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Boston University

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

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THE SIGNIFICANCE OF THE EVOLUTION OF RELIGIOUS BELIEF AND BEHAVIOR FOR RELIGIOUS STUDIES AND THEOLOGY

Wesley J. Wildman

INTRODUCTION

The chapters in this volume report on traffic at the intersection of evolutionary theory and the *scientific study of religion*, by which I mean the interdisciplinary study of the cognitive, emotional, psychological, social, and communicative elements of religion using the methods of the natural and social sciences. (Note: I shall italicize key terms throughout this chapter at the place where each is defined to help readers formed in quite different intellectual contexts track what I mean.) The scientific study of religion has profound connections to the wider academic study of religion—that is, *religious studies*, pursued by *religionists*, to use a term that seems to be gaining currency. It is also deeply connected to scholarly reflection on religious beliefs and practices—that is, *theology*, pursued by *theologians*, who may belong to theistic and nontheistic religious traditions or may have religiously nonaffiliated or secular projects. If religionists are usually the outsiders who strive for neutrality in their study of religion, theologians tend to be the insiders, making a virtue of their existentially lively religious commitment to generate profound insights that outsiders cannot easily grasp or express. Of course, there are exceptions in both cases.

Cooperation between experts interested in religion from all specializations and perspectives should produce a deeper understanding of the evolution of religious beliefs and behaviors and thereby of the origins and functions of religion. I am one of a growing number of scientists, religionists, and theologians who acknowledge that as a worthy goal. Our motivations do

not always cohere. We probably all find religious phenomena intrinsically fascinating, and we can certainly all see that religion is often a crucial factor in geopolitics, economics, social change, and culture wars. We probably work in the hope that understanding will bring empathy and self-control, as it does so often in other facets of life. Some may go further and imagine that understanding religion may give us the power we need to eliminate it and to deliver its victims into humanistic enlightenment. Others might dream of a form of religion that can remain authentically spiritual while being fully aware of its evolutionary origins, social functions, psychological dynamics, and economic implications. Despite these discrepant motivations, cooperation seems feasible, and I think we can suspend our hidden or not-so-hidden social agendas for the sake of a quest for understanding.

Unfortunately, gaining an interdisciplinary understanding of religion is more difficult than it might seem. The scientific study of religion, religious studies, and theology are quite different discourses and sometimes shockingly disconnected. As one who bridges all three, I have concluded that they are not incommensurate, but they are very often so differently angled that fitting them together is challenging. This conceptual jigsaw is simplest when religionists and theologians allow the scientist to do his or her thing, as happens in this volume, and then see how that affects their projects. But many more complex interactions are possible.

Consider religious studies and the scientific study of religion. Religious studies as a field is deeply committed to registering the complexity and intricacy of religion in its phenomenological descriptions, historical reconstructions, and sociological models. It is profoundly interdisciplinary, much as political economy is. Because of its encompassing nature, religious studies have the ability to absorb and respond to scientific perspectives on religion without having to abandon its own fundamental methodological commitments. The scientific study of religion has a different set of commitments. Scientists work within methodological limitations that promote the simplification of endlessly complex religious phenomena to the few salient features that prove tractable for scientific investigation. Scientists can be interested in the whole complexity of religion and do well to know something about it for the sake of avoiding embarrassing caricatures. But their first commitment is to finding something they can chew on, so they must argue (or simply hope) that selecting certain limited strands from the interwoven fabric of religion does not invalidate their results.

This strikes religionists as appallingly reductionist. To them, the descriptions of religious phenomena that some scientists offer, without any trace of self-consciousness or hint of apology, are comically or, perhaps, dangerously oversimplified. Religionists feel certain that a high conceptual price is being paid for this reductionist strategy even when they do not immediately know how to advise the scientist who would gladly work with a more nuanced

interpretation of religion. At the very least, the price of casual reductionism is a social one. Most people in the large world cultures of the contemporary world listen to scientists no matter what they are saying. Their propagation of superficial understandings of religion can have potentially serious social and political consequences, from distorted understandings of religion and deep suspicion of science in the general religious public to the gradual loss of scientific prestige as reeducation painstakingly corrects careless scientific oversimplifications.

Nevertheless, science still achieves fascinating results in its study of religious beliefs and practices. Knowing that religious ideas take certain repeatable forms or that a tendency toward certain religious behaviors is heritable can be highly useful within the broader framework of religious studies. To make use of these benefits, religionists must get past their allergic reaction to the reductionist approach. Unfortunately, the field of religious studies has paid little attention to the scientific study of religion. That needs to change—and quickly. Scientists have been setting a challenging new agenda for religious studies over the past several decades, and it is time that more religionists engage it, if only to test it from their own perspectives.

The scientific study of religion affects theology, too. Theology typically ventures its own claims about the origins and functions of religion, perhaps through an intellectual interpretation of a founding narrative, through a doctrine that purportedly conveys a divinely revealed truth about the purpose of a religious ritual, or through a reflective interpretation of the astonishing experiences that can occur in meditation or corporate worship. Such theological claims typically concern only one part of a single religion, and few theologians ever attempt to coordinate such claims into a theoretical edifice that arches across religious traditions. In fact, most theologians generally seem uninterested in religion in the sense of the whole collection of phenomena that religious studies examines—not a good thing, in my view, but understandable given the way theologians often work on behalf of living religious communities. More important for our current concerns, theological claims frequently do not harmonize well with what the scientific study of religion has to say about the evolution of religious beliefs and behaviors and about the origins and functions of religion. Theologians have usually avoided this conflict problem, just as religionists have, by withdrawing into supportive communities with social identities strong enough to maintain local plausibility structures regardless of wider intellectual currents. From such local havens of acceptance and relevance, they need pay no social price for ignoring what scientists say about the evolutionary origins and functions of religion.

By contrast, there are intellectually compelling subtraditions within most theological traditions that seek to engage what other intellectuals have to say about matters of concern to theology. Such theologians—the ones likely to pick up a book of this sort—exert great effort to learn what religionists

and scientists have discovered about religion and seek to take account of those discoveries in their theological theories. Theological theories on some topics may operate conceptually independently of the scientific study of religion. But many theological theories have conceptual and logical traction with parts of the scientific study of religion; indeed, some scientists seem to presume this when they informally and sometimes publicly pronounce on the theological significance of the latest discovery pertinent to religion. Unfortunately, the discipline of theology is often identified with its most shrill and narrow-minded exponents, as much by cultural luminaries with an antireligious ax to grind as by conservative religious leaders. But the work of imaginative intellectuals seeking to integrate the scientific study of religion and religious studies into a specifically theological theory of religion persists quietly around the margins of religiously driven culture wars and in the interstices of the socially complex world of theological studies. Such theological theories seek to identify not only the origins and functions of religion but also the value of religious practices and the truth of religious claims, and they seek to do this coherently by uniting every relevant perspective into a consistent theory. This is why theology, in this very particular sense, is the most interdisciplinary of all intellectual ventures.

TWO LEVELS OF DIALOGUE

The dialogue between scientists, religionists, and theologians over the evolution of religious beliefs and behaviors unfolds—or can unfold—on two levels. First, at the level of conceptual content, there should be two-way traffic between scientific theories and the associated empirical research on the one hand and what religionists and theologians say about religious beliefs and practices on the other. Most obviously, religious studies and theology furnish basic data for the scientific study of religion. The most intellectually well-crafted statements about the beliefs of a religion are typically delivered by expert theologians, so scientists studying religion should ensure that they know about such statements rather than confining themselves to the knowledge base of popular religious self-understandings. Similarly, the most sophisticated descriptions of religious practices come from religionists specializing in ritual studies, so scientists ought to take account of them in deciding on the most salient aspects to study in detail. Doing this would have an immediate effect on the quality of scientific work. Scientists would be far more precise about what they are studying—not religious ritual but a particular religious practice and not a universal religious belief but an idea found in some parts of some religions and not others—and far more cautious about drawing obviously fallacious conclusions about religion as a whole from whatever part of religion they actually are studying.

In the other direction, religionists and theologians ought to have some response to emerging scientific theories of the origins of religion, to the dawning intelligibility of bizarre religious activities, and to theories of cognition that predict the recurrence of supernatural beliefs. Evolutionary psychology and cognitive neuroscience should influence theological claims about ultimate and proximate realities, salvation and liberation, the meaning and purpose of life, and how so many human beings come to believe in such things. How do theological assertions about sacred religious communities comport with the emerging evolutionary account of their origins? Can theologians continue to say everything they have formerly said about the theological meaning of church and synagogue, temple and sangha?

The second level of dialogue concerns method. On the one hand, the nature and function of theology demand evaluation in light of these results from the scientific study of religion. Is theology a socially embedded intellectual activity specializing in legitimating identity-nurturing deflective and projective responses to an uncertain natural environment? Is it a divinely given responsibility on behalf of a supernaturally established body of sacred revelation? Is it a religiously neutral form of philosophical inquiry? Can it be all of these at once? Scientific understandings of religion should impact the theologian's perception of what it means to assert and evaluate religious truth claims and to operate as the intellectual wing of a religious group and thus what it means to function as a theologian. Similarly, the scientific study of religion raises sharp questions for religionists about the adequacy of the generally humanistic, literary, and historical approaches to the study of religion. Does not the scientific study of religion show that these approaches need to be complemented—and possibly constrained—by the approaches of natural and social scientists?

On the other hand, the insights of religious studies and theology should chasten the scientific study of religion, inhibiting its tendency toward hasty and sometimes hostile reductionism in approaching religious phenomena. Religionists and theologians who accept an evolutionary theory of religion will inevitably assert that the evolution of human social tendencies and higher cognitive capacities provoked and promoted religious behavior. They will say that this particular product of the evolutionary process opened up a universe of religious depth that would have remained closed otherwise. They will picture the existential coloring and religious depth of reality gradually becoming a part of the environment of human life as human beings evolved the abilities to engage it. This viewpoint makes a virtue of the evolutionary account of the origins and functions of religious beliefs and behaviors. Religionists and theologians tend to agree on this much even if theologians then go further to speculate on the meaning of all this, whereas religionists typically remain content to analyze its functions and effects. The scientist studying evolution and religion may not be able to speak to the reality of

religious phenomena, but it is dangerous for that scientist simply to refuse to consider the role that religious realities may play in conditioning the evolutionary process itself.

This presents a serious methodological conundrum for the scientist. The scientist does not want to leave out factors relevant to an inquiry about the evolutionary origins of religious beliefs and behaviors, yet the scientific method appears unable to make use of the hypothesis of the reality of religious phenomena because scientific evidence appears incapable of settling such a question. Scientists may be tempted to rule out ~~the reality of~~ religious realities a priori rather than remaining neutral to them because they are intractable within the scientific framework of analysis. In that case, alert religionists and theologians, as well as other scientists, must be ready to call the wayward back to the straight-and-narrow path of scientific discipline. If science cannot settle metaphysical questions about the reality of religious objects positively, then neither can it settle such questions negatively. Scientists must *bracket* the questions—in the sense of suspending consideration of them—and also remain alert to the fact that such bracketing can limit the validity of their conclusions.

ORGANIZATION OF THIS CHAPTER

Evidently, the potential interactions among the scientific study of religion, religious studies, and theology are conceptually and methodologically complex, perhaps forbiddingly so. I have sketched these complexities with just enough detail to suggest how this volume fits into a wider intellectual venture, with a small but growing body of literature. In the remainder of this chapter, I shall comment at both the conceptual and the methodological level. I shall organize my thoughts into four major sections, reflecting the most important themes of the volume: CST, the evolutionary status of religion, the cognitive elements of religion, and the adaptive functions of religion. Sometimes I offer summary overviews or fill in background that is missing in the volume, thinking especially of what religionists and theologians might need to follow the scientific chapters. But my primary task is to say enough on each issue that I can briefly indicate its significance for religious studies and theology.

TERMINOLOGY AND BASIC CONCEPTS

Throughout this chapter, I take for granted the meaning of several key terms in evolutionary biology impinging on evolutionary psychology. Keeping these terms in mind is particularly important for religionists and theologians. Words such as “fitness” and “adaptiveness” may have misleading connotations in their worlds of thought, suggesting sound psychological adjustment,

empirically accurate interpretation of an environment, health-promoting lifestyles, or spiritually efficacious beliefs and practices. As important as these ideas are for understanding religion, they should not be conflated with the differential reproduction advantage associated with the concepts of fitness and adaptive function in evolutionary biology.

Fitness always refers to reproductive fitness, which means the ability of a biological entity (*organism*) to pass genetic information (*genes*) to future generations. This refers not to the number of offspring (which may be infertile or die before they reproduce, after all) but to the spread of genetic material in future generations. A simple (but not foolproof) test of fitness is whether one's offspring themselves are reproductively successful. Fitness is always relevant to an *environment*, within which a population has a *niche* where it is subject to particular *selection pressures* in the form of nutrition, disease, and predators. A key question in evolutionary biology is whether the environment relevant to fitness can include high-level social factors as well as low-level biological factors. Evolutionary psychology's core hypothesis is that social and psychological factors are relevant to evolutionary fitness.

A *trait* is a genetically based characteristic of an organism, such as eye color or a genetic propensity to cancer. I will use *characteristic* or *feature* to refer to aspects of an organism's behavior and function in general. The genetic basis of traits is an extremely complex matter because genes often influence more than one characteristic of an organism and traits usually depend on many interacting genes. Unresolved questions about the genetic basis of organism characteristics abound, particularly in the context of evolutionary psychology, where the concern is with emergent characteristics such as behaviors, emotions, and beliefs. Many behavioral characteristics can be cultivated independently of genetic makeup, so it is frequently unclear whether certain behavioral features of organisms are traits in the genetic sense at all. To say that a behavioral predisposition is a trait implies that the behavioral predisposition has a genetic basis that somehow persists through cultural and contextual factors and tends to express the associated behavior in widely varying circumstances. Twin studies and adoption studies can help to decide whether a behavior has a genetic component and thus whether the associated behavioral tendency is a trait. In human evolution, most key traits were developed in the very long Pleistocene environment of evolutionary adaptation, a hunter-gatherer lifestyle prior to settled agriculture that I shall refer as the *ancestral environment*.

A *mutation* is a structural and molecular chemical change in genetic material. Many mutations are irrelevant to an organism's function, at least in the short term, though presumably many unexpected things can happen in gene evolution in the long term. The sorts of mutations we are interested in produce or affect traits. In evolutionary psychology, the focus is on mutations that affect cognitive and behavioral traits. An *adaptation* is

a mutation or a set of mutations that increases individual fitness. Genetic change is *adaptive for a population* when it produces traits that increase the population's average fitness.

Fitness is a relative term, expressing differential reproduction advantage of one organism relative to others of the same species in the same environment or average differential reproduction advantage of one population relative to a similar population at a different time or place or in a changed environment. There is no absolute measure of fitness. A *niche* is the ecological setting for a *species* of organisms and determines the part of the wider environment that is causally relevant to the species' fitness. A *niche resonance* is a self-reinforcing match between an adaptive trait and an environment that increases both the frequency of the trait in the population and the fitness of organisms possessing the trait. A niche resonance can link genetically distinct traits in such a way that the frequency of both traits increases in the population. This is especially important in sexual reproduction, where a male trait and a female trait can reinforce one another and increase in frequency within the population even though neither trait alone would increase fitness. Niche resonances can even occur between species, particularly in *communicative environments* that permit the sending and receiving of signals between predators and prey. Evolutionary psychology proposes that niche resonances might also sponsor *gene-culture coevolution*, a hypothetical relation between organisms and environment in which genetically linked cultural practices have a genetic influence.

Adaptive function refers to the biological or behavioral function of a genetic trait that causes it to be adaptive. A trait that decreases fitness has a *maladaptive function*; selection pressures may reduce the presence of such traits in the population. A genetic feature can be neither adaptive nor maladaptive if no selection pressure exists in a particular context to affect its presence in the population. The question of the context for assessing adaptive function and maladaptive function is a vexed one in evolutionary psychology. The *original selection context* is that in which a trait first becomes established in one or more organisms within the ancestral environment and then spreads widely through the species because of its adaptive function in that context. An established trait can also have effects other than the *primary adaptive function* for which it was selected. These effects, whether copresent already in the original selection context or appearing only much later as environmental conditions change and new traits are established, are called *side effects* or *by-products*. When by-product effects serve to increase fitness independently of the primary adaptive function, the underlying trait has a *secondary adaptive function*. As with primary adaptive function, there can be *secondary maladaptive functions* and secondary functions that are neither adaptive nor nonadaptive, or *nonfunctional by-products*.

Traits adaptive in one context can become maladaptive in a new context. By-products can be simultaneously adaptive, maladaptive, and nonfunctional

with respect to different selection mechanisms. There is great deal of dynamism here as varying sets of traits interact with diverse environments. Evolutionary psychology proposes that culturally conditioned behaviors can combine with genetic traits to have genetically relevant effects, as when health care policies and technologies create reproductive opportunities for those who would not have been able to reproduce in the ancestral environment. *Sexual selection*, the process of mate choice, is particularly important in giving genetic relevance to culturally conditioned aspects of organisms. *Communicative environments* vastly expand the range and likelihood of trait side effects. Some may be potentially maladaptive, as when communication allows human beings to wipe out malaria in some parts of the world, thereby reducing the presence of malaria resistant genes and exposing larger numbers of people to a future outbreak of deadly malaria under new environmental conditions. Most side effects are not directly exposed to selection pressures, as when human beings flip coins, cook waffles, and play cricket.

Different types of evolutionary theorists tend to focus on different contexts. Some focus on the original context for a trait's selection, some on the long-term persistence of traits through varied environments, and some on the current observable adaptive function of traits. This leads to quite different conceptual and terminological frameworks and sometimes to a great deal of confusion. Miscommunication can be mitigated by paying attention to the question of context for claims about the adaptiveness of traits. As it happens, diverse terminological frameworks are evident in the chapters of this volume, particularly around signaling theory and evolutionary by-products. When we come to those topics, therefore, I shall return to terminological and conceptual clarification in an attempt to promote mutual understanding.

COSTLY SIGNALING THEORY AND RELIGION

Most of the chapters in this volume accept the promise of costly signaling theory (CST) to offer an explanation of bizarre, seemingly fitness-reducing, and otherwise hard-to-explain behavioral characteristics, including certain religious phenomena. CST seems to apply only to some aspects of religion, and thus its usefulness as an explanation of religion's evolutionary origins is hard to assess with any confidence. Moreover, CST is controversial even in its native domain, as we shall see later in this chapter. Yet CST also suggests that costly religious behaviors can no longer serve as evidence that religion lacks an evolutionary origin. On the contrary, CST explains how such counterintuitive behaviors might actually increase fitness in communicative environments. Since there is no systematic accounting of the CST controversy in the current volume, a sketch of the main issues is in order here before turning to its application to religion.

A Sketch of the Development of Costly Signaling Theory

In a famous 1975 paper, biologist Amotz Zahavi introduced the *handicap principle* (Zahavi 1975, 1977a, 1977b). Inspired by his long observations of small Arabian Babbler birds, Zahavi was trying to explain how apparently fitness-reducing handicaps could evolve. In the realm of sexual selection, a standard example is the weighty and florid plumage of some male peafowls (peacocks). Such plumage might be sexually appealing to female peafowls (peahens), but it is metabolically expensive to produce, tiring to lift and spread, and increases the peacock's vulnerability to predators. The male trait thus seems to decrease fitness. The corresponding female trait also seems to decrease fitness by limiting the number of eligible mates. This doesn't make much sense on the premises of natural selection alone, so how could such an arrangement have evolved? In the interspecies realm, a standard example is gazelle stotting. When a gazelle notices a lion stalking in the savanna grass, the gazelle starts leaping in place, high in the air. Should not the gazelle save its valuable energy for running away and make the most of its time by starting immediately? For its part, the lion tends to avoid high-stotting gazelles and go after low-stotting or no-stotting gazelles instead.

Zahavi's key move in explaining such phenomena was to hypothesize a *communicative environment*, within which evolutionarily relevant *signals* can be sent from *signalers* to *receivers* so as to influence receiver behavior. The peacock's plumage is a trait that "sends a message" about genetic value (in the sense of likely reproductive fitness of offspring), while the peahen's instinctive attraction to florid plumage is a trait that permits her to "receive the message" about genetic value, which influences her mate-selection behavior. The two traits together in the right environment create a niche resonance that increases the frequency of exorbitant plumage in males and the frequency of attraction to such plumage in females. Males may die sooner, but they will find mates more quickly and more often (peacocks are polygynous in the wild and only monogamous in captivity), so their overall reproductive fitness may in fact increase, contrary to initial expectations. Females will have fewer potential mates, yet their overall fitness may increase because of increased fitness of their offspring.

Zahavi's intuitive (though not experimental) causal explanation of such behaviors promised an analytical framework for understanding their evolutionary origins and significance. At the time when Zahavi made his proposal, the most broadly accepted theory was Ronald Fisher's runaway sexual selection explanation (Fisher, 1930). Fisher proposed that there are no selection pressures (apart from peahen mate selection) on peacocks with large plumages, so the trait is amplified in the population without limit so long as peahens are attracted to such plumage. Surely runaway sexual selection applies in many cases, but the handicap principal is superior in

the case of peafowl because it accommodates the fact that plumage varies tremendously among peacocks. This variation presumably allows it to be used as a reliable fitness signal.

Gazelle stotting can also be explained on the premise of communication between gazelle and lion. The speculative reconstruction of this communication is as follows. The gazelle uses up valuable energy, but it shows the lion how strong and fast it must be through the height of its leaping. A lion smart enough to get that message but not smart enough to realize that gazelles with longest-lasting stotting displays may be more exhausted and easier to catch will chase down nonleaping or lower-leaping gazelles. This helps the lion because a failed chase is extremely exhausting, making a subsequent chase even less likely to succeed and risking starvation. It helps the individual gazelle by deflecting the predator's attention to weak or sick animals. At the gazelle population level, this deflection costs nothing in average fitness if the killed animal is old. It may actually improve average fitness if the unlucky prey is genetically prone to weakness. The resulting niche resonance increases the frequency of both the stotting trait in the gazelle population and the cognitive inference trait in the lion population. The careful scientist immediately wonders whether this story can ever really be confirmed or even experimentally tested because it depends on the cognitive contents of animal minds.

These explanations of seemingly fitness-reducing traits make evolutionary sense only if the signals in question are reliable indicators of reproductive fitness. Why? Suppose it turns out that low-leaping gazelles can actually run faster and dodge better than high-leaping gazelles. The lion that chases low-leaping gazelles, thinking they are more vulnerable, is less likely to eat. Its fitness is reduced by its possession of this mistaken cognitive structure, and the frequency of that trait will decrease in the lion population accordingly. Correspondingly, the high-stotting trait offers no survival advantage for gazelles to offset the disadvantage of exhaustion when lions do not treat stotting as a reliable signal of strength and speed. In this case, the stotting trait is not relevant to reproductive fitness, so it cannot function as an authentic signal and would not become an evolutionarily stable feature of the gazelle–lion–savanna environmental niche.

Zahavi's proposal was not received warmly at first. Evolutionary biologists from John Maynard Smith (1976) and Richard Dawkins (1976) to Robert Trivers (1985) and Mark Kirkpatrick (1986) criticized it because it flies in the face of the principle of natural selection, had no theoretical justification in the familiar terms of game theory, relied on very little data, and seemed to oversimplify animal signaling phenomena. Whereas natural selection eliminates fitness-reducing traits, the handicap principle can amplify them. Explanations of strange biological phenomena are welcome, of course, particularly when such phenomena make little sense on the principle of

natural selection alone, but the theoretical confusion induced by conflicting principles at the heart of biological evolution was not welcome. In fact, the problem of conflicting principles in evolutionary biology is long-standing. Darwin himself had distinguished the principle of sexual selection from the principle of natural selection and had produced no fully satisfying synthesis (see Darwin, 1859, 1872). This suggests that the difficulty accepting Zahavi's speculative interpretations of his observations may have been driven in some cases by a selection-oriented orthodoxy in biology that was not nearly as empirically minded as Darwin himself was.

The handicap principle is far more general than Darwin's sexual selection principle because it may help to explain surprising phenomena in sibling competition, predator-prey communication, and a variety of other contexts (see Zahavi & Zahavi, 1997). It is really about how the principle of natural selection needs to be modified to accommodate the fact of emergent communicative contexts. *Fitness remains the evolutionary yardstick, but in communicative environments natural selection is only one of many possible algorithms for optimizing fitness.*

Alan Grafen's landmark 1990 paper confirmed this interpretation of the handicap principle with game-theoretic formality that was alien to Zahavi's more intuitive observational work (see Grafen, 1990). Grafen's mathematical model showed how handicaps, understood as a kind of costly signaling, could optimize fitness in evolutionarily stable ways. The model also clearly exposed the assumptions of the handicap principle, allowing evolutionary biologists to see how it could complement the principle of natural selection. Grafen's work helped to win broad acceptance of the handicap principle among experts in the field. Some early critics reversed their early judgments (see Dawkins 1989), while others sought to generalize animal signaling theory to include the possibility of noncostly signals as well as the costly signals of the handicap principle (see Maynard Smith & Harper, 2003). With Grafen's contribution, the idea of handicap traits making sense in communicative environments had taken a huge step toward theoretical stability, and what we now know as CST was born.

Contemporary critics of CST have isolated weaknesses and oversimplifications in CST-based modeling. They point out that real-world relationships are multifaceted and cannot be reduced to the simple roles of CST game-theoretic models; that the actual genetic relevance of signals is often assumed rather than shown; that the models rarely accommodate dynamic complexities due to the social realities of cheating and deception, memory, and reputation; and that the game-theoretic criterion of evolutionarily stable scenarios oversimplifies the fluidity of evolutionary environments and the endlessly complex relationships that animals form within them. Yet because of the success of the handicap principle in solving some classic problems in evolutionary biology, scientists have tried to apply CST to other phenomena

that they find difficult to explain. In the biological sciences, it is an important factor in theories of sexual selection, kin relationships, and predator–prey behaviors. In the human sciences, it appears in theories of class distinctions, conspicuous consumption, fashion trends, adolescent peer-group dynamics, deception, language development, and ritual. Anthropologists and psychologists use CST to explain dangerous or bizarre human behaviors that reduce individual fitness, from needless risk taking to painful rituals and from altruistic acts of sacrifice to exorbitant acts of public generosity. Despite the ongoing challenges to CST, therefore, it appears to be here to stay. The core idea that communicative environments change the way environmental–species niches optimize evolutionary fitness corrects selection-focused biology by pointing out that complex emergent communicative environments permit many novel pathways to increasing fitness.

While experts now agree that costly signals are among the signaling phenomena that can be evolutionarily relevant, it is important to ask why costly signals turn out to be important in a given case when there are so many other potentially relevant dimensions of signaling, such as the communicative capacities involved in noncostly cooperation behaviors. In other words, if noncostly signals can enhance evolutionary fitness, why would costly signals ever arise? This is not a difficult question to answer, in principle: costly signals may be able to solve some problems that noncostly signals cannot, such as the freeloader (or free-rider) problem discussed in several places in this volume. But it is extremely important to keep this question in mind because game-theoretic models often suggest that non-CST equilibria persist alongside CST equilibria for biological signaling systems. In order to be credible, therefore, a CST-based analysis of a behavioral trait probably has to *show* that explanations based on noncostly signaling do not rule out a role for costly signals. But this level of rigorous argumentation is hard to achieve because evolutionary biology presumes communicative environments that we cannot inspect but only imaginatively reconstruct. The speculation that inevitably results makes it difficult to determine why, given that every imaginable kind and variation of signaling seems to have a role in evolution, one kind of signaling rather than another seems to have paid off in a particular evolutionary niche.

A similar frustration concerns the struggle for terminological consistency and conceptual clarity in this area. The chapters in this volume sometimes use different words for similar concepts and the same words for quite distinct concepts, thereby reproducing in microcosm the problem plaguing signaling theory as a whole. As just one example, Sosis uses the word “index” and its cognates such as “indicator” in multiple ways. Sometimes he uses it to describe a causal type of sign, as in his claim that behaviors, badges, and bans “indexically signal” (i.e., functionally signal because causally related to) acceptance of a community’s moral norms. In this usage, an index or indicator is a sign that

is causally related to that about which it communicates. Other times he uses it to mean a suggestion, as when he says that fakable signals can still be useful “indicators” of belief. In this usage, an index or indicator increases the probability that an observer’s assumption about sincerity will be correct. Sosis needs both ideas but has only one term.

Maynard Smith and Harper (2003) directly address the terminological and conceptual problems of signaling theory. They offer a conceptually well-organized survey of animal signaling and propose sharp definitions aimed at eliminating confusions and stabilizing language used to frame theories of signaling. They also situate CST-type explanations in the broader context of animal signaling, allowing us to see how CST can complement other lines of explanation for behavioral traits. Without a conceptually adequate and consistent lexicon of key terms, entering the world of thought of a particular author is a stiff challenge for outsiders and may lead to misunderstandings and conceptual muddles even among specialist readers.

Through all these complexities, several points emerge forcefully. First, communicative environments ~~enhance~~ the range of fitness-enhancing evolutionary strategies, permitting fitness-reducing behaviors to persist in particular species–environment niches. The natural selection filter in its simplest form seems to serve as an indispensable foundation for more elaborate strategies, such as animal signaling phenomena. Second, signaling theory helps to shift the focus in evolutionary biology from selection to fitness, which is to move attention from one strategy to the overarching end served by all strategies. It does this by linking the principle of natural selection with sexual selection, the handicap principle, cooperation, altruism, reputation, and other communication-based modes of analysis into a more comprehensive theoretical approach to evolutionary fitness. This promises to resolve the tension between apparently conflicting evolutionary principles that has persisted in biology since Darwin’s writings. Third, if we allow that a species can become genetically predisposed to certain behaviors within an evolutionary niche, then we also have to allow that those behavioral predispositions may persist in the population even when the niche disappears and the environment changes radically. This can lead to “fish out of water” behaviors that, while expected in the original selection environment, may seem bizarre in a new environment, perhaps because they continue to involve costly signaling when the conditions for overall increase in fitness of a costly signal no longer obtain. This in turn invites explanations of seemingly needlessly costly or otherwise bizarre human behaviors in terms of genetic conditioning.

A CST of Religion (Sosis)

With this quick survey in place, we come to religion. Several chapters in this volume assert that CST can help to make sense of a number of human

behaviors present in what we now call religion. Pinker mentions CST as an explanatory framework that might make sense of costly religious initiations and sacrifices. Emmons and McNamara use CST to interpret the pervasiveness of certain sacred emotions in religion. Koenig and Bouchard mention CST as one possible factor in the emergence of religiousness in the ancestral environment. Bulbulia accepts CST as the framework for understanding how religion facilitates group commitment and uses this to enhance and correct McClenon's ritual healing thesis that religion evolved because it promotes health-increasing placebo benefits. Atran uses CST to explain how religion, though not an adaptation itself, functions adaptively as a solution to ever-present existential problems of death and deception. Sosis devotes his entire chapter to explaining how CST illumines the evolution of religious beliefs and practices.

The general pattern of the reasoning seems to go something like this. As outsiders we can observe religious behaviors that strike us as strange because they seem to reduce fitness (e.g., Bulbulia's cognitive error associated with religious beliefs) or because they cause pain (e.g., Sosis's agonizing and terrifying religious rites)—of course, we also observe that these behaviors make perfect sense to insiders. We reason that the counterintuitive, excessively painful, or fitness-reducing character of these behaviors means that they would not arise spontaneously in a social group unless there were genetic predispositions to perform them. Consequently, we assume the presence of such genetic predispositions—and in some cases there is evidence, as some of the chapters recount, especially Emmons and McNamara, Koenig and Bouchard, and Bering. But we do not assume that there is a specific genetic tendency to penis laceration (as described by Sosis) because this is not widespread enough in the species to be an innate tendency expressing a trait. Rather, we assume that there is a genetic tendency to tolerate and seek such behaviors that expresses itself with wide variations in ways specific to culture and circumstance. Some of these behaviors may align strongly with religious rituals, while others may not. After this, we seek to understand precisely what these deeper genetic predispositions are, why they are religiously linked when they are, and how they were formed in the ancestral environment.

Sosis's chapter marshals an impressive array of evidence both that religion at least sometimes involves costly signaling and that costly signaling can help to explain the origins and persistence of some features of religion. His leading questions are excellent: Given the near ubiquity of costly behaviors, why do we spend so much time and energy on them? What is the evolutionarily point? And why do costly behaviors vary so dramatically in nature and intensity?

Sosis begins with an excruciating description of the torture of boys and young men among the Ilahita Arapesh, galvanizing readers' attention by

challenging their moral norms in the way that only anthropologists can—they do this, one suspects, with secret self-congratulatory flourishes of pleasure as they picture their readers' discomfort. But such is life, apparently. Sosis intends his illustration to be a thought-provoking example of the problem he seeks to address. He then frames the problem in religious terms as if he had just been describing instances of religious rituals. But the connection between penis laceration and religion is nowhere established, as it is, for example, in a very different form in circumcision. This would be a minor point except that the fuzzy boundary between religious and nonreligious rituals—evident elsewhere in the chapter, too—endangers the heart of Sosis's argument. If we focus on costly religious rituals, we tend to ask about the evolution of religion. But if the relevant evolved traits underlie costly rituals in general and not specifically costly religious rituals, then we will not succeed in throwing much clear light on the evolutionary origins of religion by studying costly rituals. So when Sosis analyzes the communicative content of religious behaviors, badges, and bans, it is fair to ask what the evolutionary rationale is for limiting the scope of the question to religion and whether this way of framing the issue distorts the resulting accounts both of human nature and of religion.

It is not difficult to see how theoretical distortion might occur. Our theory of the communicative content of religious behaviors, badges, and bans may lead us to propose that religion evolved specifically to promote such signaling. Indeed, Sosis plausibly argues that religion promotes reliable signals better than simply announcing promises, but he merely assumes the superiority of religion to all other social mechanisms for establishing signal reliability without offering good reasons to think it is so. What if promise making was accompanied by some costly, nonreligious ritual, such as offering up one's children as a guarantee of sincerity? Indeed, this has happened, as when a slave makes such a suggestion to reassure a master that he or she will return from a journey. Less potentially deadly forms of collateral are common in financial transactions. The result would be a nonreligious cultural practice highly conducive to truth telling, promise keeping, and reliable signaling. The relevant trait is a cognitive one: we need to be able to count on a promise in spite of our ability to deceive and in spite of our *theory of other minds* that allows us to imagine being deceived. But those cognitive traits could promote many sorts of costly ritual practices, even if they were not religious in any recognizable sense. Therefore, we would err if we saw here a reason for the evolution of religion. We have only a reason for the evolution of behavioral traits ~~supporting~~ costly rituals that support reliable signaling. The question of the role of religion in such rituals—and the reasons for its absence in some—is not directly answered in such arguments.

Sosis addresses this difficulty later in his chapter. He wisely notes that religion is much more than costly rituals supporting reliable signaling that

can solve group-bonding problems. It also includes myths and mystical experiences, beliefs and emotions. He focuses on religious beliefs in supernatural agents, the effects of internalizing such beliefs, and their emotional significance. He argues that internalized beliefs in supernatural agents expose one's private intentions to a supernatural being capable of seeing and punishing deception. Such beliefs thus function as an internal goad to honest signaling. Religious practices, as Sosis points out, cause participants to internalize such beliefs through ritualized repetition and emotional priming. And most religious communities back up these mechanisms for internalizing group norms with an array of punishments, beginning with disapproval and fines and running through public shaming and physical beatings all the way to banishment, excommunication, torture, and execution.

In this way, Sosis argues that religion evolved as a means of maximizing the reliability of signals in socially complex communicative contexts. But he leaves open the question about whether the underlying traits are tightly tied to religion or rather promote quite general features of human behavior that influence the evolution of religion along with other loci of ritualized behavior and belief. He hints at part of the reason for this open-endedness at the end of his chapter. To Sosis—and I think this is commendable—the practical problems associated with religious beliefs and practices are much more important than reconstructing their evolutionary origins. Yet if we are to apply a CST-based theory (or indeed any other evolutionary theory of religion) to contemporary problems, it is best to have our theoretical ducks in a row. Knowing what sort of story our theory implies at the trait level serves as a check on theoretical adventurousness and may even help to avoid the covert operation of bias in our social and political analyses.

The Import of Costly Signaling for Religious Studies and Theology

The significance of CST for religious studies and theology is obvious: if CST is correct, then religious studies and theology have been overlooking something vital.

This hits home in religious studies, particularly within *ritual theory*, a fascinating and complex interdisciplinary area of study involving many lines of investigation. It involves historical investigation about the origins of rituals and their changes over time as well as description of the varied cultural expressions of similar rituals—themes less likely to be impacted by CST. But ritual theorists also try to explain the social and religious functions of rituals. The main resources here come from theoretically oriented sociologists and anthropologists who have proposed wide-ranging frameworks for understanding human behavior. Unfortunately, most of the theoretical frameworks in play within ritual theory do not discuss

evolutionary psychology and certainly not CST. As a result, many interpretations of costly religious rituals are currently leaving out a potentially field-transforming insight.

CST also deeply challenges theological readings of costly rituals. A theologian typically tries to make sense of the particular rituals that predominate in a single religious tradition as expressed in a particular place and time, being careful to take account of historical developments and the deliverances of sacred texts and traditional wisdom. Some theological interpretations of rituals ignore ritual theory altogether and work intensively within the plausibility structures and resources of a local religious tradition. Neither CST nor ritual studies are likely to induce such theologians to raise their eyes and consider “external” theoretical interpretations of ritual. By contrast, other theologians attempt to forge interpretations of the theological significance of ritual while absorbing the best theoretical understandings of ritual in general. Such theologians will be fascinated by CST, regardless of their tradition of focus or their religion of affiliation, if they have one. For them, CST raises the question of whether theological interpretations of ritual nurtured within religious communities are compatible with evolutionary psychology’s insights into the function of rituals in human groups. What happens to the theological interpretation of shamanic self-flagellation and the Hajj’s dangerous crowd-crushing stoning-the-devil ritual or of ancestor reverence and the pouring out of precious milk in Hindu puja when CST is drawn into the interpretation? Theologians inclined to say that Jewish circumcision expresses a covenant between God and God’s chosen people may look at the origins of the rite, which was among grown men, quite differently in the light of CST. CST may also help theologians used to thinking of the Christian Eucharist as a means of participating in the saving benefits of Jesus Christ’s sacrificial death to look on the historical origins and early social significance of the Eucharist in new and potentially revolutionary ways.

Finally, theologians interested in the theological meaning and social significance of religious groups need to scrutinize their working interpretative frameworks in the light of evolutionary psychology and CST in particular. The sorts of social functions that CST speaks of—such as solving the free-loader problem and increasing the reliability of commitment signals—are rarely mentioned in theological interpretations of religious groups, yet these kinds of dynamics may be among the most important factors influencing their origins and function.

THE EVOLUTIONARY STATUS OF RELIGION

A prominent theme in this volume is the evolutionary status of religion. Is religion an evolutionary adaptation, increasing fitness in and of itself and originating because of its adaptive function? Is it a side effect of a collection

of adapted traits, much as language and war and commerce seem to be? Is it a nonadapted by-product of the evolutionary process, like the redness of blood, or perhaps a maladaptive by-product, such as back problems that derive from erect posture? Is it possible that religion has no genetic component at all, either in its unfathomable origins or in its subsequent cultural expressions? These questions lie at the heart of the interpretation of religion within evolutionary psychology, and some of them are quite significant for religionists and theologians, as we shall see.

Religion as Nongenetic

We might be tempted to think there is no genetic component to religion, despite its near universality among human beings, because we can find no way to account for the diversity of religious practices and beliefs in terms of genetic traits. Rather, on this view, we should understand religion as a culture-level response to social needs for bonding and legitimation, to the problems of deception and freeloading, and to primal experiences of transcendence, revelation, love, and death. Religion is diverse because cultural practices are genetically underdetermined, leaving lots of room for chance factors to condition the particular practices of a given group. Religion recurs across cultures and eras for the same reason that fire does: it is an effective way to deal with the common challenges. We need presuppose no genetic tendency to either religion or fire. How credible is this nongenetic interpretation of religion?

The classic modern sources for the scientific study of religion include early philosophical and theological theorists such as Immanuel Kant and Georg Hegel, early sociologists such as Émile Durkheim and Max Weber, early psychologists such as Sigmund Freud and Carl Jung, and early crossover intellectuals such as William James. It is vital to note that these field-defining religionists worked by and large out of the nongenetic framework for understanding religion that I have just sketched. To a very large extent, the nongenetic framework for interpreting religion continues to dominate religious studies today. For example, few religious studies programs offer courses in the evolutionary psychology of religion.

In many ways, this does not matter much. To study the peculiar changes that crept into Buddhism when it migrated eastward from India into China, historians work closely with documentary sources. They can do that without paying any attention to evolutionary psychology if they confine themselves to description of the changes, surely a difficult enough challenge. Yet changes in religious beliefs on such migrations might well be affected by genetically based cognitive structures that constrain the options for how given beliefs are reframed in a new cultural context. If the historian is interested in explaining the changes rather than just describing them—and most historians do have

such interests—then the evolutionary psychology of religion claims a place in the discussion.

Such thought experiments challenge prevailing assumptions in religious studies that religion is a nongenetic, culture-level phenomenon or that its genetic linkages are irrelevant to understanding it. The chapters in this volume (especially Bering and Koenig and Bouchard) recount seemingly robust evidence that some aspects of religiosity have a genetic component. So religionists need to start paying attention to evolutionary theories of religion on pain of irrelevance. But irrelevance cuts both ways. From the point of view of even the most elementary religious studies, the lack of nuance in evolutionary theories of religion is appalling and makes the affected scientific work irrelevant for understanding religion as such, which in turn compromises its usefulness even for understanding a single dissociated feature of religion.

The disconnect between evolutionary theories of religion and mainstream religious studies is quite profound and must be overcome not only for the sake of theoretical adequacy but also to improve the quality of public discourse about religion. A scientist studying a single feature of religion may not have the broad-based knowledge needed to properly appreciate manifold levels of value in religious phenomena. To have such a person speak in public about a religious controversy can be disastrously insensitive and potentially insulting to adherents of a religion. In fact, we saw unsophisticated punditry from scientists repeatedly in the widespread controversy over the September 30, 2005, Danish publication—and subsequent republication in more than fifty other countries—of caricatures of the Prophet Muhammad. It is religious studies specialists who best understand religions and their internal and external battles. Yet the evolutionary study of religion casts many contemporary religious controversies into a fascinating and informative light that may eventually help to explain group identity struggles better than sociology alone. The quality of public discourse about religion demands that if hard scientists are not going to learn religious studies, then some religious studies specialists need to overcome their “genetics does not matter” mentality and seek to learn about the evolutionary interpretation of religion and the brain.

Religion as an Adaptation

On the spectrum of theories about the evolutionary status of religion, the view that religion is an evolutionary adaptation lies at the opposite end from the nongenetic view. The *adaptation explanation* says both that genetic predispositions to specifically religious beliefs and behaviors increased average fitness in the ancestral environment and that the primary adaptive functions of these beliefs and behaviors are precisely what caused the genetic predispositions

originally to become well established—and eventually virtually ubiquitous—in the human population.

This is a bold claim, considering that we cannot inspect the ancestral environment to check its accuracy. But perhaps we are not totally confined to speculative reconstructions of how things went down in the savanna. Adaptationists assume that the beliefs and behaviors associated with religion-inducing traits were expressed in ancestral environments in ways similar to today. This assumption is implausible if we think the challenges that originally provoked religious beliefs and behaviors no longer obtain. But it is plausible if we have reason to believe that those behaviors solved similar evolutionary challenges consistently across evolutionary contexts. In that case, we can indirectly inspect the original selection context by directly examining religious beliefs and behaviors in the contemporary world. Research on the evolutionary origins of religion as an adaptation can then be accomplished by studying how tightly connected religious beliefs and behaviors are to genetic traits in the current context. This involves twin and adoption studies to isolate genetic from environmental contributions to religious belief and behavior. It also increasingly involves neurological and biochemical studies. But it is crucial for the adaptationist's case that the relevant genetic traits induce specifically religious beliefs and underlie specifically religious practices—as against other, nonreligious beliefs and practices that might play a role in solving social problems among savanna hunter-gatherers.

In this way, we might try to construct the evidential foundations for a theory of the evolution of religion as an adaptation: religion rides on the back of specifically religious beliefs and behaviors that are tightly linked to genetic traits, with the traits selected for by virtue of the problem-solving usefulness of the associated beliefs and behaviors. Around this core of belief-inducing and behavior-promoting genetic traits, there may be a complex accretion of side-effect behaviors and cognitive tendencies that are not as tightly linked to genes and therefore can account for the massive variation in religious expression across cultures and eras. The adaptive functions of core religious beliefs and behaviors would produce structural similarities in all religious phenomena, however, and perhaps even specific religious beliefs and behaviors that are universal or nearly universal across the wealth of religious expressions. On this view, we could and should define religion in terms of these core genetically linked behaviors. (Startlingly, we have here the promise of a relatively objective solution to the religionist's unending problem of trying to define religion.)

The adaptation explanation is helpfully vulnerable to correction. Simply look for evidence of structural factors that persist through religious phenomena. Religionists have discovered few such universal factors, and most that have been discovered seem not to be distinctively tied to religion but rather seem to be generic features of human cultural activity. This weighs

against the adaptationist explanation of religion. But perhaps religionists have not been looking in the right places or for the right things. Cooperation between evolutionary theorists and specialists in the study of religion might turn up stronger evidence to support the adaptationist case.

I believe that relatively few theorists explicitly defend in print the idea that religion as a whole or in large part is a genetic adaptation. Yet many evolutionary psychologists attack adaptationism as if this view had a lot of supporters and they were causing a lot of trouble. Perhaps this is a vengeful expression of frustration that the adaptationist line is so easy for the general public to grasp that oversimplified adaptationist views, rather than their more complex competitors, typically make the front pages of newsmagazines and television documentaries. The title of Dean Hamer's (2004) book says everything we need to know about the popular cachet of adaptationist readings of religion: *The God Gene: How Faith Is Hardwired into Our Genes*. Even when books do not argue explicitly for religion as an adaptation, publishers often insist on oversimplified titles that suggest the eminently comprehensible adaptationist position, as in Matthew Alper's (2001) *The "God" Part of the Brain*, which comes complete with the neurological modularist's favorite sort of image on the cover: a brain scan with a small patch lit up (presumably with spiritual illumination). A similar adaptationist oversimplification happened in the press's reception of V. S. Ramachandran's work on a temporal lobe brain area that seems connected to religious experiences, reportedly to Ramachandran's great dismay (see Ramachandran, 2004; Ramachandran & Blakeslee, 1998).

Hamer is more cautious than his many critics often allow, but he does seem to want to argue for religion as an adaptation, so it is worth noting the weakness of his argument (Hamer is aware of the difficulty but risks it for the sake of speculatively articulating a bold hypothesis). He claims to find a correlation between a point mutation on a single gene (VMAT2) and small differences on surveys about self-transcendence experiences (for details, see Hamer, 2004). But this is not the same as providing an argument for religion as an adaptation. Most obviously, the mutated gene may have evolved for reasons having nothing to do with religion, whereafter its religious significance (such as it is) kicks in as a side effect, and nothing is gained for the adaptation case. Unfortunately, Hamer does not investigate this alternative, so his argument for religion as an adaptation is weaker than he would like. Not holding anything back, Carl Zimmer, in his *Scientific American* review of the book, suggests an alternative title for *The God Gene*: "A Gene That Accounts for Less Than One Percent of the Variance Found in Scores on Psychological Questionnaires Designed to Measure a Factor Called Self-Transcendence, Which Can Signify Everything from Belonging to the Green Party to Believing in ESP, According to One Unpublished, Unreplicated Study." Evidently, we need clear criteria for establishing that something is an adaptation, which brings us to Pinker's contribution to this volume.

Criteria for Adaptation (Pinker)

Pinker helpfully lists four adaptationist explanations for the pervasiveness of religious belief: religious beliefs are adaptive because (a) they truly describe the environment of human life, (b) they bring comfort, (c) they forge unified communities, or (d) they answer our need for moral values. His discussion of these four explanations is extremely brief and serves mainly to indicate that he is more interested in explaining religion as a by-product of a host of behaviorally linked genetic traits. I agree with Pinker's preferred approach, so I am ready to appreciate his arguments against these four adaptationist perspectives.

In relation to (a), Pinker rightly treats as an empirically testable hypothesis religion's claim that its beliefs describe reality. But he considers only the theistic type of religion and only one type of theism, the one most vulnerable to falsification because it is strongly oriented to moral confidence and hope for a better world (i.e., a personal, caring, judging God). And then he dismisses all religious beliefs because of the empirical inadequacy of this particular worldview. While I happen to agree with Pinker about the empirical implausibility of "a personal, attentive, invisible, miracle-working, reward-giving, retributive deity," I also think it is tendentious to choose this as the only representative of religious belief worth mentioning in the quest to test the empirical claims of religion. I would be glad to see a patient evaluation of the more theoretically persuasive, if less popular, forms of religious belief, the ones historically adopted by intellectuals because of their empirical adequacy, among other reasons. Some of these are broadly theistic, as in Aristotle's and Plato's worldviews and the philosophical theisms of Neoplatonism and South Asian religion. Others are nontheistic, as in philosophically refined versions of Buddhism, Daoism, and Confucianism. These belief systems are intellectually and existentially profound.

In relation to (b) and (c), Pinker allows that religion may bring comfort to some people and may unite communities but rejects these as adaptationist explanations of religion because they do not establish why the characteristics in question are adaptive or, if they are, why their adaptive functions were the cause for the fixing of genetic predispositions to the associated beliefs and behaviors. In other words, the comforting and bonding elements of religion are available to all approaches to explaining religion, including the nongenetic approaches, and all will make use of them to explain why religion persists, so the adaptationist can make special claim on them only if he or she also shows that these features of religion are adaptive in the original selection context in their specifically religious forms. This involves showing that other, nonreligious ways of getting access to the same comforting and group-bonding benefits are either impossible or less adaptive than the religious ways. Unfortunately, Pinker's criticisms of these two adaptationist

explanations of religion merely ask for more detail and do not acknowledge that a lot more detail already exists in the literature on the subject. For example, Pinker asserts that we have no reason to think that religious beliefs could induce people to cooperate. But he does not say what is wrong with one of the core assertions of the “religion is adaptive because it facilitates cooperation” position, namely, that religion causes people to believe that their private thoughts are transparent to a supernatural power with an interest in preventing deception and promoting group loyalty. In the right social context, a person demonstrating such beliefs will be trusted by potential mates and the wider community alike and thus is more likely to have an opportunity to reproduce, passing along whatever genetic component plays into his or her predisposition to this sort of religious belief. These and related themes recur in the chapters of this volume, and it is unfortunate that Pinker does not address them but merely assumes that they carry no argumentative weight.

In relation to (d), Pinker argues that the idea of a retributive, humanlike deity plays no role in our best explanations of the logic of morality. But this depends on which logic of morality we accept. I think the sociology of knowledge’s interpretation of the role of morality in the social construction of reality is highly persuasive, particularly as elaborated in Peter Berger’s interpretation of religion as in part a means of legitimation and social control (see Berger, 1967). Sociologist Émile Durkheim anticipates and inspires many of the insights of the sociology of knowledge (see Durkheim, 1915), including its recognition of religion as the means by which groups codify their core moral commitments. Similarly, Immanuel Kant’s accounting of the natural logic of human moral reasoning demands a religious framework for moral reasoning to be rational and practical: our moral reasoning presumes (but cannot prove) standards of right and wrong vested in an ultimate moral judge who has the power to reward and punish. Kant and Durkheim and Berger cannot easily be swept aside. I consider religion’s role in moral reasoning and practical moral activity to be one of the strongest arguments for religion as an adaptation, but its strength derives essentially from group-bonding and cooperation considerations and from comfort considerations having to do with moral orientation and the management of cognitive dissonance—the second and third points on Pinker’s list.

Despite these difficulties, the main point of Pinker’s argument is well taken. The fact that claims of adaptiveness are challenging to support in any domain makes the idea of religion as an adaptation difficult to establish. He mentions three criteria for a trait to be an adaptation. The first two are more or less obvious: the trait has to be innate, and it must increase a population’s average fitness in the ancestral environment. Pinker’s third criterion is more complex because it concerns the epistemology of evidence as much as biology: arguments for the supposed increase in average fitness due to the putatively adaptive trait do not count if they take the form of

suspiciously convenient explanations (“just-so” stories). Rather, the arguments must justify the usefulness of the trait with independently convergent evidence from several perspectives. That is, arguments that some aspect of religion increases average fitness in a population have to be based not only on our ability to imagine their practical usefulness in an ancestral environment but also on evidence from some independent field, such as cognitive science or biomechanical engineering. The criterion functions as a burden-shifting principle, defining what counts as a satisfactory argument for average fitness increase due to a trait and therefore setting the bar high for claims that religion is an adaptation.

Evolutionary Side Effects

There are many examples of side effects of adaptive traits that solve problems in ancestral environments (and perhaps also in contemporary cultural settings) and thus turn out to have a secondary adaptive function even though this is not the reason that the underlying traits were originally selected. Language and commerce are standard examples in the literature. In fact, even if side effects have no subsequent adaptive function or prove to be maladaptive, they may still be culturally important. For example, war is probably a side effect of genetic predispositions to violence, combined with the challenges of resource scarcity and possibly our inability to control powerful emotions, and it seems mostly maladaptive as a form of behavior, being extremely costly with questionable benefits at the best of times.

Such side effects are very common in evolution, indeed far more numerous than direct adaptations. This only makes sense: as biological systems get more complex and carry more information, the number of potential trait interactions increases exponentially, well beyond the prodigiously high information limits of DNA. It is in this fuzzy world of trait interactions that most of culture comes to life. Cultures are diverse because they explore the vast space of human behavioral tendencies made possible by trait interactions in different ways. They take advantage of the opportunities presented by random events and the human learning capacity to determine quite different beliefs and behaviors, moral norms and social conventions, languages, and life patterns. Most evolutionary psychologists seem to believe that it is in this space of possibilities that religion finds its origins. There are many theoretical frameworks for articulating precisely how this occurs, however, and there is considerable controversy within evolutionary psychology over which theoretical framework is correct.

Some of the questions that recur in disputes over the evolutionary origins of religion as a side effect are as follows. (1) Given the complexity of religion, which features of religion are we all talking about in any given claim about its evolutionary origins? (2) How can we design experiments to

yield unambiguous determination of genetic traits having religious beliefs and behaviors as their side effects? (3) Given that the ancestral environment is no longer with us, how can we discern adaptive function in the original selection context of traits having religious beliefs and behaviors as their side effects in the contemporary world? (4) Were secondary adaptive functions of traits having religious beliefs and behaviors as their side effects evident from the beginning, even in the original selection context, or did those secondary adaptive functions only appear later, in changed environments? (5) Did religious beliefs and behaviors ever have a secondary adaptive function or have they always been nonadapted or maladaptive? (6) Is it possible that some features of religion directly increased fitness in the original selection context and thus were adaptive, while other features were side effects with secondary adaptive functions? (7) Can we place the entire research enterprise of the evolutionary origins of religion on firmer evidential foundations?

These are enormously complicated questions, and evolutionary psychology is in some disarray partly because of their complexity. Terminological inconsistency plagues the literature, sometimes reflecting unclear concepts. A number of theorists have attempted to come to the rescue, offering key definitions in an attempt to furnish a solid foundation for evolutionary psychology and to tame the zoo of crazy concepts and tangled terms. Stephen Jay Gould has been a particularly important figure because of his coining of the two terms “spandrel” (Gould & Lewontin, 1979) and “exaptation” (Gould & Vrba, 1982). His pluralistic approach to evolution was aimed at overthrowing what he saw as a selection-and-adaptationist-oriented orthodoxy and instilling an awareness of the prodigiously complex space of possibilities opened up by emergent complexity in the evolutionary process. Thus, Gould championed the idea of evolutionary side effects and pluralism of evolutionary mechanisms, along with evolutionary theorists such as Richard Lewontin, as far back as the 1970s. Since then, tidying-up efforts have improved the conceptual clarity of key terms, but some terminological confusion persists.

Buss, Haselton, Shackelford, Bleske, and Wakefield (1998) explain this persistence by pointing out that sociologists, psychologists, anthropologists, and biologists working in evolutionary psychology—and I add religionists—with little or no training in evolutionary biology can get caught in the terminological difficulties because it is virtually impossible for an outsider to penetrate very far into the extremely technical literature on the subject, with its vast array of evidence and intricate argumentation. As Kirkpatrick points out in his chapter for this volume, it is nowhere truer than in evolutionary theory that a little knowledge can be a dangerous thing. But terminological differences having potentially serious conceptual implications are common even among specialists. Indeed, authors in this volume use terminology about the evolutionary status of religious beliefs and behaviors differently. I pointed this out earlier in relation to signaling, and I note now that it is the case also with

terms such as “exaptation,” “spandrel,” and “functionless by-product.” I am sure there are good reasons for any lexicon of terms. For the sake of consistency and to honor the one who coined key terms, here I follow Gould (1991), as enhanced and corrected by Buss et al. (1998)—though I note the objections to Buss et al. (1998) advanced by Kennair (2002) and others.

The key terms for describing evolutionary side effects are “exaptation,” “spandrel,” and “functionless by-product.” Table 11.1 distinguishes these three concepts from one other and from adaptation and indicates how common each is in the real world, reflecting the previous argument that complexity exponentially increases in the space of possibilities for trait interaction.

Brief discussions of exaptation, spandrel, and functionless by-product will illumine these distinctions. Gould’s definition of exaptation has become the standard for both use and abuse, and I present it here using terms already discussed. An *exaptation* is a feature of an organism that originated not as an adaptation but as a side effect of an adaptation that proved (often much later)

Table 11.1 Definitions of Evolutionary Adaptions Versus Evolutionary By-Products

	Adaptation	Exaptation	Spandrel	Functionless By-Product
Corresponds to a trait with an adaptive function that caused the trait to become fixed in the original selection context	Yes	No	No	No
Corresponds to a trait with a secondary adaptive function in the original selection context or in some subsequent evolutionary context	Possibly	Yes	No	No
Does not correspond to a trait but has a secondary adaptive function in the current context of study	Possibly	Possibly	Yes	No
Relative frequency in human life within the current context of study as postulated by theorists	Rare	Common	Very common	Virtually ubiquitous

to have a secondary adaptive function (see Gould, 1991; Gould & Vrba, 1982). Gould spoke of *cooption* to describe the way evolution makes use of a secondary adaptive function.

Named for the more or less unprogrammed parts of an architectural design, Gould defined a *spandrel* as a side effect of biological features that were never selected for their usefulness even in the original selection context and yet subsequently prove to possess an adaptive function in a new evolutionary context (see Gould & Lewontin, 1979). One of his examples is a bridge that was not designed with shelter in mind but subsequently provides shelter to homeless people.

Spandrels and exaptations collectively do not account for side effects with no adaptive functions in any later environment. Buss et al. (1998), in refining Gould's distinctions, call these *functionless by-products*. Of course, there are also a host of *random effects* in evolutionary biology, and these play a role in all these concepts, including functionless by-products. Similarly, biology and context jointly present *constraints* that profoundly affect evolutionary design (there seem to be only two basic ways of connecting optic nerves to eyes, for example), and constraints figure in all of these concepts too.

This lexicon of terms and associated concepts situates spandrels in a middle space between exaptations and functionless by-products. On the one side, spandrels share with exaptations the functional characteristic of increasing fitness in some evolutionary environment, but spandrels differ from exaptations in being side effects of nonadapted characteristics, whereas exaptations are side effects of adapted traits. On the other side, spandrels share with functionless by-products the same evolutionary origins as side effects of nonadapted traits, but spandrels proved to be useful in the sense of increasing fitness in some evolutionary context, whereas functionless by-products never did or at least do not in the context assumed in a given study.

Religion: Exaptation, Spandrel, or Functionless By-Product?

The *by-product explanation* for religious beliefs and behaviors has proved important because it is so difficult to show that religion is an adaptation. Adaptation arguments fail typically because genetic predispositions to religious beliefs and behaviors are not uniquely tied to those beliefs and behaviors. Genetic predispositions to violence are not uniquely connected with war, genetic predispositions to appreciate beauty are not uniquely connected with art, and genetic predispositions to inquire are not uniquely connected with science. Yet war, art, and science can affect and obviously have affected fitness in a variety of ways.

The same applies to religion. One much-talked-about feature of some religious beliefs concerns supernatural agents. It is extremely difficult to show that the cognitive predisposition to believe in supernatural causes is an

adaptation. Rather, this tendency probably derives from more basic cognitive strategies that are demonstrably adaptive but not uniquely tied to religious beliefs, such as overactive pattern recognition skills and the readiness to impute intentionality to hard-to-interpret natural events. These abilities had an adaptive function in the ancestral environment because they enabled us to interpret movements in bushes as potentially dangerous and thereby helped us to escape predators. Overactive pattern recognition skills routinely led and still lead to cognitive error, to be sure, including running away from bushes when the wind rather than a tiger caused the rustling, but they can still be adaptive. In his chapter for this volume, Bulbulia illustrates another way that religious-cognitive error can sometimes increase fitness, namely, by gaining access to health-promoting placebo benefits. It follows that religious beliefs and behaviors grounded in these cognitive capacities can be understood as sometimes adaptive side effects of traits originally adapted for nonreligious functions—that is, as exaptations.

An evolutionary psychologist might conclude that religion is a spandrel rather than an exaptation. In that case, the argument concerns the original selection context for the features whose side effects underlie the religious behavior in question. If those features were based in traits that were originally selected for some other adaptive function and now have a secondary adaptive function in religion, then we have an exaptation. If those features were not based in traits that were selected for some other adaptive function but rather were combinations of side effects of evolutionary design, springing from chance events and merely expressing certain design constraints, then we have a spandrel. Of course, if you trace a spandrel back through its chain of dependencies far enough, you do find traits adapted for something somewhere, just as most family trees contain an aristocrat and a criminal. In this sense, the line between spandrels and exaptations is unclear. In his chapter for this volume, Pyysiäinen illustrates this difficulty by describing the possibility of gene–culture evolution in relation to religion. This further obscures the conceptual boundary between spandrels and exaptations. But it is still important to recognize that features of religion can be more and less remote from adapted traits. Adaptations just are adapted traits. Exaptations are side effects tightly linked to genes, with the side effect possibly co-occurring in the original selection context though never the cause of the fixing of the trait. Spandrels are more remote side effects with secondary adaptive functions.

The distinction between exaptations and spandrels seems to have little bearing on the way religionists understand religion, as fascinating and important as this distinction may be in evolutionary biology generally. Much more important for religious studies is the distinction between both of these ideas and functionless by-products. The functionless by-product explanation of religion is a relatively rare viewpoint because most theorists

readily grant that religion helps to catalyze group cohesion and to solve social problems ranging from deception to freeloading. The eventual adaptiveness of religion seems obvious at the social level, therefore, even when we cannot agree on whether religion is an adaptation or an exaptation or a spandrel and even when we can't generate consensus around what are the relevant genetic traits and how closely they are tied to religious beliefs and behaviors. The functionless by-product viewpoint is most common among those who believe the moral downside of religious beliefs and behaviors outweighs its strategic social benefits. This passionate antireligious position has an opposing twin in the equally passionate proreligious view that denies any genetic component in religion at all on the grounds (quite mistaken, I think) that a genetic link would evacuate religion of its spiritual value and sacred character.

The contemporary value of religious beliefs and behaviors is a point of great moment for religionists and theologians alike, and it has enormous political and social significance. Detractors of religion have argued for centuries that we should eliminate religion (or many parts of religion) because it is bad for people. One way this is done these days is to argue that the badness of religion is due to its being maladaptive or a functionless by-product of the evolutionary process. In such cases, the assumption is that adaptive function is valuable and good, whereas we can dispose of evolutionary by-products with no adaptive function without any loss of value. None of the contributors to this volume explicitly makes this case, but a number of chapters certainly lean in that direction. For example, Pinker asks how a powerful taste for apparently irrational beliefs could evolve, and Bulbulia's argument depends on understanding religious beliefs in the framework of cognitive error.

Religionists and theologians—including scholars with no religious affiliation—tend to find these sorts of characterizations of religious belief outrageous and inexcusable. I have heard terrible things said about such characterizations—shoddy scholarship! lazy interpretation! ideological naïveté! To be completely direct about this, I think these criticisms are well earned in a few cases. Certainly the logical problems with such patterns of valuation are obvious. If adapted function really is good and maladaptation or no adaptation really is bad, then moral consistency demands a eugenics program to optimize adapted function, understood in some (no doubt ridiculous) way. If value accrues through adaptive function but not through functionless by-products, then most cultural artifacts are relegated to the low-value bargain-basement bin because they have not been around long enough to have much effect on human genes. So much for glorious cooking, fabulous new-year fireworks, and awe-inspiring architecture!


I think religionists and theologians should go to war over these issues with the few ideologically extreme scientists guilty of such sins. That is certainly preferable to bending over backward trying to be tolerant, perhaps

because religionists condescendingly think that scientists can't be expected to understand the multidimensionality of value or because religionists are cowed by science's current cultural prestige—which, I note with concern, is capable of being squandered if a few shrill scientists do not learn to speak in public with greater depth of awareness. It is important to remember at this point that this sharp criticism is being leveled by a religionist and theologian already inclined to see human religion in many respects as a kind of agonized striving against the difficulties and uncertainties of life, full of cognitive self-deception, and unaware of the social forces that drive it. Despite this religious and moral critique of religious beliefs and behavior, I am deeply moved by the empirical fact that religion has enormous and genuine value for vast numbers of people. Moreover, this value is assessable independently of any considerations of evolutionary fitness. In other words, my criticism is not religious special pleading but a demand for more intellectual sophistication across the board.

Spleen vented, I note that religionists and theologians still stand to learn a great deal from scientists about the origins of religion by studying its adaptive functions, both in the original selection context and in subsequent evolutionary environments. But little is gained for the religionist or the theologian by mastering the intricate debates over adaptations versus exaptations versus spandrels since little depends on the details of how religion evolved once it is granted that religion is in fact partly the product of evolutionary processes.

No contributor to this volume argues either that religion is a functionless by-product or that religious beliefs and behaviors have no genetic component at all. The strongest argument for religion as an adaptation is probably that of Bulbulia, whose chapter's subtitle describes religiosity as "an adaptation for health and cooperation." There is no representative of any of the supposedly classic views of religion as an adaptation, either based on specific genes or based on specific brain modules that increase reproductive fitness. The most explicit argument against religion as an adaptation is that of Kirkpatrick, who titles his chapter simply "Religion Is Not an Adaptation." The other contributors, while possibly allowing that some features of religion may be adaptations or functionless by-products, stand firmly in the exaptation–spandrel region of the explanatory spectrum with regard to most features of religion. Here I focus on Kirkpatrick's argument that religion is a complex combination of side effects that have a variety of adaptive functions.

Religion as a Collection of Multiple By-Products (Kirkpatrick)

In his chapter, Kirkpatrick articulates a  multiple-side-effects hypothesis about the origins of religion. He does this in lovely prose, clearly, and with a focus on saying why adaptationist explanations of religion fail. This should

be particularly helpful for readers of this volume. If they want a detailed explanation of attachment theory, which is the heart of Kirkpatrick's positive viewpoint, they can consult his 2004 book on the evolutionary psychology of religion.

Kirkpatrick's attack on adaptationist explanations of religion is entertaining and insightful. He begins by showing how slender the evidence is for the adaptationist view, especially God modules and God genes. He then points out that the adaptationist view faces serious theoretical problems. For instance, he shows that adaptationists by the nature of the case have to explain religion through one or maybe two adaptive traits so that they inevitably end up focusing on certain bits of religion and leaving other pieces out. They might focus on religious experience but leave out group bonding and morality, or else they emphasize cognitive susceptibility to supernatural beliefs but neglect ritual. Kirkpatrick further argues that adaptationists tend to conflate the psychological benefits of religion with reproductive fitness, they often underestimate the fitness costs of alleged religious adaptations, and they remain tantalizingly vague on the key question of the mechanisms by which religious traits get selected for their specifically religious adaptive function—all big no-nos in evolutionary theory. He concludes by stating his own view, that "religion represents a collection of byproducts of a variety of mechanisms that evolved for other (nonreligious) purposes" (Kirkpatrick, pp. 272–273).

As I noted earlier, it is more difficult to locate bona fide defenders of the religion-as-adaptation view than one might suspect, given the frequency with which they are attacked. Unfortunately, Kirkpatrick does not cite many—or any—bona fide defenders of the religion-as-adaptation view, despite saying often enough that God modules and God genes are "commonly cited" as reasons to think that religion is an adaptation. He mentions Hamer (2004), but even Hamer acknowledges that the case for religion as adaptation is difficult to make out, and Kirkpatrick himself notes this. I suspect that this lack of cited opponents is evidence of a difference between what gets published in evolutionary psychology and the way evolutionary psychologists talk—a distinction needed to make sense of many disciplines. Or perhaps Kirkpatrick is indirectly attacking the media frenzy around the religion-as-adaptation view, which reflects the public's fondness for oversimplified pictures of complex phenomena.

Be that as it may, the case against adaptation is well made here. Kirkpatrick's argument definitely shifts the burden of proof to his opponents, showering them with challenges to meet in order to justify any claim that religion is an adaptation.

Religion as a Baldwin Phenomenon (Pyysiäinen)

Pyysiäinen's chapter for this volume might well be treated in the next section, on the cognitive dimensions of religion. I mention it here because he

argues that religion has an evolutionary history similar to that of language; both are products of gene–culture coevolution. Like Kirkpatrick, Pyysiäinen thinks that religion is not an adaptation or a collection of adaptations in itself, but he emphasizes more strongly than Kirkpatrick does the role of gene–culture coevolution in the origins of religion.

To make this point, Pyysiäinen refers to the late nineteenth-century writings of James Baldwin, after whom the Baldwin effect is named. The Baldwin effect as it is used today (Pyysiäinen cites Deacon, 1997; Dennett, 1991) is actually a variety of mechanisms whereby learned behavior leads to genetic changes. The most obvious examples, which Pyysiäinen does not mention, are learned social stigmas against people with genetic disorders, which limit the spread of the genes in question. A more interesting example is language, which Pyysiäinen does discuss. According to Terrence Deacon (1997), human language is an instance of the Baldwin effect: it is a three-way coevolution of vocal-tract physiology, the cognitive capacity for symbolic reference, and communicative social environments. Language was not directly selected for in the evolutionary process, but it comes to have an adaptive function anyway once it arrives on the scene. Pyysiäinen thinks that much the same is true of religion. If that is the case, he argues, then religion derives neither from cognitive adaptations specific to religious beliefs nor from simple side effects of traits that were selected for their nonreligious adaptive functions. Rather, religion is a collection of side effects that changes culture and thereby alters what gets selected in the evolutionary process. I would have appreciated more detail at this point so as to grasp more clearly how Pyysiäinen believes religion changes the terms of natural selection. I presume he has in mind sexual selection effects, as when mate selection is guided in part by a preference for partners who use religious beliefs and practices to signal their reliability.

The consequences for religion of this gene–culture resonance are interesting, too, and again akin to the evolution of language. Brains evolve much more slowly than both languages and religions. Just as languages that children cannot learn do not become important, so religions that fail to make cognitive sense to children do not get much play. To apply Pyysiäinen's framework to a religious example that is important to me, I suspect his analogy with language leads to the correct analysis of liberal religion: if a great deal of education is required to make sense of a religious outlook, which is the case for liberal and naturalist forms of religion, then its influence is likely to be confined to an intellectual elite and its numbers small.

COGNITIVE DIMENSIONS OF RELIGION

Religion is not only about beliefs. But there is no question that beliefs are a big part of religion. And there is also no question that beliefs in supernatural agents are quite common in religion. The prevalence of supernatural beliefs

inspires us to ask what it is about human evolution that leaves us, as a rule, so willing to entertain supernatural causes and agents. This has been the focus of intense research in recent decades, and a number of the authors in this volume present their perspectives on what has been discovered.

Before setting out in this new direction, however, I wish to point out that there have always been religious people who reject supernatural beliefs as superstitious and will have nothing to do with them. They are common in our time, too. Judging from this volume, which in this respect faithfully reflects the wider literature in cognitive psychology of religion, these nonsupernaturalist, antisuperstitious religious folk are not taken seriously or treated with respect. They are not even mentioned as exceptions to a rule, and the resulting cognitive theories of religion strike religionists and theologians as exceedingly fragile. This is an obvious instance where deeper knowledge of religion might help scientists studying religion to deal with powerful contraindicating evidence.

Religion and Supernatural Beliefs (Bering)

Bering's chapter is a well-written survey of research on the cognitive psychology of belief in the supernatural. The awareness of the complexity of religion that he demonstrates at the end of his chapter is particularly commendable. His research focuses on children, on the grounds that we can use their rapid cognitive development to assess what level of cognitive complexity would have been needed to entertain the idea of supernatural agents in the evolutionary process. This makes sense as a research strategy because there are so few avenues of approach to questions about levels of cognitive development in evolution, but it is a dubious assumption just the same.

Bering reports on experiments designed to test whether the human tendency to believe in supernatural agents and states is innate or acquired through cultural exposure. His results suggest that even the youngest children are inclined to impute mental states to a dead mouse eaten by an alligator in a puppet play. Yet these youngest of children rarely mentioned beliefs about afterlife prevalent in their culture, which older children tended to do. Bering concludes that belief in an afterlife cannot be entirely a matter of cultural conditioning and that we have here evidence for an innate tendency to treat mental states as fundamental and persistent regardless of bodily state.

There are several problems here. First, Bering's research question about innateness versus social acquisition presumes that the two options jointly exhaust the possibilities. But this omits the possibility that children are born with another innate tendency, namely, to develop a theory of other minds, which initially applies to everything and so often misfires. With the greater cognitive sophistication of later childhood, however, children can detect

inferential mistakes and thus implicitly feel their need for a more plausible intellectual framework for mental states beyond death, whereon they adopt whatever sophisticated framework their environment offers. This interpretation is quite opposed to Bering's yet consistent with the data he presents. Second, Bering's method of approach is flawed in that, ~~at~~^{at} least as he describes ~~the experiment~~, he does not conduct the experiment on a broadly cross-cultural basis so as to control for the effect of cultural exposure. This ought to be an important check on his interpretation of these preliminary results. Third, a subtler methodological difficulty is that such experiments are notorious for not successfully controlling for extraneous factors, such as the experimenter's interview technique (tone of voice, facial expressions) and contextual factors (subjects may enter an "as if" mode of explanation as dictated by the experimental context). This can result in answers that do not reflect authentic metaphysical opinions but rather merely the sorts of answers that ought to be given in the context of such a language game. Despite these difficulties, this sort of research is just getting started, and Bering's results are fascinating and useful within limits.

Bering acknowledges that belief in supernatural entities depends on more fundamental cognitive traits and so rejects the idea that it is an adaptation. He presents experimental evidence to support his claim that such beliefs cause a *Santa Claus effect* wherein human beings believe they are being watched, with attendant improvements in behavior and conceivably an increase in average fitness. It follows that the cognitive traits underlying the tendency to believe in the supernatural have a secondary adaptive function even though they were probably selected originally for a more cognitively basic adaptive function. That makes them exaptations rather than spandrels, in Bering's terminology, but in the lexicon introduced here, this shows only that they are exaptations or spandrels but not functionless by-products. The question of whether belief in the supernatural is an exaptation or a spandrel has to be settled by analyzing whether it is a side effect of a trait. Bering argues for the former, so belief in the supernatural is an exaptation rather than a spandrel, but for different reasons than he gives.

Religion, Cognition, and Emotion (Atran)

Atran perceives the importance and value of religion in a multileveled way. This is enormously helpful when communicating with religionists and theologians and also a prerequisite for responsibly carrying out public commentary duties. I note, moreover, that this does not interfere even a tiny bit with a fair-minded and rational scientific approach to analyzing the cognitive and evolutionary roots of religion, which is Atran's goal in his chapter for this volume. He does oversimplify religion, unfortunately, but not as egregiously as some others.

As the subtitle of his 2001 book *In Gods We Trust: The Evolutionary Landscape of Religion* suggests, Atran sees the human evolutionary heritage as a landscape that constrains, without determining, the development and function of individuals, cultures, and religions. This leads to an interpretation of religion as a recurring by-product of more basic evolutionary traits, of course, but the interesting point in Atran's theory is that he claims to account for variations in religious beliefs and behavior as different journeys within the constraining landscape. Is there really this much freedom to structure religion differently in different cultural settings? Atran gives the impression that the freedom is rather limited when he claims that many fundamental structures recur in all religions, such as supernatural agents, rhythmic coordination of affective bodily states, and social devices to promote cooperation and deal with deception. Empirically, he is mistaken on this point in the sense that there are numerous unexplained exceptions of which religionists are sharply aware, and his argument would be much stronger if he acknowledged the exceptions and explained them instead of speaking of religion as if these exceptions did not exist. But the nonsupernaturalist subtraditions within the world's religions are in the minority, as are those that shun rhythmic coordination of affective bodily states and those that have no important social component, so his general point about landscape-based constraints on religious beliefs and behaviors probably survives.

Atran stresses that the cognitive functions associated with supernatural beliefs are present in many domains of human life, including our appreciation for fictional cartoon characters. It is the emotional freight associated with religion that makes all the difference in bonding communities together, solving social challenges of cooperation and deception, and inspiring the willingness to sacrifice that he sees in the Islamic jihadists he studies. His question, therefore, is how the conceptual foundations of religion ~~manage to work in such a way that they~~ ramify religious beliefs so powerfully that people are willing to die for them. His answer is similar to that of Pascal Boyer (2001), and I quote a key passage from Atran's chapter that compactly express it: "The conceptual foundations of religion are intuitively given by task-specific panhuman cognitive domains, including folk mechanics, folk biology, and folk psychology. Core religious beliefs minimally violate ordinary intuitions about how the world is, with all its inescapable problems, thus enabling people to imagine minimally impossible supernatural worlds that solve existential problems, including death and deception."

A useful feature of Atran's chapter is the experimental evidence he presents in support of the memorable quality of minimally counterintuitive beliefs. This helps to explain why supernatural religious beliefs persist and thus fits the theory of religion as a cultural product passed from generation to generation because it makes sense to children and solves social and existential problems. What is less clear, here as well as in Boyer (2001), is precisely how minimal

counterintuitiveness is adaptive, which is crucial to understanding the evolutionary origins of religion, as against its persistence. In any event, perhaps the most impressive aspects of Atran's contribution are his appreciation for the passionate intensity of much religion, which helps him stay empirically true to some of its complexity, and his ability to harmonize the cognitive elements of religion with the emotional, ritual, social, and moral dimensions.

Consequences for Religious Studies and Theology

Just as CST has the potential to transform the branches of religious studies that focus on ritual, so cognitive science of the sort that Bering and Atran present has the potential to transform the way religious studies approaches phenomena related to religious belief. The field of comparative religious ideas within religious studies and theology is quite young, but already it has become dominated by the view that religious ideas are usually too full of richly layered existential and contextual meanings to be significantly compared to one another. While anyone who knows anything about religion finds it easy to appreciate this view, it also seems somewhat defeatist, cutting off a valid line of inquiry before it gets started. I suspect that the landscape constraints that Atran describes, backed by the sorts of experiments that both he and Bering summarize, could provoke a more balanced approach in comparative religious ideas, opening religionists and theologians to the possibility that religious beliefs might be a mix of constraints that produce recurring similarities and cultural or chance determinations that produce differences. By the same token, the cognitive science of religion would do well to notice the staggering wealth of detailed information that religious studies specialists have collected about the world's religious beliefs and practices. Unfortunately, cognitive scientists sometimes speak as if their wisdom on similarities and differences in world religious beliefs should be taken seriously even though they know less than a rank novice in religious studies about the vast associated literatures.

The cognitive science of religion has particularly challenging implications for some forms of theology. Theology rarely investigates the truth claims of religion in respect of the evolutionary function of the corresponding beliefs or the cognitive appeal of minimal counterintuitiveness. Were theologians to address such issues frankly, they would necessarily make manifest the social and psychological dynamics of religion, which seem to work more smoothly when religious people remain unaware of them. The theologian is not alone in this. The social scientist who is also a member of a religious community likewise knows firsthand the stressful experience of being a participant-observer. But the first-order intellectual tasks of psychologists and sociologists of religion do not involve nurturing the religious faith of believers, so their role is more easily accepted and understood in religious communities.

Theologians who take it as part of their moral obligation to support the spiritual well-being of religious believers and who begin publicly discussing the cognitive science of religion may find themselves in an especially difficult situation. They can be understood as betraying their calling, and they may be—indeed, they often have been—resisted both by other theologians and by the very religious groups they seek to serve. This led Van Harvey to describe such an impossibly doubly committed intellectual as an “alienated theologian.” It follows that there are powerful incentives for such theologians not to take up the social sciences, evolutionary psychology, or the cognitive psychology of religion with the seriousness these lines of research deserve. Of course, at this point it is important to recall that there are many kinds of theologians, some of whom have secular and nonreligiously affiliated intellectual projects, and they are not so constrained.

RELIGION AND ADAPTIVE FUNCTION

We first considered the costly signaling argument that bizarre religious behaviors can have adaptive functions in communicative environments, removing an objection to the thesis that religion is in part a product of the evolutionary process. Then we saw that, while religious studies and theology may have little at stake in the technical debates over the evolutionary status of religious beliefs and behaviors, they have a great deal to learn from the fact that religion becomes intelligible when understood at least in part as a product of evolutionary processes. Subsequently, we noticed how religion makes still more evolutionary sense when its entanglements with human cognitive evolution are taken into account. These three themes arc through the chapters of this volume—most authors mention all of them, at least in passing—and jointly they constitute an extremely persuasive case that religion is best understood in close connection with evolutionary biology and evolutionary psychology. This volume also contains other arguments about the adaptive functions of religion, all of which contribute to strengthening the case for religion as at least in part a product of the evolutionary process. I take those up briefly in the following section.

Religion and Sacred Emotions (Emmons and McNamara)

Emmons and McNamara use a costly signaling framework to explain how character strengths can increase cooperation and thereby average fitness. Strengths of character include honesty, trustworthiness, integrity, and emotions such as gratitude. They contend that religion is a universal feature of human life and a crucial promoter of such emotions, behaviors, and character strengths. It follows that scientists studying the evolution of emotion and the neuropsychology of character should take into account the role of

religion. The authors kindly provide a usefully compact survey of the scientific study of religion and emotion that points interested readers more deeply into the relevant literatures. They then launch into their case, showing that CST helps to make evolutionary sense of sacred emotions such as gratitude. In particular—and this takes us a step beyond Sosis—they argue that religion inculcates in people genuine virtues to the degree that their consistent integrity and generosity are virtually impossible to fake. In this light, religion appears to be an indispensable component in the “gene–culture arms race” to solve social cooperation problems through unfakable signals of reliability. The unfakable signals in this case are actually genuine virtues.

It is a pleasing change of pace to read a chapter that takes ordinary virtues seriously and does not allow their evolutionary role to leave them somehow questionable. In fact, it is quite unusual to find scientists who take value seriously at a number of levels at once rather than just at the level that science can most easily handle through quantification. This kind of humane and humanistic perspective does not interfere with the precision of the argument from a scientific perspective. And from a religionist’s perspective, the argument is more compelling and realistic because it resists the sorts of “nothing-but” reductionism that indirectly suggests (while rarely directly claiming) that the things reduced have only the value of that to which they are reduced. This kind of sensitivity will increase the influence of the scientific study of religion as well as its intellectual quality, and I think more authors should follow Emmons and McNamara’s example.

Religion and Traditional Moral Values (Koenig and Bouchard)

Koenig and Bouchard are concerned with the sorts of evidence that scientists must seek in order to establish heritability of characteristics (for the sake of clarity, note that they use “trait” both in the generic sense, here translated to “characteristics,” and in the specific sense of “genetic trait”). Their chapter is important in this volume because it illustrates how complicated arguments about genetic linkage typically are and also because it indirectly highlights the lack of sophistication in some science writing about genetic linkage. It is a lot easier to claim that a religious belief or a behavior is genetically linked than it is actually to demonstrate this. Unfortunately, the shortcut to genetic linkage—that is, just stating it rather than showing it—is taken rather often in evolutionary psychology literature, without due notice. Yet Koenig and Bouchard are motivated to do this for another reason entirely, namely, to refute what they say is a common claim, namely, that moral values and religiousness are formed by family socialization independently of any genetic component. Koenig and Bouchard’s specific interest is in the heritability of certain moral values that correlate significantly with one another on standard measures. They call the

moral values authoritarianism, conservatism, and religiousness—jointly, the *traditional moral values triad* (TMVT).

The authors do not immediately reject the idea that religiousness is a biological adaptation, acknowledging that the universality of the religious tendency and the structural similarities of its various manifestations do indeed suggest that it may be an adaptation. They even go so far as to mention the counterargument that religion often involves avoidable suicide and martyrdom, answering it with the standard CST reply that highly demanding groups produce highly committed members, citing military basic training and hazing as illustrations. With admirable caution, however, Koenig and Bouchard do not buy in to the adaptationist line. In fact, they rightly insist that heritability does not imply adaptation, a point we have seen many times in this volume in the form of “religion is a by-product not an adaptation” theses. This sort of balanced caution and precision is characteristic of the entire chapter and a most welcome virtue.

The bulk of the chapter concerns evidence for the heritability of the TMVT from twin and adoption studies, and what a fabulous array of evidence it is. I would have to check my amateur impression with experts, but the data appear to support their conclusion that the three components of the TMVT are significantly heritable. I assume that this is equivalent to tossing a cat into the pigeon cage of researchers studying socialization and that this is precisely the effect that Koenig and Bouchard intend. Among religious studies specialists, researchers routinely proceed as if socialization were the only significant factor in interpreting decisions to stay affiliated with religious groups. Religious educators rarely entertain the idea of a genetic component to religiousness, let alone address the significance of this for their strategic proposals. Anyone involved in socialization research needs to keep an eye on this research.

Likewise, theologians speculating about universal religious instincts, universal quests for salvation or liberation, and universal longings for ultimate meaning may need to pause and consider how the heritability of authoritarianism, conservatism, and religiousness fit into their speculations. Religious doctrines that propose a universal religious state of humanity may have been formed by people inclined to believe and seek such theories and reinforced by others with the same inclinations. This selection bias may not mean that the beliefs are false, but it does suggest that serious challenges to them are probably going to be encountered far less often than would seem appropriate if empirical adequacy is part of the goal.

Religion and Ritual Healing (McClenon)

McClenon’s chapter for this volume recapitulates part of the argument from his 2001 book on shamanic healing practices. His strategy is sensible: if

current-day shamanism gives us the best insight into early hominid life, then we should study shamanism in order to understand the origins of religion. When we do that, dissociation and ritual suggestion come to the fore as the means by which shamans mediate therapeutic benefits to those with whom they work. Thus, McClenon concludes that ritual healing lies at the origins of religion: “ritual healing practices shaped genotypes governing the human capacity for dissociation and hypnosis, allowing modern forms of religiosity.” McClenon, unlike many other defenders of religion as a by-product of some trait or traits, actually states what the underlying trait is: a capacity for dissociation and hypnosis. This trait gets established in the human population because its therapeutic benefits give a fitness advantage to those who have it. And its aftereffects include social codification of the procedures that maximize those fitness benefits, which is ritual healing, leading in due course to religion. This is the ritual healing theory of the origins of religion.

McClenon’s case is carefully argued and well written. I contend, however, that it tells a plausible story about only one of the evolutionary by-products that are assembled in contemporary religions beliefs and practices. To adapt Kirkpatrick’s criticism, which he made more narrowly in the context of battling adaptationist arguments, it is insufficient to theorize about one component of religious beliefs and practices as if this could lead to a theory of the origins of religion. Strangely, despite the flow of McClenon’s rhetoric toward explaining the origins of religion (e.g., as in the previous quote), in the conclusion of his chapter he straightforwardly acknowledges that his ritual healing theory “does not preclude group selection theories and other processes that may have shaped religious genotypes.” And this admission follows right on the heels of a list of distinctive advantages of the ritual healing theory as an explanation of religion, including its genetic basis, which cannot hold true if his theory does not preclude other theories purporting to explain the genetic basis of religiosity. I conclude that McClenon has overstated his case slightly but that the overstatement affects only the comprehensiveness of his account of the evolutionary origins of religion.

Other scientists inquiring into the origins of religion would do well to follow McClenon’s example of specificity and clarity about underlying traits and selection mechanisms. And their theories will have to take account of McClenon’s.

Religion and Placebo Benefits (Bulbulia)

I mentioned Bulbulia’s chapter in passing several times already, but here I focus on it in connection with the alleged adaptiveness of religion by means of its placebo benefits. Bulbulia’s entertaining chapter is the only one in this volume explicitly to acknowledge the problematic effects of his scientific methodological naturalism on his treatment of the subject matter and explicitly to

argue in favor of it anyway. This shows an impressive degree of methodological self-awareness. But it also leads him to describe religious beliefs as cognitive errors, based, as far as I can see, only on the assumption that supernatural beings, whether or not they exist, do not do anything in the world, so if you think they do, you must be wrong. I happen to agree with Bulbulia's (stated) assumption that supernatural beings do not interfere in natural processes. In my case, this is because I believe that supernatural beings do not exist (i.e., I am a religious naturalist). Even so, I think impressive methodological self-awareness does not excuse preemptive settling of metaphysical claims, which is what the phrase "cognitive error" does. Nevertheless, as Bulbulia himself requests, we should give him the benefit of the doubt and see how far he can get with his "as if not" assumptions about supernatural beings.

Bulbulia is the closest this volume has to a living, breathing adaptationist. He accepts the argument that religion is universal feature of human life because it is a biological endowment. And he suspects that McClenon (discussed previously) puts his finger on the reason why: that religiosity evolved to foster placebo health benefits. But McClenon's case in his chapter is more cautious than Bulbulia's. McClenon argues that the capacity for dissociation and suggestion were what evolved, not religion. These traits evolved in a long-term gene-culture evolution nexus (ritual healing) driven by the fitness advantages that dissociation and suggestion confer. Religion is a by-product. I have not consulted McClenon's other writings, and perhaps Bulbulia interprets them correctly, but it is important to note that McClenon is not making an adaptation case for the origins of religion in this volume. Despite this quibble over interpreting McClenon, Bulbulia offers a fascinating defense and extension of McClenon's case, one that is far more closely geared to the evolutionary biology literature than McClenon's own way of arguing.

At the heart of Bulbulia's case is the claim that healing and religiosity use the same kind of cognitive structures, including especially supernatural beliefs. That is, supernatural entities both heal and perform religiously relevant functions, such as saving, protecting, and enlightening. Given the way healing mechanisms work through dissociation and suggestion, only those that truly believe with unshakable confidence will be healed. To be healed, correspondingly, is an unfakable sign of religious commitment. This kind of CST argument welds ritual healing theory, religious cognition, and the social elements of religion into a flexible and multifaceted theoretical edifice. Even so, I doubt that all these features of human behavior can be so tightly correlated with a few genes so that religion is rightly described as an adaptation.

CONCLUSION

The chapters in this volume contain a wealth of information about evolution and religion. While I certainly have scratched the surface in this chapter,

I was obliged to leave many ideas and arguments untouched. This testifies to the collective complexity and value of the chapters. In this conclusion, I confine myself to three brief points.

First, concerning reductionism, I think it is extremely unlikely that we will ever comprehend the evolved diversity and complexity of religious beliefs and practices using only one of the existing theoretical frameworks for explaining the origins of religion. Nor is it likely that we can cleanly prioritize these theories, ranking the most fundamental ahead of the derivative and gaining a clear impression of what came first and why. In certain corners of the evolutionary-origins-of-religion marketplace, there are enthusiastic groups hawking their favorite viewpoint as the key to understanding religion. A few chapters in this volume show traces of such enthusiastic conviction. Yet a fair-minded reader of a variety of serious theories must allow that many have the beginnings of a robust empirical basis and impressive theoretical integrity. The problem with one-sided enthusiasm among scientists is reductionism of the varied and complex phenomena of religion merely to what falls within the ambit of the theoretical framework for explaining its origins and functions. At this point, the religious studies specialist insists on urging their scientist colleagues to honor the complexity of the phenomena they seek to analyze and to take more seriously properly rich descriptions of religion. Many theoretical frameworks will have to play a role in explaining the origins and functions of religions (notice the plurals) because religions are too diverse, complex, paradoxical, existentially vibrant, and socially potent for any one theory to express the very heart of religion, if there even is such a thing, without massive oversimplification.

Religionists rightly resist theories that seek to give a substantially comprehensive account of the origins and functions of religions yet do not register this mass of contradictory details and exception-filled patterns that is religion in actual practice. In this way, religionists claim the role of data gatherers and data parsers for scientists aiming to present evolution-based and cognition-based hypotheses about these data. The interpretation of “religion as a whole,” whatever that contested concept finally means, is a shared endeavor that requires contributions from religionists and scientists alike. Interested theologians need to be fully aware of developments in this joint investigation so as to avoid their own version of reductionism as they seek to interpret religious phenomena.

I have drawn attention to a few of the many places where the chapters in this volume oversimplify the complexity of religion or speak as if its value were confined to the aspects that science could grasp. While I defended an appropriate reductionism as a feasible strategy for studying religion, I also want to challenge specialists in the scientific study of religion to strive for intelligent selection of salient features of religion and to shun damaging forms of reductionism. I have tried in a few places to suggest how deeper and

broader knowledge of religious phenomena might help scientists to be more accurate and to avoid proposing causal theories of religion that presume data against which religionists effortlessly point out numerous unexplained exceptions. Realizing how infuriating their simplistic characterizations seem to specialists in religious studies and theology may be enough to trigger better scholarship. Otherwise, perhaps they will be inspired to greater care by the awesome responsibility of speaking in public about religion with authentic respect and genuine learning at a time when a great deal depends on such skillful public speech.

Second, not one of the scientific contributors to this book gives any evidence of realizing that there are such things as naturalistic religious outlooks and naturalistic theologies. The emphasis on supernaturalism is overbearingly strong, which leaves the reader floundering when trying to make sense of philosophers such as Plato and Aristotle, Sankara and Lao-tzu, on whose thought vast traditions of religious philosophy have been built. Many theologians have held—and many living theologians insist—that supernaturalism is the antithesis of authentic religion because (so they say) it embraces cognitive self-deception for the sake of undeniable communal benefits and immediate but uncertain comfort. There are plenty of theologians who will reject this naturalist theological outlook as a faithless betrayal of one or another home tradition, but it is not a perverse or destructive challenge to conventional religion. Rather, it is a theological articulation of a vision of human spiritual and moral maturity. It has a great deal in common with secular humanism and a great fondness for learning in all forms. It functions within all religious traditions, often on the underside or in the interstices of religious sociality, as a challenging goal for serious religious people of a particular type. To have seen this intellectually and socially important religious perspective discussed, even as an exception to the rule, would have been gratifying to me and many other religionists and theologians who are likely to pick up this volume and take seriously its topic. To ignore it altogether, without any explanation, is bizarre. Be that as it may, it is especially important to note that naturalistic theological viewpoints accommodate scientific insights into the origins and functions of religion easily and constructively. And that should be as interesting to thoughtful scientists studying religion as their scientific work is to such religionists and theologians.

Finally, and most important, religionists and theologians must accommodate insights from the scientific study of religion. I pointed out many areas where the theories emerging from evolutionary psychology not only would influence but also could potentially utterly transform religious studies and theology. Many religionists and theologians will go their own way in the specialized language games of their discourse communities, of course, but their work will be the poorer for neglecting this emerging literature. Those theologians and religionists who do engage the scientific study of religion

have a daunting task ahead of them. They will seek to make sense of the way that religion engages human beings with ultimate realities. And they will do this with a view of religion as, in part, an ad hoc, complex, and variable assemblage of adapted and exapted genetic traits constraining culturally colored exploration of a landscape of social and existential possibilities. That is a difficult task. It is also a culturally and intellectually valuable one. And the scientific study of religion can help religionists and theologians do it better.

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