entities;
- animal relations, including control of animal spirits and transformation into animals;
- malevolent acts or sorcery; and
- hunting magic.

RELIGIOUS UNIVERSALS AND SOCIETAL SPECIFICS: SHAMANISTIC HEALERS

The hunter-gatherer shamans' utilization of ASC to communicate with the spirit world on behalf of the community and for divination and healing is found in all societies; these features constitute universals of religion with biological bases (Winkelman, 2000, 2004a, p. 231). These ASC, spirit relations, and community rituals are a human religious universal; however, these activities are associated with different types of practitioners in more complex societies. The term "shamanistic healers" has been proposed for these universally distributed practitioners who use ASC for training, healing, and divination (Winkelman, 1990). The different types of shamanistic healers share the following characteristics:

- induction of ASC in training and professional activities;
- providing divination, diagnosis, and healing;

physical treatments (e.g., massage, herbal preparations);
use of rituals and invocations; and
removal of detrimental effects of spirits and human agents (e.g., sorcerers)
(Winkelman & Winkelman, 1991).

Shamanistic healers share other features, including providing relief by meeting needs for assurance and counteracting anxiety and its physiological effects. Their symbolic manipulations can change emotional responses and share commonalities in addressing emotional distress. The processes include eliciting community support and meeting needs for belonging, comfort, and bonding with others. Shamanistic healing practices can also heal emotional problems by eliciting repressed memories and restructuring them, providing opportunities for social confession and forgiveness, resolving intrapsychic and social conflicts, and providing processes for expression of unconscious concerns. Emotions and unconscious dynamics typically are manipulated by attributing these processes to external forces (spirits).

Shamanistic healing practices utilize universal aspects of symbolic healing (Dow, 1986). This involves placing the patient's circumstances within the broader context of cultural mythology and ritually manipulating these relationships to emotionally transform the patient's self and emotions. Ritual manipulation of unconscious psychological and physiological structures enables shamanistic healers to evoke cognitive and emotional responses that cause physiological changes. These are achieved by the manipulation of cultural symbols associated with autonomic responses and through activities that cause physiological changes (e.g., drumming, fasting).

There are differences in the emotional psychodynamics of shamans and other shamanistic healers, reflected in the psychodynamic differences in soul journey, possession, and meditation (Winkelman, 2000). Shamanistic healers also differ with respect to a variety of other characteristics, including the types of societies in which they are found, the processes involved in their training, the nature and source of their powers, and their relationships to social institutions. These differences in shamanistic healers are illustrated in the following discussion of shaman/healers, mediums, and healers.

Shaman/Healers

The empirically derived group of magico-religious practitioners labeled shaman/healers are associated with sedentary agricultural societies at all levels of social stratification and political integration. The adoption of agriculture and its associated consequences are the fundamental cause of the transformations of shamans into shaman/healers. The fundamental role of agriculture in the transformation of the original forms of shamanism into

other types of shamanistic healers is further supported by the significant association of agricultural societies with the presence of another form of magico-religious practitioner, priests (Winkelman, 1992). Although the shaman/healers engage in healing and divination for the community, they differ from shamans on a number of key features. Shaman/healers are also engaged in agricultural rituals. Their training emphasizes the role of a professional group that provides instruction, ceremonial recognition of formal status, and group activities (Winkelman, 1992). Shaman/healers also have specialized roles: they may perform diagnosis or agricultural rituals but not healing, or they may heal specific kinds of illness. Shaman/healers enter ASC and have interactions with the spirit world, but these generally do not involve soul journey (not possession). Many are typified by meditative ASC (Winkelman, 1986b, 1992, 2000). Their powers include both spirits and impersonal sources, including rituals and techniques learned from other professionals.

Healers

Healers are found in agricultural societies with political integration beyond the level of the local community. Healers are almost exclusively male and generally hold high social and economic status that is reflected in political, legislative, and judicial powers and officiation at group ceremonial activities. Their professional organizations that provide costly training and certify initiates also wield considerable power, which enables healers to be full-time specialists. Healers also engage in specialized diagnosis and healing, but many seem to lack the ASC activities that are the defining characteristics of shamans. ASC may nonetheless be part of the clients' experience in the interaction with the healers. The cultural significance and structuring of interactions with healers has profound effects on consciousness. Healers' treatments emphasize rituals, spells, incantations, formulas, and sacrifices. Their divination procedures use material systems, which they interpret to make diagnoses. Exorcism is a significant activity; they also frequently use herbal medicines. Healers engage in life cycle activities such as naming ceremonies, marriage rituals, and funerals. Their differences from shamans emphasize the healers' lack of ASC and direct communication with spirits; the existence of powerful professional organizations and formal political power; their relations with superior spirits rather than animal spirits; the use of material and mechanical systems for divination; and their learning of spells, formulas, and ritual enactments for healing. Healers are found in societies with priests and generally work in collaboration with them. Healers also have the power to determine who is a sorcerer or witch and take actions against those individuals. The roles of healers are often complemented, especially in stratified societies, with the role of mediums, who more directly engage the ASC capacities associated with shamanism.

Mediums

The practitioners empirically classified as mediums are called diviners, healers, prophets, and shamans, but they have profiles distinct from the empirically derived characteristics of shamans. Mediums are found primarily in agricultural societies, and their presence in a society is significantly predicted by the presence of political integration beyond the local community. Mediums are predominantly women and are generally of low social and economic status. Mediums are generally not believed to engage in malevolent acts, but rather act against the influences of sorcerers, witches, and evil spirits. They engage in worship and propitiation of their possessing spirits and make sacrifices to them. Mediums' ASC generally begin as spontaneous possessions that occur in late adolescence or early adulthood and constitute both an illness and a call to the profession. Possession ASC episodes are interpreted as the personality and volition of the individual being taken over by a spirit entity. The ASCs are characterized by symptoms of lability in the central nervous system (e.g., compulsive motor behavior, tremors, convulsions, seizures, and amnesia)—symptoms of temporal lobe discharges not associated with shamans or other types of shamanistic healers (Winkelman, 1986b). The training of mediums involves deliberate induction of ASCs, which are also characterized as involving spirit possession and post-ASC amnesia, reflecting the belief that the medium's body is controlled by the spirits that make the utterances. This auditory revelation contrasts with the shaman's visions. Other significant contrasts of mediums and shamans, apart from the features of their respective societies, involve the medium's control by the spirits; the affliction and training occurring later in life (early adulthood); ASC characteristics of possession, amnesia, and convulsions; and agricultural rituals and propitiation.

Mediums and healers both specialize in treatment of possession (see Bourguignon, 1976). The psychodynamics of possession provide symbolic mechanisms for externalization of the control of emotions and attachments. The concept of possession involves outside forces that act upon the patient's body and consciousness. The possession ASC involves dramatic changes in emotions and self, with the possessing spirits providing opportunities to engage in alternate selves that express socially prohibited roles and emotions. The phenomena of possession allow the responsibility for feelings and behaviors to be displaced from the patient and instead attributed to a spirit entity that controls the body and mind. Possession manipulates self, emotions, and relations to others (Boddy, 1994). Possession may shift responsibility for illness and deviance from self to other, placing responsibility for emotions and behavior within the domains of the spiritual or social relations. Possession allows for indirect influences and subtly alters power relations, enabling transformative influences on one's own and others' sense of identity. Possession affects

emotional dynamics by expanding self-expression and reconstructing identity and altering self and interpersonal relations through channeling expression of emotions of anxiety, fear, and desire.

The Socioeconomic Transformation of Shamans and Shamanistic Healers

Shamans formed the original basis of magico-religious practices in hunter-gatherer societies. These practices of core shamanism were transformed as a consequence of social evolution. The emergence of sedentary agricultural societies, political integration, and class structures had significant effects on the psychobiological foundations of shamanism, but their origin in innate brain structures and functions of consciousness assured the persistence ASC-based healing practices in more complex societies. The persistence of shamanic potentials was in the shamanistic healers (shaman/healers, mediums, and healers), who represent the universal manifestation of the core characteristics of shamanism postulated by Eliade (1964): the use of ASCs in training, healing, and divination activities; their enactment in a community context; and their relations with the spirit world. Differences among shamanistic healers reflect the adaptation of these psychobiological potentials to different subsistence practices and social and political conditions that transformed the manifestation of shamanic potentials in terms of types of ASC and spirit relations, selection and training practices, the sources and nature of their power, their socioeconomic and political status, illness ideologies, and the nature of their treatments and professional practices (Winkelman, 1990, 1992; Winkelman & Winkelman, 1991).

Cross-cultural data (Winkelman, 1986a, 1990, 1992, 1996) illustrate this evolution of the shamanic potentials in the systematic relationships of different types of shamanistic healers and other magico-religious practitioners (e.g., sorcerers/witches and priests) to socioeconomic conditions. The transformation of shamanic practices into other types of shamanistic healers and magico-religious practitioners is a function of: (1) agriculture replacing hunting and gathering; (2) transformation of nomadic life-style to fixed residence patterns; (3) political integration of local communities into hierarchical societies; and (4) social stratification—the creation of classes and castes and hereditary slavery. Relationships of practitioner types to socioeconomic conditions are illustrated in Table 6.1 (adapted from Winkelman, 1992). These practitioner-societal configurations also correspond to relationships between practitioner selection procedures and their professional functions (Winkelman, 1992), providing the basis for a model of the evolution of magico-religious functions. These involve three major dimensions: (1) the psychobiological basis in ASC (shamanistic healers); (2) the role of social-political and religious leadership (priests); and (3) the conflict of

shamanistic healers and priests, manifested in the sorcerer/witch. Shamans were the original source of ASC traditions and provided the social leadership potentials at the basis of priesthoods. Shamanistic practitioners were eventually persecuted by priestly religious structures, giving rise to a phenomena recognized as witchcraft.

The general model of the relationship among magico-religious practitioner types and social conditions outlined in Table 6.1 was assessed with multiple linear regression and log linear analyses. The variables used were the number of types of magico-religious practitioners (1 to 4) and binary variables representing the socioeconomic conditions of the presence of agriculture, two or more levels of political integration beyond the local community, and the presence of classes. The multiple r (.82) was highly significant ($p < .001$), and all of the predictor variables were independently significant. In the log linear analyses, the interaction among the socioeconomic variables were not significant in the prediction of number of types of magico-religious practitioners. The model that specified independent effects of these variables (agriculture, political integration, and classes) on the magico-religious configurations was highly significant (.9796) and fit the data well (see Winkelman, 1986a, for details).

THE BIOLOGICAL BASES OF SHAMANIC UNIVERSALS

The universals of shamanism—the similarities in shamanistic healers across cultures—indicate underlying biogenetic foundations. Winkelman (2000, 2002a, 2002b, 2004a, 2004b) has identified aspects of these biological universals in the context of evolutionary psychology, implicating natural

Table 6.1 Magico-Religious Practitioner Types, Social Conditions, and Biosocial Functions

		Magico-religious practitioner types and societal configurations			Biosocial functions
		Priest	Priest Sorcerer/ witch or medium	Priest Sorcerer/ witch medium	Social control Social conflict Altered states of consciousness
	Shaman	Shaman/ healer	Healer	Healer	
Socioeconomic conditions	Hunter/ gatherer	Agriculture	Political integration	Social classes	

structures and processes of the human organism and in terms of the concepts of innate processing modules. Central aspects of these biological bases include:

1. the biogenetic roots and functions of ritual as a communication and social coordination system that enables community bonding rituals that manipulate the mammalian attachment processes, eliciting the opioid-attachment mechanisms
2. altered states of consciousness that produce an integrative mode of consciousness, an integration of the potentials of the triune brain through synchronized ascending brain discharges, which are manifested in the shamanic soul flight and visionary experiences
3. manipulation of innate representational modules or cognitive operators related to self-awareness and social identity formation, employing the concepts of spirits as personal and social representation systems
4. integrative forms of thought based in an analogical representation system produced through integration of innate cognitive modules related to animal, self, and other representations and information capacities operating in the somatic (bodily) and visual (“presentational symbolism” [Hunt, 1995]) modalities.

The Psychobiological Consequences of Community Rituals

Shamanic activity requires community participation. Community rituals produce both psychosocial (community cohesion, positive expectation, and social support) and psychobiological effects (eliciting attachment and opioid mechanisms). Frecska and Kulcsar (1989) describe how communal rituals elicit attachment bonds and other psychosociophysiological mechanisms that release endogenous opiates and produce psychobiological synchrony in the group. Shamanic rituals release endogenous opiates through a variety of mechanisms—for example, austerities, fasting, water restriction, strenuous exercise, hyperstress of emotions (Winkelman, 1997). Rituals use social attachment and conditioned cultural symbols to elicit brain opioid systems. Emotionally charged symbols elicit the opioid system and permit ritual manipulation of physiological responses in integrating psychic, mythological, and somatic spheres. One mechanism for community bonding involves chanting, music, dance, and imitative ritual—eliciting an ancient communicative system that Donald (1991) discusses as mimesis, an imitative communication channel that evolved to enhance social bonding and communication of internal states. Music, chanting, singing, and dancing have origins in mimetic modules that provide rhythm, affective semantics, and melody (also see Wallin, Merker, & Brown, 2000). Chanting and music not only provide a nonlinguistic channel for communication—promoting cohesion, coordination, and cooperation among the group—but they also induce healing and

altered states of consciousness through engaging theta and alpha brain wave production.

Altered States of Consciousness: The Integrative Mode of Consciousness

The “ecstasy,” or ASC, central to shamans’ selection, training, and professional practice typically involves singing, chanting, drumming, and dancing, followed by collapse and apparent unconsciousness, but accompanied by intense visual experiences. This ASC involves a natural response of the brain that produces physiological, functional, and psychological integration. Mandell (1980) found that the overall physiological dynamics of ASC involve slow wave discharges from the serotonin circuits of the limbic brain (the “emotional brain” or paleomammalian brain) with lower brain structures, producing synchronized brain waves across levels of the brain. Auditory driving (singing, chanting, drumming, and music) is a primary mechanism for producing ASC and brain wave synchronization; dancing, fasting, and other austerities, most psychoactive drugs, and social and sensory isolation reinforce the response (Winkelman, 1997, 2000). Shamanic ASCs typically activate the autonomic nervous system to the point of exhaustion and collapse into a parasympathetic dominant state that evokes the relaxation response. The shaman’s ASC elicits the “integrative mode of consciousness” (Winkelman, 2000), a normal brain response to many activities (e.g., chanting, drumming, fasting, meditation) with synchronized brain wave patterns in the theta and alpha range. These connections produce coherent theta brain wave discharges that synchronize the frontal areas of the brain, replacing the normal fast and desynchronized brain wave activity with slow wave activity representing preverbal behavioral and emotional information.

Shamanic ASCs involve intense visual imagery that Noll (1985) refers to as “mental imagery cultivation.” These experiences reflect an innate representational system referred to as “presentational symbolism” by Hunt (1995). Visions provide analysis, analogic synthesis, diagnosis, and planning. Shamanic visions are natural brain phenomena resulting from release of suppression of the visual cortex and involve the same brain substrates for processing of perceptual information. Images are a form of psychobiological communication experienced in a preverbal symbol system. Imagery plays a fundamental role in cognition, providing a basis for relations between different levels of information processing, integrating unconscious information with emotions, linking somatic and cognitive experience. The shamanic ASC is typified by the soul-flight experiences, involving natural symbolic systems for self-representation that are found cross-culturally in out-of-body and near-death experiences. The homologies reflect their innate basis in psychophysiological structures as forms of self-representation that are a natural

response of the human nervous system. Laughlin (1997) discusses the universality of body-based metaphor that is manifested in shamanic cosmology and a natural body-based epistemology (also see Laughlin, McManus, & d'Aquili, 1992). Soul flight involves "a view of self from the perspective of other," a form of "taking the role of the other" in presentational symbolism (Hunt, 1995). These self-representations provide forms of self-awareness referenced to the body, but apart from the body, producing shamans' altered consciousness and transcendence.

Spirits and Innate Processing Modules

Fundamental features of shamanism—animism, totemism, and animal spirits—are self, intrapsychic, and social representations produced through integration of specialized innate processing modules for natural history intelligence (recognition of animal species), self-conceptualization, and mental attributions regarding social "others" ("mind reading") (Winkelman, 2000, 2002a, 2004a, 2004b). The shamanic role in managing these modules is exemplified in shamans' characteristics: social intelligence—being group leader and mediator of intergroup relations; natural history knowledge—being master of animals; and self conceptualization—exemplified in identity shifts developed through animal familiars, soul flight, and death-and-rebirth experiences.

Perceptions of spirits are a natural phenomena of the human brain, the outcome of fundamental properties of the human brain and consciousness (Winkelman, 2004b). Spirits are "sacred others," the result of the integration of the spiritual and social worlds in cultural processes that Pandian (1997) characterizes as the production of the symbolic self. Spirit beliefs exemplify social norms and psychosocial relations, structuring individual psychodynamics and social behavior. Spirit beliefs protect from stress and anxiety through management of emotions and attachments. Spirits provide variable command-control agents for mediating conflict between the different instinctive agents and aspects of self, facilitating operation with respect to a hierarchy of goals.

These representations reflect preverbal structures of consciousness and thought processes of lower brain structures. These specialized forms of knowledge production are combined in metaphoric processes to produce shamanic features—animism, totemism, and animal spirits. The spirit world (animism) and anthropomorphism use innate representation modules for understanding self and social others, attributing human mental and social characteristics to animals, nature, and the unknown. Spirit concepts are based in social intelligence, the ability to infer the mental states of others. This intuitive psychology and "theory of mind" attributes mental states to others through the organism's use of its own mental states to model others' minds

and behaviors. This attribution underlies the spirit world. Totemism and animal allies and powers involve the natural history intelligence, employing capacities for distinguishing animal species to understand and mold personal identity and produce differentiation of self and social groups. This universal analogical system for creation and extension of meaning uses natural history intelligence to differentiate personal and social identities (also see Winkelman, 2004a).

THE HOLISTIC IMPERATIVE AND SHAMANIC HEALING: INTEGRATING THE TRIUNE BRAIN

Shamanism integrates a mammalian caring heritage into community ritual practices; it provides healing and survival through: eliciting the visionary and psychosomatic capacities of hypnotic susceptibility; physiological effects of community rituals and ritually induced ASC, eliciting the parasympathetic response and the opioid and serotonergic neurotransmitter systems; bonding different groups in alliances for food and protection; social therapies engaging community participation and social symbol systems engaging self-development and the mammalian attachment dynamics; psychological and self-therapies engaging spirits as psychocultural systems and representations of innate psychological dynamics of the self represented in animal spirits; and symbolic-psychophysiological dynamics from ritual manipulation of emotions, self-structures, and the nervous system (see Winkelman, 2000, for details).

HYPNOSIS AS A RITUAL HEALING CAPACITY

McClenon (2002) describes how an inheritable quality manifested in hypnosis was a central factor in our evolved psychology and propensity for religious healing. Hypnotizability contributes to ritual healing through the induction of relaxation and ASC and the ability to engage attention and imagination. McClenon reviews evidence for the presence of the hypnotic capacities in other primates, illustrating that it is an ancient primate adaptation. Hypnotic behavior among other animals provides mechanisms for reducing social stress and engaging the relaxation response. Rituals among animals involve the kinds of repetitive movements that facilitate hypnotic induction in humans and produce relaxation, thereby reducing aggression. In humans, rituals' repetitive and stereotyped behaviors produce both an alteration of consciousness and a sense of intragroup cohesion experienced as "union" or "oneness," classic aspects of religious and mystical experiences. Hypnosis is part of the general physiological changes associated with ASC.

McClenon contends that the tendency to suggestibility, which is based in hypnotic capacities, contributes to a biological capacity for recovery

from disease. This capacity of suggestibility enhances symbolically induced physiological changes, psychophysiological responses that facilitate healing. Hypnosis enhances placebo effects that have physiological consequences for healing. Shamanic practices are successful in treating the same kinds of conditions for which hypnosis has been shown to have significant clinical effects: somatization, mild psychiatric disorders, simple gynecological conditions, gastrointestinal and respiratory disorders, self-limiting diseases, chronic pain, neurotic and hysterical conditions, and interpersonal, psychosocial, and cultural problems (see McClenon, 2002, for review).

The hypnotic capacity provides enhanced innovation derived from access to the unconscious mind and its creative visions. Hypnotizability involves focused attention, reduced peripheral awareness, and an abeyance of critical mentation that facilitates a focus on internal imagetic representations and enhanced belief and expectation. Shamanism exploits the co-occurrence of hypnotizability, dissociation, fantasy proneness, temporal lobe lability, and thin cognitive boundaries. These share a common underlying dimension in a “transliminality factor” involving enhanced connections between the unconscious and conscious aspects of the mind. Highly hypnotizable people have thin cognitive boundaries that enable greater access to the unconscious and the flow of information from the unconscious to the conscious. The thin cognitive boundaries provide survival advantages by facilitating the development of creative strategies and facilitating the induction of altered states of consciousness.

INTEGRATING THE TRIUNE AND MODULAR BRAINS

Human evolution produces a fragmentation of consciousness due to the modular structure of the brain (Mithen, 1996), the diversification of personal and social identities, and the automatization of brain processes (Laughlin et al., 1992). This produces a need for integrative brain processes—what Laughlin et al. refer to as the holistic imperative, the drive toward expansion and integration of consciousness at higher levels. Shamanistic activities produce psychological, social, and cognitive integration, managing relationships among behavioral, emotional, and cognitive processes and between physiological and mental levels of the organism. Shamanistic activities use metaphors, ASC, visual symbols, and group rituals to integrate the operations of various brain systems and their functions.

One aspect of this shamanic integration involves linkages across the evolutionary strata of the brain. MacLean (1990, 1993) proposes the brain involves three anatomically distinct yet interconnected systems—the reptilian brain, paleomammalian brain, and neomammalian brain—which provide the basis for behavioral, emotional, and informational functions that MacLean (1993, p. 39) calls protomentation, emotiomentation, and

rationmentation, respectively. These communication systems have been referred to as “subsymbolic” (Ashbrook, 1993) and presentational symbolism (Hunt, 1995). Interactions across levels of the brain are not mediated primarily through verbal language, but through nonverbal forms of mentation that utilize social, affective, and presentational (visual symbolic) information.

The hierarchical management of behavior, emotions, and reason is mediated both physiologically and symbolically. The relationships among innate drives, social attachment, and cultural demands create many different kinds of health problems—chronic anxiety and fears, behavioral disorders, conflicts, excessive emotionality or desires, obsessions and compulsions, dissociations, repression, and so on. The paleomammalian brain mediates many of these processes to promote an integration of the self within the community. The paleomammalian brain’s emotiomentation processes provide a major basis for shamanic healing, based on integrating its subjective evaluative influences and self-reference with the instinctual responses of the reptilian brain and the cognitive processes of the neomammalian brain.

These integrative processes are elicited by key aspects of shamanism—the ASC, the physiological and psychological effects of community rituals, and the representations of person and social processes in spirits. Shamanic traditions produce an integration of consciousness through rituals that stimulate physiologically based psychological integration, metaphoric cognitive processes, and community bonding rituals. Shamanic therapies involve a variety of mechanisms for the transformation of the patient’s health, eliciting physiological responses and social support and enhancing symbolically mediated placebo and other psychosomatic effects (Winkelman, 2000). The physiological basis of shamanism involves ASCs that produce systemic brain integration, a coordination and increased coherence of the potentials of many parts of the brain. ASC imposes the paleomammalian brain’s analogical processes and material of an emotional, social, and personal nature into the self-conscious processes of the frontal cortex. The diverse conditions and procedures that evoke this integrative brain condition indicate that it is a natural state of the human organism. The shaman engages transformative process through ASCs that entrain neurognostic structures and provoke restructuring of the self at levels below conceptual and operational thought, acting upon the psychological and cultural structures of consciousness. Physiological aspects of ASC—parasympathetic dominance, interhemispheric synchronization, and limbic-frontal integration—have inherent therapeutic effects. The relaxation response is elicited by parasympathetic dominance, which counteracts excessive activity of the sympathetic nervous system. This has preventive and therapeutic value in diseases characterized by increased sympathetic nervous system activity and a range of stress-related maladies.

Shamanistic rituals provide assurance; they counteract emotional distress and anxiety and their deleterious physiological effects. Symbolic manipulations are the most effective processes for intervention in stress mechanisms, reestablishing balance in the autonomic nervous system by changing cognitive and emotional responses. Precipitous stress-induced parasympathetic states can cause erasure of memories and previously conditioned responses, alterations in beliefs, increased suggestibility, and reversal of conditioned behavior.

ASC and ritual effects have the ability to elicit emotional memories and reduce the ego-centeredness that inhibits the experience of community connectedness and support that meets needs for belonging, comfort, and bonding with others. Shamanistic healing elicits and restructures repressed memories, providing processes for expression of unconscious concerns and resolving intrapsychic and social conflicts. Shamanic ritual management of behavior, emotions, and reason is mediated physiologically and symbolically within the paleomammalian brain, where social signaling and bonding provide subjective evaluations that play a vital role in integrating instinctual responses of the ancient brains with the cognitive processes of the neomammalian brain. Shamanic ritual evolved as a system for managing the relationships among innate drives and needs, social bonding processes, and cultural representational systems. It provides a system for managing health problems derived from anxiety, fears, conflicts, excessive emotionality, obsessions, and compulsions. Basic therapeutic mechanisms of shamanism link the individual to modal physiological patterns and social expectations.

CONCLUSIONS

Not all religions are based on shamanism and ASC. However, all societies have religious practices based in shamanistic healing, the biologically based roots of shamanism manifested in the use of ASC for community healing through contact with the spirit world. Human evolution selected for these potentials because they were adaptive in enhancing social cohesion, mediating stress responses, and producing psychophysiological integration. Shamanism's primordial, cross-cultural, and empirically derived status gives it a central role in the development of theories of human religiosity. The empirically derived nature of the shamanic paradigm makes it a natural epistemology of religiosity and an explanatory resources for a naturalistic approach to the nature, origins, development, and persistence of religious experiences. The shamanic paradigm identifies central issues for a biology of religion in the congruence of shamanic elements with aspects of an evolved psychology, revealing the biogenetic structuralist foundations of religious conceptions and practices.

NOTES

The findings here were first reported in a doctoral dissertation (Winkelman, 1985) and elaborated in a series of publications (Winkelman, 1986a, 1986b, 1990, 1992, 1996, 1997, 2000, 2002a, 2002b, 2004a).

1. Universals were inferred for a category of practitioners when the characteristics were reported for 75 percent or more of the group, and the presence of information was significantly predicted by data quality control measures assessing the ethnographers' extent of coverage and involvement with magico-religious practices. In essence, universality of a feature was inferred when most of the practitioners of a type had the characteristic in question, and its absence was a reflection of poor data available for the culture and its magico-religious practitioners.

REFERENCES

- Ashbrook, J. (1993). The human brain and human destiny: A pattern for old brain empathy with the emergence of mind. In J. Ashbrook (Ed.), *Brain, culture and the human spirit: Essays from an emergent evolutionary perspective* (pp. 183–210). Lanham, MD: University Press of America.
- Boddy, J. (1994). Spirit possession revisited: Beyond instrumentality. *Annual Review of Anthropology*, 23, 407–434.
- Bourguignon, E. (1976). *Possession*. San Francisco: Chandler and Sharpe.
- Donald, M. (1991). *Origins of the modern mind*. Cambridge, MA: Harvard University Press.
- Dow, J.W. (1986). Universal aspects of symbolic healing: A theoretical synthesis. *American Anthropologist*, 88, 56–69.
- Eliade, M. (1964). *Shamanism: Archaic techniques of ecstasy*. New York: Pantheon Books.
- Frecska, E., & Kulcsar, Z. (1989). Social bonding in the modulation of the physiology of ritual trance. *Ethos*, 17(1), 70–87.
- Halifax, J. (1979). *Shamanic voices*. New York: Dutton.
- Harner, M. (1990). *The way of the Shaman*. San Francisco: Harper & Row.
- Hultkrantz, A. (1973). A definition of shamanism. *Temenos*, 9, 25–37.
- Hunt, H. (1995). *On the nature of consciousness*. New Haven, CT: Yale University Press.
- Ingerman, S. (1991). *Soul retrieval*. San Francisco: Harper Collins.
- Jakobsen, M. (1999). *Shamanism: Traditional and contemporary approaches to the mastery of spirits and healing*. New York: Berghahn Books.
- Laughlin, C. (1997). Body, brain, and behavior: The neuroanthropology of the body image. *Anthropology of Consciousness*, 8(2–3), 49–68.
- Laughlin, C., McManus, J., & d'Aquili, E. (1992). *Brain, symbol and experience toward a neurophenomenology of consciousness*. Boston: Shambhala.
- MacLean, P. (1990). *The triune brain in evolution*. New York: Plenum.
- MacLean, P. (1993). On the evolution of three mentalities. In J. Ashbrook (Ed.), *Brain, culture and the human spirit: Essays from an emergent evolutionary perspective* (pp. 15–44). Lanham, MD: University Press of America.

- Mandell, A. (1980). Toward a psychobiology of transcendence: God in the brain. In D. Davidson & R. Davidson (Eds.), *The psychobiology of consciousness*. New York: Plenum.
- McClenon, J. (2002). *Wondrous healing: Shamanism, human evolution and the origin of religion*. DeKalb: Northern Illinois University Press.
- Mithen, S. (1996). *The prehistory of the mind: A search for the origins of art, religion and science*. London: Thames and Hudson.
- Murdock, P., & White, D. (1969). Standard cross-cultural sample. *Ethnology*, 8, 329–369.
- Noll, R. (1983). Shamanism and schizophrenia: A state-specific approach to the schizophrenia metaphor of shamanic states. *American Ethnologist*, 10(3), 443–459.
- Noll, R. (1985). Mental imagery cultivation as a cultural phenomenon: The role of visions in shamanism. *Current Anthropology*, 26, 443–451.
- Pandian, J. (1997). The sacred integration of the cultural self: An anthropological approach to the study of religion. In S. Glazier (Ed.), *Anthropology of religion: A handbook of method and theory* (pp. 505–519). Westport, CT: Greenwood Press.
- Peters, L., & Price-Williams, D. (1981). Towards an experiential analysis of shamanism. *American Ethnologist*, 7, 398–418.
- Siikala, A. (1978). *The rite technique of Siberian shaman* (Folklore fellows communication 220). Helsinki, Finland: Soumalainen Tiedeskaremia Academia.
- Townsend, J. (1997). Shamanism. In S. Glazier (Ed.), *Anthropology of religion: A handbook of method and theory* (pp. 429–469). Westport, CT: Greenwood Press.
- Wallin, N.L., Merker, B., & Brown, S. (Eds.). (2000). *The origins of music*. Cambridge, MA: MIT Press.
- Winkelman, M. (1985). *A cross-cultural study of magico-religious practitioners*. Unpublished doctoral dissertation, University of California.
- Winkelman, M. (1986a). Magico-religious practitioner types and socioeconomic analysis. *Behavior Science Research*, 20(1–4), 17–46.
- Winkelman, M. (1986b). Trance states: A theoretical model and cross-cultural analysis. *Ethos*, 14, 76–105.
- Winkelman, M. (1990). Shaman and other “magico-religious healers”: A cross-cultural study of their origins, nature and social transformation. *Ethos*, 18(3), 308–352.
- Winkelman, M. (1992). *Shamans, priests and witches. A cross-cultural study of magico-religious practitioners*. Anthropological research papers #44. Tempe: Arizona State University.
- Winkelman, M. (1996). Religious practitioners. In D. Levinson & M. Ember (Eds.), *Encyclopedia of cultural anthropology* (pp. 1105–1109). New York: Henry Holt.
- Winkelman, M. (1997). Altered states of consciousness and religious behavior. In S. Glazier (Ed.), *Anthropology of religion: A handbook of method and theory* (pp. 393–428). Westport, CT: Greenwood Press.
- Winkelman, M. (2000). *Shamanism: The neural ecology of consciousness and healing*. Westport, CT: Bergin and Garvey.
- Winkelman, M. (2002a). Shamanism and cognitive evolution. *Cambridge Archeological Journal*, 12(1), 71–101.

- Winkelman, M. (2002b). Shamanic universals and evolutionary psychology. *Journal of Ritual Studies*, 16(2), 63–76.
- Winkelman, M. (2004a). Shamanism as the original neuroethology. *Zygon*, 39(1), 193–217.
- Winkelman, M. (2004b). Spirits as human nature and the fundamental structures of consciousness. In J. Houran (Ed.), *From shaman to scientist: Essays on humanity's search for spirits* (pp. 59–96). Lanham, MD: Scarecrow Press.
- Winkelman, M., & White, D. (1987). A cross-cultural study of magico-religious practitioners and trance states: Data base. In D. Levinson & R. Wagner (Eds.), *Human relations area files research series in quantitative cross-cultural data* (Vol. 3D). New Haven, CT: HRAF Press.
- Winkelman, M., & Winkelman, C. (1991). Shamanistic healers and their therapies. In W. Andritzky (Ed.), *Yearbook of cross-cultural medicine and psychotherapy 1990* (pp. 163–182). Berlin: Verlag Fur Wissenschaft Und Bildung.

SCHIZOPHRENIA, NEUROLOGY, AND RELIGION: WHAT CAN PSYCHOSIS TEACH US ABOUT THE EVOLUTIONARY ROLE OF RELIGION?

Steven A. Rogers and Raymond F. Paloutzian

Religious ideation and delusion have long been part of the symptomatology of individuals with schizophrenia. Over the past several decades, the nature of this relationship has generally been considered disadvantageous, with religious delusions and hallucinations presupposed as the source of much of the social isolation and personal torment associated with schizophrenia. Some of this may be owing to the current reign of the disease model of psychopathology, where the symptoms of schizophrenia or other mental illness are perceived as vagaries to be rooted out and cured. This does not answer the question about what distinguishes the meaning of religious experiences of individuals with schizophrenia from the experiences of those without it. Granted, much public and personal harm can be laid at the feet of individuals responding to grandiose delusions and perceptual abnormalities, such as hearing voices commanding ego-dystonic violence. However, the process of decrying the negative consequences of the religious content of schizophrenic symptoms may overlook the personal or social contribution of individual symptoms. It may be that individuals with schizophrenia have an ability to tap into a spiritual realm and experience the divine via hallucination, delusion, and anomalous perceptual experiences. This ability may represent one of the unique societal contributions of schizophrenia that has led to its persistence across races, continents, and a common genetic ancestry. To the extent that we can understand the biological and neurological substrates of religious delusion and ideation in schizophrenia, we may develop unique insights into the biological and evolutionary nature of religion, including why humans developed the capabilities that enable them to have religious systems of meaning.

This chapter (a) highlights the biological, neurological, and clinical substrates of schizophrenia; (b) explores the relationship between schizophrenia and religion, including the role of the frontal and temporolimbic systems in religious delusions; and (c) discusses the implications of religious delusions and schizophrenia for the biology, evolutionary underpinnings, and psychology of religion.

THE BIOLOGY AND NEUROLOGY OF SCHIZOPHRENIA

The Syndrome of Schizophrenia

Schizophrenia represents a chronic and frequently debilitating group of illnesses that are characterized by cognitive, emotional, and behavioral symptoms. Considering the heterogeneous nature of its symptoms, schizophrenia is generally held to represent a syndrome rather than a single, identifiable disease (Puri, Lekh, Nijran, Bagary, & Richardson, 2001). It lacks a pattern of regularities or a unified body of symptoms that is manifested in every patient (Kemp, 2000), but the unique combination of these symptoms has led to a readily identifiable condition or syndrome. These symptoms can be grouped into three domains: positive, negative, and cognitive phenomenon (Kasai et al., 2002; Wong & Van Tol, 2003).

Positive symptoms refer to the presence of unusual phenomenon, such as hallucinations, delusions, positive thought disorders, and disorganized speech—the first three generally representing what clinicians understand as psychosis. Most of those with schizophrenia report that their hallucinations are auditory (i.e., hearing voices of family members, God, or angry others) and that their delusions involve persecution, grandiosity, external control, or ideas of reference. Negative symptoms refer to features of normal human behavior that are absent, such as emotional flattening, social withdrawal, apathy, and poverty of speech. Central to the cognitive symptoms of schizophrenia are deficits in executive function, attention, memory, and general intellectual function (Mohr & Huguelet, 2004).

Typically, the negative and cognitive symptoms are persistent and chronic, whereas the positive, psychotic symptoms are episodic in presentation (Wong & Van Tol, 2003). However, the positive symptoms are the most unsettling and noticeable clinical phenomenon, often leading to stigmatization and hospitalization. This is evident in the discomfort, perplexity, and fear of those who encounter individuals responding to internal voices or shouting their status as messengers of God.

Religious Meaning Systems

Many of these symptoms of schizophrenia may sound bizarre and unusual when compared to our own experiences. This makes it easy to assume that

the religious experiences of such persons are also somehow essentially different from those of the rest of the population, as if the differences are in kind rather than amount. Perhaps the more acute question is whether the shared meaning system that religion provides is somehow different among those with schizophrenia or whether the elements of this meaning system are in disarray consistent with the symptoms of schizophrenia.

By using the concept of a meaning system, we are referring to a cognitive structure that allows for abstraction, generalization, and representation of a relationship or relatedness between two entities (Baumeister, 1991; Paloutzian, 2005; Park, 2005a, 2005b; Park & Folkman, 1997; Silberman, 2005). According to Park (2005a, 2005b; see also Paloutzian & Swenson, *in press*, and Park & McNamara, *this volume*), the two main elements of a meaning system are global meaning and an infinite array of specific daily meanings. Typically, the global meaning gets translated into smaller daily meanings for the comings and goings of daily life, such as everyday events and experiences. Religion provides one type of global meaning system that serves as an overarching umbrella subsuming beliefs about the divine-human relationship, global goals and values, and a subjective sense of meaningfulness—a sense that, at the end of it all, there is continuity and the self and community are included in it. This system enables individuals to evaluate everyday events, such as whether a behavior is consistent with one's beliefs, if a communication or event can be attributed to God, or if an event that follows a prayer constitutes God's divine answer.

This is particularly relevant during times of stress and coping. When distressing information confronts the individual or community, an appraisal process is set in motion to determine whether the information is relatively consistent or inconsistent with the expectations of the religious meaning system. New information that is congruent with this meaning system is incorporated and strengthens it, whereas new information that is incongruent with the religious meaning system may represent a form of distress that invokes a process of meaning assessment, reappraisal, and perhaps reconstruction. In other words, information that is discrepant from the global meaning system is either rejected or used to modify the global meaning system and its effects on the daily meanings. For example, difficult events may be interpreted as part of a divine plan, new attitudes or behaviors may be adopted toward the stressor, or new meaning may be given toward the stressor and those exposed to it. In this way, new meaning is made out of the confluence of the old and the stressors that confront it, and this new meaning is then carried forward to face new life circumstances.

This is how meaning systems operate in the mind of the normative population, but it remains unclear how these elements relate in the mind of those with schizophrenia. It may be that the particular pattern of these elements is adaptive in the mind of those with schizophrenia and once played an essential role that contributed to the survival of early human societies. To answer these

questions, however, requires understanding the structural underpinnings of schizophrenia and the processes that are involved in making meaning.

Structural Underpinnings

Despite the heterogeneity in the religious and nonreligious symptoms of schizophrenia, it has remained clear that schizophrenia represents a chronic brain condition with identifiable neurological and biological substrates. There is heterogeneity in the structural and neurophysiological abnormalities that comprise the substrates of schizophrenia, which is consistent with the variety of symptoms inherent to schizophrenia. However, research has consistently shown that the brains of individuals with schizophrenia are generally differentiated by diffuse enlargement of the ventricles and decreased cortical volume, with particular reductions in the gray matter of the medial temporal and frontal lobes, as well as their thalamic relays (Clinton & Meador-Woodruff, 2004; Crow, 1995; Halliday, 2001; Kasai et al., 2002; Wong & Van Tol, 2003).

This is evident in a review of 193 peer-reviewed studies that conducted MRI on patients with schizophrenia (Shenton, Dickey, Frumin, & McCarley, 2001). Central to the findings of this study were that the brains of individuals with schizophrenia had ventricular enlargement and significant reductions in the size of the medial temporal lobe (amygdala, hippocampus, parahippocampal gyrus), superior temporal gyrus, and the prefrontal gray matter and orbitofrontal regions of the frontal lobe. Similarly, brain SPECT imaging has shown hypofrontality and temporal lobe hypoperfusion among those with schizophrenia (Camargo, 2001), with the medial temporal lobe being a particularly crucial and principal site for abnormality, largely owing to its connections with prefrontal cortices (Arnold, 1997).

These structural abnormalities are consistent with the cognitive impairments that often accompany schizophrenia. Ventricular enlargement has been associated with deficits in abstraction, attention, and language, all of which are central to meaning system processes. Medial temporal dysfunction corresponds to deficits in verbal and visual memory; abnormalities in superior temporal gyrus may account for disordered thinking and memory; and frontal lobe deficits are correlated with impaired working memory, attention, cognitive inflexibility, and set shifting (Antonova, Sharma, Morris, & Kumari, 2004; Arnold, 1997; Levin, Yurgelun-Todd, & Craft, 1989; Shenton et al., 2001). Although environmental factors invariably play a role in the development of schizophrenia, these neural and structural abnormalities have led most to conclude that schizophrenia represents a biological brain disorder.

To the extent that clinical phenomena are tied to these structural abnormalities, one would expect that positive and negative symptoms, including

religious delusions, should also be largely determined by neuropathological substrates. Indeed, many of the negative symptoms of schizophrenia, such as flattened affect and apathy, are associated with reductions in the gray matter of the ventromedial frontal regions and the white and gray matter of the prefrontal regions (Kurachi, 2003; Wong & Van Tol, 2003). The presence of positive symptoms of delusions implicates frontal and temporolimbic systems (Kurachi, 2003; Saver & Rabin, 1997), whereas thought disorders have been inversely correlated with activity and gray matter volume in the bilateral inferior frontal, left superior temporal, and middle temporal regions (Kasai et al., 2002; Puri et al., 2001). Similarly, those experiencing auditory hallucinations have significant volume reductions in the superior temporal gyrus and the medial temporal lobe, especially in the left hemisphere (Heckers et al., 1998; Kurachi, 2003; Stephane, Barton, & Boutros, 2001). Neuroimaging on those experiencing auditory hallucinations revealed decreased metabolism in lateral temporal language regions and increased cerebral blood flow from the inferior frontal lobe to Broca's area (Wong & Van Tol, 2003).

Schizophrenia as a Disruption of Normal Brain Activity

Interestingly, the substrates for the positive and negative symptoms of schizophrenia are not separate, additive, or unique processes, but instead represent disruptions of normal brain activity. For example, each of the cortical regions implicated during auditory hallucinations is related to normal speech perception and auditory processing. These normal processes involve interconnections between frontotemporal cortices, limbic and paralimbic regions, and the thalamus, but the disruption of these interconnections appears to result in the secondary activation of Wernicke's areas (speech perception) and Broca's area (expression). The disruption of the first leads to the experience of hallucinations and the second induces subvocal speech activity that accompanies the hallucinations (Stephane et al., 2001). In other words, the experience of auditory hallucinations appears to partially stem from the activation of those areas responsible for subvocal speech generation and speech perception, but there is a biological failure to differentiate external and internal speech, so that inner speech is perceived as external to the self. Similar deficits in frontal and temporolimbic systems likely account for the perceptual distortions, defects in formal reasoning, and failed search for disconfirming evidence that characterize thought disorders (Saver & Rabin, 1997). Hence, the symptoms of psychosis, such as auditory hallucinations and delusions, are deeply rooted in normal brain activity for speech, perception, and thought.

In a sense, the symptoms of psychosis are deeply rooted in what it means to be human. This is particularly striking when we realize how they are fundamentally connected to many of the ways we distinguish ourselves as human, including the way we make meaning or sense of our internal and

external worlds. Many of the areas compromised in schizophrenia, including the superior temporal gyrus, frontal lobes, and gray matter connectivity, are intimately involved in abstraction, relating, and the construction of meaning and the perception of coherence. When these areas are compromised through reduced cortical volume and pressure from ventricular enlargement, it becomes difficult to make judgments, engage in abstract thinking, and formulate conceptual relationships. In a sense, the areas responsible for how we make meaning and patterns out of chaos are dysregulated in schizophrenia. This may explain some of the disintegrated thinking, incoherence, and unusual ways for constructing new meaning that are experienced by those with schizophrenia (see Park & McNamara, this volume, for additional discussion of meaning and neurology). Not only does this raise interesting questions about the biological basis by which we construct meaning, but it also suggests that the symptoms of psychosis disrupt normal neural channels to create existential differences between those with schizophrenia and those without it. These differences include the ways they construct meaning, purpose, and coherence, which intimates the possibility of a unique existential role for those with schizophrenia.

Neurochemical Changes

The symptoms of schizophrenia are not only supported by structural abnormalities that impact what it means to be human, but also by neurochemical pathology. Most likely, changes in neurotransmitter levels contribute to and mediate the larger changes in brain structure. The two primary systems that have been implicated are the dopaminergic and glutamatergic systems. The results of both PET imaging and the effectiveness of medications that target dopamine receptors have intimated that overactivity of the dopamine system may be partially responsible for the emergence of psychosis (Lewis & Lieberman, 2000; Wong & Van Tol, 2003). In particular, abnormalities in the metabolic mechanisms, presynaptic storage and release, vesicular transport, and postsynaptic reuptake of dopamine in the meso-limbic systems may foster hallucinations, delusions, and other psychotic symptoms (Carlsson, Waters, Waters, & Carlsson, 2000; Lewis & Lieberman, 2000).

The symptoms of psychosis may also be related to hypofunction of the N-methyl-D-aspartate (NMDA) receptors in the glutamatergic system. This is intimated by the ability of NMDA antagonists to induce psychotic symptomatology. Although the exact mechanisms of the glutamatergic system are uncertain, its impact on psychosis may be related to excitotoxic damage to hippocampal neurons or interactions with the dopamine system, such as fostering dopamine release in the mesolimbic system (Lewis & Lieberman, 2000; Wong & Van Tol, 2003). In particular, glutamatergic neurons appear to regulate dopamine neurons, so hyperglutamatergic may cause an increase

or decrease in dopamine function, which in turn influences the emergence of psychotic symptomatology (Carlsson et al., 2000). In fact, it may be that the interplay between the dopaminergic and glutamatergic pathways acts on striathalamic pathways in a way that fosters psychosis. These two pathways are largely antagonistic, with dopamine being inhibitory and glutamate being stimulating, so one possibility for psychosis is that the hyperactivity of dopamine or hypofunction of glutamate overstimulates the thalamus, leading to sensory overload and hyperarousal (Carlsson et al., 2000).

It is most likely, however, that schizophrenia cannot be simply reduced to dopamine-receptor blocking or glutamatergic intervention. In order for neurochemical changes to mediate the progressive structural abnormalities that give rise to schizophrenia, it seems likely that multiple neurochemical system changes are involved. This is evident in the recent effectiveness of medications with a high affinity for serotonin receptors (Ban, 2004).

Nevertheless, these neurochemical, structural, and functional departures from normal development suggest that the specific positive and negative symptoms of schizophrenia may be artifacts of a disruption in the neural regions that regulate or control those symptoms. This is not to dismiss the influence of biology or psychosocial pressures on the symptoms of schizophrenia, nor to suggest that schizophrenia occurs in a biological vacuum. Quite the contrary, research has consistently demonstrated that environmental insults, such as exposure to infectious diseases and stress during gestation or childhood, may contribute to the pathogenesis of schizophrenia (Lewis & Lieberman, 2000). These events may act as stressors on susceptible neural circuits and compound deficits in maturational processes of apoptosis, synaptic pruning, and myelination (Shenton et al., 2001).

However, the close association between the symptoms of schizophrenia and underlying neural substrates suggests that even the influence of environmental and psychosocial factors may be mediated by neurological sequelae. In fact, schizophrenia is most accurately conceived as a neurodevelopmental syndrome, or an encephalopathy, where subtle, nonclinical abnormalities are present early in life and later expressed as the full syndrome. The emergence of the full syndrome may be related to developmental alterations in the temporal lobe that interrupt connections between temporolimbic and prefrontal regions (Kasai et al., 2002; Shenton et al., 2001). Therefore, schizophrenia and its corresponding symptoms are intimately tied to a common biology. This removes some of the comfort of saying that schizophrenia is external or outside, and instead forces us to see it within and internal to a shared humanity. By understanding the neural and biological substrates for the religious character of schizophrenia, including religious delusions and hallucinations, we may be able to better understand the biological etiology and persistence of religious symptoms. Ultimately, we may also be able to better shape our understanding of religious meaning systems in general, how they differ from

the nonschizophrenic population, and how the religious symptoms of psychosis may perpetuate the cross-cultural constancy of schizophrenia.

SCHIZOPHRENIA AND RELIGION

The Importance of Religion for Those with Schizophrenia

There is much contemporary debate surrounding the relationship between schizophrenia and religion. Some of this debate may be occurring because this relationship crosses the boundaries between science and faith, the political and the individual, and the personal and the institutional. Those adhering to the views of Sigmund Freud or Albert Ellis may contend that religious beliefs are unnecessary at best for mental health and detrimental at worst. Others, such as the *Diagnostic and Statistical Manual for Mental Disorders* (American Psychiatric Association, 1994), may embrace political correctness and simply avoid any discussion of the religious content of psychosis (Pierre, 2001).

However, these often represent artificial distinctions, particularly for individuals with schizophrenia who see religion and spirituality as salient aspects of their everyday functioning and coping. Over one-third of those with schizophrenia are highly interested in religious practices, and two-thirds perceive spirituality as having a significant meaning in their lives (Mohr & Huguelet, 2004). Among psychiatric inpatients in particular, 95 percent believe in God and 53 percent pray or consult the Bible (Kroll & Sheehan, 1989).

For many with schizophrenia, religion also represents an important resource for coping. In London, 61 percent of psychotic patients use religion as a significant coping strategy (Kirov, Kemp, Kirov, & David, 1998), much like the majority of Saudi Arabian patients with schizophrenia use religious forms of coping to combat their auditory hallucinations (Wahass & Kent, 1997). In North America, 80 percent of individuals with severe mental illness use religious forms of coping to deal with their symptoms and daily difficulties, with nearly half indicating that religion becomes more important when their symptoms are exacerbated (Rogers, Poey, Reger, Tepper, & Coleman, 2002). Consequently, religion is not only personally meaningful and important in the lives of individuals with schizophrenia, but it also represents a resource that they have found to be particularly effective in dealing with the symptoms of their illness. It may, therefore, represent a disservice to remove our understanding of religion from our understanding of schizophrenia. On the contrary, our knowledge of both religion and schizophrenia may be enhanced by respecting their relationship and acknowledging that what seems foreign to us may not be the religious experiences themselves but the meanings that individuals with schizophrenia attribute to them.

Considering the high importance placed on religion, it is not surprising that many of the symptoms of schizophrenia, particularly hallucinations and delusions, are infused with religious content and meaning. Up to 70 percent of

those with schizophrenia experience auditory visual hallucinations (Stephane et al., 2001), and 90 percent experience delusions at some point during their illness (Saver & Rabin, 1997). Among patients with auditory hallucinations, it is not uncommon for them to describe their hallucinations as the voice of God or the taunting of demons. Similarly, many patients with psychosis or schizophrenia experience grandiose delusions with religious themes or content (Getz, Fleck, & Strakowski, 2001).

The prevalence of these religious delusions may vary by culture and prior religious affiliation. Among individuals with schizophrenia in Britain, 24 percent had religious delusions (Siddle, Haddock, TARRIER, & Faragher, 2002), and 36 percent of American inpatients had religious delusions (Appelbaum, Robbins, & Roth, 1999). In contrast, only 7 percent of Japanese inpatients and 6 percent of Pakistani inpatients with schizophrenia had religious delusions (Stompe et al., 1999; Tateyama et al., 1993). These differences may reflect the relative emphasis placed on religion in the larger culture. Both the British and American cultures have higher rates of belief in God than the Japanese and Pakistani cultures. Moreover, the frequency and severity of religious delusions appears to depend on the level of patients' religious activity, with a greater likelihood and severity of religious delusions among those who are more religiously active (Getz et al., 2001). This may be because they have greater access to religious language and content, as well as a religious meaning system to shape the attributional style for their hallucinations and delusions. In contrast, those with less religious activity may have auditory hallucinations expressed as the voices of family members or delusions manifested as persecution by the government. Nevertheless, religious themes are intrinsic to the hallucinations and delusions of many individuals with schizophrenia.

Biological and Neurological Correlates

Religious Delusions

Research has revealed that the religious delusions of people with schizophrenia also have neural substrates and can be tied to specific biological correlates. SPECT neuroimaging on individuals with schizophrenia who are actively experiencing religious delusions revealed increased uptake in the frontal and left temporal regions, as well as reduced occipital uptake (Puri et al., 2001). This may reflect the overactivation and dysfunction of the left temporal region, as well as the potential inhibition of visuosensory processing in the occipital regions.

Temporal Lobe Epilepsy

Similar profiles are evident in the religious experiences and psychotic symptoms of individuals with other brain conditions, such as temporal lobe epilepsy. There has long been a relationship between religious experiences

and temporal lobe epilepsy across the ictal, post-ictal, and inter-ictal stages. In the ictal phase, religious or spiritual experiences frequently occur as components of psychic auras that involve depersonalization, derealization, ecstasy, and visual and auditory hallucinations, similar to schizophrenia. For some, these psychic auras are accompanied by “ecstatic seizures,” or ictal sensations of intense pleasure, joy, and contentment that provide insight into the unity, harmony, and divinity of all reality (Saver & Rabin, 1997). Neuroimaging research has discovered that these ictal events of spiritual or mystical experiences may have a temporolimbic origin and become evoked by transient, electrical microseizures within deep structures of the temporal lobe (Hansen & Brodtkorb, 2003). The positive and affective nature of these experiences may be the result of electrical stimulation of the limbic system, which adds an affective dimension to perceptual data processed by the temporal neocortex. Interestingly, these experiences are frequently resolved with anterior temporal lobectomy, which raises strong implications for the biological mediation of religious experiences.

Moreover, the post-ictal and inter-ictal phases of temporal lobe epilepsy have been associated with high levels of religious behaviors or ideation. Similar to the psychotic process in schizophrenia, the state of post-ictal psychosis is accompanied by religious experiences in 27 percent of individuals with temporal lobe epilepsy (Arnold, 1997; Ogata & Miyakawa, 1998). This state of post-ictal psychosis is usually incurred by increased spike discharges in the subcortex and limbic system of the temporal lobe (Ogata & Miyakawa, 1998), but the content of the psychoses is often religious and accompanied by grandiosity and elevated mood. Due to inter-ictal spiking in the temporal lobe, a sort of sensory-limbic hyperconnection syndrome is created, leading to inter-ictal hyperreligiosity (Persinger & Makarec, 2002). It is thought that this hyperconnection leads to a heightened emotional responsiveness to stimuli, with religion being a frequent response or schema for ordering these stimuli due to its personal meaningfulness and explanatory power. This hyperreligiosity occurs at a level similar to schizophrenia (Saver & Rabin, 1997), which suggests the possibility that religious experience, interest, and expression have a common neurological underpinning that is expressed in the context of organic brain conditions such as epilepsy and schizophrenia.

This strong connection between epileptic events and religious intensity has led to recent conclusions that a substantial number of founders of major religions, prophets, and leading religious figures have been documented as having epilepsy. The auras of Paul and Dostoevsky may have been triggered by simple partial seizures, and the spiritual lives of leaders like Joan of Arc and Soren Kierkegaard may have been influenced by afflictions with epilepsy (Hansen & Brodtkorb, 2003). However, it is evident that one does not have to suffer from an organic brain condition to be religious. If the religious delusions and ideations of those with schizophrenia or temporal lobe epilepsy

are rooted in temporolimbic hyperconnectionism, it is likely that there is a continuum of temporolimbic lability that may account for religious, mystical, or paranormal experiences across cultures and ages. This is supported by the high level of mystical and religious experiences, as well as the strong sense of a presence of a sentient being, that occurs among individuals who do not have epilepsy, but who score high on measures of complex partial epilepsy (Persinger & Makarec, 2002).

Schizotypy

Similar research has been conducted on individuals with schizotypal traits. Schizotypy exists on a continuum with schizophrenia, somewhere between normal and the full syndrome of schizophrenia. Similar to those with schizophrenia, these individuals tend to have strong religious proclivities and abnormal perceptual or cognitive experiences, including religious experiences (Maltby & Day, 2002). Interestingly, they also share decreased gray matter in the frontal and medial temporal lobes, although they do not have the changes in the medial and dorsolateral frontal regions that are associated with the full expression of schizophrenia (Kurachi, 2003).

If taken at face value, these findings suggest that the perceived differences between the religious experiences of nonpsychotic adults and the religious delusions and hallucinations of individuals with schizophrenia may be slim when examined from a neurological perspective. It may be more appropriate to say that all individuals exist on a continuum of temporal lobe sensitivity, where certain stimuli, such as grief, loss, and crisis, enhance the lability of the temporal lobe and thereby elevate the likelihood of religious experience. Hence, religion appears to be biologically linked to the continuum of schizophrenia-related symptoms.

THE EVOLUTION OF SCHIZOPHRENIA AND RELIGION

The Schizophrenia Paradox

One of the consequences of this evidence for the biological substrates of schizophrenia and religious experience is that they are likely to be highly shaped by evolutionary and genetic processes. Contemporary research has consistently documented that schizophrenia occurs with 1 percent incidence across time and place (Ban, 2004; Burns, 2004; Lewis & Lieberman, 2000). This incidence rate has come to represent a cross-cultural constant because it persists with equal levels across races, continents, and societies that have gross differences in climatic, physical, industrial, and cultural environments (Crow, 1995). This stable and resilient incidence rate is especially telling

because it exceeds known mutation rates and persists despite the early mortality rates and 50 percent reduction in fecundity that are associated with schizophrenia (Brune, 2004; Burns, 2004). In fact, the persistence of schizophrenia despite its reproductive disadvantages has come to be called the *schizophrenia paradox*. It begs the question why a condition that confers personal torment and societal suffering, and that frequently leads to early death and low reproductive rates, prevails and persists with such consistency in the general population. This paradox suggests that environmental influences, such as prenatal insults and viral infections, cannot fully explain the ubiquity and emergence of this condition. The persistence of schizophrenia must therefore be related to genetics and the evolution of the human brain.

Genetic Studies

Consistent with a genetic explanation for schizophrenia, family studies on twins and adoptees have established that over 80 percent of the risk for developing schizophrenia is accounted for by genetic mechanisms (Wong & Van Tol, 2003). Family studies have consistently demonstrated highest risk (5–17%) in first-degree relatives with schizophrenia, which gradually diminishes in second-degree (2–6%) and third-degree (2%) relatives, although these rates are still higher than the general population (Kirov, Donovan, & Owen, 2005; Lewis & Lieberman, 2000; Wong & Van Tol, 2003). In fact, the risk for developing schizophrenia among children who have one parent with schizophrenia is nearly 15 times higher than the general population (Ban, 2004). In twin studies, monozygotic twins shared a concordance rate of 30–69 percent for schizophrenia, whereas dizygotic twins have a concordance rate of 10–26 percent (Ban, 2004; Kirov et al., 2005; Lewis & Lieberman, 2000; Wong & Van Tol, 2003). Similarly, adoption studies have consistently demonstrated greater risk for schizophrenia in biological parents than adoptive parents. These results confirm that there is a significant genetic and inherited quality to schizophrenia, where susceptibility is inherited and transmitted through genetic processes. In fact, strong research suggests that schizophrenia is a cross-cultural and genetic constant, predating the formation of the oldest genetically isolated racial enclaves and persisting through ancient Mesopotamia, Grecian and Roman history, and modern time (Burns, 2004; Jeste, del Carmen, Lohr, & Wyatt, 1985; Polimeni & Reiss, 2003). Considering this strong genetic inheritance, the persistence of schizophrenia despite formidable societal and reproductive resistance seems mostly likely linked to evolutionary processes.

The Evolutionary Advantage of Schizophrenia

From an evolutionary perspective, and perhaps from the mindset of contemporary medicine, natural selection should have eliminated the susceptibility

genes of schizophrenia. Few can argue against the economic, personal, and societal costs incurred by schizophrenia. However, one of the reasons why it might not have been eliminated is because its disadvantages were offset by certain advantages for the individual, kin, or group. Schizophrenia may be an ancient phenomenon because it has an advantageous phenotypic quality, such as a distinct contribution that satiates one of the needs of society, thereby enabling it to persist.

Creativity

Throughout our present understanding of schizophrenia, there has been little disagreement that this neurological condition is associated with high levels of achievement. For many people with schizophrenia, the gifts of creativity, charisma, and leadership occur alongside personal torment and societal disruption. Studies of families in Iceland, which has a small, stable, and isolated gene pool, have consistently revealed exceptional creative potential and achievement in adopted children with at least one biological parent with schizophrenia (Brune, 2004; Horrobin, 1998), which was not demonstrated among adopted children of normal biological parents. Cases of schizophrenia in famous individuals like Henry VI of England, Felix Platter, Isaac Newton, and John Nash all provide evidence that genius may occasionally be the bedfellow of psychosis (Heinrichs, 2003; Jeste et al., 1985). This high level of achievement and creative capacity is similar to the strong levels of creativity and the high number of musicians, writers, and artists who score high on inventories of temporal lobe sensitivity (Persinger, 2001). This is not surprising considering that the major neurological correlate of creativity is the temporal lobe (Persinger, 2001), so that the shared creativity and accomplishment between schizophrenia and epilepsy may follow from shared temporal lobe abnormalities. If the price of achievement is madness, then the persistence of schizophrenia across time and culture may be partially rooted in the leadership, charisma, and creativity it brings.

Religious Attunement

The persistence of schizophrenia may also be related to a unique level of attunement to religious experiences. Individuals with schizophrenia may have a unique ability to tap into a possible spiritual realm and to experience the divine via hallucination, delusion, and anomalous perceptual experiences in a way that may have contributed to its endurance. The adopted children of biological parents with schizophrenia are not only more creative and achievement-oriented than those with normal parents, but they are also significantly more religious, with almost a quarter expressing strong religious sentiments (Horrobin, 1998). Similarly, individuals with schizophrenia not only find

religion to be particularly meaningful and salient to their lives, but it represents a significant source of coping and often infuses the content of their hallucination and delusions. Therefore, the boundaries between the human and the divine may be significantly more blurred for those with schizophrenia, perhaps in a way that provided a historical advantage. In their own way, people with schizophrenia may function like mediums, or intermediaries, between the spiritual and the corporeal, the human and divine.

Shamanism

In traditional or tribal communities, shamans are believed to possess spiritual powers and to commune with the supernatural world. Interestingly, shamanism shares a similar epidemiology with schizophrenia, such as an adolescent onset and a similar incidence rate. It also frequently involves psychotic-like behaviors, such as abnormal perceptual experiences, profound emotional upheavals, bizarre mannerisms, and religious ideation (Krippner, 2002; Polimeni & Reiss, 2002). The symptoms of social isolation, bizarre mentation, spiritual hallucinations, and religious grandiosity that characterize schizophrenia may parallel the societal retreat, prophecy, divine communion, and spiritual unity of the shaman. Both share moments of dissociation between reality and unreality, and both share trance-like states in which profound visual and auditory phenomena are experienced.

Considering these strong similarities, it is highly likely that those with schizophrenia historically played a shamanistic role. Religion has been with humans as long as there have been humans (Albright & Ashbrook, 2001), so it has been necessary for certain members of society to construct new religious meaning systems or maintain preexisting ones that would lead to values, goals, and a sense of identity that fosters the survival of the group. In a sense, the role of the shaman, and perhaps the role of religious symptoms in schizophrenia, is to be responsive to the society's needs for religiousness and mediate a shared meaning system. In fulfilling this shamanistic role, it seems likely that the symptoms of psychosis would be highly advantageous, especially when spearheading religious rituals (Polimeni & Reiss, 2003). To the extent that shamans have abnormal perceptual experiences, bizarre mannerisms, and religious ideation, they may be able to commune with a perceived transcendent in a way that dispenses divine meaning for the experiences of a society. This is particularly true prior to the past few thousand years, when humanity largely existed within hunting and gathering societies that were shaped and influenced by some form of shamanism. In these societies, the religious symptoms of individuals with schizophrenia would be meaningful to understanding changes in the weather, animal behavior, and ways of successfully surviving within and between communities. This suggests that part of the reason why religious symptoms of

individuals with schizophrenia may have survived is because they subserved this adaptive shamanistic role when human nature as we know it emerged. They were able to see something in a new way and construct religious or spiritual meaning out of it. In modern society, the religious delusions and hallucinations of schizophrenia may seem nonsensical, perhaps because we are less dependent on religion and more dependent on reason and intellect to provide a meaning system, but these experiences may have been especially meaningful to human societies at one time.

Granted, there are differences between shamans and individuals with schizophrenia (Stephen & Suryani, 2000), including documented differences in personality traits (Krippner, 2002) and the tendency for the former to have visual hallucinations rather than auditory hallucinations (Polimeni & Reiss, 2002). Some of these differences may be shaped by culture and language, but it does not negate the historical probability that individuals with schizophrenia subserved an important societal role of mediating the human and the divine. In other words, maybe schizophrenia persisted because it performed certain essential religious functions for society. Maybe it did not persist due to a distinct reproductive advantage, but rather because of group selection and behavioral specialization in a shamanistic role.

The Test of Culture

One test for this theory is to determine whether schizophrenia is particularly adaptive in contemporary contexts that have increased sensitivity to religious issues and experiences. For much of human history, the symptoms of schizophrenia were not considered the domain of medicine, but rather the realm of religion and the supernatural (Jeste et al., 1985). This is largely because the high value placed on the attunement of schizophrenia with the divine resulted in little distinction between the religious and the psychotic. However, over the past several decades, the prevalence of religious hallucinations and delusions has pivoted on a cultural axis, with higher frequencies in cultures in which religion exerts a more powerful influence. In Okinawa, where spiritual specialists called *yuta* actively provide spiritual intervention, hallucinations are highly valued as a marker of genuine spiritual intervention. In fact, many *yutas* have been diagnosed with schizophrenia and are treated in mental hospitals, but they are still actively sought for religious, spiritual, and other counseling by other patients in the hospital (Allen, Naka, & Ishizu, 2004). Similarly, many of the yogis in India exhibit beliefs and behaviors that are akin to psychosis and that would be considered delusions in Western culture (Castillo, 2003). These include positive symptoms such as grandiose beliefs and religious auditory and visual hallucinations, as well as negative psychotic symptoms, such as affective flattening, alogia, and avolition. Furthermore, religious delusions occur with significantly greater

frequency in Seoul and Taipei when compared to Shanghai (Kim et al., 2001). Interestingly, the major religious orientations of Seoul and Taipei are shamanistic in nature, whereas religion has been predominantly oppressed in China. This suggests that there is little separation between schizophrenia and shamanistic roles in those cultures that place a high premium on religious experiences. It also suggests that the elements of psychosis in one culture may be holy in another.

In fact, when compared to modern Western cultures, the incidence of non-affective psychoses with acute onset was 10 times higher in traditional cultures with strong religious sentiments (Castillo, 2003). Even more profound is the better course and outcome of functional psychoses in traditional cultures, possibly because these cultures place higher value on psychotic experiences and respond with greater sympathy and social support than might be offered in Western settings (Castillo, 2003).

Together, these findings suggest that, although the rate of schizophrenia is independent of culture and era, the content of schizophrenic delusions and hallucinations appears to be sensitive to sociocultural and political situations. There may be a gradual fading of religious delusions within cultures that have a reduced emphasis on religion, largely because there is a reduced evolutionary need for the shamanistic role of schizophrenia. Clinicians in Western societies most likely discourage the religious content of psychosis because it has been associated with poorer treatment outcomes, reduced adherence to treatment, and literal interpretations of commands in the Bible (i.e., “cutting out one’s eye”; Siddle et al., 2002). However, this approach may discount the possibility that poorer outcomes and treatment adherence may reflect the loss of a meaningful role for those with schizophrenia. The loss of this role may represent the loss of identity and the elevation of fragmentation. In traditional, non-Western societies in which this role is preserved, schizophrenia and religious psychoses may have a better home.

IMPLICATIONS FOR RELIGION

The current picture that has emerged thus far is that schizophrenia and the religious content of psychosis are subserved by biological and neurological substrates. When these biological and genetic underpinnings are paired with the cross-cultural persistence of schizophrenia and religiously oriented psychosis, schizophrenia appears to have a distinct evolutionary advantage. Considering the strong parallels between shamanistic tendencies and psychotic behavior, this advantage may be rooted in the mediation of a spiritual realm (or rooted in the neural substrates of a religious meaning system that defines global meaning via religious hallucination, delusion, and anomalous perceptual experiences). In a sense, the continuum of psychoticism may be fundamental to religiousness, particularly when the contradictions and

tragedies of life raise existential questions and crises of meaning (Joseph, Smith, & Diduca, 2002). It is the need for mediation between the human and divine during these occasions that may have fostered the biological emergence of the religious symptoms of psychosis. This understanding of the biological basis for schizophrenia and religious delusions, as well as the specialized role of schizophrenia for religion, raises some necessary questions and may lead to some unique insights, particularly for religion.

Implications from the Neurology of Schizophrenia and Religion

A Physicalist View of the Person

Among these implications is the notion that phenomena on the far end of the continuum of religious experiences, such as delusions and hallucinations, are biologically mediated. Not only is schizophrenia a neurodevelopmental and biological brain disorder, but all of its clinical phenomena, including religious delusions and hallucinations, are also mediated by neurological substrates and neurochemical changes. This argues for a monistic or physicalist view of the person, where religion represents an aspect of a unitary, corporeal self, rather than a separate entity within the person that is imposed from without in a Platonic dualism between spirit and body. Such a monistic view may be more respectful to those with schizophrenia because it does not differentiate between the neurological and the religious. It is this sense of differentiation, or a fragmented sense of self, that is central to the clinical phenomenon of schizophrenia, where the individual has a skewed sense of ego boundaries between the self and other, the real and the unreal. Any attempt to separate the biological from the religious may exacerbate this dissociated sense of self. In contrast, and similar to many therapeutic approaches to schizophrenia, a physicalist or monistic conception of the self integrates the symptoms and experiences of schizophrenia into a holistic view of the person.

At first glance, the contention for a physicalist view of the person may seem like it reduces all religious experience to biology and precludes the intervention of a higher power. Quite the contrary, it could foster humbleness at the foresight of a higher power to biologically construct humans in a way that enables them to experience the divine (Saver & Rabin, 1997). It also retains the possibility of supervenient properties, where the biological substrates of religious experience create religious phenomena that are not reducible to the sum of the individual, neurological parts (Murphy, 1999).

Perhaps it is helpful to distinguish between mediation and generation. To suggest that religious delusions and experiences have neural substrates in temporolimbic abnormalities or deficiencies in the dopaminergic and

glutamatergic systems says nothing of the origin or source of these abnormalities. Much about the development and action of these neurological mechanisms remains a hypothesis, which renders it more appropriate to say that the religious experiences and psychotic content of individuals with schizophrenia are *mediated* rather than *caused* by empirical and biological substrates. This leaves significant room for emphasizing the operation of supervenient processes, the possibility of emergent properties greater than the starting parameters, and the remarkable intervention of a higher power in creating the neurological capacity for experiencing the divine. In other words, the neurological substrates of religious experience, psychotic or otherwise, retains room for special grace while reducing the gap between the biological and the miraculous.

A Monistic View of Religion?

Regardless of how individuals retain the mystery of faith, the physicalist nature of schizophrenia and religious psychoses forces a blurring of the experiential boundaries between the religious experiences of nonpsychotic and psychotic individuals. It may be tempting to argue that the bizarre religious experiences associated with schizophrenia are clearly reducible to biology because of their aberrancy, whereas the religious experiences of normal adults are somehow more genuine or external to the corporeal self. However, the frontotemporal quality of religious experiences suggests that these are inaccurate distinctions. Religion itself may be monistic, similar to the monistic nature of the person. To the extent that the religious experiences of individuals with schizophrenia, schizotypal traits, and temporal lobe epilepsy are subserved by common neurological abnormalities that are shared with normal church attendees, it may be more appropriate to adopt an integrated view of religion and religious experiences. Many religions share common themes and stories, and the biological mediation of religious experience, as evidenced in the religious delusions and hallucinations of those with schizophrenia, may unify these religions under a common neurological umbrella. To this end, different religions may be similar in theme as well as broad biological origin.

This invariably raises questions about what accounts for differences between religions. One possibility is that the differences reflect the operation of disparate sociocultural factors on shared neural substrates, similar to the way cultural and environmental factors shape the specific religious content of schizophrenic delusions and hallucinations. Nevertheless, it may not be appropriate to separate religious experiences into distinct categories, such as those experiences that are “genuine” versus those that are “unreal.” Rather, the common neurology behind all religions suggests a continuum of religious experiences, with schizophrenia or temporal lobe epilepsy at a far end and the religious experiences of nonafflicted individuals at the other.

Can Religion Be Biologically Altered?

The neurological mediation of religious psychosis also raises questions about the appropriateness of biological intervention for religious experience. Knowing that many of the intense religious experiences associated with temporal lobe epilepsy can be mitigated with anterior temporal lobectomy, it seems plausible that the intensity of religious delusion and hallucination can be similarly attenuated through surgical intervention, providing that anatomical locations or pathways can be identified with microscopic precision. In converse fashion, it seems equally tenable that religious experiences can be biologically stimulated. Research shows that even those without identifiable features of psychopathology can experience a sensed presence of something larger by applying complex magnetic fields over the right hemisphere and bilaterally stimulating the temporal lobes (Persinger, 2001). Moreover, the ingestion of hallucinogenic agents, including LSD and mescaline, can induce visual illusions and hallucinations with religious themes in a way that closely parallels religious or mystical experiences. Might this suggest that biological intervention can be used for those psychotic and nonpsychotic individuals who feel spiritually dry and long for the voice of the divine? Alternatively, should biological resection be implemented in cases in which individuals are disturbed by religious content, such as possession, feelings of conviction, or fearful spiritual encounters? These are politically and emotionally laden questions that are unearthed by the biological underpinnings of religion and may need to be answered in the near future.

Schizophrenia and Religious Institutions

One relatively certain implication is that religious institutions may need to more readily embrace people with schizophrenia. Despite the finding that over 80 percent of individuals with mental illness use religious coping, only 15 percent feel comfortable enough to meet with a religious leader (Tepper, Rogers, Coleman, & Malony, 2001). Although the exact reasons for this are unknown, it may be partially related to the uncertainty of religious institutions about how to incorporate bizarre behaviors and religious delusions into their theological schema. Religious leaders and laypersons seldom receive training in mental illness, and when they encounter schizophrenia on their doorstep, they may be paralyzed about how to reconcile religious delusions and hallucinations with their own faith.

However, the common and shared biological ancestry of religion warrants greater inclusion of those with schizophrenia. This is particularly true in light of the historical tendencies of individuals with schizophrenia to serve shamanistic roles and to tap into the divine. Invariably, there are religious truths embedded in the context of religious delusions and hallucinations, but

this truth can only be revealed by coming alongside and listening to those with schizophrenia. In doing so, religion may learn something about itself from schizophrenia. To the extent that schizophrenia is either ignored or bypassed by religious communities, the door to this truth is closed, and the shared religious ancestry is dismissed.

Implications from the Evolution of Schizophrenia and Religion

By virtue of their religious delusions and hallucinations, individuals with schizophrenia may also have a substantial and necessary biological and societal role. They may have a distinct social function, if only allowed to perform it. Not only are they more likely to demonstrate creative capacity and extraordinary achievements, but they are also prone to hyperreligiosity, leadership, and to serving intermediary roles between the spiritual and earthly. Rather than seeing this condition as an accident or the result of mutation, maybe it would be helpful to occasionally see it as an adaptation sustained for a specific cultural need. Put differently, maybe the aberration of schizophrenia was not always a curse, but the result of the capability to construct divine meaning mediated through evolutionary processes.

This is not an attempt to glamorize schizophrenia; in fact, many individuals can testify to the personal and public harm caused by the symptoms of schizophrenia. It is to say, however, that one of the possible benefits or contributions of madness is its closeness to religion, its creation of intermediaries to a possible spiritual realm, and its provision of a religious system of meaning. It might be fearful to embrace the proximity between religion and psychosis, almost as if it risks losing the potency of religion. But maybe there is a potentially valuable role for those who blur madness and religion in their lives.

This raises questions about what would happen if we treated those with schizophrenia as cultural or religious sages. If lessons are learned from traditional, non-Western cultures, then the symptoms of psychosis would more quickly resolve and the outcome of treatment would be more favorable. In a sense, this would appropriate afflicted individuals with the evolutionary role that has been selected for them for centuries. With the waning of religious sentiment in many Western cultures, however, those with schizophrenia may be experiencing a loss of identity and greater fragmentation of the self. It is uncertain whether it is universally appropriate to recapture the shamanistic role of schizophrenia. The process of doing so might integrate the fragmented selves of those with schizophrenia and return to them an important religious role. Alternatively, the growth of Western culture and its changes in religious trends may be foretelling the evolutionary deselection of religious delusions and psychosis. These are questions that have yet

to be answered, but in the meantime, society may still have much it can learn about religion from schizophrenia.

CONCLUSION

It appears that schizophrenia and religion are both deeply mediated by neurological substrates, and these substrates may have contributed to an evolutionary advantage for schizophrenia. This advantage may be rooted in the service of a distinct intermediary role for relating to the divine via religious delusion and hallucination. This is not to suggest that all the clinical phenomena of schizophrenia are positive qualities or that individuals with schizophrenia should uniformly embrace their religious delusions or hallucinations. In fact, it may be that the genes for schizophrenia do not have any distinct advantage in themselves but persist by virtue of their fortuitous association with other adaptive genes (Burns, 2004). However, there may be potential value in certain features of schizophrenia, including the larger, shamanistic role that they once may have played.

In particular, those who are symptomatic and asymptomatic for schizophrenia both have similar needs that are served by religion. Central to these is the need to develop a global meaning system that constructs new meanings in a way that fosters group survival. The shamanistic ability of the individual with schizophrenia to see human interaction in a new way and to imagine global values that increase interpersonal care and reduce greed and violence means that there was a perpetual role for these individuals in human culture. The fact that the religious symptoms of schizophrenia have survived so long is surprising considering that many segments of society can easily react and rebel against this shamanistic role of schizophrenia, primarily because it requires that those in power change or give up some of what they have. It would be tempting for those in power to subdue the shaman and suppress the new way of seeing the world proposed by the shaman. However, if the cross-cultural constant holds, then it is reasonable to conclude that approximately one person per hundred had an imagination and vision for the good of society that was strong enough to let it survive. Some might ask where the shamans or visionaries are in Western society today. Perhaps the artifacts of shamanism still reside with those afflicted with schizophrenia.

ACKNOWLEDGEMENTS

The authors wish to thank Erica Swenson for her help in the preparation of this chapter and the Catlin Foundation whose grant supported her research assistantship.

REFERENCES

- Albright, C. R., & Ashbrook, J. B. (2001). *Where God lives in the human brain*. Naperville, IL: Sourcebooks.
- Allen, M., Naka, K., & Ishizu, H. (2004). Attacked by gods or by mental illness? Hybridizing mental and spiritual health in Okinawa. *Mental Health, Religion, and Culture*, 7, 83–107.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.
- Antonova, E., Sharma, T., Morris, R., & Kumari, V. (2004). The relationship between brain structure and neurocognition in schizophrenia: A selective review. *Schizophrenia Research*, 70, 117–145.
- Appelbaum, P. S., Robbins, P. C., & Roth, L. H. (1999). Dimensional approach to delusions: Comparison across types and diagnoses. *American Journal of Psychiatry*, 156, 1938–1943.
- Arnold, S. E. (1997). The medial temporal lobe in schizophrenia. *Journal of Neuropsychiatry and Clinical Neurosciences*, 9, 460–470.
- Ban, T. A. (2004). Neuropsychopharmacology and the genetics of schizophrenia: A history of the diagnosis of schizophrenia. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 28, 753–762.
- Baumeister, R. F. (1991). *Meanings of life*. New York: Guilford Press.
- Brune, M. (2004). Schizophrenia—An evolutionary enigma? *Neuroscience and Biobehavioral Reviews*, 28, 41–53.
- Burns, J. K. (2004). An evolutionary theory of schizophrenia: Cortical connectivity, meta-representation, and the social brain. *Behavioral and Brain Sciences*, 27(6), 831–855.
- Camargo, E. E. (2001). Brain SPECT in neurology and psychiatry. *Journal of Nuclear Medicine*, 42(4), 611–623.
- Carlsson, A., Waters, N., Waters, S., & Carlsson, M. L. (2000). Network interactions in schizophrenia—therapeutic implications. *Brain Research Reviews*, 31, 342–349.
- Castillo, R. J. (2003). Trance, functional psychosis, and culture. *Psychiatry*, 66, 9–21.
- Clinton, S. M., & Meador-Woodruff, J. H. (2004). Thalamic dysfunction in schizophrenia: Neurochemical, neuropathological, and in vivo imaging abnormalities. *Schizophrenia Research*, 69, 237–253.
- Crow, T. J. (1995). A theory of the evolutionary origins of psychosis. *European Neuropsychopharmacology Supplement*, 59–63.
- Getz, G. E., Fleck, D. E., & Strakowski, S. M. (2001). Frequency and severity of religious delusions in Christian patients with psychosis. *Psychiatry Research*, 103, 87–91.
- Halliday, G. M. (2001). A review of the neuropathology of schizophrenia. *Clinical & Experimental Pharmacology and Physiology*, 28, 64–65.
- Hansen, B. A., & Brodtkorb, E. (2003). Partial epilepsy with “ecstatic” seizures. *Epilepsy and Behavior*, 4, 667–673.
- Heckers, S., Rauch, S. L., Goff, D., Savage, C. R., Schacter, D. L., Fischman, A. J., et al. (1998). Impaired recruitment of the hippocampus during conscious recollection in schizophrenia. *Neuroscience*, 1(4), 318–323.
- Heinrichs, R. W. (2003). Historical origins of schizophrenia: Two early madmen and their illness. *Journal of the History of the Behavioral Sciences*, 39(4), 349–363.

- Horrobin, D.F. (1998). Schizophrenia: The illness that made us human. *Medical Hypotheses*, *50*, 269–288.
- Jeste, D.V., del Carmen, R., Lohr, J.B., & Wyatt, R.J. (1985). Did schizophrenia exist before the eighteenth century? *Comprehensive Psychiatry*, *26*, 493–503.
- Joseph, S., Smith, D., & Diduca, D. (2002). Religious orientation and its association with personality, schizotypal traits, and manic-depressive experiences. *Mental Health, Religion, and Culture*, *5*, 73–81.
- Kasai, K., Iwanami, A., Yamasue, H., Kuroki, N., Nakagome, K., & Fukuda, M. (2002). Neuroanatomy and neurophysiology in schizophrenia. *Neuroscience Research*, *43*, 93–110.
- Kemp, D. (2000). A Platonic delusion: The identification of psychosis and mysticism. *Mental Health, Religion, and Culture*, *3*, 157–172.
- Kim, K., Hwu, H., Zhang, L.D., Lu, M.K., Park, K.K., Hwang, T.J., et al. (2001). Schizophrenic delusions in Seoul, Shanghai, and Taipei: A transcultural study. *Journal of Korean Medical Sciences*, *16*, 88–94.
- Kirov, G., Donovan, M.C., & Owen, M.J. (2005). Finding schizophrenia genes. *Journal of Clinical Investigation*, *115*, 1440–1448.
- Kirov, G., Kemp, R., Kirov, K., & David, A.A. (1998). Religious faith after psychotic illness. *Psychopathology*, *31*, 234–245.
- Krippner, S.C. (2002). Conflicting perspectives on shamans and shamanism: Points and counterpoints. *American Psychologist*, 963–977.
- Kroll, J., & Sheehan, W. (1989). Religious beliefs and practices among 52 psychiatric inpatients. *American Journal of Psychiatry*, *146*, 67–72.
- Kurachi, M. (2003). Pathogenesis of schizophrenia: Part I. Symptomatology, cognitive characteristics, and brain morphology. *Psychiatry and Clinical Neurosciences*, *57*, 3–8.
- Levin, S., Yurgelun-Todd, D., & Craft, S. (1989). Contributions of clinical neuropsychology to the study of schizophrenia. *Journal of Abnormal Psychology*, *98*(4), 341–356.
- Lewis, D.A., & Lieberman, J.A. (2000). Catching up on schizophrenia: Natural history and neurobiology. *Neuron*, *28*, 325–334.
- Maltby, J., & Day, L. (2002). Religious experience, religious orientation, and schizotypy. *Mental Health, Religion, and Culture*, *5*, 163–174.
- Mohr, S., & Huguélet, P. (2004). The relationship between schizophrenia and religion and its implications for care. *Swiss Medical Weekly*, *134*, 369–376.
- Murphy, N. (1999). Supervenience and the downward efficacy of the mental: A non-reductive physicalist account of human action. In R.J. Russell, N. Murphy, T.O. Meyering, & M.A. Arbib (Eds.), *Neuroscience and the person: Scientific perspectives on divine action* (pp. 147–164). Berkeley, CA: Center for Theology and the Natural Sciences.
- Ogata, A., & Miyakawa, T. (1998). Religious experiences in epileptic patients with a focus on ictus-related episodes. *Psychiatry and Clinical Neurosciences*, *52*, 321–325.
- Paloutzian, R.F. (2005). Religious conversion and spiritual transformation: A meaning-system analysis. In R.F. Paloutzian & C.L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 341–347). New York: Guilford Press.
- Paloutzian, R.F., & Swenson, E.L. (in press). Spiritual experiences, neurology, and the making of meaning. In C. Jäger (Ed.), *Brain-religion-experience: Multidiscipline encounters*. New York: Springer.

- Park, C.L. (2005a). Religion and meaning. In R.F. Paloutzian & C.L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 295–314). New York: Guilford Press.
- Park, C.L. (2005b). Religion as a meaning making framework in coping with life stress. *Journal of Social Issues*, 61(4), 707–730.
- Park, C.L., & Folkman, S. (1997). Meaning in the context of stress and coping. *Review of General Psychology*, 1, 115–144.
- Persinger, M.A. (2001). The neuropsychiatry of paranormal experiences. *Journal of Neuropsychiatry and Clinical Neurosciences*, 13, 515–524.
- Persinger, M.A., & Makarec, K. (2002). Temporal lobe epileptic signs and correlative behaviors displayed by normal populations. *Journal of General Psychology*, 114, 179–195.
- Pierre, J.M. (2001). Faith or delusion? At the crossroads of religion and psychosis. *Journal of Psychiatric Practice*, 7, 163–172.
- Polimeni, J., & Reiss, J.P. (2002). How shamanism and group selection may reveal the origins of schizophrenia. *Medical Hypotheses*, 58, 244–248.
- Polimeni, J., & Reiss, J.P. (2003). Evolutionary perspectives on schizophrenia. *Canadian Journal of Psychiatry*, 48, 34–39.
- Puri, B. K., Lekh, S. K., Nijran, K. S., Bagary, M. S., & Richardson, A. J. (2001). SPECT neuroimaging in schizophrenia with religious delusions. *International Journal of Psychophysiology*, 40, 143–148.
- Rogers, S.A., Poey, E. L., Reger, G. M., Tepper, L., & Coleman, E. M. (2002). Religious coping among those with mental illness. *International Journal for the Psychology of Religion*, 12, 161–175.
- Saver, J. L., & Rabin, J. (1997). The neural substrates of religious experience. *Journal of Neuropsychiatry and Clinical Neurosciences*, 9, 498–510.
- Shenton, M.E., Dickey, C.C., Frumin, M., & McCarley, R.W. (2001). A review of MRI findings in schizophrenia. *Schizophrenia Research*, 49, 1–52.
- Siddle, R., Haddock, G., Tarrrier, N., & Faragher, E. B. (2002). Religious delusions in patients admitted to hospital with schizophrenia. *Social Psychiatry and Psychiatric Epidemiology*, 37, 130–138.
- Silberman, I. (2005). Religion as a meaning-system: Implications for the new millennium. *Journal of Social Issues*, 61(4), 641–664.
- Stephane, M., Barton, S., & Boutros, N. N. (2001). Auditory verbal hallucinations and dysfunction of the neural substrates of speech. *Schizophrenia Research*, 50, 61–78.
- Stephen, M., & Suryani, L. K. (2000). Shamanism, psychosis, and autonomous imagination. *Culture, Medicine, and Psychiatry*, 24, 5–40.
- Stompe, T., Friedman, A., Ortwein, G., Strobl, R., Chaudhry, H. R., Najam, N., et al. (1999). Comparisons of delusions among schizophrenics in Austria and in Pakistan. *Psychopathology*, 32, 225–234.
- Tateyama, M., Asai, M., Kamisada, M., Hashimoto, M., Bartels, M., & Heimann, H. (1993). Comparison of schizophrenic delusions between Japan and Germany. *Psychopathology*, 26, 151–158.
- Tepper, L., Rogers, S.A., Coleman, E.M., & Malony, H.N. (2001). The prevalence of religious coping among persons with persistent mental illness. *Psychiatric Services*, 52, 660–665.

- Wahass, S., & Kent, G. (1997). Coping with auditory hallucinations: A cross-cultural comparison between Western (British) and non-Western (Saudi Arabian) patients. *Journal of Nervous and Mental Disease*, *185*, 664–668.
- Wong, A.H.C., & Van Tol, H.H.M. (2003). Schizophrenia: From phenomenology to neurobiology. *Neuroscience and Biobehavioral Reviews*, *27*, 269–306.

BETWEEN YANG AND YIN AND
HEAVEN AND HELL: UNTANGLING
THE COMPLEX RELATIONSHIP
BETWEEN RELIGION AND
INTOLERANCE

Ian Hansen and Ara Norenzayan

Religious faith deserves a chapter to itself in the annals of war technology, on an even footing with the longbow, the warhorse, the tank, and the hydrogen bomb. (Richard Dawkins, 1989, pp. 330–331)

The baseness so commonly charged to religion's account are thus, almost all of them, not chargeable to religion proper, but rather to religion's wicked practical partner, the spirit of corporate dominion. And the bigotries are most of them in their turn chargeable to religion's wicked intellectual partner, the spirit of dogmatic dominion. (William James, 1982/1902, p. 337)

Religion's relationship to intolerance, conflict, and mass violence is well known but controversial and poorly understood. Although religion has waxed and waned in perceived importance as a driver of conflict in human history, the rising share of worldwide violence attributed to extremists of one religion or another appears symptomatic of a worldwide resurgence in religion-related conflict and religiously motivated intolerance and violence (Atran, 2002, 2003). This rise has brought renewed interest to the role of religion and culture in motivating intolerance and violence (Appleby, 2000; Juergensmeyer, 2003; Kimball, 2002; Nelson-Pallmeyer, 2003). Because religion is often named a human universal in a species with tremendous cultural

variation, its association with intolerance and support for violence, and potential explanations for these relationships, are of utmost importance.

In this chapter, we explore different components of the construct “religion,” especially for predicting socially relevant psychological phenomena like prejudice, intolerance, scapegoating, and support for religious violence. Anthropologists, psychologists, philosophers, theologians, and even religious figures have often proposed distinctions between two different kinds of religion or religiosity, morally elevating one kind of religiosity at the expense of the other. This dual understanding of religion is remarkably recurrent, and the joints at which religion is carved often appear to be similar across perspectives, temperaments, and life callings. Specifically, those who divide religiosity generally divide it between subjectively centered natural-organic religiosity (e.g., inward revelation, personal religious experience), and socially transmitted cultural religiosity (e.g., learned doctrines, practices, and social identities; what one dogmatically believes to be true and false). We dispute the notion that subjective-natural and objective-cultural religiosity are inversely related or even orthogonal, instead proposing that they are best understood as bound together, sometimes quite tightly bound together. With regard to predicting religious intolerance and support for religious violence, we argue against carving religion into empirically inverse or unrelated elements, arguing specifically against the utility of the intrinsic/extrinsic religiosity dichotomy commonly employed in the religion and prejudice literature and in the psychology of religion generally (Allport & Ross, 1967). We find that the aspect of religion that involves devotion to the supernatural or to a specific supernaturally grounded faith and practice (devotional religiosity) indeed goes along with the aspect that involves adopting one religious community’s epistemic and moral vision as true, and treating all deviations from that moral vision as false, dangerous, alien, or degenerate (coalitional religiosity).

As empirically related as these aspects of religion are, our research has found that they have opposite relationships to religious intolerance: coalitional religiosity independently predicts intolerance and scapegoating, and devotional religiosity independently predicts tolerance and rejection of scapegoating. With an eye to developments in the cognitive sciences, evolutionary psychology, and cultural psychology, we explore why these distinct aspects of religiosity might be so tightly bound together and yet be associated with opposite social attitudes toward outgroups.

GROUNDING RELIGION IN AN EVOLUTIONARY FRAMEWORK

An evolutionary approach to religion attempts to explain most religious phenomena as arising from adaptive group selection (Wilson, 2002), adaptive

individual selection (e.g., Landau, Greenberg, & Solomon, 2004; Sosis & Alcorta, 2003), or some invocation of individual selection that at best sees religion as an exaptation, spandrel, or by-product of other adaptive psychological tendencies (Atran & Norenzayan, 2004; Boyer, 2003; Guthrie, 1993).

Whether invoking notions of group selection or individual selection, adaptation, exaptation, or spandrel, however, scientific researchers of religion increasingly consider religion “natural” or organic, in the sense that religion is rooted in ordinary human cognition and transmitted via social interactions among individuals (see Atran, 2002; Barrett, 2000; Boyer, 2001; Lawson & McCauley, 1990; Pyysiäinen & Anttonen, 2002). This emphasis on the natural or organic aspect of religion as being paramount is a departure from the previously reigning paradigm in the social sciences that treated religions and cultures as primarily superorganic—that is, brought about, maintained, and developed through processes that are irreducible to individual mind/brain mechanisms. The most radical examples of such a seemingly superorganic process is Durkheim’s (1915/1965) view of religion as an organizer of social life that supersedes individual psychology and Dawkins’s (1989) famously hypothesized “meme”—a faithfully self-replicating unit of information, analogous to yet fully independent from the gene. Indeed, religious and cultural changes (perhaps including the apparent genesis of culture and religion itself) appear to have some degree of independence from genetic changes, yet the afore-mentioned research into the natural origins of religion is accumulating evidence that religious thought and behavior are shaped by psychological inclinations rooted in natural selection.

Generally, those of us who take naturalized approaches to religion do not dispute, and in fact take great interest in, the processes of cultural transmission that shape religious thought and behavior. However, a natural science of religion ought to take as its starting point the psychological building blocks of religion—those elements, possibly rooted in human evolution, that tend to reoccur across time and place and may canalize the cultural transmission of religion into predictably convergent yet culturally distinct pathways. Anthropologically speaking, there is a near universality of (1) belief in supernatural agents who (2) relieve existential anxieties such as death and deception but (3) demand passionate and self-sacrificing social commitments, which are (4) validated through emotional ritual (Atran & Norenzayan, 2004). There are salient similarities to be found between even the most radically divergent cultures and religions (Norenzayan & Heine, 2005). There are even traces of ritual, cooperative, and self-sacrificing behavior in the animal kingdom (Burkert, 1996). All this suggests that religion, for all its variation, may contain a common framework ultimately based in the slow processes of evolution by natural selection. If we are to go beyond proximal explanations of the relationship of religion to prejudice, intolerance, and war, an evolutionary paradigm can be immensely helpful.

THE MULTIPLICITY OF THE CONSTRUCT “RELIGION”

Before seeking to explain religion's relationship to intolerance, it helps to adopt an understanding of religion that is neither too monolithic to be credible nor too pluralistic to be coherent. Because the phenomena of religion are so many and varied—or at least because “religion” as a word can be used to refer to so many different kinds of thought and behavior—it makes sense to try to organize religious phenomena according to a minimal set of psychologically plausible tendencies. For centuries, those who have attempted to explain religion (and even those who have propagated certain religions) have often distinguished two aspects of religion, treating them not only as distinct but also as opposites. For predicting religious intolerance, a dual understanding may reflect a relatively reliable and practical differentiation of one broad group of religious phenomena from another.

Dual understandings of religion generally consider a sense of the omnipresence of the divine (whether sensed directly and spontaneously or with the aid of prayer, meditation, or drug ingestion) more subjective/natural than it is socially transmitted/cultural. It would require a separate chapter to review the intellectual history of attributing the experience of divinity to something inward, personal, and subjective, in contrast to the absorbing of collective religious identity and religious creed and dogma as outward, cultural, and objective. Some illustrative examples are: James's (1982/1902) distinction between the “babbling brook” from which all religions originate (p. 337) and the “dull habit” of “second hand” religion “communicated . . . by tradition” (p. 6) as well as that between “religion proper” and corporate and dogmatic dominion (p. 337); Freud's (1930/1961) distinction between the “oceanic feeling” as an unconscious memory of the mother's womb and “religion” as acceptance of religious authority and morality as a projection of the father; Weber's (1947, 1978) distinction between religious charisma in its basic and “routinized” forms; Adorno's distinction between “personally experienced belief” and “neutralized religion” (Adorno, Frenkel-Brunswick, Levinson, & Sanford, 1950); Rappaport's (1979) distinction between the “numinous”—the experience of pure being—and the “sacred” or doctrinal; and, more recently, Sperber's (1996) cognitive distinction between “intuitive” beliefs—“the product of spontaneous and unconscious perceptual and inferential process” (p. 89), and “reflective” beliefs “believed in virtue of other second-order beliefs about them.” It is not only modern twentieth- and twenty-first-century philosophers and social scientists who have made this distinction. Even the Christian Apostle Paul elevated “the Spirit” of the new Christian covenant over “the letter” (2 Corinthians 3:6), a distinction he equated with that between giving life and killing. The text that inspired the Daoist religious and philosophical movements, the *Dao De Jing*,

parallels this distinction between the revelatory and the culturally transmitted by warning against the decline from intuitive knowledge of the Way to an attachment to the trappings of ritual:

When Tao is lost, there is goodness. When goodness is lost, there is kindness. When kindness is lost, there is justice. When justice is lost, there is ritual. Now ritual is the husk of faith and loyalty, the beginning of confusion. (Feng & English trans., 1972)

In all of these dual understandings, the subjective/natural is named and discussed in a more positive light than the cultural/socially transmitted and they are sometimes treated as mutually exclusive orientations. Assigning opposite moral valence to subjective-natural and objective-cultural religion makes them seem more like dichotomies than distinctions, bitter rivals that cannot easily cooperate toward a common end any more than good and evil should cooperate to a common end. With a more dialectical perspective, however, one could view these dichotomies not as rivals but as complementary elements that harmonize with each other as the dark and light droplets of the Daoist yin-yang symbol are thought to complement and harmonize with each other. With a dialectical understanding of religion, we may see subjective-natural and objective-cultural religion not as incompatible competitors, but as complementarily skilled partners, each containing an element of the other, each reinforcing each other's existence. There may still be a place for a heaven-hell understanding of devotional and coalitional religiosity, however, where one droplet deserves moral praise and the other moral blame, and harmonious coexistence between the droplets, even if empirically demonstrable, reflects a mere interlude before the inevitable divorce.

Interestingly, the model that best reflects this nuanced understanding of religion may have been that of William James, quoted at beginning of this chapter. James spoke in excoriating terms of "corporate dominion" and "dogmatic dominion" and yet admitted that each may be a "practical . . . and . . . intellectual partner" of religion respectively. James generally admired "religion proper" and was somewhat defensive about its pollution by its "wicked" partners. Even if corporate and dogmatic dominion rarely, if ever, divorced themselves from "religion proper," James might have had good moral reasons to wish for such a divorce. Specifically, if corporate and dogmatic dominion predicted prejudice, intolerance, and war, while "religion proper" predicted openness, tolerance, and peace, then wishing for a divorce was quite reasonable for someone who morally preferred openness to prejudice, tolerance to intolerance, and peace to war. Was James right to perceive such different moral natures among such close partners? In the following sections, we illustrate how our studies of religion and religious intolerance offer support to James's paradoxical assessment.

HOW TO ISOLATE “RELIGION PROPER” FROM ITS “WICKED” PARTNERS

One way to see how religious devotion relates to tolerance independent of anything like corporate and dogmatic dominion is to isolate the different constructs with different measures and see whether the different measures make different predictions. The measures we are most concerned with are those tapping religious devotion, rooted in supernatural belief, and coalitional religiosity, rooted in the costly commitment to a community of believers—a community that is morally and epistemically elevated above other communities. Religious devotion centers on the awareness of and attention to God or the “divine” broadly conceived. Typical religious devotion scale items would be “My religion involves all my life” or “In my life I feel the presence of God” (both from Hoge’s [1972] Intrinsic Religious Motivation Scale).

Coalitional religiosity, on the other hand, should be approximated by validated scales measuring what social psychologists consider coalitional boundary-setting social tendencies, such as authoritarianism, fundamentalism, dogmatism, and related constructs (e.g., Kirkpatrick, 1999). These constructs all unquestioningly exalt one way of living and understanding as morally and epistemically superior to others, thus conveying unswerving loyal commitment to a specific identity and ideology. Typical coalitional items would be “The things I believe in are so completely true, I could never doubt them” (from Altemeyer’s [1996] Dogmatism Scale) or “When our government leaders condemn the dangerous elements in our society, it is the duty of every patriotic citizen to help stomp out the rot that is poisoning our country from within” (from Altemeyer’s [1999] Authoritarianism Scale) or “There is a complete, unfailing guide to Divine happiness and salvation, which must be totally followed” (from Altemeyer & Hunsberger’s [1992] religious Fundamentalism Scale). We call these items “coalitional religiosity” not because they always explicitly convey a concern with membership in a coalition but because they reflect an absolute and exclusive attachment to one particular epistemic and moral understanding. It is theoretically possible to be rigidly committed to one’s own personal and privately developed understanding, but we assume such rigid stances generally derive from half-understood dogmas and moral prescriptions of one’s group or its leadership. That is to say, it is generally from groups that we derive our rigid ideological attachments.

A statistical procedure called multiple regression makes it possible to see how coalitional and devotional variables independently predict intolerance. When religious devotion variables and coalitional variables are analyzed in a multiple regression for their relationship to religious tolerance, the regression procedure essentially freezes the empirical “partners” of religious devotion and looks at the independent part of religious devotion that still varies

from less devoted to more devoted even as all of its partners are held in place (equal levels of authoritarianism, fundamentalism, etc. across varying levels of religious devotion). This makes it possible to investigate the independent relationship between religious devotion and intolerance while holding coalitional variables constant. A few studies in the literature have found that if authoritarianism or fundamentalism is held constant, then a religious devotion measure such as Christian orthodoxy¹ can have a *negative* relationship to prejudice, even a religiously sanctioned prejudice such as anti-gay prejudice (Kirkpatrick, 1993; Laythe, Finkel, & Kirkpatrick, 2001; Rowatt & Franklin, 2004). This is despite the fact that the Christian orthodoxy scale is positively correlated with every item on Altemeyer's authoritarianism scale (Altemeyer, 1988), which we consider a coalitional variable and is a robust predictor of many different kinds of prejudice (Altemeyer, 1981, 1988, 1996). Our research also shows tolerant potential in religious devotion even when the dependent variable is religious intolerance instead of race prejudice or anti-gay prejudice. Whether measured by Hoge's (1972) intrinsic religiosity scale (a measure of devotional religiosity) or by a related scale (devotion to the divine) adapted from Fiorito & Ryan (1998) or by self-reported prayer frequency, religious devotion is often negatively related to religious intolerance when measures of coalitional attitude are controlled for—even if devotion is positively related to intolerance when coalitional attitude is not controlled for.

In statistics, when a certain relationship emerges between variables only when controlling for other variables, the variable with the hidden independent relationship is called a suppressor variable (Cohen & Cohen, 1975; Conger, 1974). Suppressor variables are difficult phenomena to understand when described abstractly, but in one of our studies we luckily had data that allowed us to illustrate it visually and intuitively. A procedure called “median split” was used on a sample of 194 Canadian students who were divided into two groups of 97 according to their scores on religious devotion (the average of two devotion scales)—the higher scorers comprised one group (devoted), and the lower scorers comprised the other group (not devoted). This sample was taken from Study 2 in Hansen and Norenzayan (2005). As shown in Figure 8.1, authoritarianism, dogmatism, fundamentalism, and exclusivity covaried with devotion, so the more devoted group was also more authoritarian, dogmatic, fundamentalist, and exclusivist. As for intolerance (see Figure 8.2), the more devoted group was more intolerant than the nondevoted group on one measure (civil intolerance, or willingness to violate the civil and political rights of religious others), more tolerant on another (religious/moral violence—specifically support for “killing the wicked”), but not different on the other measures. This pattern of religious devotion predicting some kinds of tolerance and other kinds of intolerance but being generally orthogonal to tolerance is consistent with the many contradictory and null

Figure 8.1 Means on Religiosity Variables for a Canadian Sample (Simple Median Split on Religious Devotion)

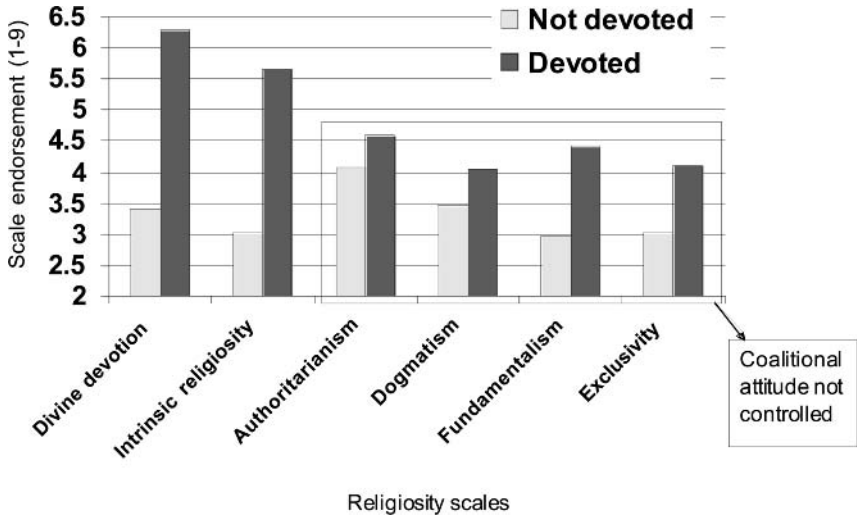
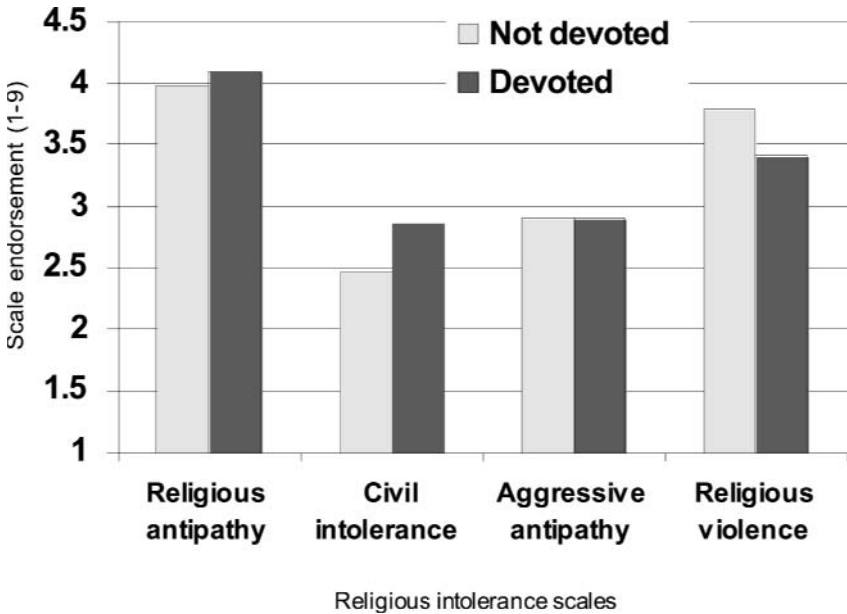


Figure 8.2 Means on Intolerance Variables for a Canadian Sample (Simple Median Split on Religious Devotion)



findings in the religion and prejudice literature (Donahue, 1985; Kirkpatrick & Hood, 1990).

Figures 8.3 and 8.4 illustrate how this uninteresting finding becomes interesting. Again we split the sample in half, but in order to hold coalitional attitude constant, we divided the sample not simply with a median split based on religious devotion scores, but based on a “more devoted than coalitional” score. We created this score by subtracting the average of the four coalitional variables from the average of the two devotional variables, or

$$(\text{divine devotion} + \text{religious devotion}) / 2 - (\text{authoritarianism} + \text{fundamentalism} + \text{dogmatism} + \text{exclusivity}) / 4.$$

While this formula bears no resemblance to the formulas used in multiple regressions, splitting the sample by this formula luckily accomplished what a multiple regression effectively does: holding some variables constant while allowing other variables to vary. As shown in Figure 8.3, authoritarianism, fundamentalism, dogmatism, and exclusivity are a lot less different between the two groups than they were in Figure 8.1: These coalitional attitude variables are more or less held constant between the devoted group and the not devoted group. Even with this more controlled division of the devoted from the nondevoted, the devoted group is above the mean of the scale (5), and the nondevoted group is below it. Figure 8.4 shows that with this more controlled division of the sample between the devoted and nondevoted, the devoted group was *less* intolerant on all measures, even on civil intolerance (recall that the devoted group was *more* intolerant on this measure when coalitional variables were not controlled).

To summarize, when not controlling for coalitional attitude (Figures 8.1 and 8.2), the religiously devoted showed a generally orthogonal (zero) relationship to tolerance; but when coalitional attitude was controlled for (Figures 8.3 and 8.4), they showed less intolerance on all measures. These figures mirror the pattern found with multiple regression. In multiple regression, the independent effect of religious devotion positively predicted religious tolerance when controlling for coalitional attitude (as well as for religious affiliation, ethnicity, and nation of birth). The independent core of religious devotion appears to be related to tolerance.

THE ROLE OF DEVOTIONAL AND COALITIONAL RELIGIOSITY IN SUPPORT FOR VIOLENCE

Even in the face of this evidence one may still argue that this independent core of religious devotion is only related to tolerance when there is something tolerant to be found in a specific religious or cultural milieu: Figures 8.1 through 8.4 describe a Canadian sample composed mostly of the religiously unaffiliated, Christian, and Buddhist college students. College students have

Figure 8.3 Means on Religiosity Variables for a Canadian Sample (Controlled Median Split: Religious Devotion Minus Coalitional Attitude)

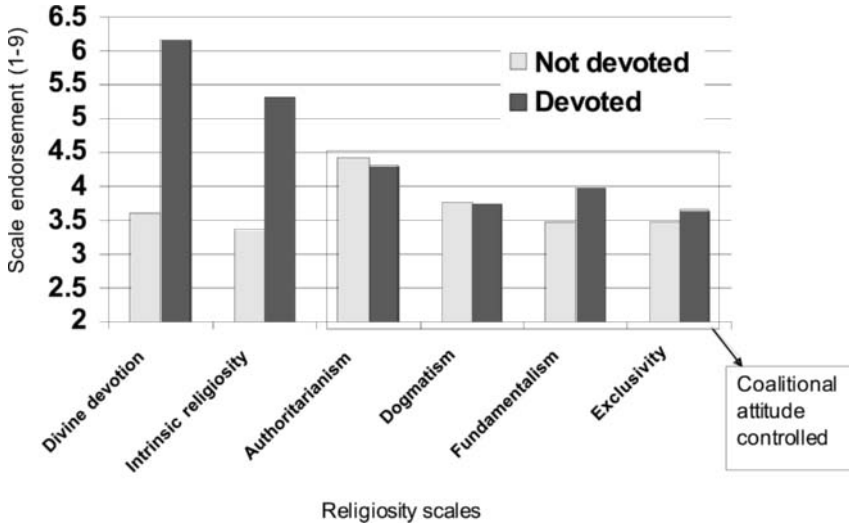
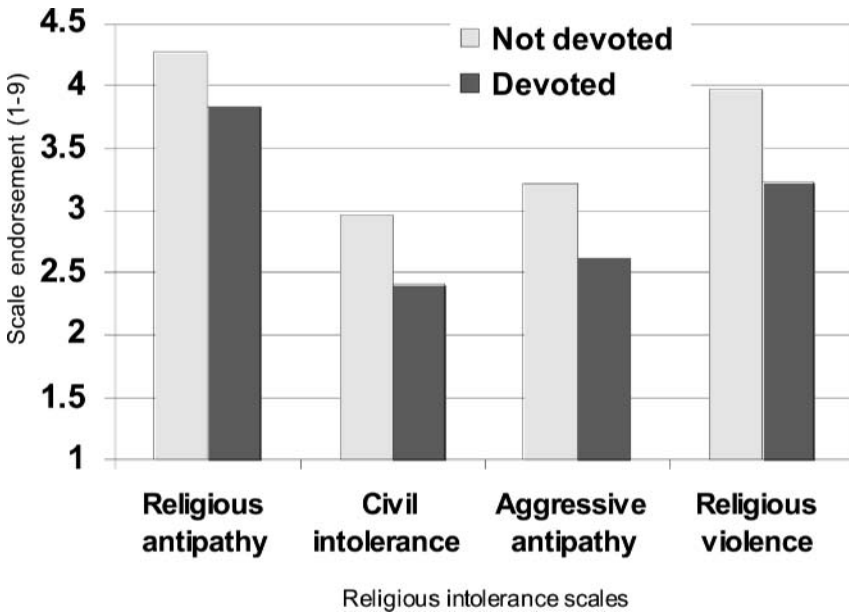


Figure 8.4 Means on Intolerance Variables for a Canadian Sample (Controlled Median Split: Religious Devotion Minus Coalitional Attitude)



a reputation for tolerance. Canada has a reputation for tolerance. The unaffiliated are thought to be more tolerant than the affiliated. Buddhism has a reputation for tolerance as a religion, and the plurality Christian West has a reputation for tolerance as a culture. Both halves of the sample had coalitional scores below the midpoint of the scale. Perhaps this sample provided unusually ample opportunities for religiosity to be expressed in a tolerant way. But we found similar results in a non-Western Malaysian sample, with religious devotion predicting intolerance when not controlling for coalitional attitude and predicting tolerance when coalitional attitude was controlled for (Hansen & Norenzayan, 2005). In Malaysia, coalitional feeling ran considerably higher, yet the pattern of relationships was the same.

In an effort to investigate this phenomenon with a broader cross-cultural sample, we examined an international sample of 10,069 people in 10 nations: the United States, the United Kingdom, Israel, South Korea, India, Indonesia, Lebanon, Russia, Mexico, and Nigeria (Ginges, Hansen & Norenzayan, 2005; Hansen & Norenzayan, 2005). Representative samples were drawn in each of the 10 countries. Participants in these nations had completed a survey about religious attitudes carried out under the auspices of the British Broadcasting Corporation (BBC) in 2004. As an indicator of religious devotion we chose frequency of prayer. As indicators of coalitional attitude and behavior we chose frequency of attendance at organized religious services and a statement of religious exclusivity: “My God (beliefs) is the only true God (beliefs).” We call this “exclusivity” because it asserts the truth of one’s own beliefs to the exclusion of all other beliefs. As with all of our studies, devotional and coalitional measures were positively and strongly related to one another, all $r_s > .3$. One measure of intolerance was a statement scapegoating other religions: “I blame people of other religions for much of the trouble in this world.” Again, we used regressions to analyze how each aspect of religiosity independently predicted scapegoating. Again, we found that exclusivity was a positive independent predictor of scapegoating, while prayer was a negative independent predictor. Attending religious services was not an independent predictor when other predictors were controlled for. Religious affiliation, nation surveyed, work type, gender, and age were all controlled for.

To illustrate the results of the regressions more intuitively, we divided the 10,069 participants into eight subsamples based on the different aspects of religious engagement to determine how adding prayer, adding exclusivity, and adding religious attendance are associated with different levels of scapegoating. It is possible to compare two groups that are otherwise similar, but differ only on one aspect of religiosity—for example, looking at those who attend services but do not pray as compared with those who attend services and pray to see what prayer contributes to scapegoating among attenders.

Although we only report data for the full sample in this chapter, if the sample is divided by religion (Christians, Jews, Muslims, Hindus) and each

religion divided into the eight subcategories, the results are remarkably similar to the full sample, especially with regard to the effect of prayer. In this case, however, some of the eight categories have very few people in them, so differences in the means are difficult to interpret by themselves. These are the eight categories into which we divided the sample.

1. PRAY ONLY: Those who pray regularly (but are not regular attenders or exclusivists) [$n = 493$]
2. ATTEND ONLY: Those who are regular attenders (but are not regular prayers or exclusivists) [$n = 160$]
3. EXCLUSIVIST ONLY: Those who are exclusivists; say their God is the only true God (but are not regular prayers or attenders) [$n = 1,411$]
4. PRAY + ATTEND: Those who are prayers and attenders only (not exclusivists) [$n = 543$]
5. PRAY + EXCLUSIVIST: Those who are prayers and exclusivists only (not attenders) [$n = 1,344$]
6. ATTEND + EXCLUSIVIST: Those who are attenders and exclusivists only (not prayers) [$n = 420$]
7. ALL THREE: Those who are prayers, attenders, and exclusivists [$n = 3,497$]
8. NONE: Those who are not regular prayers, attenders, or exclusivists [$n = 2,200$]

Thus, to examine what prayer contributes to scapegoating, we compared:

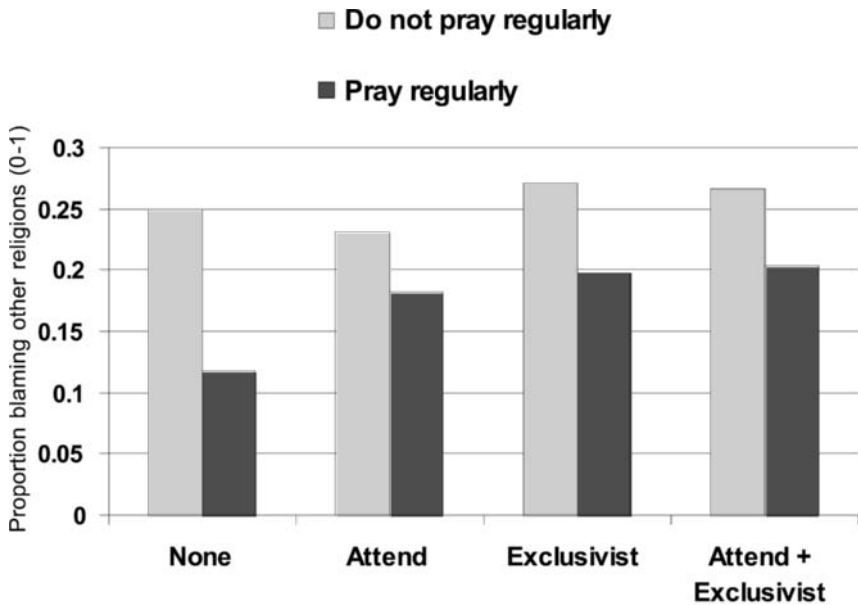
1. NONE with PRAY ONLY
2. ATTEND ONLY with PRAY + ATTEND
3. EXCLUSIVIST ONLY with PRAY + EXCLUSIVIST
4. ATTEND + EXCLUSIVIST with ALL THREE

These comparisons are graphed in Figure 8.5. Note that the group that prays is always less scapegoating than the comparable group that does not. The scapegoating difference between the praying and the not praying is not confined to the mostly secular (not attending and not exclusive) but also is evident among the most coalitionally religious (both exclusivist and attending organized services). This suggests that a decline in prayer (or subjectively experienced faith generally) among the fundamentalist (coalitionally religious) may be associated with greater intolerance rather than greater tolerance. This finding is in contrast to the widely held belief that secularization is the surest path to religious tolerance. Since prayer's independent association with decreased scapegoating is true across religious groups (as mentioned previously, Jews, Christians, Hindus, and Muslims examined separately all show the pattern of Figure 8.5), this also challenges the idea that devotional processes yield tolerance in some religions and intolerance in others. There

are discernible group differences between religions in coalitional religiosity, devotional religiosity, and intolerance. Yet prayer is associated with tolerance regardless of the relative intolerance of the prayer’s religion. By this analysis, many religions appear to contain potential for tolerance, and that potential may lie in part in prayer, or perhaps more generally in subjectively experienced religious devotion, of which regular prayer would be one manifestation. It is interesting to note that prayer is a stronger independent predictor of belief in God and importance of religion in one’s life than religious attendance and exclusivity (Ginges et al., 2005). In fact, we also found that multi-item measures of religious devotion (intrinsic religiosity, devotion to the divine) also predict belief in God better than coalitional religiosity (authoritarianism, exclusivity) (Hansen & Norenzayan, 2003). Because what best predicts belief in God also best predicts tolerance, these results are especially challenging to any secularization-promotes-tolerance hypothesis.

Regular prayer correlates substantially with belief that one’s God or beliefs is the only true God or beliefs, $r(10,069) = .40$. Yet it is possible

Figure 8.5 Proportion of Participants Endorsing the Statement, “I Blame People of Other Religions for Much of the Trouble in this World”



Participants grouped by exclusivity and attendance

Note: Contrasting those who pray regularly vs. those who do not among those who neither attend services nor are exclusivist, those who attend only, those who are exclusivist only, and those for whom both are true.

that the independent contribution of exclusivity to scapegoating is the opposite of prayer's independent contribution to scapegoating. To examine what exclusivity contributes to scapegoating, we compared:

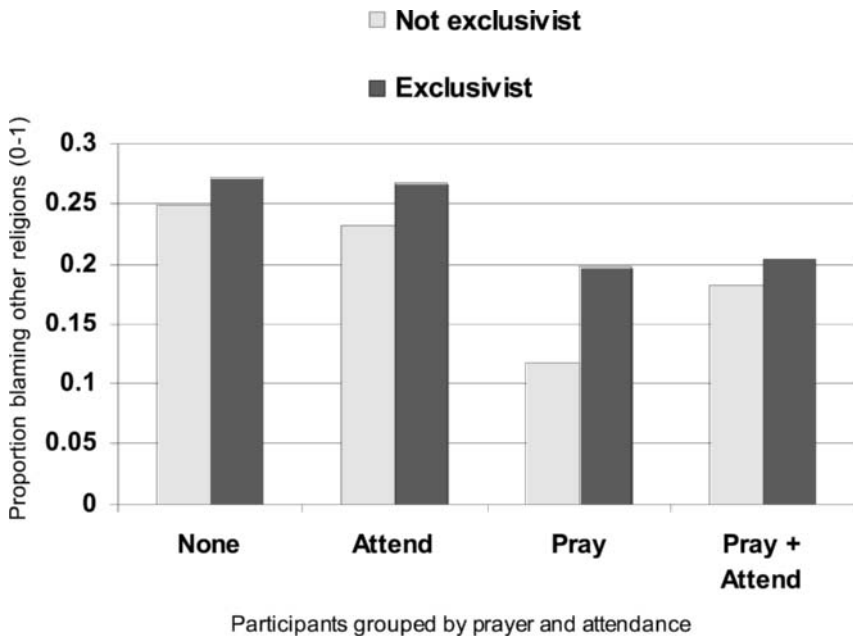
1. NONE with EXCLUSIVIST ONLY
2. ATTEND ONLY with ATTEND + EXCLUSIVIST
3. PRAY ONLY with PRAY + EXCLUSIVIST
4. PRAY + ATTEND with ALL THREE

These comparisons are graphed in Figure 8.6. Note that the group that is exclusive is always more scapegoating than the comparable group that is not. This is in stark contrast to the effect of prayer.

To examine what regular attendance at religious services contributes to scapegoating, we can compare:

1. NONE with ATTEND ONLY
2. EXCLUSIVIST ONLY with ATTEND + EXCLUSIVIST
3. PRAY ONLY with PRAY + ATTEND
4. PRAY + EXCLUSIVIST with ALL THREE

Figure 8.6 Proportion of Participants Endorsing the Statement, "I Blame People of Other Religions for Much of the Trouble in this World"

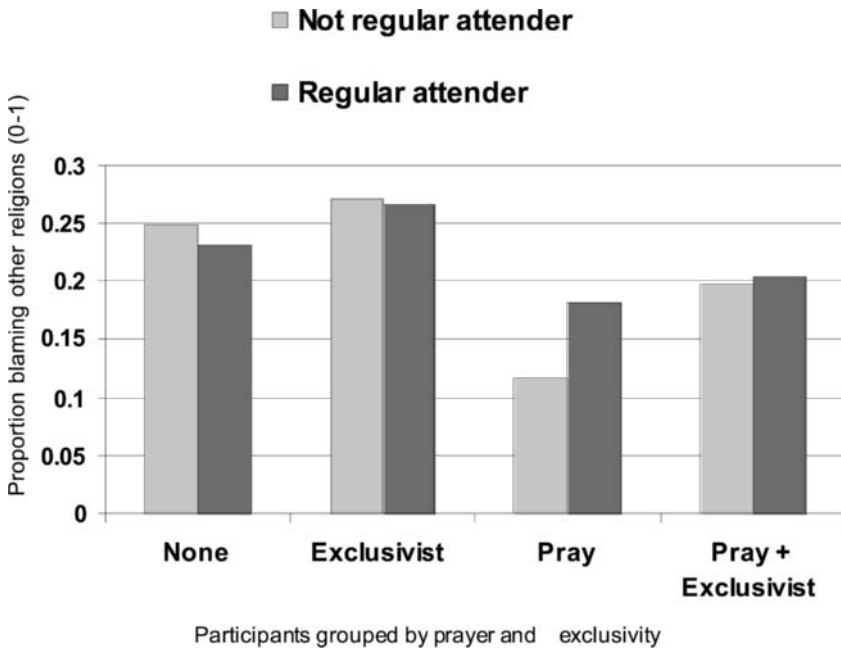


Note: Contrasting those who are exclusivist vs. those who are not among those who neither attend services nor pray, those who attend only, those who pray only, and those who do both.

These comparisons are graphed in Figure 8.7. In this case, attendance adds surprisingly little or nothing to scapegoating—increasing scapegoating only when compared with a prayer only condition. As mentioned earlier, these results essentially mirror the findings of the multiple regressions: Exclusivity is a positive predictor of scapegoating, prayer is a negative predictor, and attendance is not an independent predictor.

Although religious attendance did not independently predict blame, in other studies (Ginges et al., 2005) religious attendance showed more evidence of being a potentially coalitional variable relative to prayer. In a representative sample of Muslim West Bank Palestinians, frequency of religious attendance predicted support for suicide attacks on Israelis (more mosque attendance was related to more support), but frequency of prayer was unrelated to support for such attacks. Similar results were obtained in an experimental study among religious Jewish settlers in the occupied territories; in this case, reminders of synagogue attendance produced substantial support for Baruch Goldstein’s historic suicide attack on Palestinian worshippers at the Machpela Cave mosque in 1994, whereas reminders of prayer did not.

Figure 8.7 Proportion of Participants Endorsing the Statement, “I Blame People of Other Religions for Much of the Trouble in this World”



Note: Contrasting those who attend regularly vs. those who do not among those who neither pray nor are exclusivist, those who are exclusivist only, those who pray only, and those for whom both are true.

In Study 3 of Ginges et al. (2005), we amended our measure of scapegoating in the BBC study to count only scapegoaters of other religions who were also willing to die for their God or beliefs (thus creating a more stringent two-variable measure of support for combative martyrdom). Using this measure, our findings supported those of Ginges et al. (2005). In the six different faiths that we examined (comprising the majority faiths of six different nations: Protestants in the United Kingdom, Catholics in Mexico, Russian Orthodox in Russia, Jews in Israel, Muslims in Indonesia, and Hindus in India), regular attendance was a greater positive predictor of combative martyrdom than regular prayer (which was, in some cases, a nominally negative predictor of combative martyrdom). When all six samples were combined, regular prayer was unrelated to combative martyrdom, while regular religious attendance was a significant positive predictor of combative martyrdom. Those who attended services regularly were more than twice as likely to endorse combative martyrdom (Ginges et al., 2005).

In contrast to predicting scapegoating alone, prayer was not a reliably negative predictor of combative martyrdom in the BBC study or in the West Bank study. Perhaps this is because these studies did not measure enough coalitional variables to partial out the coalitional variance in prayer—in our studies in Malaysia and Canada, failing to control for any two of the four coalitional variables left religious devotion with a null rather than negative relationship to intolerance. It may also have been because prayer was quite strongly correlated with martyrdom generally. In the BBC study, even when exclusivity and attendance were controlled for, prayer was still strongly related to willingness to die for one's God and beliefs (though prayer was less strongly associated with martyrdom than exclusivity). Willingness to die for God, however, is not on its face a prejudiced, intolerant, or violent attitude, though it certainly is a potentially self-sacrificing one. But when the self-sacrifice begins to take on a dimension of scapegoating, blaming, or hostility to others, then religious devotion becomes unrelated to such tainted sacrifice, while coalitional religiosity maintains its positive relationship.

REEXAMINING THE RELIGION AND PREJUDICE LITERATURE

Our seemingly paradoxical paradigm of religion and intolerance rests on the premise that the intolerance-predicting aspect of religion (coalitional attitude) is strongly correlated with the tolerance-predicting aspect (religious devotion). This marks a departure from the religion and prejudice literature, which has generally attempted to force a dichotomous understanding onto the aspects of religion to match a dichotomous understanding of prejudice. Dichotomous understandings of religion, however, have yielded messy,

inconclusive, and contradictory findings on how religion relates to prejudice, an issue to which we now turn.

Gordon Allport (1950) is widely credited with beginning empirical investigations of religion and prejudice and of religion generally. Allport arguably got empirical investigations of religion and prejudice off on the wrong foot by speaking of “mature” and “immature” religion, hypothesizing that “mature” or intrinsic religiosity was about directly experiencing one’s religious faith while “immature” or extrinsic religiosity was geared toward seeing religion as little more than a source of community or conventional moral values, friends, financial opportunities, etc. In this regard, Allport’s constructs map conceptually onto the widely noted subjective/natural versus objective/cultural distinction, but Allport, whose Protestant heritage likely inclined him to value the intrinsic as morally superior to the extrinsic (Cohen, Hall, & Koenig, 2005), was disappointed to find that intrinsic and extrinsic religiosity, which were supposed to be mutually incompatible, were unrelated rather than inversely related (Allport and Ross, 1967). Even as unrelated measures, however, intrinsic and extrinsic religiosity were less than satisfactory tools for investigating how different aspects of religion predict prejudice. In the first couple of decades of research using Allport’s scales, extrinsic religiosity predicted racial prejudice and some other undesirable outcomes (Donahue, 1985). Intrinsic religiosity, while only occasionally predicting lack of prejudice, was generally orthogonal to prejudice, at least to racial prejudice (Donahue, 1985). Since early investigations, however, measures of intrinsic religiosity have produced a whole spectrum of relationships with different kinds of prejudice under different circumstances, ranging from negative (Duck & Hunsberger, 1999; Fisher, Derison, & Polley, 1994; Ponton & Gorsuch, 1988) to orthogonal (Donahue, 1985) to positive (Duck & Hunsberger, 1999; Fisher et al., 1994; Herek, 1987; McFarland 1989)—with the prediction of prejudice often depending on the kind of prejudice explored.

Moreover, extrinsic religiosity has also shown inconsistent relationships with prejudice, predicting prejudice in Allport and Ross’s (1967) research and in many occasions afterward (see Donahue, 1985, for a review), but occasionally manifesting no relationship to prejudice (e.g., Griffin, Gorsuch, & Davis, 1987) or a negative relationship (Duck & Hunsberger, 1999; Strickland & Weddell, 1972). Further, extrinsic religiosity when measured as orthogonal to intrinsic has been found to have inadequate reliability (Trimble, 1997). When Hoge (1972) produced a psychometrically viable intrinsic religiosity scale with extrinsic reversed items, the three extrinsic items that fit in the scale were more indicative of a wholesale lack of religious devotion than an alternative socially driven understanding of it (Batson, Schoenrade, & Ventis, 1993). Generally, the body of literature on intrinsic and extrinsic religiosity has failed to reach empirically satisfying conclusions with regard to prejudice

and intolerance (Kirkpatrick & Hood, 1990). These scales may still be useful for other pursuits, however—for example, distinguishing the relative importance of socially mediated and personally felt religiosity in different religious faiths (Cohen, Siegal, & Rozin, 2003).

Several researchers (e.g., Altemeyer, 1996; Batson et al., 1993; Kirkpatrick & Hood, 1990) have suggested that part of the problem may be that intrinsic religiosity scales are not the ideal measure of nonprejudiced “mature” religiosity. Rather, these scales indicate religious devotion or commitment, a psychological inclination that is widespread but logically (and often empirically) orthogonal to prejudice as generally conceived and may be as easily held by “immature” as by “mature” religious people.

We hold that, although the construct of intrinsic religiosity fails to capture “mature” or “intrinsic” religiosity (and thus is misnamed), it may nevertheless capture a kind of generalized subjectively rich devotion. As a measure of devotion, intrinsic religiosity may yield the odd relationships with prejudice recorded in the literature because religious devotion tends to be linked with coalitional attitudes. This relationship between intrinsic religiosity and coalitional variables was not a novel finding in our research but is documented in numerous studies (Duck & Hunsberger, 1999; Kahoe, 1975; Leak & Randall, 1995; Moghaddam & Vuksanovic, 1990; Watson, Sawyers, & Morris, 2003). This fits with William James’s assertion that corporate and dogmatic dominion are partners of religion proper.

In fact, when evolution-minded social scientists propose any possible utility or value in religion to survival and procreation, that utility is often described in terms of religion’s value to coalition-building (Kirkpatrick, 1999; Sosis & Alcorta, 2003; Wilson, 2002). Because all our measures of coalitional attitude are empirically related to some kind of prejudice, coalitional attitude appears to be a kind of intermediary between religious devotion and prejudice or intolerance. When this intermediary is statistically held out of the picture, religious devotion appears, at the least, unrelated to intolerance, and in many cases, inversely related to it.

Coalitional religiosity is likely rooted in the costly sacrifice to the community of believers that is the hallmark of religion. As evolutionary theorists have noted, sacrificial displays can be selected for if carriers of honest signals of group membership are more likely to be reciprocated by a community of cooperators. Even in rights-oriented “individualist” cultures, one is expected to sacrifice all selfish gains that might accrue from being on the benefiting end of injustice toward others. Atran (2002) and others (Atran & Norenzayan, 2004; Sosis & Alcorta, 2003) note that sincere expressions of willingness to make any kind of sacrifice (including the potential ultimate sacrifice of one’s own life) only occasionally necessitate actually following through on that sacrifice in a way that has long-term costs to the potential for survival and reproduction of the genes carried by that individual. However, the material

and social support benefits that can accrue to those who sincerely express or demonstrate such willingness are both more likely to occur and are of more obvious value to the long-term survival of one's genes—unless one is among the unlucky individuals whose sincere demonstration involves actually dying before reproductive potential is maximized (and even then, socially given benefits to close kin may offset the genetic loss of one individual). This “adaptive sacrifice display” explanation for religious devotion is related to the evolutionary concept of “costly signaling,” a process that explains many forms of sacrificial displays in the animal kingdom—for example, why peacocks who burden themselves with more costly plumage may nevertheless be more likely to pass on their genes by increasing their chances of mating with a receptive peahen. Costly signaling theory offers an explanation of why humans engage in altruistic displays such as sacrifice and ritual without treating the group as a unit of selection (Sosis & Alcorta, 2003).

Does Religious Devotion Foster Empathy and Self-Boundary Transcendence?

That coalitional religiosity encourages intolerance toward outgroups seems obvious. But it is less clear why devotional religiosity can, under some conditions, foster tolerance. Some evidence from neuroscience provides a novel speculation as to the process by which devotional experience may lead to transcendence of group boundaries. Neuroscience investigations of religion² tend to focus exclusively on the spiritual, meditative, or ecstatic aspects of religious experience (d'Aquili & Newberg, 1999) and almost never with the coalitional aspects. Some investigations (e.g., d'Aquili & Newberg, 1998, 1999; Holmes, 2001; Newberg, d'Aquili, & Rause, 2001) have found that when people are subjectively experiencing a transcendent or supernatural-oriented state, there is often decreased activity in the parietal lobe or other object association areas, where perceptions that distinguish self from non-self are processed. The frontal lobes known to be associated with sense of self (Edwards-Lee & Saul, 1999) and theory of mind (Brune, 2005) are also implicated in religious practices (McNamara, 2001; McNamara, Andresen, & Gellard, 2003), including meditation (Newberg et al., 2001) and religious recitation (Azari et al., 2001), both of which are common in prayer. These areas may play a role in any relationship prayer might have to greater tolerance, empathy or other-concern, since they all seem potentially relevant to whether sense of self is experienced in a more limited or more expansive way. Perhaps commonplace empathic experiences of seeing oneself in another or caring for another as one would care for oneself have some family relationship to rarer mystical experiences of “oneness” and even to more extreme cases where the self-other boundary completely dissolves.³

It is reasonable, though admittedly speculative, to propose that any area of the brain generally involved in breaking down distinctions should have some relevance to breaking down distinctions between oneself and other closely related individuals. This breakdown may well be involved in enabling identification with a group as extended social self—an identification of obvious relevance to coalitional religiosity. Coalitional concerns are not central to typical religious experience, however. This breakdown of the distinction between self and other appears more directly bound up in feeling emotionally and even viscerally related to something far greater than both oneself and any finite group: God or some other supernatural being or reality. It is plausible that this feeling of connection with this numinous realm may often stop at or recede after time to a more limited sense of connection with an identifiable human group, perhaps because human groups are easier to integrate into understanding and decision-making than are numinous mystical deities. Nevertheless, numinously oriented beliefs and practices may potentially lead in some cases, to a much greater openness, even an expansion of one's moral circle to include humanity at large, with all of its different nations, races, religions, and ways of living.

This sort of broad transcendent manifestation of religion may express itself infrequently, however, as evidenced by religious devotion's unclear relationship to tolerance when coalitional religiosity is not controlled. Coalitional religiosity arguably reflects a limited kind of self-transcendence that simply upgrades individual selfishness to group selfishness, sometimes with dramatically violent consequences. Yet religious devotion's independent relationship to tolerance suggests that religion has the potential to transcend group selfishness as well. It is almost as if a more limited religious transcendence is in tension with a more thoroughgoing transcendence. What lies beyond group selfishness we may dub "God-selfishness," a focus of oneself on a God or divine being or principle that is transcendent of all individuals and groups, including oneself and one's own groups. God-selfishness would appear to be what religious devotion measures tap into when the variance of coalitional religiosity is controlled for. To the extent that this broader transcendence of self often manifests itself as a tolerant sense of kinship with all, then it would appear to render Dawkins's pessimism about religion unwarranted.

Whether or not pessimism is warranted, circumspection certainly is. Religious devotion is a tenuously broad expansion of selfishness, one that might often revert to a strain of group selfishness or individual selfishness enhanced by religious self-deception and narcissism, as observers of religious persecution and hypocrisy will readily attest. Nevertheless, our findings suggest that religious devotion is more than a hypocritical disguise for individual selfishness and group selfishness. Such devotion also appears to coexist with a genuine concern for all people, and perhaps even for all beings. Moreover, the God-selfishness of religious devotion appears potentially more attuned

to this all-embracing concern than individual selfishness or group selfishness stripped of supernatural understanding.

In English, the word “religion” is related to the Latin word *religio*, *religere* meaning to bind together. The individuals that religion binds together may form groups that do as much or more violence to each other than the individuals might have done on their own out of unaligned selfishness. Yet, to the extent that people experience some degree of self-transcendence in prayer and other acts of devotion, a broad feeling of connectedness with others may result. This connectedness may make intolerance and violence less appealing for that moment of devotion and perhaps, over time, as a chronic habit of mind and behavior. Transcendent moments pass, and the many forces that generate human conflict will likely continue to be a part of the human drama. But when religious transcendence is broad rather than narrow, it has the potential to contribute to a world where the bloody rivalries of nation, race, and religion are known only as shadowy memories of fading history.

ACKNOWLEDGMENTS

The writing of this chapter was supported by a Social Sciences and Humanities Research Council of Canada grant to the second author (410-2004-0197) and by a University of British Columbia Killam Predoctoral Fellowship to the first author. We thank Eleanor Chow for helpful comments on an earlier version of this chapter.

NOTES

1. A scale that, as named, sounds like a measure of credal fundamentalism, but in its actual content (see cite) is more of a positive statement of faith in Christianity than an epistemic and moral elevation of Christianity above other faiths.

2. In citing neurotheological investigations, we are neither endorsing nor critiquing the scientific merit of this research. Regardless of whether the conclusions of neurotheological investigations follow from the evidence, we find these conclusions illustrative of a widespread and, we think, plausible intuition that religious experience is at least in part about self-transcendence, specifically transcendence of the boundary between self and other.

3. Holmes (2001) notes that persons whose parietal superior lobes were damaged or destroyed suffer an agonizing disability, in that they experience great difficulty in distinguishing between themselves and the rest of the world. This condition makes it difficult, for example, for the patient to walk, because he’s unsure of where the floor ends and his foot begins, or even to sit down, because she doesn’t know where her body ends and the chair begins. This is not unlike the mystical experience that is reported by deep meditators of being “at one” with the universe. For these patients, being “at one” with the universe is such a constant experience, performing tasks that require the simple differentiation between “self” and “world” become extraordinarily difficult.

REFERENCES

- Adorno, T. W., Frenkel-Brunswick, E., Levinson, D. J., & Sanford, R. N. (1950). *The authoritarian personality*. New York: Norton.
- Allport, G. (1950). *The individual and his religion*. New York: Macmillan.
- Allport, G. W., & Ross, J. M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, 5, 432–443.
- Altemeyer, R. A. (1981). *Right-wing authoritarianism*. Winnipeg, Canada: University of Manitoba Press.
- Altemeyer, R. A. (1988). *Enemies of freedom: Understanding right-wing authoritarianism*. San Francisco: Jossey-Bass.
- Altemeyer, R. A. (1996). *The authoritarian specter*. Cambridge, MA: Harvard University Press.
- Altemeyer, R. A. (1999). Right-wing authoritarianism (1990 version). In J. P. Robinson, P. R. Shaver, & L. S. Wrightsman (Eds.), *Measures of political attitudes* (Vol. 2, pp. 104–106). Toronto: Academic Press.
- Altemeyer, R. A., & Hunsberger, B. (1992). Authoritarianism, religious fundamentalism, quest, and prejudice. *International Journal for the Psychology of Religion*, 2, 113–133.
- Appleby, R. S. (2000). *The ambivalence of the sacred: Religion, violence and reconciliation*. Lanham, MD: Rowman & Littlefield.
- Atran, S. (2002). *In Gods we trust: The evolutionary landscape of religion*. Oxford, England: Oxford University Press.
- Atran, S. (2003). Genesis of suicide terrorism. *Science*, 299, 1534–1539.
- Atran, S., & Norenzayan, A. (2004). Religion's evolutionary landscape: Cognition, commitment, compassion, communion. *Behavioral and Brain Sciences*, 27, 713–770.
- Azari, N. P., Nickel, J., Wunderlich, G., Niedeggen, M., Hefter, H., Tellmann, L., et al. (2001). Neural correlates of religious experience. *European Journal of Neuroscience*, 13, 1649–1652.
- Barrett, J. (2000). Exploring the natural foundations of religion. *Trends in Cognitive Science*, 4, 29–34.
- Batson, C. D., Schoenrade, P., & Ventis, L. (1993). *Religion and the individual*. New York: Oxford University Press.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Boyer, P. (2003). Religious thought and behaviour as by-products of brain function. *Trends in Cognitive Sciences*, 7, 119–124.
- Brüne, M. (2005). Emotion recognition, “theory of mind,” and social behavior in schizophrenia. *Psychiatry Research*, 133, 135–147.
- Burkert, W. (1996). *Creation of the sacred: Tracks of biology in early religions*. Cambridge, MA: Harvard University Press.
- Cohen, A. B., Hall, D. E., & Koenig, H. G. (2005). Social versus individual motivation: Implications for normative definitions of religious orientation. *Personality and Social Psychology Review*, 9, 48–61.
- Cohen, A. B., Siegel, J. I., & Rozin, P. (2003). Faith versus practice: Different bases for religiosity judgments by Jews and Protestants. *European Journal of Social Psychology*, 33, 287–295.

- Cohen, J., & Cohen, P. (1975). *Applied multiple regression/correlation analysts for the behavioral sciences*. New York: Wiley.
- Conger, A.J. (1974). A revised definition for suppressor variables: A guide to their identification and interpretation. *Educational and Psychological Measurement*, 34, 35–46.
- d'Aquili, E., & Newberg, A.B. (1998). The neuropsychological basis of religions, or why God won't go away. *Zygon*, 33, 187–201.
- d'Aquili, E., & Newberg, A.B. (1999). *The mystical mind: Probing the biology of religious experience*. Minneapolis, MN: Augsburg Fortress.
- Dawkins, R. (1989). *The selfish gene*. Oxford, England: Oxford University Press.
- Donahue, M.J. (1985). Intrinsic and extrinsic religiousness: Review and meta-analysis. *Journal of Personality and Social Psychology*, 48, 400–419.
- Duck R., & Hunsberger, B. (1999). Religious orientation and prejudice: The role of religious proscription, right-wing authoritarianism and social desirability. *International Journal for the Psychology of Religion*, 9, 157–179.
- Durkheim, E. (1915/1965). *The elementary forms of the religious life*. New York: Free Press.
- Edwards-Lee, T.A., & Saul, R.E. (1999). Neuropsychiatry of the right frontal lobe. In B.L. Miller & J.L. Cummings (Eds.), *The human frontal lobes: Functions and disorders* (pp. 304–320). New York: Guilford Press.
- Feng, G.F., & English, J. (Trans.). (1972). *The tao te ching*. New York: Vintage.
- Fiorito, B., & Ryan, K. (1998, August). *Development and preliminary reliability of a new measure of religiosity: Religiousness and spirituality questionnaires*. Poster session presented at the annual meeting of the American Psychological Association, San Francisco, CA.
- Fisher, R.D., Derison, D., & Polley, C.F. (1994). Religiousness, religious orientation, and attitudes towards gays and lesbians. *Journal of Applied Social Psychology*, 24, 614–630.
- Freud, S. (1961). *Civilization and its discontents* (J. Strachey, Trans.). New York: Norton. (Original manuscript published 1930)
- Ginges, J., Hansen, I., & Norenzayan, A. (2005). *Religion and combative martyrdom*. Unpublished manuscript, University of Michigan.
- Griffin, G.A., Gorsuch, R.L., & Davis, A.L. (1987). A cross-cultural investigation of religious orientation, social norms, and prejudice. *Journal for the Scientific Study of Religion*, 26, 358–365.
- Guthrie, S. (1993). *Faces in the clouds: A new theory of religion*. New York: Oxford University Press.
- Hansen, I.G., & Norenzayan, A. (2003). Devotional religiosity, coalitional religiosity and belief in the supernatural. Unpublished raw data.
- Hansen, I.G., & Norenzayan, A. (2005). *Coalitional vs. devotional religiosity: Explaining cultural differences between Christians and Buddhists in religious intolerance*. Unpublished manuscript, University of British Columbia.
- Herek, G.M. (1987). Religious orientation and prejudice: A compilation of racial and sexual attitudes. *Personality and Social Psychology Bulletin*, 13, 34–44.
- Hoge, D.R. (1972). A validated intrinsic religious motivation scale. *Journal for the Scientific Study of Religion*, 11, 369–376.
- Holmes, B. (April 21, 2001). In search of God. *New Scientist*, 25–27.

- James, W. (1982). *The varieties of religious experience*. New York: Penguin Books. (Original manuscript published 1902.)
- Juergensmeyer, M. (2003). *Terror in the mind of God: The global rise of religious violence*. Berkeley: University of California Press.
- Kahoe, R. D. (1975). Authoritarianism and religion: Relationships of F-scale items to intrinsic and extrinsic religious orientations. *JSAS Catalog of Selected Documents in Psychology*, 5, 284–285.
- Kimball, C. (2002). *When religion becomes evil*. San Francisco: Harper San Francisco.
- Kirkpatrick, L. (1993). Fundamentalism, Christian orthodoxy, and intrinsic religious orientation as predictors of discriminatory attitudes. *Journal for the Scientific Study of Religion*, 32, 256–268.
- Kirkpatrick, L. A. (1999). Toward an evolutionary psychology of religion and personality. *Journal of Personality*, 67, 921–951.
- Kirkpatrick, L. A., & Hood, R. W. (1990). Intrinsic-extrinsic religious orientation: The boon or bane of contemporary psychology of religion? *Journal for the Scientific Study of Religion*, 29, 442–462.
- Landau, M. J., Solomon, S., & Greenberg, J. (2004). Deliver us from evil: The effects of mortality salience and reminders of 9/11 on support for President George W. Bush. *Personality and Social Psychology Bulletin*, 30, 1136–1150.
- Lawson, E. T., & McCauley, R. (1990). *Rethinking religion*. Cambridge, England: Cambridge University Press.
- Laythe, B., Finkel, D., & Kirkpatrick, L. A. (2001). Predicting prejudice from religious fundamentalism and right-wing authoritarianism: A multiple-regression approach. *Journal for the Scientific Study of Religion*, 40, 1–10.
- Leak, G. K., & Randall, B. A. (1995). Clarification of the link between right-wing authoritarianism and religiousness: The role of religious maturity. *Journal for the Scientific Study of Religion*, 34, 245–252.
- McFarland, S. (1989). Religious orientations and the targets of discrimination. *Journal for the Scientific Study of Religion*, 28, 324–336.
- McNamara, P. (2001). Religion and the frontal lobes. In J. Andresen (Ed.), *Religion in mind: Cognitive perspectives on religious belief, ritual, and experience* (pp. 237–256). New York: Cambridge University Press.
- McNamara, P., Andresen, J., & Gellard, J. (2003). Relation of religiosity and scores on fluency tests to subjective reports of health in older individuals. *International Journal for the Psychology of Religion*, 13, 259–271.
- Moghaddam, F. M., & Vuksanovic, V. (1990). Attitudes and behavior toward human rights across different contexts: The role of right-wing authoritarianism, political ideology, and religiosity. *International Journal of Psychology*, 25, 455–474.
- Nelson-Pallmeyer, J. (2003). *Is religion killing us? Violence in the Bible and the Quran*. Harrisburg, PA: Trinity Press International.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research*, 106, 113–122.
- Newberg, A., d'Aquili, E., & Rause, V. (2001). *Why God won't go away*. New York: Ballantine Books.

- Norenzayan, A., & Heine, S. (2005). Psychological universals: What are they and how can we know? *Psychological Bulletin*, *13*, 763–784.
- Ponton, M.O., & Gorsuch, R.L. (1988). Prejudice and religion revisited: A cross-cultural investigation with a Venezuelan sample. *Journal for the Scientific Study of Religion*, *27*, 260–271.
- Pyysiäinen, I., & Anttonen, V. (Eds.). (2002). *Current approaches in the cognitive science of religion*. London: Continuum.
- Rappaport, R. (1979). *Ecology, meaning and religion*. Berkeley, CA: North Atlantic Books.
- Rowatt, W. C., & Franklin, L. M. (2004). Christian orthodoxy, religious fundamentalism, and right-wing authoritarianism as predictors of implicit racial prejudice. *International Journal for the Psychology of Religion*, *14*, 125–138.
- Sosis, R., & Alcorta, C. (2003). Signaling, solidarity, and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, *12*, 264–274.
- Sperber, D. (1996). *Explaining culture: A naturalistic approach*. London: Blackwell.
- Strickland, B. R., & Weddell, S. C. (1972). Religious orientation, racial prejudice, and dogmatism: A study of Baptists and Unitarians. *Journal for the Scientific Study of Religion*, *11*, 395–399.
- Trimble, D. E. (1997). The Religious Orientation Scale: Review and meta-analysis of social desirability effects. *Educational and Psychological Measurement*, *57*, 970–986.
- Watson P., Sawyers P., & Morris, R. J. (2003). Reanalysis within a Christian ideological surround: Relationships of intrinsic religious orientation with fundamentalism and right-wing authoritarianism. *Journal of Psychology and Theology*, *31*, 315–328.
- Weber, M. (1947). *The theory of social and economic organization*. Glencoe, IL: Free Press.
- Weber, M. (1978). *Economy and society*. (G. Roth & C. Wittich, Eds.). Berkeley: University of California Press.
- Wilson, D. S. (2002). *Darwin's cathedral: Evolution, religion, and the nature of society*. Chicago: University of Chicago Press.

CHAPTER 9

THE ORIGINS OF DREAMING

Kelly Bulkeley

The search for origins is one of the great themes of myth and legend. Every religion and cultural tradition has its story about how humans, the world, the heavens, and life itself began. These are more than just stories. What we believe happened at the beginning, *in illo tempore*, matters right now, in the present. To take the most contentious example in the contemporary United States, the different views of human origins proposed by the Bible and evolutionary science have led people to adopt highly divergent approaches to the politics of sexuality, marriage, and reproduction. Likewise, religious traditions and scientific researchers hold quite different views of the origins of dreaming, which naturally color their approaches to the nature, function(s), and meaning of dreams. If you believe dreams originate in the disembodied wandering of one's spirit or soul, your general attitude toward dreaming will likely differ from someone who believes that dreams originate in the random firing of neurons in the brain during sleep. Stories of origins *matter*.

The opposition between religious and scientific views of the origin of dreaming may seem absolute, with no possibility of reconciliation or meaningful integration. What common ground can be found between the mystic's revelatory vision of the night and the sleep laboratory subject's brief, disjointed post-awakening report? What do neurons have to do with God?

In this chapter I argue that the religion-science opposition on dreams may be bridged by connecting important but unappreciated facts from each realm. A strong case can be made that dreaming is a primal, *originating* source of both religious experience and brain-mind growth. In ways that are inextricably religious *and* neuropsychological, human dreaming has the effect of

provoking greater consciousness of self, others, world, and cosmos. My aim is to develop that case by integrating key findings from contemporary brain-mind science with current work in religious studies. Looking first at brain-mind science, I review the last century of research on the phenomenology of highly memorable dreams (what Carl Jung [1974] called “big dreams”) and establish some basic facts about prototypical human dream experience. Then I turn to religious studies and look at the special role of dreaming in people’s experiences of religious, spiritual, and existential origins, with an eye to the recurrence of those same oneirological patterns identified by contemporary science. This dual focus, on highly memorable dreams and on stories of religious origins, reveals the ways in which a strong, autonomous, creative, and iconoclastic force is at work in human dreaming. It is not necessarily a confession of religious faith, nor should it be regarded as an exhaustive scientific explanation. It is rather a reasonable conclusion that comes from considering, critically and creatively, the latest evidence from several branches of scholarship.

CURRENT SCIENTIFIC EVIDENCE ON HIGHLY MEMORABLE TYPES OF DREAMS

For the past one hundred years, the main goal of Western scientific dream research has been to explain the form and content of dreams in terms of sleep physiology. Sigmund Freud developed the psychoanalytic model by which dreams were explained as “guardians of sleep” whose manifest content (i.e., the dream as remembered) is actually a deceptive mask enabling the secret, hallucinatory fulfillment of repressed instinctual desires (Freud, 1965). Beginning in the 1950s, Freud’s model was displaced by the discovery of rapid eye movement (REM) sleep and its connection to dreaming (Aserinsky & Kleitman, 1953, 1955). Researchers found that human sleep (and indeed all mammalian sleep) is structured by automatic cycles of greater and lesser brain activation (for summaries, see Cartwright & Lamberg, 1992; Dement, 1972; Shafton, 1995). This led to numerous investigations to identify correlations between the physiology of REM sleep and the psychological elements of dreams. Initial efforts focused on eye movements (Roffwarg, Dement, Muzio, & Fisher, 1962), penile erections (Fisher, 1966), and various kinds of pre-sleep stimuli (Witkin & Lewis, 1967). Disappointingly, the results of later studies did not fulfill the initial expectations. The movements of the eyes during REM sleep do not directly match or track what people are seeing in their dreams (Aserinsky, Lynch, Mack, Tzankoff, & Hurn, 1985; Jacobs, Feldman, & Bender, 1970, 1972; Moskowitz & Berger, 1969). Penile erections (and clitoral swelling) are automatic physiological accompaniments of sleep and do not always correspond to dreams of sexual imagery or arousal (Hirsch, Karacan, & Williams, 1972). No particular pre-sleep stimulus, whether a memory task, a physical

activity, or watching a movie, has been shown to have a simple, direct impact on what people dream the subsequent night. More fundamentally, subsequent research demonstrated that dreams are not exclusively the province of REM sleep but are also reported with some frequency from NREM sleep (Foulkes, 1962; Kahan, 2000). The more closely researchers looked at actual dreams, the more they realized that REM physiology does not account for their basic features.

If nothing else, these findings indicate that pursuing a simplistic REM-dreaming isomorphism is a dead end for future scientific dream research. REM sleep may be a kind of triggering mechanism for most dreams, but the process of dreaming itself emerges from a complex, widely distributed system of brain-mind activities that are functionally independent of REM physiology. More evidence on this subject is presented later in the chapter, but for now the point is that the origins of dreaming are very clearly *not* in REM sleep. As sleep and dream researcher James Pagel notes, “Dreaming and REM sleep are complex states for which the Dreaming = REMS model has become excessively simple and limited” (Pagel, 2000, p. 988). A new scientific story of origins is needed, one that better accounts for current knowledge about the actual patterns of dreaming form and content.

Such a story will need to include an understanding of sleep physiology across REM and NREM stages. Indeed, there is no reason to believe that the artificial categories of REM and NREM are eternally valid, and we may hope that future researchers will find a better way to account for the complex, multidimensional sleep cycles of humans and other creatures. In the meantime, our stories of the origins of dreaming must include recognition of the strong and steady (if not absolute) relationship between the neurophysiology of REM sleep and the frequency and intensity of dreaming, while also acknowledging that genuine dreaming occurs outside of REM sleep. Our understanding of dreaming will always depend on our understanding of sleep in general, and future dream research will be most prosperous if it grounds itself in a more sophisticated foundation of knowledge about what’s happening in the approximately one-third of our lives we pass in slumber.

With this preliminary background in sleep physiology, the next step is to look more closely at the form and content of dreaming. I focus not on dreams in general, but on those relatively rare types of dreams that make a strong and lasting impact on the dreamer’s waking consciousness. If there is any function or value to dreaming, it is most likely to appear in those dreams that are remembered with greatest intensity, by the widest variety of people, from many different historical eras. The frequency of such dreams is increasingly well documented, and the Western psychological tradition has developed several important insights regarding their prototypical features. Drawing these insights together will provide a new basis for correlating dream psychology

and sleep physiology, and this in turn will enable us to reassess the relationship between scientific and religious stories of the origins of dreaming.

Freud

The modern psychological study of dreams began with Sigmund Freud and the publication in 1899 (postdated to 1900) of his monumental *The Interpretation of Dreams* (Freud, 1965). Freud's psychoanalytic theory was created in large part through a probing investigation of his own dreams in the years following the death of his father. The central claim of his theory is that *dreams are the disguised fulfillment of repressed wishes*. To maintain healthy functioning of the mind, dreams serve as a kind of pressure valve, releasing pent-up instinctual energies in a safe and harmless fashion. The instinctual wishes that emerge in dreams are primarily egotistical and antisocial in nature, harkening back to infantile pleasure-seeking. Freud says an agency within the mind called "the dream-work" employs symbolic imagery and metaphorical language to fulfill the instinctual wishes without arousing moral anxiety, thereby allowing the individual's sleep to continue undisturbed.

The psychoanalytic theory of dreams has attracted tremendous controversy over the past 100 years, and fortunately for our purposes we do not need to worry about the ongoing battles between Freud's friends and foes. Taken as a comprehensive explanation of all features of all dreams, Freud's wish-fulfillment theory is certainly wrong. However, taken as an insight into vital (but not all-encompassing) features of human dream experience, Freud's theory is certainly right: dreams frequently express instinctual wishes of an egotistical (especially sexual) nature, they do so by using a culturally saturated language of symbol and metaphor, and they contribute to the healthy functioning of mind and body. Freud had very little to say about highly memorable dreams *per se*. Indeed, he believed dreams were meant to be forgotten, the better to hide their disturbing instinctual core, and so he was not inclined to pay much attention to those rare dreams that for some reason or other can't be forgotten. But these three points—the role of instinctual desires, the language of symbol and metaphor, and the positive psychological function—are directly relevant to our contemporary understanding of prototypical human dreaming.

Jung

Carl Jung dates his fascination with dreaming to the earliest remembered dream from his childhood, in which he descends to an underground throne room and confronts a massive phallus on a throne (Jung, 1965, pp. 11–13). Jung was one of Freud's earliest and most enthusiastic followers, but after the angry break-up of their relationship Jung withdrew into professional and personal isolation, surrendering to an upsurge of fantasy material from

his unconscious. Building on these numinous, life-altering experiences, Jung developed a theoretical synthesis of clinical psychiatry and comparative mythology that explained dreams as natural (i.e., undisguised) expressions of the psyche whose function, even in the case of intensely frightening nightmares, is to promote the ultimate goal of individuation (Jung, 1965, 1968, 1980). Dreaming, Jung says, has the beneficial functions of compensating for the imbalances of the conscious mind and anticipating future challenges and developments in life. The classic themes, motifs, and symbols of world mythology provide the inherited mental language for oneirological expression. For Jung, dreaming is not simply a matter of animal instinct but also of spiritual enlightenment. This is especially true with what he calls “big dreams,” intensely vivid and memorable dreams that “are often remembered for a lifetime, and not infrequently prove to be the richest jewel in the treasure-house of psychic experience” (Jung, 1974, p. 36).

As with Freudian psychoanalysis, Jung’s theory is questionable if taken in absolute terms. Whether we accept the entirety of his psychological system, several of his key points remain legitimate and important: the “naturalness” of remembered dreaming, the potential psychological value of nightmares, the symbolic interplay between dreaming and mythology, and, most crucially for our purposes, the recognition of various types of extraordinary “big dreams.” Jung realized, in a way Freud never did, that certain dreams are different from other dreams, with recurrent images, themes, and feelings that deserve careful investigation in their own right (maybe in Freud’s comments on Descartes’s dreams as “dreams from above”). Jung’s case studies may be open to debate as sources of evidence, but his key insight into the significance of highly memorable dreams has been strongly supported by subsequent research.

Content Analysis

The quantitative dream research of Calvin Hall, Robert Van de Castle, and G. William Domhoff was originally developed to measure dream content in such a way that the claims of Freudian, Jungian, and other dream theories could be empirically tested (Domhoff, 1996, 2003; Hall, 1966, 1984; Hall & Van de Castle, 1966; Van de Castle, 1994). Using a content analysis method by which dreams are scored according to several discrete categories (e.g., characters, social interactions, misfortunes and good fortunes, emotions, settings, descriptive modifiers), these researchers identified a central feature of dream experience, which Domhoff (2003) calls “the continuity principle” (p. 26). On average, humans tend to dream about the same people, places, and activities that are most prominent in their waking lives. How we feel, think, and behave in our dreams is by and large continuous with our waking personalities. The findings of content analysis may not seem relevant to the study of highly

memorable dreams, especially when we note that the dream reports used by these researchers are either from most recent dream surveys, brief dream journals, or sleep laboratory awakenings—all of which are likely to under-represent the occurrence of relatively rare types of intensified, highly memorably dreaming. But this is precisely the value of the Hall, Van de Castle, and Domhoff findings: they provide background information on “ordinary” dreaming that enables us to see more clearly what makes “extraordinary” dreams so distinctive. Understanding the continuities between dreaming and waking gives a better insight into the *dis*continuities that emerge in dreaming—for example, the fantastic metamorphoses of time, space, character, and consciousness that are especially prominent in highly memorable dreams.

Hunt

Harry Hunt’s *The Multiplicity of Dreams* (Hunt, 1989) makes the case for a more sophisticated qualitative study of the recurrent patterns of highly memorable dreams. He says,

dream psychology, in its haste for its own Darwin, has bypassed the necessary foundations of a Linnaeus. The various available systems of quantitative content analysis are complex and reliable, and they correlate to a degree with cognitive, physiological, and personality variables, but they are still reminiscent of attempting to classify the natural order of species by first, ever so precisely, measuring length of limb, size of tooth, body weight, and so on—disregarding whether the animal is a reptile, fish, bird, or mammal. (p. 97)

For Hunt, the essential starting point for dream psychology is the development of a full, detailed phenomenology of dreaming in all its varied manifestations, from the ordinary to the extraordinary. Once we have such a phenomenology, then we can determine which theoretical perspectives are most helpful in understanding the data. Hunt’s creative synthesis of cognitive psychology with anthropological and historical information allows him to offer a portrait of “a natural order of dream forms” (p. 90), with each type of dream involving a distinctively patterned interaction of visual-spatial and conceptual-verbal processes. The main ones he describes are *personal-mnemonic* dreams, regarding common matters in the dreamer’s waking life; *medical somatic dreams*, relating to physiological processes in the dreamer’s body; *prophetic dreams*, presenting omens or images of the future; and *archetypal-spiritual dreams*, with vivid, subjectively powerful encounters with numinous forces, often also including extremely strong physical or “titanic” sensations. Hunt’s analysis of these types of dreams elaborates on Jung’s initial distinction between “big” and “little” dreams, providing a more detailed account of the complex psychological processes at work in their generation.

Lucid Dreaming

One type of unusual dream experience that has received considerable research attention is lucid dreaming—that is, becoming aware within the dream state that you are dreaming (although, strangely, neither Freud nor Jung paid much attention to lucid dreaming). There is much to be said about these dreams, but for our purposes the findings of three researchers are especially significant. First, Jayne Gackenbach's research on relations between lucid awareness in dreaming and alterations of consciousness in transcendental meditation shows how sustained attention practices (whether in a religious context or not) can produce striking physiological and psychological changes of a positive nature (Gackenbach, 1991; Gackenbach & LaBerge, 1988). It appears that what makes lucid dreams so memorable is the momentary realization of a kind of conscious state that various disciplines of meditation and prayer actively seek to achieve. Second, Tracy Kahan's work on dreams that involve various degrees of intentional volition and metacognition (thinking about thinking) indicates that dreaming is not mentally "deficient," but rather uses the same cognitive abilities we use in our waking lives (Kahan, 2001; Kahan & LaBerge, 1994; Kahan, LaBerge, Levitan, & Zimbardo, 1997). In lucid dreams, what we consider the "highest" forms of cognition (self-awareness, selective attention, short-term memory) are fully operational, and this raises interesting questions about the cross-state flexibility of the human psyche. And third, Fariba Bogzaran's efforts to integrate research on lucidity, consciousness, and artistic creativity highlight the recurrent patterns of entoptic phenomena that spontaneously emerge in many lucid dreams (Bogzaran & Deslauriers, 2004; Krippner, Bogzaran, & de Carvalho, 2002). One way to follow her insights will be comparing visual patterns in lucid dreams with the ancient cave paintings found in several regions around the world, where similar entoptic images are portrayed and where dream incubation rituals likely took place (Lewis-Williams, 2002).

Kuiken

Don Kuiken's work with Sikora (Kuiken & Sikora, 1993) and Busink (Busink & Kuiken, 1995) on highly impactful dreams is directly relevant to our concerns. His motivating interest was to push beyond the idea that dreaming has a single, universal function:

Perhaps dreaming *is* a sufficiently uniform phenomenon to consistently serve some function or integrated set of functions. On the other hand, perhaps dreaming is only *apparently* uniform because differences among kinds of dreaming—and among the functions of different kinds of dreaming—have not received sufficient research attention. (Kuiken & Sikora, 1993, p. 424)

Kuiken's research initially identified four types of dreaming with distinct clusters of content: *existential dreams* (distressing, concerned with separation and personal integrity); *anxiety dreams* (frightening, concerned with threats to physical well-being); *transcendent dreams* (ecstatic, concerned with magical accomplishments); and *mundane dreams* (little emotion, unimpactful). His later study added a fifth class of moderately impactful dreams, *alienation dreams*, which express emotional agitation and concerns about interpersonal efficacy. Kuiken's findings raise further questions about the best ways to conceptualize the most prominent and recurrent patterns in these dreams. He points out that anxiety and existential dreams both have negative emotions but are very different in form and content, which means that the simple term "nightmare" is too general to use for both types. He further cautions against conflating transcendent and archetypal dreams ("the term 'archetypal' suggests questionable aspects of Jungian theory rather than reflecting these dreams' phenomenology" (Kuiken & Sikora, 1993, p. 116), and against using the presence of specific religious characters or images as a defining typological feature:

For instance, the presence of a spiritual figure in an existential dream and the presence of a spiritual figure in a transcendent dream would force these dreams into the same category even though they differ dramatically in almost all other respects. (Kuiken & Sikora, 1993, p. 116)

Solms

Mark Solms has done pioneering work in the neuroanatomy of dreaming (Solms, 1997, 2000), which he has used as a foundation for a reconstructed psychoanalytic theory of the mind (Kaplan-Solms & Solms, 2000). Whatever the merits of his effort to revive Freud, Solms's work bears on our subject in at least three ways. First, he has provided additional evidence that REM neurophysiology is a mostly sufficient but not necessary trigger for the psychological experience of dreaming. His findings support a distributed, nonmodular view of brain-mind functioning:

[C]omplex mental faculties such as reading and writing (and, we might add, dreaming) are not localized within circumscribed cortical centers. . . . [They] are subserved by complex functional systems or networks, which consist of constellations of cortical and subcortical structures working together in a concerted fashion. (Solms, 1997, pp. 47–48)

Second, he has identified a double dissociation between primary visual system and dreaming. The patients in his study with visual problems had normal dreaming, and the patients with nonvisual dreaming had normal visual abilities. Specifically, he found that brain areas V1 and V2, which are crucial for

the processing of external visual signals, are not necessary for the generation and maintenance of normal dream imagery. Dreaming thus expresses an autonomous capacity for visionary experience that is independent of ordinary eyesight. Third, Solms has developed a clinical definition of “excessive dreaming” (anoneirognosis), a syndrome by which people experience intensely emotional and hyperrealistic dreams, often with unusual characters and other content features. Although Solms takes no interest in dream content, his clinical descriptions of the 10 patients who had this syndrome include reports of meeting deceased loved ones (pp. 185–186), visiting the “pearly gates” (p. 178), visiting a very beautiful place (p. 183), and having a black snake crawl into the dreamer’s vagina (p. 192). Both in form and content, these anoneirognostic dreams are quite similar to historical and cross-cultural reports of big dreams. If Solms is right that frontal limbic lesions are the cause of this syndrome, this may be a key region of the brain to study in connection with the religiously oriented experience of big dreams.

Nielsen

From his earliest writings, Tore Nielsen (1991) has been investigating highly impactful dreams, and in his recent neuroscientific work on the relationship between REM and NREM he coined the term “apex dreaming,” which he describes as follows:

The term “apex” dreaming is adopted to refer to a subcategory of dreaming that is distinguished by exceptional vividness, intensity, or complexity. . . . Apex dreaming [is] the most vivid, intense, and complex forms of dreaming: e.g., nightmare, sexual, archetypal, transcendental, titanic, existential, lucid. (Nielsen, 2000, p. 853)

Nielsen calls for recognition of the potential of the dreaming process to achieve a special degree of intensity, cohesiveness, and impact. Related to that, he has studied cross-cultural frequencies of typical dreams (Nielsen et al., 2003) and found, for example, that 81 percent of 1,181 participants reported a chasing dream, 76.5 percent a dream of sexual experience, 48.3 percent a dream of flying, 48.3 percent a dream of vividly sensing a presence in the room, 38.4 percent a dream of someone dead becoming alive, 24.4 percent a dream of having superior knowledge or mental ability, 23.8 percent a dream of seeing oneself as dead, 12.3 percent a dream of traveling to another planet or universe, and 11.2 percent a dream of encountering God in some form. These findings add substance to Hunt’s notion of the multiplicity of dreams, filling out our knowledge of recurrent patterns of dream content across differences of age, gender, and cultural background. What begins to take shape in Nielsen’s research are the recurrent, pan-human patterns that naturally emerge in apex dreaming.

Knudson

Roger Knudson's work has focused on the dynamics of beauty, aesthetics, and narrative integrity in what he calls "highly significant dreams" (Knudson, 2001; Knudson & Minier, 1999). He has explored, using elegantly detailed case studies, the specific ways in which extraordinary dreams have shaped individuals' subsequent lives. Inspired in large part by James Hillman's focus on imagery and imagination in dreams, Knudson's case studies show that the *aesthetic power* of particularly vivid dream images often enables such long-lasting effects on waking consciousness: the "image, its life never pinned down, never literalized into a fixed concept or 'meaning,' remains an animating, enlivening presence in the psychic life of the dreamer" (Knudson & Minier, 1999, p. 244). Contrary to the common presumption that dreaming is inherently bizarre, disordered, and meaningless, Knudson illuminates the extraordinary aesthetic qualities of rare but impactful types of dreams. This reminds us that, among its many other capacities, the dreaming psyche has the ability to generate images of astonishing beauty, complexity, and creativity, and this has to be acknowledged in any study of highly memorable dreams.

Revonsuo

Antti Revonsuo's threat simulation theory (Revonsuo, 2000) takes its point of departure from the "story of origins" of the human mind proposed by contemporary evolutionary psychology. The basic mental abilities humans have today originally evolved approximately 200,000 years ago on the African savannah. To understand dreams, Revonsuo says, it is necessary to ask what adaptive function they might have served in the early ancestral environment of the human species. How did dreaming contribute to the survival of our ancestors? Revonsuo argues that dreams, particularly nightmarish chasing dreams, improved the ability of early humans to escape their predators. By simulating what it would feel like to be attacked, the dreams gave the individual an opportunity to envision, prepare, and rehearse an effective response should a similar attack occur in waking life. The early humans who experienced such dreams had a better chance of survival than those who didn't, and thus the threat-simulating propensity of dreaming was incorporated by natural selection into the innate mental machinery of our species.

Given the high incidence of intensely frightening chasing dreams documented by the research of Nielsen, Domhoff, Kuiken, and others, Revonsuo is right to focus special attention on this dream type. He is also right to seek an understanding of highly memorable dreams in relation to evolution and biology, and future research will hopefully look beyond threat-simulating dreams to other types of dreams simulating other evolutionarily significant dimensions of human experience. Revonsuo has plenty of critics (Pace-Schott,

Solms, Blagrove, & Harnad, 2003), but the basic phenomenon he describes is a central fact of human dream experience: we are, as a species, predisposed (particularly in childhood) to have recurrent, frighteningly realistic dreams of being attacked, most often by animals and male strangers. The tangible impact of dreaming on a person's waking consciousness is nowhere clearer than with this type of dream.

Summary

So what can we say, based on the best available psychological evidence, about the nature of dreams? At least this much: Dreams are highly variable in form and content, perhaps infinitely so, ranging from chaotically disordered and nonsensical to elegantly structured and meaning-rich (the chaotic dimensions of dreaming have been explored by Kahn & Hobson, 1993, and Kahn, Krippner, & Combs, 2000). For the most part, dreams are continuous with waking-life emotional concerns—we dream about the major worries, hopes, and desires of everyday life. The full range of emotions is experienced in dreams, though not every dream involves emotion, and most dreams include strong visual sensations. Some dreams generate sensations so intense and vivid that they feel indistinguishable from waking reality. Occasionally there are dramatic carry-over effects in body and emotion—people may wake up gasping, crying, laughing, or sexually climaxing. Some dreams involve “higher” mental functions such as metacognition, and some dreams include dramatic alterations of self-awareness, memory, and volition.

Several mappings of dream phenomenology have been offered, not all of them compatible with one another. In other writings I have discussed several elements that should be included in any such mapping: an appreciation for the metaphorical expressiveness of dreaming (Bulkeley, 1994, 1999); the earliest remembered dreams of childhood (Bulkeley, Broughton, Sanchez, & Stiller, 2005; Siegel & Bulkeley, 1998); the frequency of good fortunes in the content analysis of dreams (Bulkeley, in press); and the themes of reassurance, sexuality, evil, death, and “titanic” experience (Bulkeley, 2000). It is still too early to settle on one particular mapping of dream phenomenology, especially given the wealth of new information coming from both scientific psychology and religious studies. For now, the most we can say with confidence is that Jung's basic typological distinction between “little” and “big” dreams is valid (even if we prefer to use different terms, like “personal” and “intensified” or “mundane” and “impactful”). Most dreams portray ordinary daily concerns and activities, make little impact on waking consciousness, and are usually forgotten immediately. A minority of dreams involves a combination of vivid imagery, intense sensations, metacognition, and/or extraordinary occurrences; these dreams make a big impact on waking consciousness and are usually remembered for a long time afterward.

At this point we turn to religious studies research on dreams, with a special focus on the various roles dreams play in religious *origins*. The primary goal is to show that contemporary psychological research on “big” dreams is confirming what most religious and spiritual traditions through history have taught regarding the powerful potentials of dreaming. Although Western scientific psychology and the world’s religious traditions use very different concepts and methods of investigation, their discoveries are converging on a vital truth about human nature.

RELIGIOUS STUDIES EVIDENCE ON DREAMING OF ORIGINS

A great deal of research has been done in recent years on the dream beliefs, practices, and experiences of various people around the world and in different periods of history (Covitz, 1990; Ewing, 1989; Gregor, 1981; Hermansen, 2001; Irwin, 1994, 2001; Jedrej & Shaw, 1992; Kelsey, 1991; Lama, 1997; Lamoreaux, 2002; Lohmann, 2003; Mageo, 2003; Miller, 1994; O’Flaherty, 1984; Ong, 1985; Patton, 2004; Shulman & Stroumsa, 1999; Stephen, 1979; Szpakowska, 2003; Tedlock, 1987; Young, 1999). This body of research is a crucial testing ground for psychological theories about the origins of dreaming. If the claims of contemporary researchers are accurate representations of universal human mental functioning, then evidence for their claims should be clearly evident in different historical eras and cultural contexts. Because religion is the primary language in which human communities have discussed their dreams, dream scientists have no choice but to engage in a serious, sustained dialogue with the history of religions.

This chapter can only offer a foretaste of that historical exploration. What follows are brief descriptions of a few major themes that are especially significant for future conversations between scientific and religious approaches to dreaming.

Shamanic Initiation and Vision Questing

Researchers working in widely varied contexts have found a close connection between dream experience and the visionary practices of shamans (ritual and healing specialists of hunter-gatherer communities) (Benedict, 1922; Eliade, 1964; Irwin, 1994; Lewis-Williams, 2002; Radin, 1936; Tedlock, 2005; Toffelmeir & Luomala, 1936; Wallace, 1958). Shamanic initiations are often prompted by unusual dream experiences, and the initiation process usually involves nightmarish torments that “kill” the old self and give birth to the new shamanic identity. David Lewis-Williams (2002) argues in *The Mind in the Cave* that shamanic dreaming and vision questing is a key to understanding the origins of the cultural and religious imagination of homo

sapiens in the Upper Paleolithic period, as illustrated by the remarkable cave paintings of modern-day France and Spain. The shaman's abilities to interact with supernatural powers, journey to otherworldly realms, heal illness, and prophesize the future are all rooted in experiences of intensified dreaming. If it is fair to regard shamanism as one of the earliest religious practices of known human history, then dreaming has been intertwined with religion from the very beginning.

Dreaming the Origins of the World

Some traditions have creation myths in which the world was created in and through a process of dreaming. The best-known of these traditions is the "Dreamtime" of the Aboriginal Australians. They believe their ancestors dreamed the land into being. "Dreaming" in this context is equivalent to "creating," meaning a power to generate life, reality, and truth. Later generations of Australian Aborigines have believed they could reconnect with those spiritually powerful creative ancestors by means of their own dream experiences (not *all* dreams are believed to have spiritual significance, just a relatively rare few of them; Lohmann, 2003; Stephen, 1979; Tonkinson, 1970; Trompf, 1990). Another myth of dreaming and cosmogenesis comes from the Hindu tradition. A popular myth from the *Matsya Purana* features a sage who briefly realizes the world is actually a dream of a sleeping god:

After Visnu had burnt the universe to ashes at doomsday and then flooded it with water, he slept in the midst of the cosmic ocean. The sage Markandeya had been swallowed by the god, and he roamed inside his belly for many thousands of years, visiting the sacred places on earth. One day he slipped out of the god's mouth and saw the world and the ocean shrouded in darkness. He did not recognize himself there, because of God's illusion, and he became terrified. Then he saw the sleeping god, and he was amazed, wondering, "Am I crazy, or dreaming? I must be imagining that the world has disappeared, for such a calamity could never really happen." Then he was swallowed again, and, as soon as he was back in the belly of the god, he thought his vision had been a dream. (O'Flaherty, 1984, p. 111)

The idea that the world is born of divine illusion is too frightening and bizarre for the sage to accept, and he reasonably concludes that he merely imagined the whole thing. This myth reflects a cultural familiarity with upsetting, disturbing, nightmarish types of dreaming, and it highlights the way such dreams can force waking consciousness to face tough questions and unsettling truths. (It also shows how waking consciousness has a tendency to *resist* those questions and truths.)

Dreaming of Divine Births

Many other traditions tell stories of divine births heralded by dreams. In the Book of Matthew in the Christian New Testament, it is revealed to Joseph in a dream that his soon-to-be wife Mary will give birth to God's own child:

An angel of the Lord appeared to him in a dream, saying, "Joseph, son of David, do not fear to take Mary your wife, for that which is conceived in her is of the Holy Spirit; she will bear a son, and you shall call his name Jesus, for he will save his people from their sins." (Matt. 2: 20–21)

After the baby's birth, Joseph has several additional dreams in which God guides his family away from the dangerous King Herod and ultimately to the safety of the town of Nazareth. These passages in the Book of Matthew presuppose a cultural familiarity with the ideas that (1) dreaming is a legitimate source of divine revelation, particularly in regard to births and origins, and (2) dreaming can be a source of warning and guidance in times of danger. Whether Joseph actually had these dreams, the Gospel story reflects a widely shared understanding of these potentials of dreaming. Likewise, Buddhist traditions have long taught that the Buddha was conceived in a dream experienced by his mother, Queen Maya, in which she is touched on her stomach by the trunk of a white elephant (Young, 1999). A fascination with dreams and birth is also evident in Korean culture, where *tae mong* dreams are avidly sought and interpreted for indications of the future character, personality, and fortunes of an unborn child (Kang, 2003). All of this indicates that the widespread connection between birth and dreaming reflects, in a more personal and human sphere, the same insight that is expressed in the cosmogonic myths: a creative power is at work in dreaming that fundamentally animates our existence.

New Religious Movements

According to anthropologists and ethnographers, remarkable dream experiences have been at the center of various new religions and revitalization movements over the past few centuries. During this time, many indigenous populations have been rapidly conquered and colonized by Western powers, provoking severe crises for these people's religious and cultural traditions. In this context of conflict and disruption, certain people experience powerful dreams that become the emotional and imagistic touchstones for a new spiritual response to the present crisis. This basic process is evident among the "cargo cults" of Melanesia (Burridge, 1960; Lohmann, 2003), the spread of African Independent Churches through Africa (Charsley, 1973, 1987; Jedrej & Shaw, 1992), the dreamer religions of Native American groups

(Irwin, 1994; Trafzer & Beach, 1985; Wallace, 1969), the charismatic voodoo-Christian cults of the Caribbean (Bourguignon, 1954; Lanternari, 1975), and perhaps even the Taliban movement of contemporary Afghanistan (Edgar, 2004). In each case, a painful clash with the forces of modernization (i.e., capitalism, Christianity, Euro-American military dominance) becomes the occasion for an eruption of visionary power in dreams. How that visionary power is *used*, whether for peaceful or violent ends, is another matter (and one deserving more analysis than is possible here). For our limited purposes, the main point is that, again, dreaming is found at the origins—when old cultural traditions crumble in the face of severe external threats and dangers, new religious inspiration regularly strikes people in the form of highly memorable dreams.

Philosophical Wonder

The world's religious and cultural traditions have also looked to dreaming as the origin of what I call "philosophical wonder." In Plato's (1961) dialogue *Theaetetus*, the young man of that name is brought before Socrates, whose playfully skeptical questioning leads the youth to realize how little certainty he has in knowing whether he is awake or dreaming. Theaetetus says, "It is extraordinary how they [such epistemological puzzles] set me wondering whatever they can mean. Sometimes I get quite dizzy with thinking of them." Socrates replies, "This sense of wonder is the mark of a philosopher. Philosophy indeed has no other origin" (p. 860). To become a philosopher, one must *experience* the dizzying, decentering wonder that comes from contemplating the vivid alternative reality of dreaming. The classic Chinese version of this comes in Chuang Tzu's philosophical text *Ch'i-wu lun* (*Discussion on Making All Things Equal*), in which he tells of Chuang Chou's butterfly dream:

Once Chuang Chou dreamed he was a butterfly, a butterfly flitting and fluttering around, happy with himself and doing as he pleased. He didn't know he was Chuang Chou. Suddenly he woke up and there he was, solid and unmistakable Chuang Chou. But he didn't know if he was Chuang Chou who had dreamed he was a butterfly, or a butterfly dreaming he was Chuang Chou. (Ong, 1985, p. 78)

It is significant that Chuang Chou's dream self is a butterfly—a creature who flies, is beautiful, and experiences radical transformations of identity (from caterpillar through chrysalis to butterfly). These are hallmark qualities of highly significant dreams, in addition to the intense feeling of complete immersion in the dream world. And, as an example with direct consequences for modern Western civilization, this vivid sensation of the *realness* of dreaming prompted a philosophical awakening for René Descartes, who had a series of

three extraordinary dreams early in his life that he interpreted as divine revelations showing him the future path he must follow in his life. These dreams represented a kind of secret origin to his philosophy, a well-hidden shamanic inspiration for “the father of modern thought” and his rationalist vision of the world. (One of Descartes’s mottoes was, “He has lived well who has hidden well”; Rodis-Lewis, 1998, p. 216; see also Bulkeley, 2004).

Summary

These are only brief snapshots of religious beliefs and practices related to dreams, and much more detailed information is available in the texts by area experts cited. The findings of all these researchers, taken as a whole, reveal to us the outline of several basic patterns in human dreaming that correspond almost exactly to the findings of contemporary psychological science. First and foremost, *all* humans are capable of dreaming, and people of all varieties—men and women, children and adults, rich and poor, powerful and weak—have experienced highly memorable types of dreams. Every culture makes distinctions among different types of dreams: some dreams are attributed to bodily processes; others to residual thoughts and feelings from the day; and still others to the influence of spiritual beings, powers, and realities. Two dream qualities are especially prominent—the visual and the emotional. Most cultures emphasize the sense of sight in dreams; they speak of “seeing” dreams, and they connect dreaming at night to “visions” seen during the day. The strong emotional qualities of dreaming are also widely acknowledged, particularly the way dreams bring forth vibrant passions and desires, often of a taboo nature. Many religious functions have been attributed to dreams, such as anticipating the future, warning of danger, heralding new births, mourning deaths and other losses, envisioning sexual pleasure, healing illness, giving moral guidance, and providing divine reassurance in times of distress. Most religious, mythological, and philosophical theories of dreaming revolve around the paradox that dreaming is both passive and active, something people receive and create, something coming from outside and inside at the same time, something that is both intimately personal and awesomely transcendent. And most traditions have developed ritual practices to elicit positive, power-inducing dreams, part of a general effort to cultivate the natural potentials of dreaming according to conscious intentions.

CONCLUSION

With the findings of both scientific psychology and the history of religions, we gain a new perspective on the origins of dreaming and its significance in human life. From the former, we learn that dreaming emerges from a substrate of neural activity in the brain-mind system. From the latter, we learn that

factors of religion, philosophy, and existential self-awareness always come into play in dreaming, wherever and whenever humans have lived. Physiological forces are definitely at work in dreaming, hard-wired into us by evolution, operating independently of conscious attention or volition. And just as definitely, spontaneous psychospiritual processes emerge in dreaming that stimulate, challenge, and expand people's self-awareness.

So what *is* the origin of dreaming? *Why do we dream?* The simple scientific answer is, we dream because we are creatures with brains that have naturally evolved to sleep on a regular, instinctively patterned basis. A more religiously inclined answer is we dream because we are spiritual beings whose imaginations allow us to roam far beyond the confines of the present world, envisioning alternative realities and future possibilities.

Science says we dream because we are human. It is our nature to dream. Religions say we are human because we dream. Dreaming is our nature.

Drawing on both of these perspectives, dreaming is best seen as *originating activity*. Dreaming is perhaps the most primordial of our creative abilities and a vital factor in both neurophysiological and spiritual development. Especially in its intensified, "apex" types of expression, dreaming has the effect of provoking greater consciousness by means of free imaginative play and heightened emotional sensitivity. The evidence from both science and religion clearly shows the long-lasting impact such dreams can have on people's waking lives.

This chapter began with the question, "what is the origin of dreaming?" In the conclusion, the answer is reflected back: *dreaming is about origins*.

I would go so far as to say dreaming is a kind of autochthonic process that shares a family resemblance to other chaotic, self-organizing phenomena, from neurogenesis to weather patterns to star formation. The mysterious origin of the universe in the Big Bang, the mysterious origin of life on Earth, the mysterious origin of the random genetic mutations that propel evolution, the mysterious origin of consciousness in an otherwise undistinguished species of primates, the mysterious origin of dreaming in each of our minds every night—these are all kindred phenomena, all processes that spontaneously generate new clusters of emergent order.

REFERENCES

- Aserinsky, E., & Kleitman, N. (1953). Regularly occurring periods of eye motility, and concomitant phenomena, during sleep. *Science*, *118*, 273–274.
- Aserinsky, E., & Kleitman, N. (1955). Two types of ocular motility occurring in sleep. *Journal of Applied Physiology*, *8*, 1–10.
- Aserinsky, E., Lynch, J. A., Mack, M., Tzankoff, S. P., & Hurn, E. (1985). Comparison of eye motion in wakefulness and REM sleep. *Psychophysiology*, *22*(1), 1–10.
- Benedict, R. (1922). The vision in plains culture. *American Anthropologist*, *24*(1), 1–23.

- Bogzaran, F., & Deslauriers, D. (2004). *Integral dreaming*. Paper presented at International Association for the Study of Dreams, Copenhagen, Denmark.
- Bourguignon, E. E. (1954). Dreams and dream interpretation in Haiti. *American Anthropologist*, 56(2), 262–268.
- Bulkeley, K. (1994). *The wilderness of dreams: Exploring the religious meanings of dreams in modern Western culture*. Albany: State University of New York Press.
- Bulkeley, K. (1999). *Visions of the night: Dreams, religion, and psychology*. Albany: State University of New York Press.
- Bulkeley, K. (2000). *Transforming dreams*. New York: Wiley.
- Bulkeley, K. (2004). *The wondering brain: Thinking about religion with and beyond cognitive neuroscience*. New York: Routledge.
- Bulkeley, K. (in press). Revision of the Good Fortune Scale: A new tool for the study of “big dreams.” *Dreaming*.
- Bulkeley, K., Broughton, B., Sanchez, A., & Stiller, J. (2005). Earliest remembered dreams. *Dreaming*, 15(3), 205–222.
- Burridge, K. (1960). *Mambu: A Melanesian millenium*. London: Methuen.
- Busink, R., & Kuiken, D. (1995). Identifying types of impactful dreams: A replication. *Dreaming*, 6(2), 97–119.
- Cartwright, R., & Lambert, L. (1992). *Crisis dreaming*. New York: Harper Collins.
- Charsley, S. R. (1973). Dreams in an independent African church. *Africa: Journal of the International African Institute*, 43(3), 244–257.
- Charsley, S. R. (1987). Dreams and purposes: An analysis of dream narratives in an independent African church. *Africa: Journal of the International African Institute*, 57(3), 281–296.
- Covitz, J. (1990). *Visions of the night: A study of Jewish dream interpretation*. Boston: Shambhala.
- Dement, W. (1972). *Some must watch while some must sleep: Exploring the world of sleep*. New York: Norton.
- Domhoff, W. G. (1996). *Finding meaning in dreams: A quantitative approach*. New York: Plenum Press.
- Domhoff, W. G. (2003). *The scientific study of dreams: Neural networks, cognitive development, and content analysis*. Washington, DC: American Psychological Association.
- Edgar, I. R. (2004). The dream will tell: Militant Muslim dreaming in the context of traditional and contemporary Islamic dream theory and practice. *Dreaming*, 14(1), 21–29.
- Eliade, M. (1964). *Shamanism: Archaic techniques of ecstasy* (W. R. Trask, Trans.). Princeton, NJ: Princeton University Press.
- Ewing, K. (1989). The dream of spiritual initiation and the organization of self representations among Pakistani Sufis. *American Ethnologist*, 16, 56–74.
- Fisher, C. (1966). Dreaming and sexuality. In R. Loewenstein, L. Newman, M. Schur, & A. Solnit (Eds.), *Psychoanalysis: A general psychology* (pp. 537–569). New York: International Universities Press.
- Foulkes, D. (1962). Dream reports from different states of sleep. *Journal of Abnormal and Social Psychology*, 65, 14–25.
- Freud, S. (1965). *The interpretation of dreams* (J. Strachey, Trans.). New York: Avon Books.

- Gackenbach, J. (1991). Frameworks for understanding lucid dreaming: A review. *Dreaming, 1*(2), 109–128.
- Gackenbach, J., & LaBerge, S. (Eds.). (1988). *Conscious mind, sleeping brain: Perspectives on lucid dreaming*. New York: Plenum Press.
- Gregor, T. (1981). “Far, far away my shadow wandered. . .”: The dream symbolism and dream theories of the Mehinaku Indians of Brazil. *American Ethnologist, 8*(4), 709–729.
- Hall, C. (1966). *The meaning of dreams*. New York: McGraw Hill.
- Hall, C. (1984). A ubiquitous sex difference in dreams, revisited. *Journal of Personality and Social Psychology, 46*, 1109–1117.
- Hall, C., & Van de Castle, R. (1966). *The content analysis of dreams*. New York: Appleton-Century-Crofts.
- Hermansen, M. (2001). Dreams and dreaming in Islam. In K. Bulkeley (Ed.), *Dreams: A reader on the religious, cultural, and psychological dimensions of dreaming* (pp. 73–92). New York: Palgrave.
- Hunt, H. (1989). *The multiplicity of dreams: Memory, imagination, and consciousness*. New Haven, CT: Yale University Press.
- Hirsch, C., Karacan, I., & Williams, R. (1972). Some characteristics of nocturnal penile tumescence in early middle-aged males. *Comprehensive Psychiatry, 13*, 539–548.
- Irwin, L. (1994). *The dream seekers: Native American visionary traditions of the Great Plains*. Norman: University of Oklahoma Press.
- Irwin, L. (2001). Sending a voice, seeking a place: Visionary traditions among native women of the Plains. In K. Bulkeley (Ed.), *Dreams: A reader on the religious, cultural, and psychological dimensions of dreaming* (pp. 93–110). New York: Palgrave.
- Jacobs, L., Feldman, M., & Bender, M. (1970). The pattern of human eye movements during sleep. *Transactions of the American Neurological Association, 95*, 114–119.
- Jacobs, J.L., Feldman, M., & Bender, M. (1972). Are the eye movements of dreaming sleep related to the visual images of dreams? *Psychophysiology, 9*, 393–401.
- Jedrej, M. C., & Shaw, R. (Eds.). (1992). *Dreaming, religion, and society in Africa*. Leiden, The Netherlands: E. J. Brill.
- Jung, C.G. (1965). *Memories, dreams, reflections* (R. Winston & C. Winston, Trans.). New York: Vintage Books.
- Jung, C.G. (1968). *Man and his symbols*. New York: Dell.
- Jung, C.G. (1974). On the nature of dreams. In *Dreams*. Princeton, NJ: Princeton University Press. (Original work published 1948)
- Jung, C.G. (1980). *The archetypes and the collective unconscious* (R.F.C. Hull, Trans.). Princeton, NJ: Princeton University Press.
- Kahan, T.L. (2000). The “problem” of dreaming in NREM sleep continues to challenge reductionist (2-Gen) models of dream generation (commentary). *Behavioral and Brain Sciences, 23*(6), 956–958.
- Kahan, T.L. (2001). Consciousness in dreaming: A metacognitive approach. In K. Bulkeley (Ed.), *Dreams: A reader on the religious, cultural, and psychological dimensions of dreaming* (pp. 333–360). New York: Palgrave.
- Kahan, T.L., & LaBerge, S. (1994). Lucid dreaming as metacognition: Implications for cognitive science. *Consciousness and Cognition, 3*, 246–264.

- Kahan, T. L., LaBerge, S., Levitan, L., & Zimbardo, P. (1997). Similarities and differences between dreaming and waking cognition: An exploratory study. *Consciousness and Cognition*, 6, 132–147.
- Kahn, D., & Hobson, J. A. (1993). Self-organization theory and dreaming. *Dreaming*, 3(3), 151–178.
- Kahn, D., Krippner, S., & Combs, A. (2000). Dreaming and the self-organizing brain. *Journal of Consciousness Studies*, 7(7), 4–11.
- Kang, H. (2003). *Taemong: Korean birth dreams*. Master's thesis, Graduate Theological Union, Berkeley, CA.
- Kaplan-Solms, K., & Solms, M. (2000). *Clinical studies in neuro-psychoanalysis: Introduction to a depth neuropsychology*. Madison, CT: International Universities Press.
- Kelsey, M. (1991). *God, dreams, and revelation: A Christian interpretation of dreams*. Minneapolis, MN: Augsburg.
- Knudson, R. (2001). Significant dreams: Bizarre or beautiful? *Dreaming*, 11(4), 167–178.
- Knudson, R., & Minier, S. (1999). The on-going significance of significant dreams: The case of the bodiless head. *Dreaming*, 9(4), 235–246.
- Krippner, S., Bogzaran, F., & de Carvalho, A. P. (2002). *Extraordinary dreams and how to work with them*. Albany: State University of New York Press.
- Kuiken, D., & Sikora, S. (1993). The impact of dreams on waking thoughts and feelings. In A. Moffitt, M. Kramer, & R. Hoffmann (Eds.), *The functions of dreaming* (pp. 419–476). Albany: State University of New York Press.
- Lama, The Dalai. (1997). *Sleeping, dreaming, and dying*. Boston: Wisdom.
- Lamoreaux, J. C. (2002). *The early Muslim tradition of dream interpretation*. Albany: State University of New York Press.
- Lanternari, V. (1975). Dreams as charismatic significant: Their bearing on the rise of new religious movements. In T. R. Williams (Ed.), *Psychological anthropology* (pp. 221–235). Paris: Mouton.
- Lewis-Williams, D. (2002). *The mind in the cave*. London: Thames and Hudson.
- Lohmann, Roger (Ed.). (2003). *Dream travelers: Sleep experiences and culture in the South Pacific*. New York: Palgrave Macmillan.
- Mageo, J. M. (Ed.). (2003). *Dreaming and the self: New perspectives on subjectivity, identity, and emotion*. Albany: State University of New York Press.
- Miller, P. C. (1994). *Dreams in late antiquity: Studies in the imagination of a culture*. Princeton, NJ: Princeton University Press.
- Moskowitz, E., & Berger, R. J. (1969). Rapid eye movements and dream imagery: Are they related? *Nature*, 224, 613–614.
- Nielsen, T. A. (1991). Reality dreams and their effects on spiritual belief: A revision of animism theory. In J. Gackenbach & A. A. Sheikh (Eds.), *Dream images: A call to mental arms* (pp. 233–264). Amityville, NY: Baywood.
- Nielsen, T. (2000). Cognition in REM and NREM sleep: A review and possible reconciliation of two models of sleep mentation. *Behavioral and Brain Sciences*, 23(6), 851–866.
- Nielsen, T., Zadra, A., Simard, V., Saucier, S., Stenstrom, P., Smith, C., et al. (2003). The typical dreams of Canadian university students. *Dreaming*, 13(4), 211–235.

- O'Flaherty, W.D. (1984). *Dreams, illusion, and other realities*. Chicago: University of Chicago Press.
- Ong, R.K. (1985). *The interpretation of dreams in ancient China*. Bochum, Germany: Studienverlag Brockmeyer.
- Pace-Schott, E., Solms, M., Blagrove, M., & Harnad, S. (Eds.). (2003). *Sleep and dreaming: Scientific advances and reconsiderations*. Cambridge, England: Cambridge University Press.
- Pagel, J.F. (2000). Dreaming is *not* a non-conscious electrophysiological state. *Behavioral and Brain Sciences*, 23(6), 984–988.
- Patton, K. (2004). Dream incubation: Theology and topography. *History of Religions*, 43(3), 194–223.
- Plato. (1961). Theaetetus. In E. Hamilton & H. Cairns (Eds.), *Plato: Collected dialogues*. Princeton, NJ: Princeton University Press.
- Radin, P. (1936). Ojibwa and Ottawa puberty dreams. In R.H. Lowie (Ed.), *Essays in anthropology presented to A.L. Kroeber* (pp. 233–264). Berkeley: University of California Press.
- Revonsuo, A. (2000). The reinterpretation of dreams: An evolutionary hypothesis of the function of dreaming. *Behavioral and Brain Sciences*, 23(6), 877–901.
- Rodis-Lewis, G. (1998). *Descartes: His life and thought* (J.M. Todd, Trans.). Ithaca, NY: Cornell University Press.
- Roffwarg, H., Dement, W., Muzio, J., & Fisher, C. (1962). Dream imagery: Relationship to rapid eye movements of sleep. *Archives of General Psychiatry*, 7, 235–238.
- Shafton, A. (1995). *Dream reader*. Albany: State University of New York Press.
- Shulman, D., & Stroumsa, D. (Eds.). (1999). *Dream cultures: Explorations in the comparative history of dreaming*. New York: Oxford University Press.
- Siegel, A., & Bulkeley, K. (1998). *Dreamcatching: Every parent's guide to exploring and understanding children's dreams and nightmares*. New York: Three Rivers Press.
- Solms, M. (1997). *The neuropsychology of dreams: A clinico-anatomical study*. Mahwah, NJ: Erlbaum.
- Solms, M. (2000). Dreaming and REM sleep are controlled by different brain mechanisms. *Behavioral and Brain Sciences*, 23(6), 843–850.
- Stephen, M. (1979). Dreams of change: The innovative role of altered states of consciousness in traditional Melanesian religion. *Oceania*, 50(1), 3–22.
- Szpakowska, K. (2003). *Behind closed eyes: Dreams and nightmares in ancient Egypt*. Swansea, England: Classical Press of Wales.
- Tedlock, B. (2005). *The woman in the shaman's body: Reclaiming the feminine in religion and medicine*. New York: Bantam Books.
- Tedlock, B. (Ed.). (1987). *Dreaming: Anthropological and psychological interpretations*. New York: Cambridge University Press.
- Toffelmeir, G., & Luomala, K. (1936). Dreams and dream interpretation of the Diegueno Indians of Southern California. *Psychoanalytic Quarterly*, 5, 195–225.
- Tonkinson, R. (1970). Aboriginal dream-spirit beliefs in a contact situation: Jigalong, Western Australia. In R.M. Berndt (Ed.), *Australian Aboriginal anthropology* (pp. 277–291). Sydney: University of Western Australia Press.
- Trafzer, C.E., & Beach, M.A. (1985). Smohalla, the Washani, and religion as a factor in Northwestern Indian history. *American Indian Quarterly*, 9(3), 309–324.

- Trompf, G.W. (1990). *Melanesian religion*. Cambridge, England: Cambridge University Press.
- Van de Castle, R. (1994). *Our dreaming mind*. New York: Ballantine Books.
- Wallace, A.F.C. (1958). Dreams and wishes of the soul: A type of psychoanalytic theory among the seventeenth century Iroquois. *American Anthropologist*, 60, 234–248.
- Wallace, A.F.C. (1969). *The death and rebirth of the Seneca*. New York: Vintage Books.
- Witkin, H.A., & Lewis, H.B. (1967). Presleep experiences and dreams. In H.A. Witkin & H.B. Lewis (Eds.), *Experimental studies of dreaming* (pp. 148–201). New York: Random House.
- Young, S. (1999). *Dreaming in the lotus: Buddhist dream narrative, imagery, and practice*. Boston: Wisdom.

CHAPTER 10

CHEMICAL INPUT, RELIGIOUS OUTPUT—ENTHEOGENS: A PHARMATHEOLOGY SAMPLER

Thomas B. Roberts

THE HIDDEN SPIRITUAL CONTINENT

Although she was writing in 1963, today we can apply Mary Barnard's comments on "drug plants" to religion and entheogens just as aptly as when she wrote her prescient words about mythologies and cults more than 40 years ago (1963/1966):

[W]hich, after all, was more likely to happen first: the spontaneously generated idea of an afterlife in which the disembodied soul, liberated from the restrictions of time and space, experiences eternal bliss, or the accidental discovery of hallucinogenic plants that give a sense of euphoria, dislocate the center of consciousness, and distort time and space, making them balloon outward in greatly expanded vistas? . . . [T]he drug plants were there, waiting to give men a new idea based on a new experience. The experience might have had, I should think, an almost explosive effect on the largely dormant minds of men, causing them to think of things they had never thought of before. (pp. 21–22)

Today we would call Barnard's drug plants *entheogens* and name her field of study *pharmatheology*. Because the word *psychedelic* became encrusted with connotations of wild hippies, bright colors, visual distortion, and socially undesirable people and events, in 1979, Carl A. P. Ruck and others coined the word *entheogen* as a less negatively loaded substitute for *psychedelic*. With this change, the emphasis switched from "mind clearing, giving a clear view of the mind" to "generating the experience of god."

In 1995, the Right Rev. Aline Lucas-Caldwell coined and defined *entheology* (2001). I admire her definition so much, I adopt it as the definition of *pharmatheology* too; thus, they are synonyms:

Entheology is that branch of theology which deals with the experience and/or knowledge of the divine, and of the revelation of the divine, through the agency of psychoactive substances (used as sacraments), be it a revelation of the divine within and/or without. (p. 147)

To this I would include the complementary influences of culture, language, beliefs, social context, and personality as they influence these experiences.

I prefer *pharmatheology* because it is a closer parallel to *neurotheology*, making it an easier fit into the existing idiom of medicine and biological sciences. Although the word *pharmacothology* exists and is etymologically purer, the shorter *pharmatheology* is easier to say and sounds better to the ear. Like the *psychedelic* versus *psychedelic* tug-of-war between euphony and etymology, to me euphony wins. Others may have already coined *pharmatheology*, but this is the first published instance I know of. Whatever word is used, Bernard's point is well taken. In fact, it is stronger now that we have over 40 years of additional information to support her speculations.

The most accessible introductions to pharmatheology for general, educated nonscientific readers are *Entheogens and the Future of Religion* (Forte, 1997), *Cleansing the Doors of Perception* (Smith, 2000), *Psychoactive Sacramentals* (Roberts, 2001), *Entheology.org* (2005), and *Higher Wisdom* (Walsh & Grob, 2005). My syllabus designed for a possible course called *Entheogens—Sacramentals or Sacrilege?* (Roberts, 2005) lists over two dozen more books and numerous articles. The online reference *Religion and Psychoactive Sacraments* (Roberts & Hraby, 1995–2003) contains excerpts from over 550 books, dissertations, and topical issues of journals as well as extended bibliographic information.

This chapter collects some specimens of pharmatheology and considers the explosive effects entheogens are having on our ideas about religion, including—but not limited to—brain-religion studies. The chapter describes entheogen-derived ideas from some of the major scholars in the field and some of my own leanings on these topics. The expanding interest in entheogens is embedded in the larger intellectual context of multistate mind-body studies. Entheogens recast existing questions for churches and society while giving birth to entirely new ones. The chapter raises over 150 questions that deserve to become part of a program of sustained, systematic entheogenic inquiry into religion.

Most remarkably, entheogens make it possible to address both scientific and humanistic religious studies with experiments. I expect this experimentation will expand our knowledge of religion several fold, possibly even by

several powers. On the face of it, this seems unlikely, a brash assertion, even absurd. How could entheogens promise this? This chapter explains some of entheogens' leads. And what are entheogens, anyway?

An entheogen is a psychoactive plant or chemical used in a spiritual context. The best known example is peyote as used by the Native American Church. Other examples are LSD, mescaline, psilocybin, marijuana, ecstasy, ayahuasca, and a host of other substances. Most of these plants and chemicals also have nonentheogenic uses such as medicine, psychotherapy, creativity, or problem solving, but this chapter focuses only on their entheogenic effects. Legal or illegal, accepted or taboo, it is the religious or spiritual context and/or effect that qualifies something as an entheogen; not its chemical structure or governmental scheduling. It is common for someone to take a psychoactive without a spiritual intention but still have a spiritual experience, and these unintended spiritual encounters qualify as entheogenic too.

The chemical structure of many entheogens is similar to serotonin's. Serotonin is a neurotransmitter, one of the chemicals that nerve cells use to communicate with each other (and also found in the blood). As some of the earlier chapters in this series discuss, it is active in religious experiences. So experimenters could design religious experiments that use like-structured entheogens as close substitutes for serotonin. A whole research specialty might study the similarities and differences between entheogenic religious experiences and naturally occurring ones.

Sometimes, as with internationally renowned philosopher of religion Huston Smith's first mescaline experience, one's theological assumptions become manifest and confirmed (Smith, 2001). For others, the opposite happens; for the world's leading researcher on the clinical uses of psychedelics, Stanislav Grof (2001), his previous atheistic religious assumptions underwent a "180-degree turn" (p. 27). The idea of "god within"—more exactly, a subjective experience that might be interpreted as "god within"—often becomes more credible to entheogen questers and may occur to people who were previously unfamiliar with the idea.

In one of the hottest leads in neurotheology and pharmitheology, Grof (1975/1993) reports:

In my experience, everyone who has reached these [perinatal] levels develops convincing insights into the utmost relevance of the spiritual and religious dimensions in the universal scheme of things. Even hard-core materialists, skeptics and cynics, and uncompromising atheists and antireligious crusaders such as Marxist philosophers suddenly became interested in a spiritual search after they confronted these levels in themselves. (pp. 95–96)

Grof is widely considered the world's leading expert on clinical psychedelic psychotherapy, and from a religious point of view his work is especially

significant because the 5,400-plus sessions he has guided or whose clinical reports he has read have lead him to discover a transpersonal, or spiritual, part of our minds. Contrary to his philosophical and psychiatric expectations, while exploring the perinatal and transpersonal levels of their minds, his patients experienced basic religious phenomena such as the physiological process of being born again, religious symbols and concepts alien to their cultures, and ego transcendence. According to Grof, the birth process (perinatal level) includes an Edenic womb, Hellish entrapment, cosmic struggle, ego death, and rebirth. Do these presage parallel religious experiences? Must one experience ego death and rebirth to enter the kingdom of heaven? Mystical experiences include giving up the ego and being born into a new, fresher existence. Could we have stumbled onto a way to conduct entheogenic born-again experiments? The perinatal level is an almost untouched continent for brain-religion-psychology studies.

Are Grof's clinical findings replicable? What do they portend about universal and folk ideas about religion? Are cross-cultural similarities expressions of activated circuits in our brains? Do these circuits have their origin in the birth process? Do constants emerge across cultures and religions? More puzzling yet, what if they do? How are we to understand this? Are these questions now open to experimental confirmation or disconfirmation?

Might babies have genetic programs waiting to be activated by the stresses of the birth process, with a set of standard variations that show up as temperaments? Possibly related to this, two researchers at Vanderbilt University's Department of Pharmacology found that LSD influences gene expression in rat brains. Nichols and Sanders-Bush (2002) reported: "We have identified a number of genes that are predicted to be involved in the process of synaptic plasticity" (p. 635). Is this a clue to a mechanism involved when Grof's patients relived their birth traumas and recovered perinatal memories during deep, LSD-assisted psychotherapy? Is the religious phrase "born again" more psychophysiological than it is usually given credit for?

Michael Winkelman, a professor of anthropology at Arizona State University and a founder of the Society for the Anthropology of Consciousness (www.sacaa.org), coined the word *psychointegrator* (2001) to draw attention to the fact that these substances integrate brain functions and help people through the psychotherapeutic process of integration. By integrating neural, sensory, and cognitive processes, psychointegrators (psychedelics) allow "the enhancement of access to deeper cognitive structures," and deeper cognitive structures may be at the root of religious cognition. His "neurophenomenological framework" (Winkelman, 2000, p. 27) links biology with subjective experience. He summarizes:

The paleomammalian brain manages processes associated with self, identity, species survival, family and social relations, learning and memory, and sexual

and aggressive emotions as well as their behavioral integration. Entheogens (and [altered states of consciousness] in general) enhance systematic integration of the psyche by producing heightened arousal and awareness, and by interfering with habituated behavioral routines. The paleomammalian brain and limbic system provide the social and emotional mentation and behavior. These fundamental cognitive processes involve nonverbal communication and, forms of mental and social representation that manage the processes of emotional and social life. (Winkelman, 2002, pp. 56–57)

Marvelous neurotheological experiments could be done using as subjects people with various cultural, political, social, and religious backgrounds to see what changes, if any, would appear after having intense perinatal and/or mystical experiences. As Barnard implies in the epigraph to this chapter, entheogens may cause us to rethink our understandings of brain, religion, and psychology. Indeed, they are doing so now. And entheogens make it possible to examine these questions and assumptions experimentally.

Religion *Is* about Something

I find it helpful to distinguish two types of religious experiences. The first take place during egoic states, when we identify with our usual individual being (i.e., when I am Tom Roberts having an experience). A second type occurs when we have non-self experiences (i.e., when my identity as Tom Roberts is away on vacation, and I experience the transpersonal part of my mind). Barnard's "rethinking" happened for me as I came upon mystical experiences unexpectedly. Rather than a sudden conversion, my interest in entheogens and religion grew slowly from a blend of entheogen-derived mystical experiences over many years and reading about them over several decades. This chapter focuses on transpersonal entheogenic experiences.

The Mystical Door to Religion

To my surprise, I came to take religion seriously, not as a believer in one or another creed but when I realized: Religion *is* about something, and that something is mystical experiences. Like other experiences, mystical experiences are subjective events, but also ones that can be studied empirically. Given the experience, though, the real problem is what to make of them. And this is one place neurotheology studies can shed some light. This section briefly considers mystical experiences. The chapters in this series by Hood and by Azari discuss mystical experiences more thoroughly. After a quick scan of mystical experiences, I frame some questions for future neurotheological researchers under three categories: sciences, humanities, and church and polity.

First, why are mystical experiences so important, so overwhelmingly influential? Wilson Van Dusen (1961), who was chief clinical psychologist at Mendocino State Hospital in California at the time he wrote this, explains:

There is a central human experience which alters all other experiences. It has been called *satori* in Japanese Zen, *moksha* in Hinduism, religious enlightenment or cosmic consciousness in the West. The experience is so central that men have spent their lives in search of it. Once found life is altered because the very root of human identity is deepened. I wish to draw attention to the fact that the still experimental drug . . . (LSD) appears to facilitate the discovery of this apparently ancient and universal experience. Many ways have been taken to enlightenment. Now I draw your attention to a relatively new way. (p. 11)

Imagine what it would mean for our understanding of this aspect of religion if these experiences could be more or less reliably stimulated (or simulated) in experimental conditions.

In 1994, I connected the Chicago Theological Seminary with the Council on Spiritual Practices (CSP), and in February of 1995 we co-sponsored a small invitational conference-retreat on entheogens. To help establish a common background for attendees and to satisfy my own curiosity, I compiled a bibliography of books, dissertations, and topical issues of journals about entheogens and included excerpts. The CSP collected my findings at its Web site *Religion and Psychoactive Sacraments: An Entheogen Chrestomathy* (www.csp.org/chrestomathy). A chrestomathy is a collection of short writings on a topic, similar to an anthology, but characteristically with brief excerpts rather than complete writings. The interdisciplinary nature of entheogenic studies lends itself not only to a common topic that a menagerie of disciplines can contribute to, but also to new avenues for scholarly and experimental studies. At the time, I naively thought it would be a simple job of collecting a couple dozen entries; in 2002, I stopped the chrestomathy project at over 550 entries, and I have a folder with about 100 more to add in that vague future of good intentions.

Thanks to entheogens, it is possible to design experiments that examine how various religious beliefs become more (or less) credible to people who have had entheogenic mystical experiences. Entheogens link chemicals, brain, and religious cognition in an experimental theology.

What are mystical experiences? What roles do they play in spiritual development, religion, and religious studies? What are entheogens, and how do they contribute to our understanding of these topics? What happens when entheogens, the brain sciences, and religious studies are hybridized? Since my first LSD-based mystical experiences about 35 years ago, these questions have guided me beyond seeing religion as a mere accretion of social and historical constructions to a rich collection of ideas across the spectrum of

academic fields. As with most research, every finding generates more questions than it answers.

First, it is important to distinguish the way the word *mystical* is used in common language from the way it is used in religion. In common language, mystical connotes esoteric, occult, irrational, strange phenomena, and other odd, ghostly thoughts. In the psychology of religion, however, mystical denotes a specific kind of experience (or group of similar experiences), as Hood's chapters portray. Like many terms in philosophy, there are disagreements over mysticism's best definition but general agreement on the central family of experiences that compose it.

Primary Religious Experience

People who take an experience-based, mystical stance toward religion and spiritual development consider these experiences to be religion's foundation in two senses: foundation in the sense of founding or origin and foundation the sense of a building's solid foundation on which a structure is built. Thus, the phrase *primary religious experience* (PRE) is a synonym for *mystical experience*. To an increasing number of both religious mystics and secular skeptics, entheogens provide ways to experimentally study the links between the brain sciences, anthropology, psychology, and religious studies.

Several primary religious experiences are newly open to experimentation thanks to entheogens. Following the line of conceptual development from James (1902) through Stace (1961) to Pahnke (1963), Hood (1975), and Hood, Morris, and Watson (1993), Hruby (2001) lists nine typical subjective experiences that comprise mystical experiences. This list changes somewhat from instance to instance and is an ideal model, so any particular mystical experience will vary from this perfect specimen. The important point is, thanks to entheogens, we can study these experiences and the questions that stem from them experimentally. The nine experiences are unity, transcendence of time and space, deeply felt positive mood, sense of sacredness, objectivity and reality, paradoxicality, alleged ineffability, transience, and persisting positive changes in attitudes and behavior.

I had a hard time remembering the nine types of mystical experiences, so I gave my Psychedelic Mindview class in the honors program at Northern Illinois University the task of coming up with a mnemonic device. Keeping in mind that all the qualities need to be included but that their order is not important, they came up with POTT MUSIC:

Paradoxicality—opposites seem true

Objectivity—noetic quality

Transcendence—of time and/or space

Transience—limited duration

Mood—deeply felt positive mood

Unity—“All is one,” egolessness

Sacredness—divine presence, holiness

Ineffability—impossible to explain

Change in behavior—serving humanity, cosmic values

These are subjective experiences seen through language and flavored by culture, so they may not imply an objective reality—although many people feel they do and have had their lives changed because of them. Depending on one’s assumptions, qualities such as sacredness and unity are open to various interpretations, and this is where the exegetical fun begins.

Entheogenic approaches to religious studies build on the assumption (some would say observation) that mystical experiences were an experiential, historical origin of religion (as Barnard stated) and a constant though uncommon source of nourishment through the ages. Today, entheogens make PREs more accessible. As with other spiritual disciplines, entheogens can—but do not always—produce mystical experiences. By providing a useful mindset in the subjects and a supportive environment, researchers can increase the likelihood of such intense spiritual experiences.

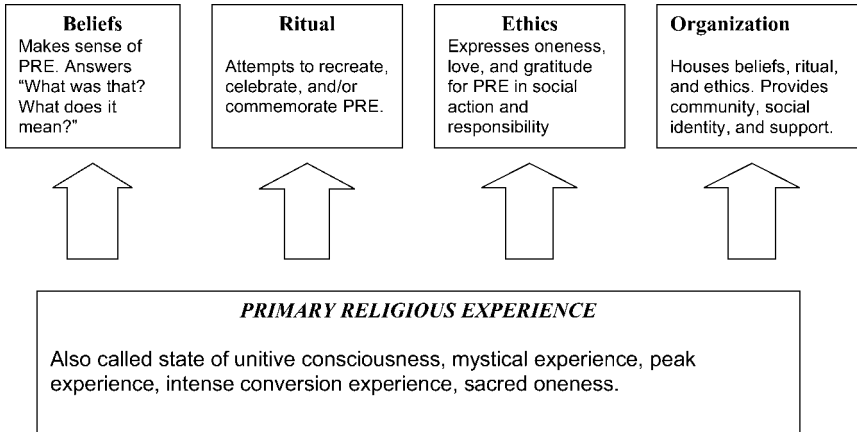
Religions also have social, cultural, historical, philosophical, and theological input, but from a mystical perspective, primary religious experiences are the soil from which religion springs:

Indeed, isn’t religion, above all—before it is doctrine and morality, rites and institutions—*religious experience*. Under the influence of Protestant theologian Friedrich Schleiermacher in nineteenth century Europe and philosopher-psychologist William James in early twentieth-century America, many Westerners have come out in support of the priority of religious experience. And isn’t religious experience in its highest form *mystical experience*, as in India, where it seems more at home than anywhere else? (Küng, Ess, von Stietencron, & Bechert, 1986, p. 168)

Entheogens provide a way to test this question experimentally. From this perspective, today’s theology and beliefs, liturgy and rites, social concerns and moral action, and religious organizations all have some of their roots (not all of their roots) in primary religious experience (see Figure 10.1 for an illustration of this relationship).

Cultivating the Entheogenic Root

Beginning with the hypothesis that the core of religious experience is its mystical taproot, how do we cultivate this root? As the other volumes in this

Figure 10.1 Primary Religious Experience (PRE) as the Taproot of Religion

series and the chapters in this book show, the brain sciences can contribute to our knowledge by documenting what entheogens and other mind-body psychotechnologies do to our nervous and hormonal systems. What are the brain, hormonal, and cognitive correlates of people who are having these experiences? Here is a rich vein to pursue, and many of the other chapters in this set of three books illustrate the inspiring indications and insightful nuggets leading to this vein. Largely missing, though, are studies that use entheogens to move from simple descriptions to experimental treatments. This lack is partly collateral damage from the war on drugs and partly because of theological disputes over whether entheogen-occasioned sacred experiences are genuine or misleading.

With natural, plant-derived entheogens and laboratory-synthesized entheogens, it is possible to develop what Smith (2000) called "empirical metaphysics" (pp. 9–13). These leads provide independent variables in the sciences and ways to develop experimental humanities. Most interestingly, entheogens can provide ways to bridge the mind-body gap experimentally by using these chemicals as independent treatments and humanistic variables as dependent ones. That is, it is possible to give an entheogen, map where it is active in the body, and chart changes in religious beliefs, values, and cognitions.

QUESTIONS AND TOPICS FOR THE SCIENCES

With the cautious acceptance of medical psychedelic research by the U.S. Food and Drug Administration (Kurtzweil, 1995), with exploratory medical research awakening (Horgan, 2005), and with scientific publications reviewing these leads (Nichols, 2004), we can look forward to updated information on mystical experiences, not yet as the major hypothesis, but as adjunct findings to

medical and scientific research. After decades of prohibition, new studies using psychedelics' healing prospects have recommenced (Roberts and Winkelman, in press). It will probably be some time before the FDA and other government agencies permit religious entheogenic research, and correlations among the characteristics of entheogenic peak experiences, spontaneous remission, spiritual cognition, and our immune systems will likely draw them to it (Roberts, 2006; Roberts & Hruby, 1996). Other countries may scoop the United States in this area.

Before pointing to some good leads for future pharmatheological research, to the implications for the humanities (even for founding experimental humanities), and some implications for churches and polity, it is worth noting that psychedelics have—unbeknownst to most biologists—already greatly benefited the biological sciences. In his plenary address to the Serotonin Club, David E. Nichols, a professor of medicinal chemistry and molecular biology in the School of Pharmacy and Pharmacal Sciences at Purdue University, said: “Let me start off by suggesting that a significant number of the people in this room tonight and indeed a significant percentage of serotonin researchers worldwide first gained their interest in serotonin through some association with psychedelic agents” (Nichols, 1999–2000). Serotonin, LSD, and many psychedelics share the indole chemical structure: the so-called God spot (Connor, 1997) is also a serotonin spot.

In addition to lighting scientific curiosity about neurotransmitters and posing topics to study, psychedelics also have helped researchers learn valuable cognitive skills during sessions that they have transferred back to ordinary consciousness as aids to research. Kary Mullis, inventor of the polymerase chain reaction technique (a way of multiplying small biological samples so they will be large enough to study) attributes his Nobel Prize-winning insight to a visualization skill he learned with psychedelics. He says he was not under the influence of psychedelics at the time he had this idea, but that he owes his insight to his ability to visualize, and he owes his ability to visualize to LSD (Doblin, 1994).

Psychedelics have a third role in scientific thought, providing novel ways for thinking “outside the box” of our ordinary mind-body state. An analogy between computers and our brains helps describe this. When a new digital program (electronic information processing program) is installed on a computer, the computer can be used in new ways; similarly, when we change our brains' bioinformation processing routines with chemicals and botanicals, we use our brains in new ways. I predict that future historians of scientific thought will judge that inventing new mind-body psychotechnologies was the major intellectual advance of the late twentieth and early twenty-first centuries (Roberts, 2006).

Of course, many other-state ideas are useless, but the double helix is not. According to science journalist Alun Rees (2004), Francis Crick was on LSD

when he thought of the double helix model of DNA. Crick did not deny Rees's suggestion but threatened to sue Rees if he published it, so Rees came public only after Crick's death.

It is credible that scientists of the future will use entheogens and other mind-body psychotechnologies to widen their array of professional cognitive skills and as ways to invent ideas. I hope this set of books will provide a responsible and accurate scientific and religious context for entheogenic ideas and promote the free and open discussion of entheogenic topics.

The Science-and-Religion Complex

Charles Tart's (1969) admonition for psychologists to include information on altered states in their theories and observations is equally apt for the researchers in pharmitheology: "The most important obligation of any science is that its descriptive and theoretical language embrace *all* the phenomena of its subject matter; the data from [altered states of consciousness] cannot be ignored if we are to have a comprehensive psychology" (p. 6). If scientists and theologians omit descriptive and theoretical language about entheogens, we can hardly have a comprehensive neurotheology or pharmitheology.

In the brain-religion studies, much (though not all) research is descriptive. Activities in the nervous system during religious experiences are described. Correlational studies look at relationships among religious activities, denominational membership, demographic variables, social values and morals, and political positions. Frequency of prayer and other religious activities are associated with health, mental adjustment, or other supposed outcomes. Researchers in the Department of Clinical Neuroscience at Stockholm's Karolinska Institute and Hospital hint at how correlational studies might advance to experimental ones:

[W]e found the correlation of self-transcendence was shown to be fully dependent on the spiritual acceptance scale. . . . The spiritual acceptance scale measures a person's apprehension of phenomena that cannot be explained by objective demonstration. Subjects with high scores tend to endorse extrasensory perception and ideation, whether named deities or a commonly unifying force. Low scorers, by contract, tend to favor a reductionistic and empirical worldview.

A role for the serotonin system in relation to spiritual experiences is supported by observations of drugs such as LSD, psilocybin [DPT] mescaline, and [MDMA] that are known to cause perturbations of the serotonin system in several brain regions.

On a behavioral level, these drugs elicit perceptual distortions, illusions, a sense of insight, spiritual awareness, mystical experiences, and religious ecstasy. (Borg, Bengt, Soderstrom, & Farde, 2003, pp. 1967–1968)

The Good Friday Experiment

A trophy study for a future neurotheologian would be replicating the Good Friday Experiment including serotonin measures. This outstanding and classic example of experimental research using entheogens occurred in Marsh Chapel of Boston University on Good Friday 1962. Walter N. Pahnke, who was already a medical doctor and an ordained minister, conducted the most significant study to date on the entheogen-religion connection as the data for his doctoral dissertation in religion and society at Harvard. He gave psilocybin (the active ingredient in psychedelic mushrooms) to 10 graduate students from a seminary, while another 10 received an active placebo. They met in the basement of Marsh Chapel and listened to the upstairs service over a sound system. Pahnke wanted to know whether the psilocybin subjects would experience mystical states and whether they would do so more than the 10 control subjects (Hruby, 2001; Pahnke, 1963; Pahnke & Richards, 1966; Smith, 2000). They did, and what has become legendary in the psychedelic community as “the Good Friday Experiment” remains a paradigmatic experiment for others to replicate when and where such research becomes legal again.

Although the experiment of giving an entheogen to seminarians in a religious setting is distinctive, that isn't what earns the Good Friday Experiment a nomination for the most remarkable experiment in the social sciences. In the social sciences, experimental studies are in short supply; those done outside controlled lab environments are scarce. Experiments in which the subjects are administered a treatment only once are infrequent. Single-treatment, ex-lab, experimental designs with measurable long-lasting effects are rare, but in a 25-year follow-up study of Pahnke's Good Friday subjects, Doblin (2001) found:

This long-term follow-up, conducted twenty-four to twenty-seven years after the original experiment, provides further support to the findings of the original experiment. All seven psilocybin subjects participating in the long-term follow-up, but none of the controls, still considered their original experience to have had genuinely mystical elements and to have made a uniquely invaluable contribution to their spiritual lives. (p. 73)

An effect persisting 25 years from a single-treatment experimental study makes the Good Friday Experiment remarkable enough, but even that isn't what makes this experiment so amazing. “The positive changes described by the psilocybin subjects at six months, which in some cases involved basic vocational and value choices and spiritual understandings, had persisted over time and had deepened in some cases” (Doblin, 2001, p. 73). A deepened effect strengthened over a quarter of a century marks a permanent shift. Obtaining

these results from a one-treatment, informal setting, experimental study makes the Good Friday Experiment unique in the social sciences: it speaks to the power of entheogens as experimental treatments.

Do humans have an innate spiritual nature? What parts do biology and culture play in this? Entheogens supply some leads to these questions, too. Smith (1976) reminds readers: “the goal, it cannot be stressed too often, is not religious experiences: it is the religious life” (p. 155). As a philosopher, Smith is interested in the implications of these experiences for our understanding of the human mind:

In contradistinction to writings on the psychedelics which are occupied with experiences the mind can *have*, the concern here is with evidence they afford us as to what the mind *is*. . . . [J]udged both by the quantity of data encompassed and by the explanatory power of the hypotheses that make sense of this data, it is the most formidable evidence the psychedelics have thus far produced. The evidence to which we refer is that which has emerged through the work of Grof. (p. 156)

The title of Smith’s 1976 book, *The Forgotten Truth: The Primordial Tradition*, echoes Barnard’s speculation about the roles of drug plants in primitive mythologies and cults; now, entheogens give us a way to test her ideas in our times and based on our own experiences. Entheogens move us from conjectures to testing the credibility of ideas. If we suppose the human mind has an innate spiritual nature, can entheogens confirm or disconfirm that hypothesis by activating, describing, and/or developing it? Entheogens open up subjective experiences and beliefs to experimental investigation. This is no small trick.

Psychedelics (used in both entheogenic mode and secular mode) make two distinct contributions to health. The most obvious is in psychotherapy, and the broadest range of LSD-treated mental health diagnostic categories is reported in Grof’s works (e.g., 1975, 1980, 2001). Passie’s bibliography (1997) lists 687 studies and nine conferences. Of special interest to religion-based psychotherapy, states of unitive consciousness (peak or mystical experiences) are often the variable that determines whether a treatment was successful.

After decades of being in a deep freeze due to governmental restrictions and negative publicity, several pilot research projects are underway for psychosomatic conditions (Horgan, 2005): post-traumatic stress disorder (now including war-related trauma), HIV/AIDS, death anxiety with the terminally ill, alcoholism and addiction, and obsessive-compulsive disorder. Because psychedelics have bodily effects, mental effects, and spiritual effects, they may prove especially applicable to mind-body-spirit problems. Entheogens may be useful in pastoral counseling, say with alcoholics (Alcoholics Anonymous, 1984; Mangini, 1998) or in a hospice situation (Hansen, 2001).

Other studies are likely to be getting underway soon. The most up-to-date source is the Multidisciplinary Association for Psychedelic Studies (www.maps.org) and the *MAPS Bulletin* (1990+). A two-volume anthology of *Hallucinogens and Healing*, which collects these leads (Roberts and Winkelman, in press) will include a chapter on spiritual healing.

A second possible health benefit is linked more closely with psychedelics as entheogens. The characteristics of mystical experiences are similar to descriptions of spiritual healing and spontaneous remissions: overwhelmingly positive mood, transcendence of time and space, a sense of sacredness, being in the care of a powerful good force, unity, and so forth. With relationships well established between positive psychological mood, the immune system, and physical wellness, powerfully positive peak experiences might boost the immune system powerfully (Roberts, 1999). I speculate further on this connection in Roberts (2006).

Clearly, entheogens are not right for everyone. Who is most likely to benefit from entheogens? How should people be screened and prepared for their sessions, and what kinds of follow-up are best? Myron Stolaroff (1994), who headed a therapeutic-growth center in the 1960s where people could come for legal LSD sessions, recommends a gentle start:

After a number of trials of MDMA with other people, it became apparent that this was the best substance with which to introduce people to psychoactive drugs. With other substances, we had always used great care to make sure that the subject was ready for an experience that would greatly alter his perceptions, understanding, and perhaps his view of himself and his behavior. MDMA is so generally euphoric and non-threatening that a much wider range of subjects can benefit from the experience without discomfort. (pp. 41–42)

Collecting his ideas on how best to design a religious session, Stolaroff (2001) addresses selecting candidates, preparation, conduct of the session, follow up, and the training guides. Roberts (2001, pp. 250–251) anticipates a time when it will be legally possible to be screened, prepared, take a known dose of guaranteed purity under the care of a qualified guide, and be debriefed.

The importance of entheogenic experiences goes beyond religious studies to broadening the data base cognitive scientists can draw on. Shanon (2002) bridges the cognition-entheogen gap:

[T]he bringing together of Ayahuasca research and cognitive psychology defines a two-way interaction. Not only can a cognitive-psychological analysis make a crucial contribution to the study of Ayahuasca, the converse is also the case—the study of Ayahuasca may have implications of import to our general understanding of the workings of the human mind. Ayahuasca (along with other mind-altering substances) expands the horizons of psychology and reveals new, hitherto unknown territories of the

mind. Thus, the study of Ayahuasca presents new data pertaining to human consciousness, and thus new issues for investigation, new ways to look at things, new questions, and perhaps even new answers. (p. 37)

Scientific generalizations based on a wide range of observations are considered stronger than observations derived from a narrower scope. Broadening the sample observations that scientists and scholars can draw from, entheogens strengthen findings about cognition and religion. For example, with the help of ayahuasca, Shanon identified 11 cognitive parameters whose values depend on brain biochemistry, many with clear implications for religion: agenthood, personal identity, unity, inner/outer boundaries, individuation, calibration of one's size, locus of consciousness, time, self-consciousness, intentionality, and knowledge-noetic sense. Thus, ayahuasca makes it possible to experimentally unite biology, cognition, and philosophy. In this way, *Antipodes* could well become an inspiration and paradigmatic model for future generations of pharmitheologians and neurotheologians.

Inventing New Varieties of Religious Experience

Existing mind-body psychotechnologies (e.g., entheogens, meditation, chanting, contemplative prayer, ascetic practices, martial arts, or other mind-body spiritual practices) are usually used alone. Meanwhile, new psychotechnologies are being invented (e.g., biofeedback and neurotechnologies), while others are being imported into standard Western culture regularly (e.g., ayahuasca and peyote). Twenty-first-century mind-body inventors might sequence several of these in new ways. Just as new computer programs process electronic information new ways, we can invent new mind-body programs to process biological-cognitive information new ways. New recipes of these psychotechnologies might produce new, previously unknown, synthetic cognitive programs. As we learn to use our brains/minds in new ways, what will we learn about our minds? We may be on the verge of discovering (or constructing) novel mental states and resident capacities that haven't existed.

What religious experiences, thoughts, or qualia may emerge in those states (Roberts, 2006)? It seems logical to wonder whether future religious explorers and mind-body engineers will invent new kinds of spiritual experiences. Will they create new varieties of religious experience? A vast experimental unknown unfolds.

A strong bridge between science and religion cannot be built if we omit the entheogen girders. If we are to follow Tart's (1969) injunction to include all observations in our brain-and-mind disciplines, then neurotheology must be informed of pharmitheology. The most intellectually distinctive aspect of using entheogens experimentally is that they are chemicals and their effects go beyond biochemical reactions to influence philosophy, theology, beliefs,

and cognition. With entheogens, “chemical input, religious output” links brain with cognition, the sciences with the humanities. Brain, cognition, and theology are one interacting process that is experimentally studiable.

TOWARD EXPERIMENTAL HUMANITIES

In today’s humanities, religious and spiritual beliefs are constructed and deconstructed, commented on, analyzed, historicized, criticized, and otherwise run through the gauntlet of humanistic concepts and philosophical wrangling. Even more remarkably than in the sciences, entheogens make it possible to perform experiments in the religion-centered humanities, too—even experiments that promise to increase people’s understanding of selected religious and philosophical concepts. By providing direct, personal experiences, entheogens advance what might be called the experimental humanities, informing religious discussions with data-based information.

Experiments on Belief, Ethics, Qualia, and Meaningfulness

Entheogens can move the scientific study of primary religious experience from the anecdotal, descriptive, and correlational stages to the experimental stage (Pahnke & Richards, 1966; Smith, 2000). The Good Friday Experiment is the best example so far. How might empirical metaphysics inform the professional education of seminarians, advanced students of religion, and related fields? How will experiences of experimental mysticism change the research agendas of those who have primary religious experiences? What directions will they give young researchers’ professional careers? What questions will they ask? What religious activities may move from church and chancel to entheogenic religious retreats? What questions may move from the scholar’s dusty study to the glory of his garden? What methodological questions need to be answered, and what methods of inquiry need to be developed?

How do religious beliefs and philosophical positions depend on whether people have had primary religious experiences? When people experience mystical states, they find some beliefs more credible—for example, perennialism, a common mystical core underpinning world religions, the survival value of PREs, the roles of mind-body states in the origins and history of religion, self-transcendence as a state of grace, a spiritual aspect of human nature, a transpersonal “level” of the human mind. David Toolan (1987) spots the breakthroughs possible for philosophy and religion:

Even in the universities of the Catholic ghetto in which I grew up, where metaphysical speculation was highly approved, the general assumption was that the noumenal order of things could not be perceived. One got it only by subtle arguments, by “transcendental reductions” and other

such inferential, speculative acrobatics. (The ordinary pious Catholic who prayed before the Blessed Sacrament may have known otherwise, but such pedestrian experience was typically ignored by professors of “natural theology” and theology.) But is metaphysics a matter of “immediate perceptions”? Without argument? The eyewitness of a hack reporter? If true, this would be first-order cultural news. Psychedelics provided the gate-opener for just this announcement. (p. 40)

Just as the physical sciences learn about the material world by experimenting on it, entheogens and other mind-body psychotechnologies allow us to learn about the mental and spiritual worlds by experimenting on them. What personal experiences make various theological positions and topics in religious studies more credible or less credible? Experiment-based evidence will inform these discussions.

People who have undergone ego-transcendent (transpersonal) experiences with entheogens (or otherwise) often shift their values and motivation away from self-gain to community-centered values, or to a cosmic orientation.

Among the predictable characteristics of mystical experience are a sense of the sacredness of all life and a desire to establish a new, more harmonious relationship with nature and with other human beings. There is a corresponding renunciation of the various forms of self-seeking, including the ethos of manipulation and control. (Wulff, 1991, p. 639)

When we visit “the blessed Not-I” (Huxley, 1954, p. 19), it makes perfect sense that I-centered desires will be left behind, or at least put in their motivational place. Early entheogenic research in the 1960s through more contemporary studies confirm this (e.g., Fadiman, 1965; Mangini, 2000; Roberts, 1998). In a 2004 two-continent study, a medical doctor in Israel, Michael Learner, teamed up with a professor from the Department of Psychology at Bond University in Australia, Michael Lyvers, to compare psychedelic users with users of other illegal drugs and with non-drug users (Learner & Lyvers, 2004). Compared to the other two groups, psychedelic users scored higher on life values thought to be associated with spiritual or mystical beliefs such as concern with the environment, concern for others, creativity and spirituality, and manageability of their lives. They perceived life as more meaningful and were higher in empathy. Suppose we believe, “By their fruits you shall know them”; do entheogens yield good fruit?

But, as Learner and Lyvers (2004) caution: “It is possible that the higher levels of spirituality and associated values in psychedelic users were inherent pre-drug spiritual tendencies” (p. 10). In the future, if religious liberty and academic freedom are restored, experimental studies that test groups that are both high-level and low-level to begin with will solve this uncertainty.

If entheogenic mystical experiences produce ego-transcendent states that, in turn, promote these values, then we should expect other psychotechnologies that also produce these states to produce similar results. Looking at the effects of ego-transcendent practices cross-culturally, Roger Walsh (1988) reports:

the thought of harming “others” therefore makes no sense whatsoever. Rather, the natural expression of this state are said to be love and compassion or *agapé*. Similar unitive experiences have been reported in the West among contemplatives, subjects in exceptionally deep hypnotic states, patients in advanced therapy, experimental psychedelic sessions, and as spontaneous peak experiences. These experiences are under significant voluntary control only in contemplatives, either Eastern or Western, but interestingly, enduring positive after effects on personality have been reported for all these conditions, and the approaches that induce them have therefore been collectively named “holotropic therapies,” i.e., growth toward wholeness or unity. (p. 549; Walsh’s citations omitted)

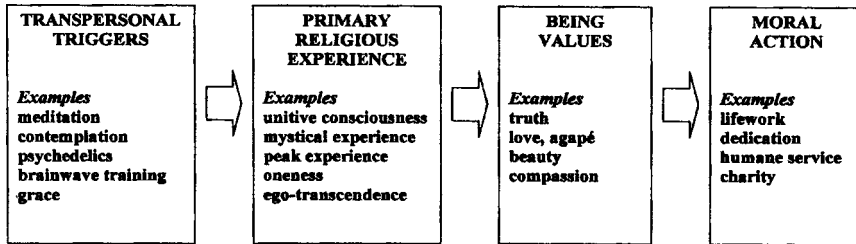
Here too, we see the complex of the transpersonal aspect of mystical states, Winkelman’s (2001) idea of “psychointegrators,” and the enduring changes Doblin (2001) found in his follow-up of the Good Friday Experiment.

But the title of Walsh’s (1988) article—“Two Asian Psychologies and their Implications for Western Psychologies”—brings up another clue, one that brings us to contemporary neuroethics. If mystical experiences occurring in culturally different societies lead to similar results, this may be due to the way our brains are structured and the way they work. (This is not to deny other possible reasons for this similarity; that’s why this similarity is only a clue, but, thanks to entheogens, it can become an experimental hypothesis.) Michael Gazzaniga (2005) proposes that “intrinsic moral reasoning” may be a capacity of our species: “[T]here could be a universal set of biological responses to moral dilemmas, a sort of ethics built into our brains” (p. xix). Might states of unitive consciousness activate these biological responses? Entheogens and other transpersonal triggers might be the required stimuli, or at least might nourish these brain processes.

By stifling research into entheogens, current drug policies are blocking entheogenic access to “intrinsic moral reasoning.” Despite their good intentions, these political decisions prohibit us from becoming more ethical. They lock us into self-centered mind-body states and the self-centered values that reside in them. It is worth noting in this regard that self-importance, Pride, is the kingpin of the seven deadly sins, and his gang of six are all ways of feeding Pride’s egoic pleasure. What happens when we knock off Pride? Figure 10.2 is a flow chart of a process of replacing ego-centered, pride-centered desires with higher motivations.

Can we admit some optimistic questions? Has the entheogen revival uncovered a hidden path of moral development? What would it mean to have

Figure 10.2 Moral Development: The Mystical Path



a more virtuous society? The possibilities that entheogens lead to higher values via a transpersonal path are certainly a lead that deserves experimental investigation. I expect it would support the claim that religions (at least their mystical traditions) have survival value.

Is sacredness a qualé? Is it a sensory quality like red, saltiness, or C-sharp, a basic sense perception whose nervous system pathways might be discovered and mapped? During some entheogenic states, sacredness seems to be a directly perceived qualé, and appears to reside in any number of objects, thoughts, or emotions. Perhaps we perceive sacredness simultaneously with these other things but misattribute this quality to them. Similarly, if we were naïve about the rural world, we might see a flowering tree when we are downwind of a pig farm and erroneously attribute the aroma of the pigs to the tree. Do we make a parallel misattribution with sacredness? Is sacredness, say, like dreams, a sort of internal, brain-generated perception? Then do we misattribute sacredness to our contemporaneous perceptions, location, thoughts, or beliefs? That is, do we project (in the psychological sense) our inner perception of sacredness outward onto inappropriate objects? Do we do this always, frequently, sometimes, never? If so, how are we to determine what is or isn't sacred?

Conversely, perhaps everything *is* sacred, and primary religious experiences allow us to perceive what we have missed in our mundane mind-body state. Entheogenic experiments may help answer these questions (or perhaps muddy them). But our failure to examine this topic is nothing less than spiritual cowardliness.

Are meaningfulness, portentousness, adoration, self-transcendence, and awe brain-built spiritual qualia? Are they too directly perceived rather than being cognitive conclusions? During primary religious experiences, some qualities seem to be arrived at through rational cognitive processes. Ineffability, for example, seems like a thought. I experience sacredness, however, as if it were a direct perception. I can imagine someone having this experience and applying "sacred" to whatever he or she is considering at the time.

If this is true, at least for some people some of the time, how is someone to determine what is truly sacred and when is sacredness merely applied? Worse

yet, maybe sacredness is only a sense we project onto the world. There goes religion! If this is true of sacredness, what about the other qualities of mystical experiences? Philosophers will have a picnic with this conundrum. Could philosophers design experiments to inform this discussion?

Extending the question, how do everyday recognized qualia vary from one mind-body state to another? Do other qualia reside in other mind-body states? If qualia depend on a self-observer, where do self-transcendent states fit in? Using entheogens for philosophical inquiry, it might become possible to collect subjective reports on these questions and at the same time chart what is going on in our brains.

The president of the psychology of religion division in the American Psychological Association, Israella Silberman (2005), proposed that much of the sometimes-conflicting results that research on religion provides might be resolved by a meaning-system approach. The research she cites is predominantly descriptive, correlational, historical, and survey. The plight of being stuck with these kinds of research is a methodological problem for religious studies, and it's one that entheogens can solve. A common report of people who have had mystical experiences (entheogenic or otherwise) is that they feel a heightened sense of coherence, purpose, and meaning in their lives. Using entheogens as independent variables (if and when this becomes legal) would allow researchers to advance the state of knowledge with experimental studies on meaning. Instead of waiting for religious peak experiences to happen at random, it is possible to greatly increase their occurrence. Instead of using mystics' reports from hundreds—and even thousands—of years ago and questionable translations of their reports, we can study fresh experiences occurring today. Instead of depending on people who may be inclined toward peak experiences, pharmatheological researchers could study a broader sample of the human population. The varieties of substances and their doses, subjects' mindsets, temperaments, personality variables, and belief systems, social contexts, and church affiliations provide practically endless combinations. Instead of making questionable cross-cultural assumptions, we could examine both cultural context and brain processes using standard doses, treatments, and measures. Here again, we see how entheogens could advance the state of the art.

Attraction to the Holy as the Origin of Religion

If one uses any of the transpersonal models of the human mind such as those of Grof or Jung, Buddhism or other Eastern psychologies, or transcendental Christianity, then exploring one's mind is naturally a movement toward its spiritual parts. From this perspective—eventually and taken far enough—the psychological path of self-knowledge turns into a spiritual

path to self-transcendence. This turns most twentieth-century psychology, with its antireligion bias, on its head. Is there an inborn desire to take this journey? Psychedelicists' inner voyages often sight spiritual lands. Could this be one reason some people, consciously or unconsciously, want to take psychoactive drugs?

What parts of our brains are involved in this voyage? Is this quest an emergent property of brain-and-body? Since mystical experiences are the most rewarding events a human can experience, how are our pleasure centers involved? Once someone has had a powerful mystical experience, does this establish neural circuits that beg for activation afterward? Do mystical experiences produce some sort of rapid neuroplasticity that establishes mystical circuits and/or activates or connects ones lying dormant? Is our society remiss in providing unhealthy ways to take these quests and not providing healthy ways? Bill Wilson, founder of Alcoholics Anonymous (1984), arrived at this conclusion:

[It was not] the material itself [that] actually produces these experiences. It seems to have the result of sharply reducing the forces of the ego—temporarily, of course. It is a generally acknowledged fact in spiritual development that ego reduction makes the influx of God's grace possible. If, therefore, under LSD we can have a temporary reduction, so that we can better see what we are and where we are going—well, that might be of some help. The goal might become clearer. So I consider LSD to be of some value to some people, and practically no damage to anyone. It will never take the place of any of the existing means by which we can reduce the ego, and keep it reduced. (p. 370)

We crave oneness, but we live in a society that seldom acknowledges this motivation and provides worthless substitutes and even dangerous social ones such as authoritarianism, consumerism, and ersatz chemical ones such as alcohol. Why are people who have had mystical experiences less likely to be authoritarian, and why do some alcoholics drop their addiction after having a mystical experience? Could we use entheogens to provide healthy ways to oneness, unity, and sacredness? Entheogens move these questions from armchair suppositions to experimental hypotheses.

Bill Wilson "was enthusiastic" about his LSD experience: "he felt it helped him eliminate many barriers erected by the self, or ego, that stand in the way of one's direct experience of the cosmos and of God" (pp. 370–371). Hundreds of clinical-psychotherapeutic studies using psychedelics have been done with alcoholics and for other indications (Mangini, 1998; Passie, 1997). These should help pastoral counseling and supply leads for pharmatheologians.

Historically, did entheogens spark the religious imagination and play a significant role in the origins of religions—shamanic, ancient, and modern? In concert with Barnard's (1966) drug-plant theme, the landmark works of

R. Gordon Wasson stand out in the field of pharmatheology. Wasson (1968) claims to have unraveled the mysterious identity of the god-plant soma from the *Rig Veda*:

There is I think an inference that we may draw: a plant with properties that could be plausibly named Herb of Immortality responded to man's deepest desires in the early stage of his intellectual development. The superb fly-agaric gave him a glimpse of horizons beyond any that he knew in his harsh struggle for survival, of planes of existence far removed and above his daily round of besetting cares. It contributed to the shaping of his mythological world and his religious life. (p. 210)

Wasson's books track the religious uses of psychoactive mushrooms around the world from the mysteries of ancient Greece (Wasson, 1968; Wasson, Hofmann, & Ruck, 1978) through contemporary uses. In Riedlinger (1990), Brown (1990) lists Wasson's bibliography. So many people have followed Wasson's path in looking at other cultures and other entheogens that he is considered one of the founders of ethnobotany and the father of ethnomycology (Riedlinger, 1990).

While botany is often left out of neurotheology discussions, the work of Wasson and his followers invites this science back into the fold. Determining what roles psychoactive plants played in the origins and development of religions can occupy specialists in this branch of ethnobotany for decades to come. To include the full range of data and to test the validity of their claims, future generations of ethnobotanists and religiobotanists should have personal experiences with these plants.

From an entheogenic perspective, even geology can contribute to understanding brain-religion connections. According to Hale, de Boer, Chanton, and Spiller (2003), the Delphic oracles in ancient Greece were seated above a fissure in the ground that emitted psychoactive gas, thus permitting them to enter altered mind-body states. When an earthquake closed the fissure and blocked the gas, the oracles lost their power. Here we see yet another instance of how an entheogenic perspective allows scientists from a previously excluded discipline to consider new hypotheses and contribute entheogenic insights to religion.

Consilience

Remarkably, entheogens provide an opportunity to study both reductive and emergent causation within a systematic program of interlocking experiments. In the reductive studies, entheogens can be administered and their effects measured on, say, receptor sites and brain structures. At a higher level of organization, we can examine their effects on cognition, beliefs, values, and theology. Looking at downward or emergent causation, we can ask how personality variables, novelty-seeking or harm-reducing

temperaments, cognitions and beliefs, theism/atheism, knowledge about entheogens, church acceptance/rejection might affect both entheogens' physiological activity and our interpretations of them. Thus, entheogens and their mind-body siblings provide tools for interlevel studies. They can advance us toward interacting networks of ideas and experiments that integrate the sciences and humanities, thus advancing Edmund O. Wilson's goal of consilience (1998).

The examples of Nichols, Mullis, and Crick in biological studies may reveal parallel strategies for inventing new insights in religious studies and elsewhere. When scientists and humanists can experiment with entheogens and other mind-body techniques, they might solve problems, formulate new questions, refine concepts, and invent new ideas. So far this chapter has sampled entheogenic aspects of mysticism, primary religious experience, neurotheology, the Good Friday Experiment, innate spiritual nature, spiritual healing and psychotherapy, cognitive studies, credibility research, mind-body invention, neuroethics and values, moral development, qualia, meaningfulness, holytropy, the origins of religion, and consilience. To recall Barnard's quotation, do entheogens cause us to think of things we had never thought of before? It is hard to answer "no." But the implications of entheogens reach beyond the sciences and humanities to church and society too. Just as questions in the sciences and humanities meld together, this blend leads to more churchly topics.

QUESTIONS ABOUT CHURCH AND POLITY

Increasing Spiritual Intelligence

Vaughan (1983) describes five kinds of spiritual learning: theological knowledge, interfaith acceptance, personal insight, spiritual practice, and psychological understanding:

The perennial philosophy and the esoteric teaching of all time suddenly made sense. I understood why spiritual seekers were instructed to look within, and the unconscious was revealed to be not just a useful concept, but an infinite reservoir of creative potential. I felt I had been afforded a glimpse into the nature of reality and the human potential within that reality, together with a direct experience of being myself, free of illusory identification and constrictions of consciousness. My understanding of mystical teaching, both Eastern and Western, Hindu, Buddhist, Christian, and Sufi alike, took a quantum leap. I became aware of all great religions, and understood for the first time the meaning of ecstatic states. (p. 109)

Vaughan (1983) describes increased intellectual understanding and personal insights that her psychedelic experience produced. While most first-person accounts describe psychedelics' perceptual razzmatazz, her thoughtful essay

describes spiritual, psychological, and intellectual growth. Vaughan's increased understanding is not just cognitive knowledge *about* these topics, but first hand direct, personal experience *of* them. Subsequently, she obtained a doctorate in clinical psychology, served as president of the Association for Transpersonal Psychology, and wrote and co-edited books on psychospiritual growth (e.g., Vaughan 2001; Walsh & Vaughan, 1993). As is often the case, her personal entheogenic experience contributed meaningful direction to both her professional and personal life.

Have we—unintentionally, even unknowingly—discovered (perhaps rediscovered) a way to increase spiritual intelligence? Two current definitions of intelligence suggest so. Harvard psychologist Howard Gardner (1983) defines intelligence as “the ability to solve problems or provide goods and services of value to a society.” By helping her solve problems in the spiritual domain, entheogens boosted Vaughan's spiritual, or existential, intelligence. Robert Sternberg (1988) defines intelligence as “mental self management.” By allowing us to manage direct encounter with the holy, entheogens give us greater self-management, higher intelligence, control over the spiritual aspect of our lives.

I find myself stunned by the implications—and excited. Perhaps we have discovered a way to increase spiritual intelligence and can design programs to increase spiritual intelligence. At the very least this would take careful selection of participants, preparation, and follow-up. People to lead entheogenic spiritual sessions would need training in psychospiritual skills. What would it mean to humanity's future to increase spiritual intelligence? I believe it is a moral, spiritual, and sacred duty to examine the feasibility of this idea (Roberts, 2001, p. 237).

The entheogenic use of psychedelics illustrates a more comprehensive theory of the human mind (Roberts, 2006); behind the intelligence of skillfully using each mind-body state lies the metaintelligence of skillfully selecting the most appropriate mind-body program for the purpose at hand.

Entheogen-induced primary religious experiences might also help selected, prepared seminarians and others in religious professions rededicate themselves to their callings. Might a religious order or guild take on this responsibility? Doblin's follow-up study of the Good Friday subjects found more of those who had psilocybin-boosted mystical experiences remained in the clergy than those who didn't, but the small size of the sample doesn't give a statistically significant result. In personal communications, clergy have told me their entheogenic sessions periodically reinvigorate their dedication to their calling.

Would entheogenic spiritual experiences be appropriate for the laity? Could current religions adjust to them? Lawrence Bush (2002) sees Judaism benefiting from entheogens:

Apart from legal impediments, why shouldn't psychedelic drugs be used in Jewish life as they have been in other faith traditions—as a tool for wrenching

open the mind and heart to “God’s presence”? Why not embrace the spiritual power of the psychedelic experience and try to elevate it, as we do with sexuality, above the recreational and into the sacramental zone? Why shouldn’t the roster of Jewish life-passages include the opportunity to have a psychedelic experience (perhaps after the age of forty, Judaism’s traditional age of enlightenment and mystical initiation, or perhaps at an earlier stage of development)—with rabbinic guidance and community approval? If Abraham’s Voice and Moses’ Burning Bush and the Revelation at Sinai are the archetypal encounters that inform our faith, why not strive to recreate such experiences throughout our “nation of priests”? (p. 91)

Entheogens suggest reinterpretation of religious texts and ceremonies—for example, soma in Hinduism (Wasson, 1968), possible references to entheogens in Judaism and early Christianity (Merkur, 2001), and the ancient Greek mysteries at Eleusis (Wasson, Hofmann, & Ruck, 1978). Entheogens also increase our understanding of anthropological and archeological findings on religion (Rudgley, 1993).

Experimental Chrismation

Bennett (2003) and (Ruck, 2003) contend that the oils used in the ancient Near East anointment ceremonies, including Judaism and early Christianity, contained psychoactive ingredients, particularly cannabis:

So, did Jesus use cannabis? I think so. The word Christ does mean “the anointed one” and Bennett contends that Christ was anointed with chrim, a cannabis-based oil, that caused his spiritual visions. The ancient recipe for this oil, recorded in Exodus, included over 9lb of flowering cannabis tops (known as *kaneh-bosem* in Hebrew), extracted into a hin (about 11 pints) of olive oil, with a variety of other herbs and spices. The mixture was used in anointing and fumigations that, significantly, allowed the priests and prophets to see and speak with Yahweh. (Ruck, 2003)

The archeology of entheogens is a growing specialty, and scholars are paying more attention to ancient ways of producing and using psychoactive plants (*Eleusis*, 2001+; Ruck, Staples, & Heinrich, 2001; Rudgley, 1993). Reenactments of these possible historical events under laboratory conditions or in religious settings or clinical laboratories via chrismation experiments could test these claims, supporting or weakening the credibility of this alleged part of religious history. Institutional review boards may need some convincing.

What ideas and interpretations gain credibility for entheogen-informed people? Will existing churches, seminaries, and religious study programs be able to incorporate entheology as Lucas-Caldwell (2001) defines it?

Entheology is that branch of theology which deals with the experience and/or knowledge of the divine, and of the revelation of that divine, through the agency of psychoactive substances (used as sacraments), be it a revelation of the divine within and/or without the individual. (p. 147)

What religious rituals and practices will evolve from entheogens? The rituals of the syncretic Christian ayahuasca-using churches from Brazil such as the Santo Daime and Uniao do Vegetal are being adapted in churches in the Netherlands and in the United States. Lucas-Caldwell (2001) and Stolaroff (2001) examine whether these, or additional adaptations, are appropriate for followers of other churches. Would existing Eucharistic services gain profundity and real (rather than symbolic) meaning with entheogens?

Because entheogenic peak experiences are only temporary states, it is not clear whether they can be converted into permanent personal traits too and become enduring steps of spiritual development. Smith (1976) raised this issue: “the goal, it cannot be stressed too often, is not religious experiences: it is the religious life” (p. 155). This theme also was addressed by the Council on Spiritual Practices (2001), where Walsh (2001) warned:

This challenge concerns the limited capacity we seem to have to catalyze ongoing development as a result of a single experience. What are the issues here? I think we need to distinguish two distinct dimensions of thinking about this problem of stabilizing any insights or breakthroughs obtained in drug-assisted therapy. We need to think of both the developmental stages and the psychological processes that are involved in transpersonal growth. (p. 21)

A swarm of questions arises. Who benefits, and who doesn't? What developmental stages and cognitive processes can help the transition from a transient mystical state to spiritual trait? Are different treatments appropriate for different ages, temperaments, levels of cognitive development, and spiritual stages? Why are some people who have had mystical experiences with psychedelics able to integrate them but others have been unable to integrate them? Can levels of readiness be strengthened by preparation, such as meditation or other spiritual practice? Are there ways to assess readiness?

New Religious Movements

Consider the possible effects that entheogens have already had on current religious practice, ritual, ethics, and the religious community:

A recent poll of over 1,300 Americans engaged in Buddhist practice showed that 83 percent had taken psychedelics . . . and 71 percent believed that psychedelics can provide a glimpse of the reality to which Buddhist practice points. (Barlow, 1996, pp. 86–87)

How does religiosity—religious activities within established religious structures and outside of them, including attendance at ceremonies, prayer, meditation, religion-motivated service, group or independent study—change with primary religious experience? Are experienced-based religions drawing people away from word-based, belief-based, text-based religions? Psychologically, is perception winning over cognition? Theologically, is primary religious experience outscoring theology? Could mainstream Protestantism revivify itself with entheogens?

With the redefinition (or at least expansion) of religion as experience-based, all the brain-mind-religion questions that researchers have asked about cognition-based religion get re-asked of experiential religion. For example: “What are our brains doing when we have such experiences?” Because our knowledge about our brains and our skill at influencing them are advancing so quickly, scientists may develop new methods of describing brain occurrences. Now, thanks to entheogens, we can add experimental mysticism to that mixture. Now that primary religious experiences can be experimentally induced, their activity in the nervous system can be mapped, their theological effects documented, and resulting shifts in values and social activity described (Pahnke & Richards, 1966; Smith, 2000).

Although seldom organized into religious communities, do entheogenists qualify as a new religious movement but one with dispersed membership rather than an organized church body? If so, it will be hard for them to become visible as most people (mistakenly) think of a system of rituals and beliefs as needing an organization to qualify as a religion.

Democratizing Primary Religious Experience

Perhaps we are experiencing a reorganization in Western religions now, parallel in some ways to the one that occurred around 1500. Before then, religious rites were the main religious activity for the ordinary person (not monks, nuns, or priests). Being religious primarily meant attending mass on Sunday; participating in church festivals, rites, and rituals; praying, and other religious activities and observances.

When the printing press and movable type democratized access to biblical (and other) texts, the emphasis changed from ritual to word. While older religious observances of the previous period sustained, new word-centered activities such as reading texts and interpreting them overlay the older religion-as-rite. New interpretations resulted, new churches flourished, and text became a standard for judging religion. Over time, the locus of Western religion shifted from rites to reading, from observances to Bible, from participation to verbalization. In contrast to pre-1500, we approach religion verbally, as cognitions—through words such as language, texts, speaking, beliefs, catechisms, dogma, doctrines, and theology. This emphasis

(perhaps overemphasis) on words shows up today in the way we describe religions—with words. We ask: “What do you believe?” not “What rituals do you perform?” Older, preliterate rites certainly remain and have been updated, but they lie obscured beneath a 500-year blizzard of words.

Is this transition going on today? Are we moving from concept-based religion to experience-based religion, from belief to primary religious experience? Whether this is a major theme in current religious life, it certainly is a leitmotiv. Perhaps Western religion is in the early stages of adding another layer of direct experience on top of word-based religion and rite-based religion. For spiritual guidance, verbalists consult the written word of God; mystics consult their direct experience of God.

A broader, cultural shift away from a single-state view of the human mind toward a multistate view supports this transition in religion (Roberts, 2006). Recognizing our minds’ ability to create and manage many mind-body states provides a friendly intellectual context for entheogens, and at the same time entheogens contribute their strand to this larger cultural tapestry. This chapter considers some benefits the entheogen family of psychotechnologies brings to religion. Other mind-body psychotechnologies and the states they produce may offer additional benefits.

Is the reprogrammable brain adaptigenic?

I hope this chapter will catalyze thinking about these questions. Behind these particular questions are some prior questions whose answers will determine how the questions in this chapter will be addressed.

Social and Constitutional Questions about Religious Liberty

As with classic paradigm shifts, entheogens formulate new kinds of questions.

- Are the questions in this chapter religious, spiritual, legal, biological, medical, or political—or all of the above?
- Are entheogen-assisted primary religious experiences authentic? What criteria should be used? Who gets to decide this?
- Who knows most? People who have had these experiences or people who haven’t?
- Who has the knowledge, right, and responsibility to decide the answers to the questions in this chapter? Each individual person, churches and clergy, medical doctors and health agencies, politicians, police, legislators, mental health professionals, members of a professional organization?

In a country that is dedicated to individual freedom of conscience and to the separation of church and state, what policy and legal hurdles do entheogens

present? Who has the right to decide the future of religion? Can current laws accommodate entheogens? The Center for Cognitive Liberty & Ethics and its publication *The Entheogen Law Reporter* (2005) address these complex social thorns and their legal complexities. Thanks to entheogens, experimental scientific and humanistic research can inform our decisions on the questions in this chapter. Although they won't answer the questions, at least we can be better informed.

SUMMARY—TOWARD PHARMATHEOLOGY

At the beginning of this chapter, we considered Mary Barnard's speculation that psychoactive plants probably had "an almost explosive effect on the largely dormant minds of men, causing them to think of things they had never thought of before." They did, and they still do. For neurotheology, the questions we've considered are the seeds for many more to come. Barnard's (1966) essay ends with these words:

Looking at the matter coldly, unintoxicated and unentranced, I am willing to prophesy that fifty theo-botanists working for fifty years would make the current theories, concerning the origins of much mythology and theology as out of date as pre-Copernican astronomy. I am the more willing to prophesy, since I am, alas, so unlikely to be proved wrong. (p. 24)

It has been over 40 years since Barnard's essay first appeared. And despite jail, interrogation, and the drug war, the last 40 years has seen remarkable advances in entheogenic studies. When legal, controlled psychedelic studies are resumed in the sciences, humanities, and religion, we can expect "an almost explosive effect on the largely dormant minds of men, causing them to think of things they had never thought of before." Dare we enter this realm? Dare we not?

REFERENCES

- Alcoholics Anonymous. (1984). *"Pass it on": The story of Bill Wilson and how the A.A. message reached the world*. New York: Alcoholics Anonymous World Services.
- Barlow, J. P. (Fall 1996). Psychedelics and Buddhism: Introduction and Liberty and LSD. *Tricycle: The Buddhist Review*. Retrieved June 13, 2006, from http://www.tricycle.com/issues/tricycle/6_1/special_section/1495-1.html.
- Barnard, M. (1966). *The mythmakers*. Athens: Ohio University Press. (Originally published 1963, *American Scholar*, 32, 578–586).
- Bennett, C. (2003, February). Was Jesus a stoner? *High Times*, 69–72. Retrieved June 13, 2006, from <http://www.420.com/nt/news/content.php?bid=31&aid=2>.
- Borg, J., Bengt, A., Soderstrom, H., & Farde, L. (2003). The serotonin system and spiritual experiences. *American Journal of Psychiatry*, 11, 1965–1969.

- Brown, J. (1990). Appendix II: Bibliography: R. Gordon Wasson and Valentina Pavlovna Wasson. In T. Riedlinger (Ed.), *The sacred mushroom seeker: Essays for R. Gordon Wasson* (pp. 257–263). Portland, OR: Dioscorides Press.
- Bush, L. (2002). Drugs and Jewish spirituality. In S. Grob (Ed.), *Hallucinogens: A reader* (pp. 82–93). New York: Tarcher/Putnam.
- Center for Cognitive Liberty & Ethics. (n.d.). Retrieved September 1, 2005, from <http://www.cognitiveliberty.org/>.
- Connor, S. (1997). "God spot" in brain found? *Sightings*. Retrieved June 13, 2006, from <http://www.rense.com/ufo/godspot.htm>.
- Council on Spiritual Practices. (2001). Code of ethics for spiritual guides. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 250–251). San Francisco: Author.
- Doblin, R. (1994). Laying the groundwork. *Newsletter of the Multidisciplinary Association for Psychedelic Studies*, 4(4). Retrieved June 13, 2006, from <http://www.maps.org/news-letters/v04n4/04401lay.html>.
- Doblin, R. (2001). Pahnke's Good Friday Experiment: A long-term follow-up and methodological critique. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 71–79). San Francisco: Council on Spiritual Practices.
- Eleusis: Journal of Psychoactive Plants and Compounds*. (2001+). New Series. Museo Civico di Rovereto (Italy).
- Entheogen Law Reporter*. (2005). Center for Cognitive Liberty & Ethics, Davis, CA.
- Entheology.org. (2005). Retrieved September 1, 2005, from <http://www.entheology.org/>.
- Fadiman, J. R. (1965). *Behavior change following psychedelic (LSD) therapy*. Unpublished doctoral dissertation, Stanford University.
- Forte, R. (Ed.). (1997). *Entheogens and the future of religion*. San Francisco: Council on Spiritual Practices.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Gazzaniga, M. S. (2005). *The ethical brain*. New York: Dana Press.
- Grof, S. (1975/1993). *Realms of the human unconscious: Observations from LSD research*. New York: Dutton. (Reprinted in 1993 by Souvenir Press, London.)
- Grof, S. (1980). *LSD psychotherapy*. Pomona, CA: Hunter House.
- Grof, S. (2001). Entheogens as catalysts for spiritual development. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 27–45). San Francisco: Council on Spiritual Practices.
- Hale, J. R., de Boer, J. Z., Chanton, J. P., & Spiller, H. A. (2003). Questioning the Delphic oracle. *Scientific American*, 66–73.
- Hansen, K. (2001). The birthing of transcendental medicine. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 207–217). San Francisco: Council on Spiritual Practices.
- Hood, R. W., Jr. (1975). The construction and preliminary validation of a measure of reported mystical experience. *Journal for the Scientific Study of Religion*, 14(1), 29–41.
- Hood, R. W., Jr., Morris, R. J., & Watson, P. J. (1993). Further factor analysis of Hood's Mysticism Scale. *Psychological Reports*, 73(1), 1176–1178.

- Horgan, J. (2005, February 26). Psychedelic medicine: Mind bending, health giving. *New Scientist*, 2488, 36–39. Retrieved June 9, 2006, from <http://www.newscientist.com/article.ns?id=mg18524881.400&print=true>.
- Hruby, P. (2001). Unitive consciousness and Pahnke's Good Friday Experiment. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 59–69). San Francisco: Council on Spiritual Practices.
- Huxley, A. (1954). *The doors of perception*. New York: Harper & Row.
- James, W. (1982/1902). *The varieties of religious experience: A study in human nature*. New York: Penguin Books. (Original work published 1902)
- Küng, H., Ess, J., von Stietencron, H., & Bechert, H. (1986). *Christianity and the world religions: Paths to dialogue with Islam, Hinduism and Buddhism*. Garden City, NY: Doubleday.
- Kurtzweil, P. (1995, September). Medical possibilities for psychedelic drugs. *FDA Consumer*. Retrieved June 9, 2006, from http://www.fda.gov/fdac/features/795_psyche.html.
- Learner, M., & Lyvers, M. (2004). Cross-cultural comparison of values, beliefs, and sense of coherence in psychedelic drug users. *Bulletin of the Multidisciplinary Association for Psychedelic Studies*, 14(1), 9–10.
- Lucas-Caldwell, A. M. (2001). What is entheology? In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 147–153). San Francisco: Council on Spiritual Practices.
- Mangini, M. (1998). Treatment of alcoholism using psychedelic drugs: A review of the program of research. *Journal of Psychoactive Drugs*, 30(4), 381–418.
- Mangini, M. V. (2000). "Yes, Mom took acid." *The sociohistorical influence of prior psychedelic drug use in adults*. Unpublished doctoral dissertation, University of California, San Francisco.
- MAPS Bulletin*. (1990+). Multidisciplinary Association for Psychedelic Studies, Sarasota, FL.
- Merkur, D. (2001). Manna, the showbread, and the eucharist: Psychoactive sacraments in the Bible. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 139–145). San Francisco: Council on Spiritual Practices.
- Multidisciplinary Association for Psychedelic Studies. (n.d.). Retrieved September 1, 2005, from www.maps.org.
- Nichols, C. D., & Sanders-Bush, E. (2002). A single dose of lysergic acid diethylamide influences gene expression patterns within the mammalian brain. *Neuropsychopharmacology*, 26(5), 634–642.
- Nichols, D. E. (1999–2000). From Eleusis to PET scans: The mysteries of psychedelics. *MAPS Bulletin*, 9(4), 50–55.
- Nichols, D. E. (2004). Hallucinogens. *Pharmacology and Therapeutics*, 101, 131–181.
- Pahnke, W. N. (1963). *Drugs and mysticism: An analysis of the relationship between psychedelic drugs and the mystical consciousness*. Unpublished doctoral dissertation, Harvard University.
- Pahnke, W. N., & Richards, W. A. (1966). Implications of LSD and experimental mysticism. *Journal of Religion and Health*, 5(3), 175–208.
- Passie, T. (Ed.). (1997). *Psycholytic and psychedelic therapy research 1931–1995*. Hannover, Germany: Laurentius.

- Rees, A. (2004, August 8). Nobel Prize genius Crick was high on LSD when he discovered the secret of life. *Mail on Sunday* (London), Section FB, 44–45.
- Riedlinger, T. J. (Ed.). (1990). *The sacred mushroom seeker: Essays for R. Gordon Wasson*. Portland, OR: Dioscorides Press.
- Roberts, T. B. (1998). States of unitive consciousness: Research summary. *San Francisco: Council on Spiritual Practices*. Retrieved June 9, 2006, from http://csp.org/experience/docs/unitive_consciousness.html.
- Roberts, T. B. (1999). Do entheogen-induced mystical experiences boost the immune system? Psychedelics, peak experiences, and wellness. *Advances in Mind-Body Health*, 15, 139–147.
- Roberts, T. B. (Ed.). (2001). *Psychoactive sacramentals: Essays on entheogens and religion*. San Francisco: Council on Spiritual Practices.
- Roberts, T. B. (2005). *Entheogens—sacramentals or sacrilege? Working design for a university course*. Retrieved June 9, 2006, from http://www.cedu.niu.edu/epf/edpsych/faculty/roberts/index_roberts.html.
- Roberts, T. B. (2006). *Psychedelic horizons: Snow White, immune system, multistate mind, enlarging education*. Essex, England: Imprint Academic.
- Roberts, T. B., & Hruby, P. J. (Eds.). (1995–2003). *Religion and psychoactive sacraments: An entheogen chrestomathy*. San Francisco: Council on Spiritual Practices. Retrieved June 9, 2006, from <http://csp.org/chrestomathy>.
- Roberts, T. B., & Hruby, P. J. (1996). *Entheogens—Return of the ostracized*. Paper sponsored by the Religion and Education Special Interest Group at the Annual Meeting of the American Educational Research Association, New York.
- Roberts, T. B., & Winkelman, M. (Eds.). (in press). *Hallucinogens and healing: New scientific evidence for psychedelic substances as treatments*. Westport, CT: Praeger.
- Ruck, C. A. P. (2003, January 12.) Was there a whiff of cannabis about Jesus? *Sunday Times* (London). Retrieved June 13, 2006, from <http://www.ukcia.org/news/shownewsarticle.php?articleid=5906>.
- Ruck, C. A. P., Bigwood, J., Staples, D., Ott, J., & Wasson, R. G. (1979). Entheogens. *Journal of Psychedelic Drugs*, 11(1–2), 145–146.
- Ruck, C. A. P., Staples, B., & Heinrich, C. (2001). *The apples of Apollo: Pagan and Christian mysteries of the Eucharist*. Durham, NC: Carolina Universities Press.
- Rudgley, R. (1993). *Essential substances in society: A cultural history of intoxicants in society*. New York: Kodansha International.
- Shanon, B. (2002). *The antipodes of the mind: Charting the phenomenology of the ayahuasca experience*. Oxford, England: Oxford University Press.
- Silberman, I. (2005). Religion as a meaning-system: Implications for individual and societal well-being. *Psychology of Religion Newsletter*, 30(2), 1–9.
- Smith, H. (1976). *Forgotten truth: The primordial tradition*. New York: Harper & Row.
- Smith, H. (2000). *Cleansing the doors of perception: The religious significance of entheogenic plants and chemicals*. New York: Tarcher/Putnam.
- Smith, H. (2001). Do drugs have religious import? A thirty-five year retrospect. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 11–18). San Francisco: Council on Spiritual Practices.
- Stace, W. T. (1961). *Mysticism and philosophy*. London: Macmillan.

- Sternberg, R.J. (1988). *The triarchic mind: A new theory of human intelligence*. New York: Penguin.
- Stolaroff, M.J. (1994). *Thanatos to eros: Thirty-five years of psychedelic exploration*. Berlin: Verlag für Wissenschaft und Bildung.
- Stolaroff, M. (2001). A protocol for a sacramental service. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 155–163). San Francisco: Council on Spiritual Practices.
- Tart, C. T. (1969). *Altered states of consciousness*. Garden City, NY: Doubleday.
- Toolan, D. (1987). Facing west from California shores: A Jesuit's journey into new age consciousness. New York: Crossroads.
- Van Dusen, W. (1961). LSD and the enlightenment of Zen. *Psychologia*, 4, 11–16.
- Vaughan, F. (1983). Perception and knowledge: Reflections on psychological and spiritual learning in the psychedelic experience. In L. Grinspoon & J. Bakalar (Eds.), *Psychedelic reflections* (pp. 108–114). New York: Human Sciences Press.
- Vaughan, F. (2001). *The inward arc: Healing in psychotherapy and spirituality*. Backinprint.com.
- Walsh, R. (1988). Two Asian psychologies and their implications for western psychologies. *American Journal of Psychotherapy*, 42(4), 543–560.
- Walsh, R. (2001). From state to trait: The challenge of transforming transient insights into enduring change. In T. Roberts (Ed.), *Psychoactive sacramentals: Essays on entheogens and religion* (pp. 19–24). San Francisco: Council on Spiritual Practices.
- Walsh, R., & Grob, C. (Eds.). (2005). *Higher wisdom: Eminent elders explore the continuing impact of psychedelics*. Albany: State University of New York Press.
- Walsh, R., & Vaughan, F. (Eds.). (1993). *Paths beyond ego: The transpersonal vision*. Los Angeles: Tarcher/Perigee.
- Wasson, R. G. (1968). *Soma: The divine mushroom of immortality*. New York: Harcourt Brace Jovanovich.
- Wasson, R. G., Hofmann, A., & Ruck, C. A. P. (1978). *The road to Eleusis*. New York: Harcourt Brace Jovanovich.
- Wilson, E. O. (1998). *Consilience: The unity of knowledge*. New York: Knopf.
- Winkelman, M. (2000). *Shamanism: The neural ecology of consciousness and healing*. Westport, CT: Bergin and Garvey.
- Winkelman, M. (2001). Psychointegrators: Multidisciplinary perspectives on the therapeutic effects of hallucinogens. *Complementary Health Practice Review*, 6(3), 219–237.
- Winkelman, M. (2002). Psychointegrators: The psychological effects of entheogens. *Entheos: The Journal of Psychedelic Spirituality*, 2(1), 51–61.
- Wulff, D. (1991). *Psychology of religion: Classic and contemporary views*. New York: Wiley.

AN ILLUSION OF THE FUTURE: TEMPTATIONS AND POSSIBILITIES

Keith G. Meador

The previous chapters in this volume provide an intriguing context within which to reflect theologically on substantive conceptual and methodological issues within the “religion and brain” conversation. My comments are far from exhaustive with regard to the thoughtful and notable varied contributions contained in this volume, but will provide some overview of relevant, broad conceptual issues that arise with some regularity and then engage individual chapters as constructive.

Sigmund Freud challenged the religious community of his day with a work titled *The Future of an Illusion* (Freud, 1928) in which he anticipated the “science” of psychoanalysis freeing us from the neurotic needs for religion as he understood them. During the three-quarters of a century since *The Future of an Illusion* was first published, the more illusory dimension of this conversation has proven to be Freud’s presumption that psychoanalysis was a science in the fullness of the scientific claims of late nineteenth and early twentieth centuries. The assumptions of explanatory power embodied within the positivistic notions of early psychoanalytic metapsychologies have appeared increasingly naïve and limited in their capacities to explain human nature, motivation, and intention.

While elegant and seductive in their creativity and intellectual lure, efforts to systematize human experience through reified metapsychological structures and theories while isolating understandings of the experiences from contextualized lives that can be intelligibly narrated have proven to be unproductive. As we attempt to engage “religion” in relation to health and behavior we could find ourselves similarly seduced into “illusions” regarding

the reducibility of “religion” to a decontextualized biological phenomenon that is amenable to measurement and “scientific” examination independent from a community of spiritual practice and theological interpretation. Although many within the current religion and health conversation would intend to promote a very different endpoint than Freud in regard to religion, efforts to codify human experiences as being “religious” or even “spiritual” that have been abstracted from contexts and communities of interpretation and practice have questionable intelligibility (MacIntyre, 1981).

Even though many participants in the current wave of “religion and brain” research might want to challenge Freud’s reductionistic inclinations regarding religion and the implications his work embodied, there may be more in common between the current movement and Freud’s agenda than one would initially realize. Freud and the current “religion and brain” studies are genuinely interesting and intellectually intriguing with regard to human experience and the mechanism and significance of neurobiological correlates with these experiences. That said, one substantive question that arises is the issue of what this has to do with “religion” or “spirituality?” What makes an experience religious or spiritual? Is some prior socially and historically mediated context of formation and acculturation not required to provide the language and interpretive capacity through which an experience is narrated? A number of the chapters in this book discuss or allude to these questions and I specifically examine some of their proposed perspectives, but the centrality of the question for all of this work needs to be highlighted for consideration.

Anne Taves (1999) clarifies that “the experience of religion cannot be separated from the communities of discourse and practice that gave rise to it *without becoming something else*” (p. 353). As a historian of religious experience from John Wesley to William James, she offers a comprehensive and thorough account of religious experience as typically considered within the American story of pietistic individualism. The dependency on social and historical context for interpreting and giving meaning to experiential phenomena (Madsen, Sullivan, Swidler, & Tipton, 2002) is a notion broadly acknowledged within much current thought. That does not mean this perspective is without detractors, but the burden is generally considered to be upon the detractors—in particular, those who reject the notion that a socially and historically constructed interpretive capacity is implicit for making meaning and deriving coherence from personal experience. The degree to which an experience mediated through biological substrates (which is a characteristic of all known brain phenomena) is interpreted as being religious or not depends on the history and contextual formation of the person having the experience. This does not limit the potential personal, and perhaps even religious or spiritual, significance of the experience for the person so engaged, but a proper understanding of this delineation does help avoid excessive presumptions regarding the universal meaning

and interpretability of neurobiologically mediated phenomena independent of traditions, practices, and cultural context.

Within these considerations, I examine the contributions to this volume, providing conceptual and theological reflection and commentary while appreciating the commitment to thoughtful inquiry evident in all of the chapters. The first section of this essay focuses on Nichols and Chemel's chapter on neuropharmacology in companion to Park and McNamara's chapter on meaning, religion, and the brain. I then attend to the issues of health in regard to the proposed conceptual models considering Newberg and Lee's review of the religion and health relationship in conversation with Magyar-Russell and Pargament's frame for health risk factors and coping, along with Hansen and Norenzayan's engagement with the extrinsic/intrinsic religiosity conversation. Finally, I consider other issues arising within the volume with a review of the temptations and proposal of the possibilities presented by the work in this volume.

NEUROBIOLOGY, RELIGION, AND INTERPRETATION

Nichols and Chemel betray their misguided trajectory of approach with their title of "neuropharmacology of religion," as if they are starting from an acknowledged understanding of "religion" about which they will elucidate a neuropharmacological understanding. When they proceed to state that religion "deals with the supernatural and relies on intuition rather than rationale," and go on to say that "the 'mind' is one place science and religion meet," they frame their notion of religion and its intersection with science in a problematic fashion from the onset. This description of religion as a phenomenon of the "mind" and the "supernatural" leaves limited opportunity to understand religion as anything more than the subjective experience of an individual in relation to the supernatural, which when interpreted exclusively by the individual claiming the experience becomes nonfalsifiable and nonverifiable. While not lacking legitimacy as an empirically discerned, biologically mediated phenomenon, the narration of an experience as being "religious" depends on much more than the absolute "natural processes within the human body." The approach taken by Nichols and Chemel, which they acknowledge to be reductionistic, is intriguing if one acknowledges the inherent limitations with regard to how one describes the neuropharmacologically induced experiences they want to explore. But, without such qualifications, they are prone to appropriate a narrow, excessively interior understanding of religion that does not acknowledge the dependency on context and socio-historical formation for the interpretation of any experience. They attempt to justify this method by stating that this understanding of religion allows one to proceed with "comparing the various forms of religious experiences,

regardless of how they are produced." What they miss is that the crucial junction of adjudication regarding religiousness of experiences is not presumed to be how they are "produced," but rather the context and means by which they are interpreted. The prior formative cultural experiences and contexts, along with the current contexts of the person within which an experience is expressed, will give shape and form to the narration of the experience. Pharmacologically induced experiences may be interpreted as "religious" by an individual whether or not they would be accepted as such by a broader community of observers. The cumulative social and historical experiences of that person provide the capacity for "religious" interpretation and the intelligibility to narrate an experience as being "religious" in their particular place and time.

As Nichols and Chemel acknowledge, current neurosciences consider all such phenomenological experiences as what they name as "religious" to be biologically mediated and produced. If all such experiences are produced through similar neurobiological processes, then how they are interpreted becomes all-important. Whether considering the contextually derived understanding of an experience for an individual formed through prior social and historical formation, or appealing to an argument for a more communally interpreted notion of the discernment of religious experience, the dependence on contextual interpretation for experience to be judged as "religious" is pivotal. Talal Asad (1993) says that "there cannot be a universal definition of religion, not only because its constituent elements and relationships are historically specific, but because that definition is itself the historical product of discursive processes" (p. 29). The attempt to classify a pharmacologically induced experience as being "religious" based on claims of "transcendence of space and time, a deeply felt positive mood, sacredness, a noetic sense of an ultimate truth or reality, paradoxicality, ineffability," while appealing to these as implying some universal religious or spiritual awareness, denies the historical particularity and specificity of religion. That a pharmacologically induced ecstatic experience can be physiologically stimulating, psychologically motivating, existentially heartening, and generally experientially gratifying is not questioned, but whether that experience is most correctly interpreted as being religious or spiritual is a significant point of inquiry. That determination is made in a socially and historically formed context whether acknowledged or not. Attempts to render such determinations separate from their contexts are fraught with reductionistic naïveté and an inadequately formed paradigm for considering the complex interaction of biology, social processes, and cultural formation as interpreters of religion and human experience.

Although employing a different approach, Park and McNamara focus on meaning making in the brain and its relationship to religion with a parallel reductionistic tendency stating that "it is likely that the frontal lobes hold

these representations of the religious self.” While legitimately linking the neurologically mediated “sense of self” to the prefrontal cortex, they overreach when they assert that a reified “self” with a religious modifier can be located in some particular domain of the brain. When appealing to the role of a “religious self” for meaning making, Park and McNamara attempt to argue for a neurologically articulated notion of “self.” While they reference the apprehension of stories within an “internal set of values and beliefs” when discussing meaning construction, they do not provide adequate development of how and through what process they believe these values and beliefs are derived. They seem to appeal to “innate preparatory or conceptual schemas” in conjunction with formative “memories” as the bases for these values and beliefs through which meaning construction will occur. While I find their appeal to a “memory-based conceptual framework” constructive, their assumptions regarding a “hierarchy of motivational constructs” seem overly optimistic in appropriating “costly signaling theory” as a means for relating religion to evolutionary survival through meaning making. Any attribution of motivation is fragile and frequently lacks credibility when observed over time. Excessive dependence on discerning internal motivations and “true believer” status, through costly signaling theory’s interpretation of ritual as contributing to evolutionary survival, may be very misleading. This is particularly relevant when trying to understand the meaning of personal sacrifice and commitments to justice within a community of faith unless developed within the context of a particular tradition of faith and practice. Although not intending to do so, these theories have the potential for substantive distortion of traditional understandings of faithfulness and reduce religious ritual to an instrumentalism that distorts worship and practices of transformation.

The memories and motivational constructs to which Park and McNamara attribute meaning making in relation to innate conceptual schemas seem to lack an appreciation of the contingencies of human existence. While claiming that the “meaningless” religious rituals can prove productive through their being “costly,” their proposed constructions for meaning making fall short due to the instrumental implications embedded within this argument. They lack a capacity to narrate the compelling nature of religious rituals and practices as a means of bearing witness to a story that gives meaning through its very capacity to narrate suffering, and even death, without any presumption of enhanced survival or perpetuation of themselves. They have a limited ability to incorporate the challenging, and perhaps disorienting, nature of the claim to faithfulness in some religious traditions such as the Christian tradition as noted by David Ford, a Cambridge theologian. He says that,

the remembering is false if it is not connected with entering more fully into the contingencies and tragic potentialities of life in the face of evil and

death. There can be no quick leap across Gethsemane and Calvary. Here are massive dislocation and disorientation, agonizing loss and the demand to unlearn some of one's deepest convictions and habits. It is therefore very serious if a contemporary celebration of the eucharist dulls instead of sharpening the sense both of exposure to danger and of a God whose way of being God is to be involved in the contingencies in a shockingly complete and painful way. (Ford, 1999, p. 47)

Ford illuminates the Christian theological understanding that God is a God of transformation and redemptive renewal of the tragic, not adaptation and accommodation in service of evolutionary survival. The most powerful potential for faith commitments and religious practices to form meaning through a "memory-based conceptual framework" is compromised when the lack of intelligibility of a ritual or behavior becomes a marker of value to survival greater than its communally remembered and contextually interpreted significance for intelligibly finding meaning within the practice or ritual. The importance of meaning, highlighted by Park and McNamara, is notable and merits continued consideration. Their acknowledged lack of adequate "integrative theories" to support their proposed models of interaction of "religion, meaning, and brain" will benefit from more theologically considered integrative efforts as they continue to push on this frontier. The thoughtful engagement of theological and anthropological implications within this work will be necessary to optimally move this work forward.

RELIGION, HEALTH, AND COPING

Newberg and Lee introduce the relationship of religion and health with a review of the literature and a recounting of some of the most notable findings. They note the increasing interest in this topic reflected by the upsurge of studies reported in this area along with the increased interest of diagnostic and regulatory bodies in the inclusion of religion and spirituality within their criteria for consideration. While noting this increasing acknowledgement and inclusion of religion within mainstream health and medicine, Newberg and Lee appropriately go on to describe the field's current dependence on claims based on associations found within correlational studies and the lack of adequate investigation to establish causal inferences to support hypotheses of mechanism. They appeal for randomized control trials in religion and health, which has some legitimacy, but before proceeding to clinically conceptualized and interpreted randomized control trials in religion and health, the challenges subsequently noted need to be systematically addressed.

The 10 challenges noted by Newberg and Lee for religion and health research are a useful concise articulation of the major conceptual and methodological issues to be considered in this work. Although the temptation to

push ahead into randomized control trials regarding the religion and health relationship is luring, adequate attention needs to be given to the issues raised in these 10 challenges prior to proceeding. This approach is needed to avoid compromising the credibility of this work for the future from the perspective of funding institutions and the broader scientific community. Randomized control trials that are inadequately conceived and implemented will be methodologically suspect and limited in interpretability. Adequately addressing these challenges within the religion and health research community should be the top priority at this time so as to optimize the future investments in more elaborate studies to discern causality and mechanisms within this relationship.

Review of the entire list of challenges is not my goal, but reflection on some of the issues embedded within the challenges and their significance for the future of religion and health inquiry may be constructive. The issue of how to define “religion” and “spirituality” is a perpetual issue with many attempts made to varying degrees of success. We have already discussed some points for consideration in regard to this issue from the perspective of the need to provide a contextual interpretation of experience if it is to be legitimately narrated as being religious. Along with the need to avoid excessive explanatory claims regarding reductionistic neurobiological phenomena, we must challenge ourselves regarding the theological significance—and ultimately methodological significance with regard to health outcome claims—of the understanding of religion employed. Shuman, Meador, and Hauerwas (2003) have argued that,

The most significant *theological* questions about the interrelationship of religion and health is not simply whether being more religious will result in better health but whether the religion in question, that is, the religion that ostensibly improves the health of some, teaches its adherents the sometimes difficult truth about God and God’s creation and helps them live well in and as part of that creation—whether they are sick or well . . . questions about the medical utility of a given religion and the practices constituting that religion have to be considered from *within* the boundaries set by that religion’s theological tradition, however permeable and elastic those boundaries may be. (p. 45)

When this particularity of religious expression within the boundaries of a theological tradition is not considered in the defining of “religion,” the methods of measurement and the ultimate significance of findings with regard to health outcomes are brought into question. The “experiential-expressivist” model of religion as described by theologian George Lindbeck (1984) provides a framework within which to better understand the formulation and implications of the individualistic, experientially dependent understanding

of religion that is so prevalent in modernity and typically informs the religion and health conversation.

An alternative understanding of religion offered by Lindbeck (1984) that ultimately allows for a more intelligible and communally verifiable religion and spirituality is the “cultural-linguistic” model. This

“cultural-linguistic” account of religion, in which “religions are seen as comprehensive interpretive schemes, usually embodied in myths or narratives or heavily ritualized,” does not disregard or deny the existence of human religious experience. Rather, it denies the primacy and the priority of *individual* religious experience by showing that myths, narratives, and rituals that make up a particular way of life themselves “structure human experience and understanding of self and world.” It is not the naked experience of an individual’s believing in something beyond the self that gives rise to the description of that experience and the accompanying religious way of life; it is the way of life of this or that religious community or culture that gives rise to the description and makes possible an individual experience that can be described as religious. (p. 45)

Hall, Koenig, and Meador (2004) frame this issue for religion and health research stating that all worldviews have languages and cultural commitments by which they narrate and give form to the good and ascribe meaning whether what is commonly called “religion” or a more “secular” faith commitment is primary in the formation of the worldview.

The importance of careful definition for informing reliable measurement of religion and spirituality is reflected in these considerations of different theological models of religion. Newberg and Lee allude to some of the varied possibilities when considering proper measurement of religion in this research. Reflected within these possibilities is the need to discern how to most optimally define religion, particularly in regard to health outcome relationships, and how to articulate the demarcation between religion and spirituality, assuming that such a demarcation exists. Hypotheses and disciplines within which religion and health research is pursued frequently affect decisions with regard to definitions of religion. Methods of measurement employed by the fields of sociology, medicine, or psychology somewhat predictably influence standard practices within the respective disciplines of inquiry. Although we may see this as inevitable due to the guilds and intellectual captivity of the disciplines, the implications for religion and health research are substantive. Newberg and Lee rightly point out the need for interdisciplinary engagement to enhance the work in this field. The importance of including theologically informed collaborators who have adequate methodological sophistication to participate in research during the design and interpretation of religion and health research cannot be overemphasized. Systematic initiatives to foster this work needs to be a priority.

The ongoing struggle to thoughtfully differentiate between religion and spirituality consumes much effort on the part of many in this work. Comprehensively addressing this issue is far beyond the scope of this essay, but the “spirituality” to which many persons within contemporary conversations appeal has many of the same hallmarks we have already discussed in regard to decontextualized religion. The more interesting issue with regard to definitions relevant to this conversation may be the boundaries between “spirituality” and “mind/body” practices rather than religion and spirituality. For those whose spirituality and practices are formed within a religious tradition, the split of religion and spirituality has little relevance. Many mind/body exercises are best interpreted as manifestations of the human spirit in service of health and well-being, but with no claim to be part of an interpretable religious tradition. When these mind/body practices are narrated as “spirituality,” it is a disservice to all constituents of the current spirituality and health conversation. Appeals to self-referential ecstatic experiences or even transcendental claims within personal and interior experiences not related to any communal context or historically derived interpretation are susceptible to distortion and presumption without means for adjudication or validation. Attribution of “spirituality” to such experiences contributes to a blurring of definitions, and when appropriated within research to an excessively broad set of experiences it distorts the findings and creates potential for misguided research design and funding.

The optimal time frame for observation or measurement in religion and health research links to the persistent issue of discerning causality and mechanism within the abundance of associations found in correlational studies. One’s hypothesis regarding the mechanism of the relationship between religion and health inevitably affects how one designs research. Added to this are the inevitable considerations of funding that frequently limit opportunities for more longitudinally designed research. The notion that depth, breadth, and intensity of exposure to religion and spirituality have an impact on the associated health outcomes is consistent with other exposures about which health outcomes might be measured and predicted. Although short-term claims to transformation are common within the history of religious experiences, claims of relationship to health constructed within defensible paradigms for research methodology are necessary. These claims would seem most likely to be justified by models in which the measure of religion as the exposure and health as the effect is intelligible within a model of exposure and effect similar to other types of research. Unless one is going to propose some form of supernatural mechanism that is inherently lacking in falsifiability and vulnerable to discounting by the research community in general, religion and health research needs to offer research designs compatible with mechanisms interpretable within standard paradigms, while not being hesitant to challenge the limitations of those paradigms within the bounds

of intelligibility to the broader scientific community. While randomized controlled trials are the gold standard within clinical trials, too quickly attempting to implement such interventions within religion and health research before more adequately understanding the mechanism for the relationship through population-based observational studies exposes the entire area of study to misrepresentation. Efforts prematurely initiated to implement clinical interventions and randomized controlled trials make the field vulnerable to inadvertent negative findings due to misplaced assumptions regarding mechanisms and ethical vulnerabilities due to the nuances inherent to the complexities of religion research.

If the proposed mechanism for understanding religion and health associations is most rightly measured through observing people of faith formed over time through particular practices of communities of faith, there is no substitute for longitudinal studies to optimally better understand this mechanism. Of course, complexity and funding issues inevitably arise, but these concerns should not interfere with clarity regarding hypothesis generation and intentionality directed toward implementing the most intellectually credible methods for this research. A “cultural-linguistically” articulated model of religion in contradistinction to the frequently prevailing “expressivist-experiential” model offers a theologically credible paradigm of religion. A broadly interpreted cultural-linguistic model of religion allows for a more scientifically intelligible religion and health research agenda if appropriated within a research paradigm and model for causal hypothesis that incorporates an adequate sense of depth and duration of exposure to form the basis for an identifiable and measurable mechanism.

Magyar-Russell and Pargament define religion as a “search for significance in ways related to the sacred” in their engagement with health, coping, and “sacred loss.” This serves as a good example of the challenges noted by Newberg and Lee with regard to definitions in religion and health research. This definition predisposes Magyar-Russell and Pargament to inadequate differentiation between religion or spirituality and psychological constructs. Their acknowledgement that this definition “rests on the assumption that people are goal-directed beings, motivated to attain value or significance in life” reveals their bias of a highly optimistic view of human nature that is embodied within this definition. The implications of this assumption are further magnified by their dependency on their notion of the internally and individualistically derived “sacred” as a primary determinant of the “religious.” While attempting to draw some delineation through this use of the concept of “sacred,” their notion of sacred is so broadly construed that it conflates communally practiced expressions of faith and interpreted constructs of God with “seemingly secular parts of life” that are “sanctified” through some form of “association with, or representation of, divinity.” This definition falls short of an intelligible understanding of religion or spirituality that would

have discernible distinction from whatever the subject might deem worthy of honoring as reflecting their own sense of value and significance. Proposing religion and health research designed using this definition for religion leaves one vulnerable to considerable distortion in measurement of variables and interpretation of findings.

An approach to religion research proposed by Magyar-Russell and Pargament for assessing benefits or harm of religiousness in their chapter is the degree to which a subject's religion is well integrated or poorly integrated. Although some form of this notion permeates a number of commonly used measures of religiosity, there are substantive concerns regarding this practice. The hierarchical implications inherent to this approach and the presumptions of the prerogative to adjudicate among manifestations of religiousness according to health or psychological functioning is methodologically suspect, especially when the discerning process is not vetted through theological lens (Cohen, Hall, Koenig, & Meador, 2005). Hansen and Norenzayan raise parallel concerns in this volume, arguing against the dichotomization frequently found with the use of intrinsic/extrinsic religiosity measures. The temptation to assign positive valence to what is deemed to be more rational and "mature" while assigning a more negative valence to religion manifested through coping that is depicted as more primitive is common but may be misleading. Comparison of the religious coping of a developing world inhabitant who attends Catholic mass daily as a practice to assuage fears of the future and out of conviction that she is called to a life of such obedience with the rationally verbalized arguments for God's identification with suffering by an academically formed Western intellectual is easily misguided by presumptions of hierarchy of religiosity.

Psychological sophistication and functioning is a legitimate and frequently important axis of assessment in relation to coping skills and health, but taking care to properly discriminate between religious coping and psychological functioning maintains more credibility for the role of both. If the measures for both are inadequately demarcated, the ability to rightly interpret either dimension of a person in relation to his or her health and coping is compromised. The construct of "sacred loss" as used by Magyar-Russell and Pargament depends on the individual's narration of the loss as "sacred," which is subjectively determined and susceptible to predisposing sensitivities that are more psychologically than spiritually mediated. While Pargament's work with negative religious coping and struggles is notable for attempting to better understand an important dimension of the religion and health relationship, the structural overlap between his depictions of "negative religious coping" and psychological struggle challenge the independence of the construct of negative religious coping from maladaptive psychological functioning articulated through religious language. Acknowledgement of this lack of

independence would not negate the relevance of the findings but would free the construct from having to carry the burden of claiming an unwarranted conceptual independence and allow for a more unified interpretation of the coping as observed. This acknowledgement would also allow for a more cogent theological interpretation through the lens of the cultural-linguistic understanding of religion as described by Lindbeck (1984).

CONCLUSION

This essay began with reference to Freud's reductionism and its reflection in the current reductionistic tendencies within parts of the religion, health, and brain conversation. Ralph Hood responds in this volume to two poles of work in psychology of religion, one of which he attributes to Freud, by invoking the work of William James as a "middle ground" of dialogue "between various psychological and religious claims." Hood uses James as a basis for his effort at finding a middle ground in his "common core thesis in the study of mysticism." Hood bases his proposal on six stated assumptions that will not be repeated here, but his dependency on these assumptions makes his proposal for a "common core" more of an assertion than an argument. The degree to which he privileges mystical states and appeals to James in asserting that privilege through stated assumptions of "causal indifference," the "ineffability of mystical experiences," insistence on "unmediated experiences of reality," and a "mystical stream" within all religious traditions whose identification and interpretation is independent of context allows him to make an argument without adequately justifying some crucial assumptions. He ultimately claims that unmediated claims of mystical experience can be "reliably measured" through the reports of those having the experiences. Although I am sympathetic to his goal in arguing for the power of narratively derived "data," his position is inadequate to justify the claim of "reliable" measurement. Hood's proposal that mysticism is an "independent type" is ultimately not compelling, and his foundationalist claims in anticipation of empirical expectations regarding mysticism are more illusory than instructive. Hood's effort to claim a "common core" is, in the end, consistent with the neurobiological phenomena described in many of the chapters in this volume, but his effort to circumvent the interpretive context or tradition within which an ecstatic or mystical experience becomes intelligible is misguided.

The limitations and implications of Hood's indebtedness to James is revealed by Stanley Hauerwas (2001) when he says,

Just to the extent that James denied the creaturely status of human beings, I suspect it is a mistake to take too seriously his arguments against natural theology as the primary objections he had to Christianity.

Those arguments were primarily an expression of James's deep moral objection to Christianity. What really bothered James was not that Christianity seemed to entail false views about the world, but that Christianity challenged the moral and political arrangements necessary to sustain the human project without God. James was profoundly right to see Christianity as the enemy of the world he hoped was being born. That James's world has come into being, a world about which he had some misgivings, makes it all the more important to attend to this aspect of this thought. Many Christians today want the world James wanted, while assuming that they can continue to have the Christian God. But James was right to think that you cannot have both. (p. 78)

We have exponentially advanced our understanding of brain function since William James, and we have made major strides in our understanding of the relationship between religion and health during the last couple of decades. Both of these areas of advance are notable and to be applauded, and the attempts at synthesis and hypothesis generation presented in the chapters in this volume are to be commended for their thoughtfulness. The challenge we all face is how to go forward with methodological integrity embodied within a vision for scientifically rigorous and theologically sophisticated inquiry into these complex phenomena and relationships. The conversations fostered within these chapters offer an opportunity to face that challenge and engage it without illusions of grandeur, but rather with a conviction of the importance of the work. Honoring the complexity of scientific inquiry regarding religion while insisting on theological intelligibility of the inquiry will protect us from many pitfalls and nurture work that will distinguish the field for the future.

REFERENCES

- Asad, T. (1993). *Genealogies of religion: Discipline and reasons of power in Christianity and Islam*. Baltimore: Johns Hopkins University Press.
- Cohen, A. B., Hall, D. E., Koenig, H. G., & Meador, K. G. (2005). Social versus individual motivation: Implications for normative definitions of religious orientation. *Personality and Social Psychology Review*, 9(1), 48–61.
- Ford, D. (1999). *Self and salvation: Being transformed*. Cambridge, England: Cambridge University Press.
- Freud, S. (1928). *The future of an illusion*. London: Norton.
- Hall, D. E., Koenig, H. G., & Meador, K. G. (2004). Conceptualizing religion: How language shapes and constrains knowledge in the study of religion and health. *Perspectives in Biology and Medicine*, 47(3), 386–401.
- Hauerwas, S. (2001). *With the grain of the universe*. Grand Rapids, MI: Brazos Press.
- Lindbeck, G. (1984). *Nature of doctrine*. Philadelphia: Westminster Press.
- MacIntyre, A. (1981). *After virtue*. Notre Dame, IN: University of Notre Dame Press.

- Madsen, R., Sullivan, W. M., Swidler, A., & Tipton, S. M. (2002). *Meaning, and modernity: Religion, polity, and self*. Berkeley: University of California Press.
- Shuman, J. J., Meador, K. G., & Hauerwas, S. (2003). *Heal thyself: Spirituality, medicine, and the distortion of Christianity*. Oxford, England: Oxford University Press.
- Taves, A. (1999). *Fits, trances and visions*. Princeton, NJ: Princeton University Press.

INDEX

- Aboriginal Australians, dreaming for, 225
- Abulafia, 125
- Adaptation: dreaming and, 222; schizophrenia and, 175
- Agricultural societies: healers in, 146; shamanistic healers and, 145–46
- AIDS patients, religion and, 107
- Alcohol: psychedelic treatment and, 255; religion impact on, 43–44
- Alcoholics Anonymous, 255; spiritual ideas in, 44
- Alienation dreams, 220
- Allport, Gordon, 95, 97, 203
- Altemeyer authoritarianism scale, Christian orthodoxy scale *vs.*, 193
- Altered states of consciousness (ASC): from auditory driving, 151; consciousness integrative mode of, 151; ego impact by, 156; emotional memory impact by, 156; gating concept and, 16; healers and, 146; hypnosis, 153–54; of mediums, 147; memory of, 16; physiology of, 151, 155; possession, 147; psychedelic model of, 15; recognition of, 15; shamanic induction of, 143; in shamanic training, 142–44; through-out history, 4–5; visual imagery in, 151; waking consciousness *vs.*, 16
- Amanita muscaria*, 5
- American Psychological Association, 254
- American Yoga Association, 51
- Animal spirits, 144, 152
- Animism, 152
- Anoneirognosis, 221
- Anxiety dreams, 220
- Apex dreaming, 221
- Appraisal process, 99; meaning impact by, 69–70; nonveridical, 70
- Appraised meanings, health impact of, 70
- Archeology, of entheogens, 259
- Archetypal-spiritual dreams, 218
- ASC. *See* Altered states of consciousness
- Association for Transpersonal Growth, 258
- Attachment theory, 93–96; God and, 95–96
- Auditory driving, ASC from, 151
- Ayahuasca, 260
- Barnard, Mary, 235, 263
- Belief, experiments on, 250–54
- Biology: of hallucinations, 177; of health, 107; highly memorable dreams and,

- 222; of meaning, 166; of psychosis, 166; of religious delusion, 177; of religious experience, 107, 156, 170, 179, 272; of shamanistic universals, 149–53
- Bogzaran, Fabria, dream research of, 219
- Book on Untying Knots* (Abulafia), 125
- Brain function: concept formation and, 79; evolutionary strata in, 154–55; hallucinogen impact on, 13–14, 17, 20–26; triune and modular, 153–56
- Brain imaging, of schizophrenia, 164
- Brain networks, in meaning and religion, 82–83
- Brain structure: religion and, 67; of schizophrenia, 164
- Brief RCOPE. *See* Religious/spiritual coping short form
- Buddhism, dreaming in, 226
- Cannabis, in Christian tradition, 259
- Capgras syndrome, 82
- Causal indifference, mystical experiences and, 123
- Center for Cognitive Liberty & Ethics, 263
- Cerebral metabolic rate, hallucinogen impact on, 20
- Cerebral metabolic rate of glucose (CMRglu), psilocybin impact on, 21
- Ch'i-wu lun* (Tzu), 227
- Christian orthodoxy scale, Altemeyer authoritarianism scale *vs.*, 193
- Christian tradition: cannabis in, 259; dreaming and, 226
- Clark, Walter Houston, 2, 27
- Cleansing the Doors of Perception* (Smith), 236
- Clinical psychedelic psychotherapy, 237–38
- Clinical trials, of hallucinogens, 13
- CMRglu. *See* Cerebral metabolic rate of glucose
- Coalitional religiosity, 188, 191–92; sacrifice and, 204; violence and, 195–202
- Cognition: imagery and, 151; perception *vs.*, 261
- Cognitive neuroscience, studies of self in, 76
- Common core thesis: in mysticism, 120, 126; phenomenological model of, 130; psychometric support for, 128
- Community rituals, psychobiological consequences of, 150–51
- Concept formation: brain mediation of, 79; WCST of, 79
- Consciousness: hallucinogens and, 12–17; integrative mode of, 151; thalamocortical system and, 13; during visionary experience, 14. *See also* Altered states of consciousness (ASC)
- Consilience, 256–57
- Constructionism, mysticism and, 126
- Content analysis, of dreams, 217–18
- Coping: behavioral strategies for, 110; negative religious, 102–4; religious, 179; religious belief impact on, 47–48; religious risk factors and, 110; with schizophrenia, 168
- Coping theory, 94, 99–105
- Cortex, hallucinogen impact on, 22
- Cortical processing: hallucinogen impact on, 21–26; psychedelic impact on, 17
- Cortico-striato-thalamo-cortical (CSTC) feedback loops, hallucinogen impact on, 13–14
- Costly signaling theory (CST), 205, 273; of religious ritual, 83–84
- Council on Spiritual Practices (CSP), 240
- Creativity: schizophrenia and, 173; temporal lobe and, 173
- CSP. *See* Council on Spiritual Practices
- CST. *See* Costly signaling theory
- CSTC. *See* Cortico-striato-thalamo-cortical (CSTC) feedback loops
- Cults, religions *vs.*, 38
- Cultural-linguistic model, 279
- Cultural revolution, psychedelics and, 9
- Culture, psychotic experiences across, 176
- DA. *See* Dopamine
- Dao De Jing, 190–91
- Death and rebirth experiences, from psychedelic use, 12
- Delusion. *See* Religious delusion

- Depression: religion's impact on, 46–47; religious involvement and, 104–5; sacred loss and, 101
- Descartes, René, dreams of, 227
- Devotion: empathy from, 205–7; intrinsic religiosity measure of, 204; prayer frequency and, 197–99; self-boundary transcendence from, 205; tolerance/intolerance and, 193–95
- Devotional religiosity, 188, 191–92; violence support through, 195–202
- Diagnostic and Statistical Manual of Mental Disorders, 168; religion and spirituality in, 37
- Divine struggles, 102–4
- D-lysergic acid diethylamide. *See* LSD
- DMT. *See* N,N-dimethyltryptamine
- Domhoff, G. William, dream research of, 217–18
- Dopamine (DA), 5-HT_{2A} receptor activation impact on, 24
- Dopaminergic system, schizophrenia and, 166–67
- Dreaming: for Aboriginal Australians, 225; about origins, 229; across cultures, 228; adaptive function of, 222; aesthetic power of, 222; alienation, 220; anxiety, 220; apex, 221; archetypal-spiritual, 218; Bogzaran research on, 219; in Buddhist traditions, 226; childhood, 223; Christian tradition and, 226; content analysis method for, 217–18; continuity experience of, 217; cross-cultural frequencies of, 221; Descartes's, 227; discontinuities in, 218; of divine births, 226; Domhoff research on, 217–18; emotions during, 223; excessive, 221; existential, 220; form/content of, 215; Freud's psychoanalytic model of, 214, 216; guidance from, 226; Hall research on, 217–18; highly memorable, 214–24; Hunt research on, 218; in indigenous populations, 226–27; intentional volition and, 219; Jung on, 216–17; Kahn research on, 219; Knudson research on, 221; lucid, 219; medical-somatic, 218; memory and, 223; memory of, 16; metacognition and, 219; metaphorical expressiveness of, 223; mundane, 220; neuroanatomy of, 220–21; new religious movements and, 226; NREM sleep and, 215; ordinary *vs.* extraordinary, 218; as originating activity, 229; origins of, 213; personal-mnemonic, 218; phenomenology of, 218; physiology of, 214; primary visual system and, 220; prophetic, 218; religious experience and, 213; religious functions and, 228; religious origins impact by, 224; religious studies research on, 224–28; REM sleep and, 214–15; self-awareness and, 223; shamanic initiation and, 224; by shamans, 224; Solms research on, 220–21; *tae mong*, 226; transcendent, 220; Van de Castle research on, 217–18; visual *vs.* emotional, 228; volition and, 223; waking consciousness impact by, 223, 225. *See also* Highly memorable dreams
- Drug policy, entheogen research and, 252
- Ego: ASC impact on, 156; devotion impact on, 205–7; entheogens impact on, 251; LSD impact on, 14; religious experience and, 239; ritual effects impact on, 156
- Eleusinian mysteries, 5, 259
- Ellis, Albert, 168
- Emotion, during dreaming, 223
- Empathy, from devotion, 205–7
- The Entheogenic Reporter*, 262
- Entheogenic research, 254; drug policy and, 252; early, 251; interdisciplinary nature of, 250
- Entheogens: archeology of, 259; ego-transcendence with, 251; ethics impact by, 260–61; as experimental treatments, 247; as independent variables, 254; Judaism and, 258–59; mind-body gap and, 243; pharmatheology and, 235; for philosophical inquiry, 254; policy/legal issues of, 262–63; psychedelics as, 248; religion inquiry and, 236; religious community impact by, 260–61; religious practices and, 150,

- 250, 260–61; in religious texts/ceremonies, 259; rituals and, 250, 260–61; serotonin substitute of, 237. *See also* Hallucinogens
- Entheogens and the Future of Religion* (Forte), 236
- Entheogens—Sacramentals or Sacrilege?* (Roberts), 236
- Epilepsy. *See* Temporal lobe epilepsy
- Episodic memory retrieval, PET of, 77
- Ergolines, 17
- Ethics: entheogens impact on, 260–61; experiments on, 250–54
- Events, real-world *vs.* imaginary, 68
- Evolution: highly memorable dreams and, 222; religion and, 188–89; schizophrenia impact by, 171–73, 181
- Excessive dreaming, 221
- Exercise programs: faith-based practices of, 45; religion and spirituality impact on, 45
- Existential dreams, 220
- Exorcism, by healers, 146
- Experience: mediated *vs.* unmediated, 121–22; without content, 129–30
- Experimental humanities, 250–57
- Experiments, on belief/ethics/qualia/meaningfulness, 250–54
- Faith: exercise programs and, 45; illness and, 36
- Faith healing, effects of, 52
- Faith traditions: church *vs.* sect, 131; mysticism and, 120; mysticism within, 125–26
- False gods, research on, 94
- FDA. *See* U.S. Food and Drug Administration (FDA)
- Feelings/affective responses, self impact on, 76
- 5-HT. *See* Serotonin
- 5-HT_{2A} receptors: DA impact of, 24; hallucinogen stimulation of, 14, 18, 24; VTA impact by, 24
- 5-hydroxytyptamine. *See* Serotonin
- Fly agaric. *See* *Amanita muscaria*
- Folie á deux, 82
- Folkman, Susan, 99
- The Forgotten Truth: The Primordial Tradition* (Smith), 247
- Forte, R., 236
- Freedman, Daniel, 14
- Freud, Sigmund, 119, 168, 269–70; dreaming model of, 214, 216
- Frontal cortex: hallucinogen impact on, 20–21; religious experience and, 273
- Frontal lobes: meditation role of, 82; prayer role of, 82; religiosity role of, 82
- The Future of an Illusion* (Freud), 269
- Gackenbach, Jayne, dream research of, 219
- Gardner, Howard, 258
- Garrett, W. R., M1/M2 mysticism of, 132
- Gating concept: ASC and, 22; in religious experience, 15
- Genetics, schizophrenia impact by, 171–72
- Global meaning, 69
- Glutamate, hallucinogen impact on, 20
- Glutamatergic system, schizophrenia and, 166–67
- God: as attachment figure, 95–96; language and, 129
- God spot, 244
- Good Friday Experiment, 9–12, 246–47, 250, 252, 257; critiques of, 10–11; long-term effects of, 11
- Grob, C., 236
- Grof, Stanislay, 237
- Hall, Calvin, dream research of, 217–18
- Hallucinations: auditory, 169; biological mediation of, 177; schizophrenia and, 167; visual *vs.* auditory, 175
- Hallucinogenic mushrooms: pre-Columbian use of, 7; religious uses of, 256; spiritual experience from, 7
- Hallucinogens, 179; brain function impact by, 25; cerebral metabolic rate impact by, 20; clinical trials of, 13; consciousness and, 12–17; cortex impact of, 22; CSTC feedback loop impact of, 13–14; frontal cortex impact by, 20–21; glutamate impact by, 20; historical evidence on, 5; 5-HT_{2A} receptor stimulation by,

- 14, 18, 24; indigenous uses of, 6; LC impact of, 23–25; mechanistic studies on, 12; mystical experiences from, 9; neuropharmacology of, 13; portentousness from, 16; pre-Columbian use of, 7; raphe cells impact by, 24; research programs on, 12; ritualistic ingestion of, 6; set and setting for, 3, 11; spiritual experience from, 7; structural groups of, 17; subjective effects of, 3; visionary states from, 3
Hallucinogens and Healing, 248
 Hatha yoga: effects of, 52. *See also* Yoga
 Healers: in agricultural societies, 146; ASC activities in, 146; exorcism by, 146; life cycle activities of, 146; mediums and, 146; socioeconomic status of, 146. *See also* Shamanistic healers; Shaman(s)
 Healing: hypnosis and, 154; with psychoactive plants, 5; shamanistic, 139
 Health: appraised meanings impact on, 70; idolatry and, 94; pessimism relation to, 70; religion impact on, 41, 91; religious risk factors for, 92, 105–8
 Health care: access to, 45–46; religion integration with, 36; religion role in, 37; religious belief impact on, 37. *See also* Religion and health
 Health researchers, religion researchers *vs.*, 41
Higher Wisdom (Walsh & Grob), 236
 Highly memorable dreams: biology and, 222; evolution and, 222; Jung on, 217–18; Kuiken/Sikora research on, 219–20; Neilson research on, 221; scientific evidence on, 214–24
 Hindu tradition: origin myths in, 225; soma in, 259
 HIV. *See* Human immunodeficiency virus
 Hoasca, 27
 Hofmann, Albert, 8
 Holy, as religion origin, 254–56
 Hood, R. W., mysticism model of, 129–30
 Hruby, P., 236
 Human immunodeficiency virus (HIV), religion's prevention role in, 45
 Hunt, Harry, dream research of, 218
 Hypnosis: ASC of, 153–54; healing and, 154; placebo effects from, 154; as ritual healing capacity, 153–54
 Idolatry, destructive implications of, 94
 Illness, faith and, 36
 Imagery. *See* Visual imagery
 Intelligence, defined, 258
 Intercessory prayer: as adjunct therapy, 50; clinical benefits from, 45; remote, 50
 Interpersonal struggles, 104–5
The Interpretation of Dreams (Freud), 216
 Interpretative framework, of religion, 70–71
 Intolerance: coalition/devotional variables predictor of, 192; devotion and, 193–95; predicting, 188; religious devotion and, 197–99; religiously motivated, 187
 Intrapsychic struggles, 104
 James, William, 119–23, 191
 Jesus, cannabis use by, 259
 Judaism,entheogens and, 258–59
 Jung, Carl, on dreaming, 216–17
 Kahn, Tracy, dream research of, 219
 Knowledge, of *vs.* about reality, 122
 Knudson, Roger, dream research of, 221
 Korean culture, dreaming in, 226
 Kuiken, Don, dream research of, 219–20
 Kykeon, 5
 Language: brain mediation of, 78; M-Scale and, 128–31; of mystics, 122; neutrality of, 129
 Language networks, meaning and, 78–79
 Lazarus, Richard, 99
 LC. *See* Locus coeruleus
 Lewis-Williams, David, 224–25
 Life expectancy, religious involvement impact on, 42
 Lindbeck, George, experiential-expressivist religion model of, 275
 Linguistics: ritual and, 73–74; speech act theory branch of, 74
 Locus coeruleus (LC), hallucinogen impact on, 23–25

- LSD (d-lysergic acid diethylamide), 179; analgesic effects of, 11; discovery of, 8; effects in humans of, 14; ego impact by, 14; *ololiuqui* and, 8; raphe cells impact by, 18–19; REM sleep impact of, 19; sense of truth from, 4; *teonanácatl* and, 7–8; terminal cancer patients use of, 11
- Lucid dreaming, 219; Transcendental Meditation and, 219
- Magico-religious practitioners: biosocial functions of, 149; cross-cultural studies of, 140–42; shamanistic healers, 145–46; social conditions of, 149; types of, 149
- Magnetic resonance imaging (MRI), of schizophrenia, 164
- MAPS Bulletin*, 248
- Martyrdom, prayer and, 202
- MDMA (methylenedioxyamphetamine), 248
- Meaning: appraisal process impact on, 69–70; biological basis of, 166; crisis of, 98; frontal lobes role in, 75; global, 69; language networks and, 78–79; loss of, 81–82; meaning of, 68–70; memory and, 68–69; mind/brain creation of, 75–81; motivational goals constraints on, 69; neural networks in, 68, 75; overarching beliefs constraints on, 69; realist *vs.* nominalist approaches to, 68; religion's production of, 70–71, 168; religious, 162–63; from rituals, 72–75, 83; self and, 75–78. *See also* Appraised meanings
- Meaning and purpose, from religion, 68, 70–71
- Meaning and religion, brain networks overlap mediating, 82–83
- Meaningfulness, experiments on, 250–54
- Meaning loss, syndromes of, 81–82
- Meaning systems, in schizophrenia, 163
- Medical psychedelic research, by FDA, 243–44
- Medical-somatic dreams, 218
- Meditation: clinical benefits from, 45; effects of, 50–51; frontal lobes role in, 82; neural structures and, 107; risks of, 51. *See also* Transcendental Meditation
- Mediums: ASC of, 1147; healers and, 146; shamans *vs.*, 147; socioeconomic status of, 147; training of, 147; women as, 147
- Memory: of ASC, 16; ASC impact on, 156; dreaming and, 16, 223; meaning and, 68–69; neurochemical process of, 2; NREM impact on, 79–81; progressive processing of, 81; REM impact on, 79–81; self impact on, 76; shamanic healing impact on, 156; sleep-associated consolidation of, 79–81; SWS impact on, 79–81; theta waves impact on, 80; visionary experience impact on, 14
- Mental health, religion and, 46
- Mental health workers, spiritual *vs.* religious, 134
- Metacognition, dreaming and, 219
- Mind: meaning and, 75–81; single- *vs.* multistate view of, 262
- The Mind in the Cave* (Lewis-Williams), 224–25
- Mortality and morbidity, among religions, 42
- Motivational theory, 93–95; intrinsic *vs.* extrinsic, 93. *See also* Religious motivation
- MRI. *See* Magnetic resonance imaging
- M-scale (Mysticism scale): empirically derived model of, 130; Factors I and II in, 128; language and, 128–31; problem with, 128–29
- Multidisciplinary Association for Psychedelic Studies, 248
- The Multiplicity of Dreams* (Hunt), 218
- Mundane dreams, 220
- Mystical, common *vs.* religious term use of, 241
- Mystical experiences, 239–40; authority of, 127; causal indifference and, 123; common core of, 125–28, 135; faith-bound interpretations of, 135; frequency of, 124; from hallucinogens, 9; ineffable nature of, 122; interpretation of, 129; phenomenological methods and, 123; phenomenological *vs.* empirical models of, 130–31; PRE and, 241–42; religious experience and, 120;

- through hallucinogens, 123; transpersonal aspect of, 252; triggers of, 123; types of, 241–42
- Mystical texts, contexts of, 126
- Mysticism: common core thesis in, 120; constructionist position on, 126; empirical study of, 124, 127; faith traditions and, 120, 125–26; Hood model of, 129–30; introvertive *vs.* extrovertive, 123–25; literatures on, 127; M1 *vs.* M2, 132; phenomenological investigation of, 128; psychological studies of, 131; religious and spiritual, 132–35; social force of, 132; Stace model of, 129–30; Troeltsch model of, 131–32; within *vs.* outside religion, 131–32
- Mysticism East and West* (Otto), 125
- Mysticism scale. *See* M-scale
- Mystics: experience interpretation by, 126; language of, 122; noetic claim of, 122
- Mythopoetic imagery, in religion, 72
- Native American Church, peyote use in, 6–7, 237
- Native Americans, dreamer religions of, 226
- Naturalistic reductive interpretation, of religious phenomena, 119
- Natural selection, religion and, 189
- Neural networks, in meaning, 68
- Neuroanatomy: of dreaming, 220–21; meditation and, 107
- Neurobiology, of religious experience, 272
- Neurochemistry, of schizophrenia, 166–67
- Neurology: of psychosis, 166; of religion, 178, 181; of schizophrenia, 173, 181; sense of self and, 76–77, 205, 273
- Neuropathology, of religious delusion, 164–65
- Neuropharmacology, of hallucinogens, 13, 17–26
- Neuroscience: cognitive, 76; reductionist approaches of, 2
- Neurotheology, 236
- New Age groups, self-rate spirituality *vs.* religiousness for, 133
- Nielson, Tore, dream research of, 221
- N-methyl-D-aspartate (NMDA), psychosis and, 166
- N,N-dimethyltryptamine (DMT), 17, 27
- Non-rapid eye movement (NREM) sleep: dreams and, 215; memory consolidation during, 79–81
- Oaxaca, mushroom cults in, 7
- Ololiuqui*, 7–8; LSD and, 8
- Origins: dreaming and, 213, 224, 225, 229; Hindu tradition and, 225; of religion, 254–56; scientific *vs.* religious views of, 213; search for, 213
- Othello syndrome, 82
- Otto, R., 125
- Pahnke, Walter, 9, 246
- Pain, religion and, 48
- Participation, in ritual, 73
- Patients: religion and spirituality for, 36; spiritual needs of, 37
- Patient survival, religiosity impact on, 43
- PCE. *See* Pure consciousness experience
- Peak experience, 4; from psychedelics, 12
- Perception: cognition *vs.*, 261; neurochemical process of, 2
- Personal-mnemonic dreams, 218
- Pessimism, health and, 70
- PET. *See* Positron emission tomography
- Peyote: archeological evidence on, 6; Native American Church use of, 6–7
- Peyotl*, 6
- Pharmatheology: defined, 236; entheogens and, 235; neurotheology and, 236
- Phenethylamines, 17
- Phenomenological methods, mystical experiences and, 123
- Phenomenology, of dreaming, 218
- Physicians, religion and spirituality for, 36
- Physiology: of ASC, 151, 155; of dreaming, 214; of religion and health, 107; of religious experience, 2; of shamanism, 155
- Plants: ethnographic uses of, 6. *See also* Psychoactive plants
- Plato, 227
- Portentousness, from hallucinogens, 16

- Positron emission tomography (PET), of episodic memory retrieval, 77
- Possession: phenomenon of, 147; psychodynamics of, 147
- Post traumatic stress syndrome (PTSD), negative religious coping and, 102–3
- POTT MUSIC, 241–42
- Prayer: effects of, 49–50; frontal lobes role in, 82; martyrdom and, 202; scapegoating and, 198–202
- PRE. *See* Primary religious experience
- Prefrontal cortex, sense of self impact by, 76–77, 205
- Primary religious experience (PRE), 241–42
- The Principles of Psychology* (James), 119–20
- Process theory, 93–94, 96–99
- Prophetic dreams, 218
- Psilocybin, 7, 9; CMRglu impact of, 21
- Psychedelics: alcoholics treatment with, 255; commercial access to, 8–9; cortical processing impact of, 17; cultural revolution and, 9; death and rebirth experiences from, 12; early scientific study of, 8–12; entheogens and, 248, 258; FDA research of, 243–44; healing benefits of, 244, 247; negative attitudes about, 8; peak experience from, 12; religious thought impact of, 4–8; research on, 8–12; serotonin and, 17–18; therapeutic use of, 11. *See also* Entheogens; Hallucinogens
- Psychoactive plants: healing with, 5; shamanic uses of, 5; spiritual practices with, 5. *See also* Hallucinogenic mushrooms
- Psychoactive Sacraments* (Roberts), 236
- Psychobiology, of community rituals, 150–51
- Psychologists, spirituality for, 134
- Psychology: anti-religious bias of, 255; of dreams, 214; of mysticism, 131; religion and, 119, 189; in religion and health, 106
- Psychosis: biological substrates of, 166; neurological substrates of, 166; NMDA and, 166; religious content of, 168, 176
- Psychotherapy, clinical psychedelic, 237–38
- Psychotic experiences, in Western *vs.* traditional cultures, 167
- PTSD. *See* Post traumatic stress syndrome
- Pure consciousness experience (PCE), interpretation of, 126
- Qualia, experiments on, 250–54
- Randomized controlled trials (RCT), of religion in health care, 38
- Raphe cells: hallucinogen impact on, 24; LSD impact on, 18–19
- Rapid eye movement (REM) sleep, dreaming and, 214–15
- Rappaport, Roy, 73–75
- RCOPE. *See* Religious/spiritual coping long form
- RCT. *See* Randomized controlled trials
- Religion and health: behavior impact on, 43; causality determination in, 40; disease incidence/prevalence with, 41–42; disease/surgical outcomes with, 42–43; life-styles impact on, 43; local environment impact on, 40–41; measurement in, 279; negative effects in, 48–49; physical/biological mechanisms of, 107; psychological variables in, 106; RCTs of, 38; research issues in, 275–78, 281; scientific study of, 1, 41, 108–11, 274; social variables in, 106
- Religion and Psychoactive Sacraments: An Entheogen Chrestomathy* (Web site), 240
- Religion and Psychoactive Sacraments* (Roberts & Hruby), 236
- Religion and spirituality: clinical study challenges in, 52; defining, 38, 275; in Diagnostic and Statistical Manual of Mental Disorders, 37, 168; exercise impact by, 45; future research directions in, 53; measurement reliability and validity in, 39; measuring, 39; scientific study design for, 38
- Religion researchers, health researchers *vs.*, 41
- Religion(s): about something, 239; AIDS patients and, 107; alcohol and

- substance abuse impact of, 43–44; appraisal process of, 70; biology of, 156, 179; brain structure and, 67; clinical implications of, 53; clinical study of, 38; coalition-building through, 204; comprehensiveness of, 71; concept *vs.* experienced-based, 262; construct multiplicity of, 190–92; coping resources from, 99; cults *vs.*, 38; cultural-linguistic model of, 276, 280; defined, 92; as delusion, 119; depression impact by, 46–47; differences between, 178; empirical studies of, 91; entheogenic inquiry into, 236, 242; evolutionary approach to, 188–89; experiential-expressivist model of, 275; health care and, 36, 37; health impact of, 91; health positive externalities from, 40; health risk factors of, 92, 105–8; HIV prevention role of, 45; hostility to, 135; integration *vs.* dis-integration and, 97; interpretive framework of, 70–71; meaning and purpose from, 67, 70–75; mental health and, 46; military conflicts from, 48; monastic view of, 178; mortality/morbidity variance among, 42; mystical door to, 239–41; mythopoetic imagery in, 72; natural selection and, 189; natural *vs.* cultural, 190–91; neurological substrates of, 178, 181; operational definition of, 91; origin of, 254–56; pain and, 48; practice and doctrine variations in, 40; psychodynamic theories of, 91; psychological building blocks of, 189; psychology of, 119; sacred element of, 92; science *vs.*, 1, 26; as social life organizer, 189; spirituality rejection of, 134; subjective experience of, 271; suffering and, 47; tolerance *vs.* intolerance predicting aspect of, 192–204. *See also* Religion and health; Religion and spirituality; Religious experience
- Religiosity: coalitional *vs.* devotional, 188, 191–92, 195–202; frontal lobes role in, 82; heaven-hell understanding of, 191; intrinsic *vs.* extrinsic, 203–4; natural-organic *vs.* cultural, 188; patient survival impact by, 43; scales of, 193; subjective-natural *vs.* objective-cultural, 188; suicide and, 47
- Religious, spiritual *vs.*, 132
- Religious attachment, health risk factor of, 95–96
- Religious attunement, schizophrenia and, 173–74
- Religious belief, coping impact by, 47–48
- Religious community, entheogens impact on, 260–61
- Religious delusion, 76, 160; biological mediation of, 177; frontal/temporolimbic systems in, 162; mediated *vs.* generated, 177–78; neuro-pathological substrates of, 164–65; religion as, 119; in schizophrenia, 161; schizophrenia and, 167
- Religious devotion: God-selfishness of, 206–7; intolerance and, 197–99
- Religious doctrine and scripture, nonfalsifiability of, 71–72
- Religious experience: biological mediation of, 170, 272; defining, 2; democratizing, 261–62; dreaming and, 213; egoic *vs.* non-self, 239; entheogen-induced, 258; frontal cortex and, 273; frontotemporal quality of, 178; gating concept in, 15; integration of, 10; mystical states and, 120; neurobiology of, 272; new varieties of, 240; nonreproducible nature of, 3; physiology of, 2; research on, 1; scientific study of, 250; temporal lobe epilepsy and, 169–70, 179
- Religious extremism, 187; dangers of, 98–99
- Religious Freedom Restoration Act of 1993, 6
- Religious ideation, in schizophrenia, 161
- Religious institutions, schizophrenia and, 179–80
- Religious involvement: depression and, 104–5; life expectancy impact by, 42; substance abuse impact on, 43–44
- Religious liberty, social/constitutional questions about, 262–63
- Religious meaning systems, 162–63
- Religious motivation, choice in, 93

- Religious movements, new, 250
- Religious mysticism, defined, 134
- Religiousness, global measures of, 108
- Religious orthodoxy, 121
- Religious phenomena, naturalistic reductive interpretation of, 119
- Religious practices: alcoholics *vs.* nonalcoholics involvement in, 44; ecological factors in, 142; effects of, 35, 49–52; entheogens and, 150, 250, 260–61; schizophrenia and, 168–69; social factors in, 142
- Religious rituals. *See* Rituals
- Religious/spiritual coping long form (RCOPE), 102–3
- Religious/spiritual coping short form (Brief RCOPE), 102–3
- Religious struggles: divine, 102; growth from, 111; interpersonal, 104–5; interventions for, 110; intrapsychic, 104
- Religious studies, entheogenic approaches to, 242
- Religious thought, psychedelic agents impact on, 4–8
- REM (rapid eye movement) sleep: LSD impact on, 19; memory consolidation during, 80; model limitation of, 215
- Revonsuo, Antti, threat simulation theory of, 222
- Rig Veda*, soma in, 5, 256
- Ritual and Religion in the Making of Humanity* (Rappaport), 73
- Rituals: community, 150; CST of, 83–84; defined, 72; ego impact by, 156; entheogens and, 250, 260–61; hypnosis and, 153–54; linguistics and, 73–74; meaning and, 72–75, 83; meaningless, 84; outcome commitment in, 74; participation in, 73; as performatives, 74; self-referential *vs.* canonical messages of, 73, 75
- Roberts, T. B., 236
- Sacred loss and desecration, 278–79; appraisals of, 100–102; depression and, 101
- Scapegoating: prayer and, 198–202; self-sacrifice and, 202
- SCCS. *See* Standard Cross-Cultural Sample
- Schizophrenia: adaptivity of, 175; biology of, 162; brain activity disruption in, 165–66; brain imaging of, 164; cognitive symptoms of, 162; coping with, 168; creativity and, 173; delusion in, 161; dopaminergic system and, 166–67; environmental factors for, 164; evolution and, 171–73, 181; genetic processes impact on, 171–73; glutamatergic system and, 166–67; hallucinations and, 167; meaning systems in, 163–64; MRI of, 164; neurochemistry of, 166–67; neurological substrates of, 181; neurology of, 162; religious attunement and, 173–74; religious character of, 167; religious content of, 161; religious delusions and, 167; religious ideation in, 161; religious institutions and, 179–80; religious practices and, 168–69; religious symptoms of, 174–75, 181; sense of self in, 177; shamanism and, 174–75, 180–81; structural underpinnings of, 164–65; syndrome of, 162. *See also* Schizotypy
- Schizophrenia paradox*, 172
- Schizotypy, 171
- Schultes, Richard Evans, 8
- Science: religion *vs.*, 1, 26. *See also* Cognitive neuroscience; Neuroscience
- Science-and-religion complex, 245
- Scientific research: dreaming, 214–24; issues in, 275–78, 281; on religion and health, 1, 41, 108–11, 275
- Scientific study, of religious experience, 250
- Self: brain mechanisms of, 75–78; breakdowns of, 76; cognitive neuroscientific studies of, 76; disorders of, 76; feelings/affective responses impact by, 76; meaning and, 75–78; memory impact by, 76; religious experience and, 239; during visionary experience, 14. *See also* Sense of self
- Self-identification, religious *vs.* spiritual, 132–33
- Self-worship, 94–95

- Sense of self: devotion impact on, 205–7; imaging studies of, 77; neuropsychological correlates of, 76, 273; prefrontal cortex impact on, 76–77, 205; in schizophrenia, 177
- Serotonin: entheogens substitute for, 237; psychedelics and, 17–18. *See also* 5-HT_{2A} receptors
- Shamanic healing: holistic imperative and, 153; memory impact of, 156; triune brain integration and, 153–56
- Shamanic initiation, dream experiences and, 224
- Shamanism: community participation and, 150; definitional *vs.* cross-cultural approaches to, 140–44; in hunter-gatherer societies, 142; physiological basis of, 155; schizophrenia and, 174–75, 180–81
- Shamanistic healers: agricultural societies and, 145–46; differences among, 145; religious universals and societal specifics of, 144–49; shamans *vs.*, 139, 146; socioeconomic transformation of, 148; universals of, 139–40
- Shamanistic universals, biological bases of, 149–53
- Shaman(s): animal spirits and, 144, 152; commonalities of, 140; concept of, 139; cross-cultural characteristics of, 142–44; cross-cultural investigation of, 139; dream experience of, 224; emic *vs.* etic, 139; healing practices of, 145; mediums *vs.*, 147; psychoactive plant use by, 5; selection of, 143; shamanistic healers *vs.*, 139, 146; socioeconomic transformation of, 148; symbolic manipulations by, 145; therapeutic processes of, 144; theta waves in, 151; visionary practices of, 224. *See also* Magico-religious practitioners
- Significance, search for, 92–93
- Sikora, S., dream research of, 219–20
- Silberman, Israela, 254
- Single photon emission computer tomography (SPECT), of schizophrenia, 169
- Slow wave sleep (SWS), declarative memory consolidation during, 79–81
- Smith, Huston, 4, 236–37, 247
- Social life, religion and, 189
- Society for the Anthropology of Consciousness, 238
- Solms, Mark, dream research of, 221
- Soma, 259; in *Rig Veda*, 5, 256
- SPECT. *See* Single photon emission computer tomography
- Speech act theory, in linguistics, 74
- Spirits, innate processing modules and, 152–53
- Spiritual, religious *vs.*, 132
- Spiritual abuse, 49
- Spiritual experiences: accounts of, 1; from hallucinogenic mushrooms, 7
- Spiritual intelligence, increase of, 257–59
- Spirituality: in Alcoholics Anonymous, 44; for psychologists, 134; with religion, 131; religion rejection through, 134
- Spiritual learning, 257
- Spiritual mysticism, 132
- Spiritual practices: effects of, 35, 49–52; with psychoactive plants, 5
- Spiritual risk: active screening for, 109; predictors for, 109
- Spiritual struggles. *See* Religious struggles
- Spiritual terrorism, 49
- Stace, W. T., mysticism model of, 130
- Standard Cross-Cultural Sample (SCCS), 140–41
- Sternberg, Robert, 258
- Substance abuse: religion's impact on, 43–44; religious involvement impact by, 44
- Suffering, religious confrontation of, 47
- Suicide, religiosity and, 47
- SWS. *See* Slow wave sleep
- Tao mong* dreams, 226
- Temporal lobe, creativity and, 173
- Temporal lobe epilepsy, religious experiences and, 169–70, 179
- Teonanácatl*, 7–8; LSD and, 8
- Thalamocortical system, consciousness and, 13
- Theatetus* (Plato), 227

- Therapeutic treatment, with psychedelics, 11
- Theta waves: memory formation impact by, 80; in shamans, 151
- Threat simulation theory, 222
- Totemism, 151
- Transcendental Meditation, lucid dreaming and, 219
- Transcendental states, ineffable quality of, 16
- Transcendent dreams, 220
- Triggers, of mystical experiences, 123
- Troeltsch, E., mysticism model of, 131–32
- Truth, LSD and, 4
- Tryptamines, 17
- Tzu, Chuang, 227
- U.S. Food and Drug Administration (FDA), medical psychedelic research by, 243–44
- Van de Castle, Robert, dream research of, 217–18
- Varieties of Religious Experience* (James), 119–20, 122
- Vaughn, F., 257–58
- Ventral tegmental area (VTA), 5-HT_{2A} receptor activation impact on, 24–25
- Violence: coalitional religiosity and, 195–202; devotional religiosity and, 195–202
- Visionary experience: autonomous capacity for, 221; consciousness and self in, 14; memory impact by, 14
- Visionary states: from hallucinogens, 3; ineffable quality of, 16
- Vision questing, 224
- Visual imagery: in ASC, 151; cognition and, 151
- Volition, dreaming and, 223
- VTA. *See* Ventral tegmental area
- Waking consciousness: ASC *vs.*, 16; dreaming impact on, 223, 225
- Walsh, R., 236
- Wasson, Gordon R., 256
- WCST. *See* Wisconsin Card Sort Test
- Wilson, Bill, 255
- Wilson, Edmund O., 257
- Winkelman, Michael, 238
- Wisconsin Card Sort Test (WCST), of concept formation, 79
- Women, as mediums, 147
- Yoga: effects of, 51–52; forms of, 52; Hatha, 52
- Yuta*, 175

ABOUT THE EDITOR AND CONTRIBUTORS

EDITOR

Patrick McNamara, Ph.D., is director of the Evolutionary Neurobehavior Laboratory in the Department of Neurology at the Boston University School of Medicine and the Veterans Administration New England Health Care System. Upon graduating from the Behavioral Neuroscience Program at Boston University in 1991, he trained at the Aphasia Research Center at the Boston Veterans Administration Medical Center in neurolinguistics and brain-cognitive correlation techniques. He then began developing an evolutionary approach to problems of brain and behavior and currently is studying the evolution of the frontal lobes, the evolution of the two mammalian sleep states (REM and NREM), and the evolution of religion in human cultures. He has published numerous articles and chapters on these topics pioneering the investigation of the role of the frontal lobes in mediation of religious experience.

CONTRIBUTORS

Kelly Bulkeley, Ph.D., is a visiting scholar at the Graduate Theological Union and teaches in the Dream Studies Program at John F. Kennedy University, both in the San Francisco Bay Area. He earned his doctorate in religion and psychological studies from the University of Chicago Divinity School and is

former president of the International Association for the Study of Dreams. He has written and edited several books on dreaming, religion, psychology, culture, and science, including *The Wilderness of Dreams*, *An Introduction to the Psychology of Dreaming*, *Visions of the Night*, *The Wondering Brain*, *Dreaming beyond Death*, and *Soul, Psyche, Brain: New Directions in the Study of Religion and Brain-Mind Science*.

Benjamin R. Chemel is a doctoral candidate working toward a Ph.D. in molecular pharmacology in the Department of Medicinal Chemistry and Molecular Pharmacology at Purdue University. He is currently researching the role of various dopamine receptor subtypes in the pharmacology of anti-Parkinson drugs, as well as LSD and other hallucinogens. His goal is to unravel the underlying molecular mechanisms that are responsible for the psychoactive effects of shamanically used visionary plants. He earned a B.S. degree with honors in 2001 from The Pennsylvania State University. Prior to beginning his graduate studies, he spent five field seasons as a botanist collecting ecological data on public lands in the western United States.

Ian Hansen is a Ph.D. candidate at the University of British Columbia. Currently conducting research in cultural, social, and political psychology, he earned an M.A. degree in psychology from the University of Illinois at Urbana-Champaign and a B.A. degree in philosophy from Swarthmore College. His thesis is on religion, religious intolerance, and support for religious violence.

Ralph W. Hood, Jr., is professor of psychology at the University of Tennessee at Chattanooga. He is past president of the Psychology of Religion Division of the American Psychological Association and a recipient of its William James Award. He is former editor of the *Journal for the Scientific Study Religion* and former co-editor of *The International Journal for the Psychology of Religion*. He currently co-edits *Archiv für Religionspsychologie*. He has published hundreds of papers on the psychology of religion and has authored, co-authored, and edited nine books.

Bruce Y. Lee is a member of the Department of Medicine, Section of Decision Sciences and Clinical Systems Modeling, at the University of Pittsburgh.

Gina Magyar-Russell, Ph.D., is a postdoctoral fellow in the Department of Psychiatry and Behavioral Sciences at Johns Hopkins University School of Medicine. She earned a doctorate in clinical psychology from Bowling Green State University. Her research and clinical interests include studies of the impact of the loss or violation of what individuals perceive as sacred,

religious, and spiritual coping in medically ill patients, and integrating spirituality into psychotherapy with adults suffering from physical illness and injury and traumatic life events.

Keith G. Meador, M.D., ThM, MPH, is professor of the Practice of Pastoral Theology and Medicine at Duke Divinity School, where he teaches pastoral theology and pastoral care. He established the Theology and Medicine Program in the Divinity School and gives leadership to varied programmatic initiatives, one of which is the Caring Communities Program, which seeks to support health ministries and form caring communities throughout the Carolinas through education of clergy, health care providers, and lay leaders in the community. The Theology and Medicine Program also includes academic opportunities for nursing, medical, divinity, and undergraduate students to pursue studies in theology and health and the practice of health ministries. Meador's scholarship focuses on pastoral theology interpreted through practices of caring and their formation within the Christian community, as well as the investigation of health ministries as a manifestation of these practices. A physician and board-certified psychiatrist, his work builds on his clinical, research, and teaching background in mental health, pastoral theology, and public health about which he lectures widely and has published numerous publications, including the recently co-authored book, *Heal Thyself: Spirituality, Medicine, and the Distortion of Christianity*. He is co-director for the Center for Spirituality, Theology and Health in the Duke University Medical Center and holds a joint appointment as a clinical professor of psychiatry and behavioral sciences in the Duke School of Medicine. He also serves as a senior fellow in the Duke Center for the Study of Aging and Human Development.

Andrew B. Newberg, M.D., is assistant professor in the Departments of Radiology and Psychiatry and an adjunct assistant professor in the Department of Religious Studies at the University of Pennsylvania. He graduated from the University of Pennsylvania School of Medicine in 1993. He trained in internal medicine at the Graduate Hospital in Philadelphia and then completed a fellowship in nuclear medicine in the Division of Nuclear Medicine, Department of Radiology, at the University of Pennsylvania. During this time, he actively pursued a number of neuroimaging research projects that include the study of aging and dementia, epilepsy, and other neurological and psychiatric disorders. Newberg has been particularly involved in the study of mystical and religious experiences as well as the more general mind-body relationship in both the clinical and research aspects of his career. His research also includes understanding the physiological correlates of acupuncture therapy, meditation, and other types of alternative therapies.

He has published numerous articles and chapters on brain function, brain imaging, and the study of religious and mystical experiences. He has also co-authored two books entitled *Why God Won't Go Away: Brain Science and the Biology of Belief* and *The Mystical Mind: Probing the Biology of Belief* that explore the relationship between neuroscience and spiritual experience. The latter book received the 2000 award for Outstanding Books in Theology and the Natural Sciences presented by the Center for Theology and the Natural Sciences.

David E. Nichols, Ph.D., is professor of medicinal chemistry and molecular pharmacology in the Purdue University School of Pharmacy and Pharmaceutical Sciences. His research interests focus on drugs and small molecules that affect behavior. He has principally worked in the areas of dopamine and serotonin function in the central nervous system, and his expertise lies in understanding the relationship between molecular structure and biological action. His research has been continuously funded by the National Institutes of Health for nearly 25 years. He has published more than 250 research articles, including book chapters and monographs, holds seven U.S. patents, and has been invited to speak at numerous international symposia. He is recognized as one of the world's top experts on the chemistry and pharmacology of hallucinogens, and his laboratory is one of the few in the world still studying the preclinical pharmacology of the potent hallucinogen LSD. In 2004, he was selected by the International Serotonin Club as the Irwin H. Page Lecturer. In addition to his work on hallucinogens, he also has been a world leader in developing novel drugs for brain dopamine D₁ type receptors for use in treating Parkinson's disease, as well as the memory and cognitive deficits of schizophrenia, and he co-founded DarPharma, Inc., to commercialize his discoveries.

Ara Norenzayan is an assistant professor of psychology at the University of British Columbia. The author of over 25 publications in the area of social and cultural psychology, he received a Ph.D. in psychology from the University of Michigan in 1999. His research interests include cognition across cultures, the psychological foundations of culture and religion, and cultural evolution.

Raymond E. Paloutzian earned a Ph.D. degree in 1972 from Claremont Graduate School and has been a professor of experimental and social psychology at Westmont College (Santa Barbara, California) since 1981. He has been a visiting professor teaching psychology of religion at Stanford University and guest professor at Katholieke Universiteit in Leuven, Belgium. He is a fellow of the American Psychological Association (divisions of

general, teaching, social issues, psychology of religion, and international), the American Psychological Society, and the Western Psychological Association, and has served as president of APA Division 36 (Psychology of Religion). The division honored him with the 2005 Virginia Sexton Mentoring Award for contributing to the development of other scholars in the field. He wrote *Invitation to the Psychology of Religion*, and, with Crystal Park, edited the *Handbook of the Psychology of Religion and Spirituality*. Paloutzian is editor of *The International Journal for the Psychology of Religion*.

Kenneth Pargament is professor of clinical psychology at Bowling Green State University. He has been a leading figure in the effort to bring a more balanced view of religious life to the attention of social scientists and health professionals. Pargament has published extensively on the vital role of religion in coping with stress and trauma. He is author of *The Psychology of Religion and Coping: Theory, Research, Practice* and co-editor of *Forgiveness: Theory, Research, Practice*. His awards include the William James Award for excellence in research in the psychology of religion from Division 36 of American Psychological Association (APA), the Virginia Staudt Sexton Mentoring Award from APA for guiding and encouraging others in the field, and two exemplary paper awards from the John Templeton Foundation.

Crystal L. Park is associate professor of psychology at the University of Connecticut. She received a Ph.D. in clinical psychology from the University of Delaware in 1993 and completed a two-year National Institute of Mental Health postdoctoral fellowship in health psychology at the University of California–San Francisco in 1995. Her research focuses on stress, coping, and adaptation—particularly on how people’s beliefs, goals, and values affect their ways of perceiving and dealing with stressful events. She has developed a comprehensive model of meaning and meaning making and has been applying this model to a variety of stressful situations. Park has published articles on the roles of religious beliefs and coping in response to stressful life events, the phenomenon of stress-related growth, and people’s attempts to find meaning in or create meaning out of negative life events. She is on the editorial boards of the *Journal of Clinical and Consulting Psychology* and *Psychology and Health* and co-edited *The Handbook of the Psychology of Religion and Spirituality*. Park is principal investigator on grants from the Lance Armstrong Foundation, to examine positive life changes in cancer survivors, and the Fetzer Foundation, to examine changes in spirituality and well-being in heart failure patients.

Thomas B. Roberts is the senior full professor in the College of Education at Northern Illinois University, where he has taught a psychedelics course

since 1982. His online archive *Religion and Psychoactive Sacraments: An Entheogen Chrestomathy* (www.csp.org/chrestomathy) is the world's largest such compilation, containing excerpts and bibliographic information from over 550 books and dissertations. He edited *Psychoactive Sacramentals: Essays on Entheogens and Religion* and wrote *Psychedelic Horizons: Snow White, Immune System, Multistate Mind, Enlarging Education*. He is expanding the chapter he wrote for this book into a book manuscript tentatively titled *Increasing Spiritual Intelligence: Chemical Input, Religious Output*.

Steven A. Rogers is a postdoctoral fellow in neuropsychology at the University of California, Los Angeles's Department of Neurology and the Semel Institute for Neuroscience and Human Behavior. He earned a doctoral degree in clinical psychology from Fuller Theological Seminary's Graduate School of Psychology, and he has received training in both clinical psychology and neuropsychology from the American Lake VA, the Long Beach VA, and UCLA's Semel Institute for Neuroscience and Human Behavior. He provides psychotherapy in a small private practice and enjoys conducting research focusing on the neuropsychology of dementia and disorders of aging, mental illness, and religion and the relationship between religious coping and mental health. In August 2006, Rogers joined the clinical psychology faculty at Westmont College (Santa Barbara, California).

Michael Winkelman (Ph.D., University of California, Irvine, M.P.H. University of Arizona) is associate professor in the School of Human Evolution and Social Change at Arizona State University. Winkelman has engaged in cross-cultural and interdisciplinary research on shamanism for the past 30 years, focusing principally in the areas of the biological bases of shamanism and altered states of consciousness. He has used cross-cultural research to establish the universals of shamanism and psychobiological research and evolutionary psychology approaches to understand the bases of these universals. He has addressed these universals of religion in *Shamanism: The Neural Ecology of Consciousness and Healing*. He has also co-edited books on *Sacred Plants, Consciousness and Healing, Divination and Healing, and Pilgrimages and Healing*. He has explored the evolutionary basis of shamanism and the applications of shamanism to contemporary health problems of addiction. He is currently working on a book on the biology of religion.

ABOUT THE ADVISORY BOARD

Scott Atran, Ph.D., conducts research and is centered in the following areas: cognitive and linguistic anthropology, ethnobiology, environmental decision making, categorization and reasoning, evolutionary psychology, anthropology of science (history and philosophy of natural history and natural philosophy), Middle East ethnography and political economy, natural history of Lowland Maya, cognitive and commitment theories of religion, terrorism, and foreign affairs.

The evolution of religion is a topic he explores in his book *In Gods We Trust* (2002). He is based both at the National Center for Scientific Research in Paris and at the University of Michigan. His recent work has focused on suicide terrorism. He has marshaled evidence that indicates that suicide bombers are not poor and crazed as depicted in the press but well-educated and often economically stable individuals with no significant psychological pathology.

Donald Capps, Ph.D., is Princeton's William Harte Felmeth Professor of Pastoral Psychology. He draws on his training as a psychologist of religion in both his teaching and his writing. In 1989, he was awarded an honorary doctorate in sacred theology from the University of Uppsala, Sweden, in recognition of his publications in the psychology of religion and pastoral care and of his leadership role in the Society for the Scientific Study of Religion, for which he served as editor of its professional journal from 1983 to 1988 and as president from 1990 to 1992.

J. Harold Ellens, Ph.D., is series editor for Praeger's Psychology, Religion and Spirituality series. He is a research scholar at the University of Michigan, Department of Near Eastern Studies. He is a retired Presbyterian theologian and ordained minister, a retired U.S. Army colonel, and a retired professor of philosophy, theology, and psychology. He has authored, coauthored, and/or edited 111 books and 165 professional journal articles. He served 15 years as executive director of the Christian Association for Psychological Studies and as founding editor and editor in chief of the *Journal of Psychology and Christianity*. He holds a Ph.D. from Wayne State University in the psychology of human communication, a Ph.D. from the University of Michigan in biblical and Near Eastern studies, and master degrees from Calvin Theological Seminary, Princeton Theological Seminary, and the University of Michigan. He was born in Michigan, grew up in a Dutch-German immigrant community, and determined at age seven to enter the Christian ministry as a means to help his people with the great amount of suffering he perceived all around him. His life's work has focused on the interface of psychology and religion.

Harold Koenig, M.D., M.H.Sc., is an associate professor of psychiatry and medicine at Duke University. He is director and founder of the Center for the Study of Religion/Spirituality and Health at Duke University; editor of the *International Journal of Psychiatry in Medicine*, and founder and editor in chief of *Research News in Science and Theology*, the monthly international newspaper of the John Templeton Foundation. His latest books include the *Handbook of Religion and Mental Health*, *The Healing Power of Faith: Science Explores Medicine's Last Great Frontier*, and *Religion and Health: A Century of Research Reviewed*.

Koenig completed his undergraduate education at Stanford University, his medical school training at the University of California at San Francisco, and his geriatric medicine, psychiatry, and biostatistics training at Duke University Medical Center. He is board certified in general psychiatry, geriatric psychiatry, and geriatric medicine and is on the faculty at Duke as professor of psychiatry and behavioral sciences and associate professor of medicine. He is also a registered nurse.

Koenig has published extensively in the fields of mental health, geriatrics, and religion, with nearly 250 scientific peer-reviewed articles and book chapters and 26 books in print or in preparation. His research on religion, health, and ethical issues in medicine has been featured on approximately 50 national and international television news programs (including all major U.S. news networks), 80 national or international radio programs (including multiple NPR, BBC, and CBC interviews), and close to 200 national or international newspapers or magazines (including cover stories for *Reader's Digest*, *Parade* magazine, and *Newsweek*). Koenig has been nominated twice

for the Templeton Prize for Progress in Religion. His latest books include *The Healing Power of Faith* (2001), *The Handbook of Religion and Health* (2001), *Spirituality in Patient Care* (2002), and his autobiography *The Healing Connection* (2004).

Andrew B. Newberg, M.D., is director of clinical nuclear medicine, director of neuroPET research, and assistant professor in the Department of Radiology at the Hospital of the University of Pennsylvania. On graduating from the University of Pennsylvania School of Medicine in 1993, Newberg trained in internal medicine at the Graduate Hospital in Philadelphia—serving as chief resident in his final year—and subsequently completed a fellowship in nuclear medicine in the Division of Nuclear Medicine, Department of Radiology, at the University of Pennsylvania. He is board certified in internal medicine, nuclear medicine, and nuclear cardiology.

In collaboration with the Departments of Neurology and Psychiatry, Newberg has actively pursued neuroimaging research projects, including the study of aging and dementia, epilepsy, and other neurological and psychiatric disorders. Additionally, he has researched the neurophysiological correlates of acupuncture, meditation, and other types of complementary therapies.

Newberg has presented his research at national and international scientific and religious meetings; his numerous published articles and chapters cover the topics of brain function, brain imaging, and the study of religious and mystical experiences. In addition to the extensive press he has received, he has appeared on ABC's *World News Tonight* and is coauthor, with Eugene G. d'Aquili, M.D., of *The Mystical Mind: Probing the Biology of Belief*.

Recently, Newberg received a Science and Religion Course Award from the Center for Theology and the Natural Sciences to teach the course titled "The Biology of Spirituality" in the Department of Religious Studies, University of Pennsylvania (spring 2000).

Raymond F. Paloutzian, Ph.D., is a national and international expert in the psychology of religion and spirituality. He received his doctoral degree in 1972 from Claremont Graduate School and has been a professor of experimental and social psychology at Westmont College, Santa Barbara, California, since 1981. He has been a visiting professor teaching psychology of religion at Stanford University and guest professor at Katholieke Universiteit Leuven, Belgium. He is a fellow of the American Psychological Association (divisions of general, teaching, social issues, psychology of religion, and international), the American Psychological Society, and the Western Psychological Association and has served as president of the American Psychological Association's Division 36 (Psychology of Religion and Spirituality). The division honored him with the 2005 Virginia Sexton

Mentoring Award for contributing to the development of other scholars in the field. He wrote *Invitation to the Psychology of Religion* (2nd ed.1996; 3rd ed. forthcoming) and, with Crystal Park, edited the *Handbook of the Psychology of Religion and Spirituality* (2005). He is currently writing chapters on religion and spirituality for handbooks by Oxford University Press and Blackwell Publishers. His current research focuses on religiously motivated child abuse and medical neglect and on a systematic review of the literature on spiritual well-being. Paloutzian is editor of the *International Journal for the Psychology of Religion*.

Kenneth Pargament, Ph.D., has conducted nationally and internationally known research that addresses religion as a resource for coping with major life stressors. His research has also examined how religion can be a source of struggle for people facing major medical illnesses. He has studied the process by which people create perceptions about the sanctity of aspects of their life activities and the various effects of “sanctification” for individual and interpersonal well-being. Most recently, he has been developing and evaluating spiritually integrated approaches to psychotherapy. Pargament won the William James Award for Excellence in Research from Division 36 of the American Psychological Association. He also won the 2000 Virginia Staudt Sexton Mentoring Award from the American Psychological Association for his generous work in encouraging both faculty, undergraduate, and graduate research in the psychology of religion. He has published extensively and his work has received national and international media attention.

