

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

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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.

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

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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.

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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 use 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).

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