13

Religion is More than Belief: What Evolutionary Theories of Religion Tell Us about Religious Commitments

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1 Introduction

Evolutionary theories of religion are often perceived as posing a challenge to religious belief. In this chapter we examine this challenge and argue that the evolutionary science of religion does not undermine the veracity of, or warrant for, religious belief, and that this emerging field affords a picture of belief that is more complex—and truly more remarkable—than what is typically presumed.

Evolutionary accounts of religion generally refer to two related areas of research: cognitive and behavioral. On one side, cognitive scientists have championed the view that religion is the byproduct of psychological constituents, each of which evolved for purposes other than religion (e.g. Atran 2002; Boyer 2001). Specifically, religious thinking emerges when agency detection is evoked and the boundaries between the ontological domains of folk biology, folk psychology, and naïve physics are minimally violated. In contrast, several evolutionary anthropologists and biologists have focused their research efforts on religious behavior, primarily employing the tools of behavioral ecology (Cronk 1994a; Sosis and Alcorta 2003; Sosis and Bulbulia 2011; Wilson 2002). Their work is aimed at understanding how selection could have favored religious behaviors that are costly in terms of time, energy, and resource investments (Bulbulia 2004; Bulbulia and Sosis 2011; Irons 2001; Rossano 2010; Sosis 2003).

A third area of research has recently emerged as evolutionary scholars have come to recognize that the cognitive science and behavioral ecological approaches can be complementary, and a more comprehensive understanding of religion's evolution can be

gained by studying religions as complex adaptive systems. This approach embraces the idea that the constituent elements of religion are adaptations or byproducts thereof, and that the integration of these elements results in a highly flexible and adaptive unit. With this outlook, scientists are beginning to show that religion is not only embodied and ecologically embedded, but also selected to extend human cooperation and coordination (Alcorta and Sosis 2005). The upshot is that religion is no longer seen by evolutionary researchers as being limited to ontological domains of cognition or distinct behavioral repertoires, but instead religion is recognized as a set of integrated elements that form a complex system capable of adapting to social, economic, political, and environmental conditions, and even to itself. Accordingly, present research examines religion systemically and holistically, thereby determining its functional effects (Sosis 2009).

To clarify at the outset our use of terms, we follow Roy Rappaport (1999:119) and understand belief as "a mental state concerning, or arising out of, the relationship between the cognitive processes of individuals and representations presented to them as possible candidates for the status of true." Belief is thus a private, internal state, and, as Rappaport emphasizes, it is objectively unknowable. In contrast to belief, Rappaport refers to public behavioral displays of religious commitments as "acceptance," and cautions that "acceptance not only is not itself belief; it doesn't even imply belief" (1999:120). We discuss this distinction further below. Lastly, rather than defining "religion" outright, we again follow previous researchers (e.g. Bellah 2011; McCauley 2011; Sosis 2009) and assume that religion is a fuzzy set that comprises (but is not limited to) commitments to supernatural agents, emotionally imbued symbols, altered states of consciousness, ritual performance, myth, and taboo.

With these definitions in mind, we now consider our central question: Do evolutionary accounts of religion undermine religious beliefs? To summarize the argument we develop below, we suggest that if religion is indeed a complex adaptive system that consists of recurring and interacting elements, then the veracity of or warrant for religious beliefs is not challenged by the evolutionary science of religion. For religious beliefs are not: 1) stable internal states of individuals, 2) homogeneous within religious communities, or 3) independent propositional claims about the world. Rather, they typically emerge from and are sustained by interacting elements within a complex adaptive system and exhibit emergent properties as part of it. Thus, while most religious systems throughout history have endured without explicit propositional beliefs (contemporary world religions frequently being the exception rather than the rule), beliefs themselves often adjust as the religious systems in which they are embedded react to changing socio-ecological conditions. It is therefore misguided to reduce religions to independent propositional beliefs and pointless to evaluate religions as though they offer objective truth claims. After all, if the systems approach is accurate, religion is much more than belief.

2 Evolutionary Approaches to Religion

The sketch of the evolutionary science of religion that we develop below considers three approaches: cognitive, behavioral ecological, and systemic. Our aim is not to offer a comprehensive survey of the field, but rather to focus on how these approaches understand and address religious belief.

2.1 The cognitive science of religion

We assume that most readers are familiar with the cognitive science of religion (CSR), since it is the most well-known branch of current research into the evolutionary science of religion (see Atran 2002 and Boyer 2001 for acclaimed overviews of the field). Accordingly, we will be straight to the point about why we contend that CSR does not challenge religious belief.

Part of the issue is attributable to the methodology of cognitive science. Cognitive scientists interrogate the processes of thought and mental organization mostly by means of identifying and isolating domains of computational specialization. Such isolation is largely done by positing a mental function for a specific and repeatable action that relies on nuclei or neural networks in the brain (most often in the neocortex). To make their results generalizable, cognitive scientists tend to ignore specific content in place of the general form and function of mentation. Cognitive scientists do not ignore reflective beliefs, but their research tends to stress unreflective beliefs since they involve fewer functions and can be easily isolated for research (Barrett 2009:77). In so doing, cognitive scientists of religion have found that there is indeed a stark difference between the reflective and unreflective religious beliefs of individuals (Barrett 2008:393), otherwise known as theological correctness and incorrectness, respectively (Barrett 2004).

For CSR scientists, it is possible to specify the central domains of religious cognition by reduction to the unreflective beliefs that make minimally counterintuitive concepts (MCIs) possible. MCIs are cognitive templates that include intuitive concepts combined with a minority of counterintuitive ones (Norenzayan et al. 2006). The central theory is: If a religious narrative corresponds to unreflective beliefs—which appear to have evolved—and contains just a few minimally counterintuitive notions, it is likely to be believed and remembered. As such, MCIs facilitate the transmission of religious ideas that are easily transferred from person to person (Barrett 2009:83). But what are the unreflective beliefs that support MCIs? Since most MCIs concern supernatural agents, the core domain behind religious belief is theory of mind (ToM) and the hypersensitive agency detection device (HADD). HADD suggests that humans are cognitively primed to detect or believe in unseen agents that act in the world. This is not to say that HADD determines belief in such, but rather that HADD renders humans (most notably children) liable to project intentionality and teleology onto the world (Barrett 2009:95). From studies along these lines it appears that we have a penchant for narratives that involve such unseen agents. Moreover, when those purported agents

minimally violate our intuitive concepts about natural beings—such as the ability to disappear or walk through walls—we tend to remember them quite well (Atran 2002). But without ToM or HADD, these kinds of beliefs are unlikely. Hence, cognitive scientists suggest that the core constituents of religion are ToM and HADD.

Let us examine, by way of illustration, some of the most remarkable conclusions from data regarding ToM and HADD. First, the research of Jesse Bering (2006) and Paul Bloom (2009) demonstrates that humans are everywhere intuitive dualists and, unless inculcated otherwise, separate the intentional minds from the bodies of persons and some animals. When confronted with death, then, people recognize the death of the body, but nevertheless continue to entertain the survival of the mind—or soul—of the deceased (Bek and Lock 2011; Bering 2006). Such "supernatural agents" have the advantages of being a mind without a body, and thereby have the power to see what the living do but remain unseen themselves.

Secondly, supernatural agents—such as the deceased—are often invoked with regard to what Atran (2002) calls *the tragedy of cognition*. Building on former points, this notion states that, because of the apparent saliency of mental or spiritual survival at death, MCIs are constructed around such notions to assuage the fears of death for the living. In short, the tragedy of cognition is that we can foresee our own deaths and therefore build on our intuitions of dualism and intentional survival to entertain ideas of the afterlife.

Finally, most traditional cultures are concerned with transgressions against supernatural agents, which often motivate prosocial behavior (e.g. Johnson 2005). The Supernatural Punishment Hypothesis maintains that belief in supernatural agents with the ability to punish the living is beneficial (if not adaptive) not because it assuaged the fears of the living, but rather because it propagated them—and in so doing promoted cooperative behavior (see Schloss and Murray 2011). The logic behind this notion is as follows. The problem in human evolution is that without institutions of law and order or incentives to punish others, human societies would not have established cooperation due to the threat of free-riders and cheaters. But if supernatural punishment is held as a belief, whether it is real or not, free-riding or cheating is deterred, which in turn increases cooperation and maximizes benefits of individuals within groups. As these three points briefly illustrate, ToM and HADD are the core to the major constituents of religious belief.

At first blush, CSR indeed challenges the primary ways philosophers and theologians justify religious belief. For example, consider divine interaction. What was once considered clear proof—that is, the direct experience of the divine—might now be attributable to ToM and HADD working alongside other neurological processes. Another example is perception of the divine. For whenever one perceives divine acts in the world, it might very well be due to HADD, which has been cultivated in the individual by a deeply religious tradition. Religious testimony also falls within the explanatory framework of cognitive science (Souza and Legare 2011). After all, nearly all instances of religious testimony fit the bill of MCIs. But these challenges are contentious and do

not explain away religious belief. This is because they all commit the same fallacy of sorts; namely, using a proximate mechanism to dispel a higher-order belief. For it does not follow that the proximate mechanisms of belief determine the nature of belief. As Murray (2009:169) explains: "The mere fact that we have beliefs that spring from mental tools selected by natural selection is, all by itself, totally irrelevant to the justification of beliefs that spring from them." Furthermore, because CSR adopts methodological naturalism—not ontological naturalism—the discoveries of CSR are logically compatible with naturalistic theology (see Visala 2011).

As a final note, CSR faces its own shortcomings that lend themselves to theological defenses. Perhaps the widest gap in the claims of CSR is the move from unreflective agency detection to reflective belief in supernatural agents. It is not clear how much ToM and HADD account for complex beliefs in the supernatural. If anything, the constituents identified by CSR serve as the necessary but not sufficient conditions of religious belief. Now, coming full circle to the beginning of this section, not identifying what is sufficient to belief is attributable to the methodology of CSR. For although CSR research examines various elements within the religious system, such as ritual (e.g. McCauley 2011), myth (e.g. Norenzayan et al. 2006), authority (e.g. Souza and Legare 2011), and of course belief, it is reductive in its investigations. Thus, it cannot easily navigate from the isolated cognitive functions it analyzes to the mental commitments that characterize most world religions, which is undeniably a move from unreflective to reflective cognition. Simply put, the cognitive mechanisms underlying religious belief do not sufficiently explain why people believe religious propositions and engage in extreme behaviors for their religion. To move closer to explanations along those lines, we must turn to the behavioral ecology of religion.

2.2 The behavioral ecological approach

Behavioral ecology is the application of natural selection theory to the study of behavioral adaptation and design in ecological settings, which extends to humans the theories and methods of animal behavioral ecology (Winterhalder and Smith 1992). The goal is to assess the degree to which behavior is adaptively adjusted to environmental conditions, broadly defined to include ecological and social parameters (Smith et al. 2001). Since environments are vital to the study of adaptive design, environmental variables are used to explain inter- and intra-cultural variation. Accordingly, behavioral ecologists describe themselves as biological accountants (Emlen 1997): they measure the costs and benefits of behavior in order to understand the selective pressures that have acted on human decision rules, and assess whether individuals are responding adaptively to current environmental conditions.

Critically, human behavioral ecologists place great emphasis on the phenotypic plasticity of behavioral traits. For it is assumed that selection has designed behavior-producing mechanisms—such as the human nervous system—to be flexible enough to respond to a range of environmental conditions. As a result, the focus of

most studies is identifying conditional behavioral strategies, which take the following form: If facing condition A, do X; if facing condition B, do Y, where X and Y are assumed to maximize fitness in their respective environments.

Whereas cognitive scientists are concerned with underlying psychological modules, behavioral ecologists are largely agnostic about the principal mechanisms of adaptive responses. Such agnosticism is not a rejection of the possibility that such mechanisms can be discovered, but rather an analytical position to focus on behavioral variation. In so doing, behavioral ecologists assume that selection has produced behavior-generating mechanisms that enable organisms to respond optimally—given design constraints and tradeoffs—to environmental conditions.

Behavioral ecological work on religion has explored diverse questions relating to the socio-ecological conditions that have favored religious behavioral patterns (Sosis and Bulbulia 2011). These results show that many aspects of religion are influenced by the environment or social milieu in which they have historically developed. For example, Beverly Strassmann (1992, 1996) examines the manner in which religious taboos and rituals surrounding sexual activity, such as attending menstrual huts among the Dogon of Mali, reduce the risks of cuckoldry. In a recent analysis, Strassmann and colleagues have shown how different religious traditions—Christian, Muslim, and animistic—differentially impact cuckoldry rates within the Dogon population (Strassmann et al. 2012). In other behavioral ecological work, Fincher and Thornhill (2012) theorize that parasite loads are a primary selective pressure on religious diversity. Remarkably, they have shown that parasite loads are indeed positively related to the number of religions within a geographical region. Probably the most extensive behavioral ecological research program on religion has sought to apply behavioral ecological signaling models to religion (Cronk 1994a; Irons 2001). Various studies along these lines have shown that costly religious behaviors serve as effective signals of group commitments (Ginges et al. 2009; Ruffle and Sosis 2007; Soler 2012; Sosis and Bressler 2003; Sosis et al. 2007). Accordingly, they demonstrate that religion serves as a signaling system that not only increases group cooperation, but also uses signaling devices that are typically adaptive in their environment.

Despite the merits of the behavioral ecological approach to religion, there are notable limitations. Most importantly, as mentioned above, behavioral ecologists are generally not concerned with beliefs—a severe limitation for a subject like religion. As such, the question regarding the dismantling of belief by the evolutionary science of religion is, to a degree, a nonstarter for behavioral ecologists. Still, this is not to say that behavioral ecology forsakes belief entirely. Behavioral ecologists who study religion have in fact incorporated the effects of supernatural beliefs into their models, but these models do not offer the deep understanding of the human psyche provided by cognitive and evolutionary psychologists. Thus, while the behavioral ecological approach shows that religion cannot be studied on cognitive grounds alone, since the environment determines much of religious variation, its emphasis on ecological externalities is also not sufficient for a broad evolutionary understanding of religion. For a more comprehensive account, we now turn to the

systems approach, which aims to fill these gaps in the cognitive and behavioral ecological approaches.

2.3 Religion as a complex adaptive system

Many evolutionary scholars have concluded that religion can be best studied by considering its constituent parts. For despite its diversity, religion consists of recurrent core features that receive varied emphasis across cultures. Breaking the social category of religion down into its more easily definable core elements—ritual, myth, taboo, emotionally charged symbols, music, altered states of consciousness, commitment to supernatural agents, and afterlife beliefs—has several advantages (see Sosis 2009). Most importantly for our purposes, by breaking religion down into its basic elements it becomes obvious that these elements did not evolve together. Ritual, for example, has antecedents in many other species (Alcorta and Sosis 2005, 2007; D'Aquili et al. 1979) and presumably has a much deeper evolutionary history in our lineage than many other core elements, such as myth. Therefore, asking when religion evolved—what many would consider the starting point of any evolutionary inquiry into religion—is a misleading question because it assumes that religion just "appeared" at some point in our evolutionary history. But this is not the case: religion is comprised of cognitive and behavioral processes that evolved first for other purposes. And although these elements evolved separately, at some point in our evolutionary history they began to coalesce regularly. With regard to timing, then, the appropriate question is: "When did the features of religion coalesce?" At the moment we do not have a clear answer to this question, and we know surprisingly little about the dynamic interrelationship between the many core features of religion. Of course, understanding why these features coalesce as they do should provide us with insights about *when* they began to do so.

Breaking religion down into its constituent parts also clarifies what selection has operated on—a coalescence of cognitive, emotional, and behavioral elements—and directs us to the appropriate questions for analyzing the adaptive value of religion. To clarify, religion is a collection of cognitive processes and behaviors that form an appropriate unit of adaptationist analysis; for it is the functioning of these processes together that makes religion an adaptive system. Although evolutionary scholars isolate and study specific core elements of religion in order to understand their fitness effects and how they function, this is only the initial stage of analysis; it is the religious system itself—the coalescence of these elements—that is the ultimate focus of an adaptationist analysis.

Indeed, evolutionary scholars are increasingly studying religion as an adaptive system (Heimola 2012; Purzycki and Sosis 2009, 2010). Purzycki et al. (2014) argue that religion is a complex adaptive system *par excellence* since:

> (*i*) It consists of a network of interacting agents (processes, elements); (*ii*) it exhibits a dynamic, aggregate behavior that emerges from the individual activities of the agents; and (*iii*) its aggregate

behavior can be described without a detailed knowledge of the behavior of the individual agents (Holland and Miller 1991:365).

All elements within a religious system are integrated and interact with each other, and significantly, they are interdependent. As Miller and Paige (2007:9) note in reference to complex adaptive systems, "Complexity arises when the dependencies among the elements become important. In such a system, removing one such element destroys system behavior to an extent that goes well beyond what is embodied by the particular element that is removed." As we will discuss below, religious systems are remarkably adaptable to changing socio–ecological conditions and therefore are often able to withstand the alteration and even elimination of some of their elements. However, because the elements within a religious system are interrelated, when religious leaders intentionally change elements, such as adjusting a ritual or introducing a new myth, it will invariably affect other elements within the system, sometimes in unintended ways (Sosis 2011). Interestingly, religious leaders and adherents often recognize the dynamic relations between elements in their religious system and use this insight as an argument for retaining practices that are no longer compelling. For example, during his fieldwork in Israel, Sosis has heard the argument that Judaism's four minor fast days, which are observed by religious Jews (often despite ignorance about what the fasts are historically commemorating), must be retained because once one practice is eliminated it will trigger an avalanche and the entire Jewish way of life will fall apart.

Similar to other complex adaptive systems, religious systems also exhibit emergent properties. As Geertz (1973) has emphasized, the interacting elements of religious systems point beyond themselves to create communities with a shared ethos and worldview. Religious beliefs give life to ritual performance, mythical recitation, symbolic meaning, and religious discourse, such that collective identities are constructed, which in turn further shapes and internalizes the beliefs. Thus religious beliefs, whether concerning the divinity of scripture, omnipotence of a supernatural agent, sanctity of land, potency of a ritual, or countless other convictions, cannot be understood as isolated propositional declarations about the world. Rather, religious beliefs must be understood and analyzed within the context of the religious system in which they are embedded.

3 Religious Systems

3.1 How beliefs are generated within a religious system

To begin, we agree with cognitive scientists of religion (e.g. Barrett 2004; Boyer 2001) that the cognitive structures which produce religious concepts—HADD, ToM, mind-body dualism, and so forth—are indeed at the foundation of religious beliefs and behaviors. These are essential ingredients of what we have been calling the religious system, that is, the recurrent set of core religious elements on which selection operates.

But the underlying cognitive structures of religion comprise only the seeds that provide the potential for the system itself. After all, ToM, mind-body dualism, and other cognitive features are necessary but not sufficient to produce religion. To be sustained across the life course and across generations, religious beliefs require reinforcement, and religious behaviors require practice. Therefore, without further qualification, we doubt that religious beliefs are "nearly inevitable" as some have claimed (Barrett 2012; McCauley 2011); religious expression requires cultural inputs and cultivation, not just cognitive potential. Whether one believes in Zeus, Vishnu, or Allah will depend on the cultural environment in which one was raised. But exposure to these supernatural agent concepts is not enough to generate commitment to them. So, what does? Adherents throughout the world believe in their gods and not other people's, regardless of exposure, because adherents perform rituals for their particular deities (Alcorta and Sosis 2005). In other words, while humans possess the cognitive machinery to believe in gods, the particular gods that humans commit to requires cultivation. Belief in this regard is not automatic but rather achieved through ritual behaviors, such as supplications to a particular god, ritual presentations of myth, ascetic practices, and healing ceremonies, all of which instill an experience of what religious persons would call the "sacred." This notion is aptly expressed by Karen Armstrong (2009:15):

> Religious discourse was not intended to be understood literally. . . People were not expected to "believe" in the abstract; like any mythos, it depended upon the rituals associated with the cult of a particular holy place to make what is signified a reality in the lives of participants.

That is to say, religious practices are technologies that are critical for performers to understand and experience their community's shared religious outlook.

In terms of cultivating religious experience, religious ritual is universally used to identify the sacred, and in so doing separate it from the profane (Durkheim 1995[1912]). But, as noted by Rappaport (1999), ritual does not merely identify that which is sacred—it *creates* the sacred. For instance, holy water is not simply water that has been discovered to be holy, or water that has been rationally demonstrated to have special qualities; it is rather water that has been *transformed* through ritual. This is because the sanctifying ritual of holy water collectively alters the participants' cognitive schema of water itself, rendering them with a template for differentiating holy water from profane water. Most importantly, from a behavioral perspective the emotional significance of sacred and profane water is quite distinct: not only is it inappropriate to treat holy water as one treats profane water; it is emotionally repugnant to do so. The central point can thus be summarized. While religious adherents differentiate sacred and profane things, their cognitive discrimination would be empty without having an emotional reaction to the sacred (Alcorta and Sosis 2005). For it is the emotional significance of the sacred that underlies "faith," and it is ritual participation that invests the sacred with emotional meaning.

The multi-modality of ritual requirements also enables ritual to yield and sustain belief. Ritual requirements are generally diverse and employ the range of human

sensory systems. Consequently, the multi-modality of ritual obligations not only facilitates interpersonal communication, but also forces practitioners to reconcile a variety of behaviors with any conflicting values and beliefs. The multi-modality of ritual requirements serves to completely affect its performers. Theologians (e.g. Tillich 1957) as well as social scientists (Klass 1995; Rappaport 1999) have noted that religion is the "ultimate concern" of its adherents. It is likely that the multi-modality of ritual, as well as reinforcement from the religious system's other elements, especially myth, enables religion to achieve this primacy.

The importance of understanding religious beliefs as embedded within a religious system is driven home every time we teach students about religion. Sosis, for example, informs his students on the first day of class that if they have never had a spiritual experience—not necessarily a religious one—there are concepts in the class, such as numinosity and altered states of consciousness, that will be difficult to interpret. Sosis explains to his students that at times during the semester their understanding will be like one who reads a review of an album, but never listens to the music. A reviewer can write about the tempo, musicianship, and moods the music evokes, but without ever hearing the album—in other words, genuinely experiencing it—it is impossible to fully comprehend the music. Bellah (2011:19) similarly observes:

> One can be instructed verbally or by diagrams as to how to tie a knot, but one doesn't know how to tie a knot until one has practiced the knot, until one's body, one's sensorimotor system, has learned the knot.

Indeed, religious beliefs are achieved through performance and they are not designed by selection—or any other forces—to be understood outside of the lives enacting them. This does not mean that academics (and students) cannot study and gain some understanding of the mechanisms and selective pressures that produce and maintain religious beliefs, but it does mean that to evaluate their veracity as independent propositional claims about the world is missing an important point. Adherents assess the truth of religious beliefs by breathing life into them—in other words, living them—through ritual performance, recitation of myths, adherence to taboos, emotional valancing of symbols, and partaking in religious discourse.

3.2 Adaptive features of the religious system

The complex systems approach to understanding religion also highlights the adaptability of religion. Religious claims are rarely stagnant or offer permanent truths about the world; they are flexible and respond effectively to changing socioeconomic and ecological conditions (Alcorta and Sosis 2005; Purzycki and Sosis 2009; Sosis 2009). Religions are complex adaptive systems that are not only responsive to changing conditions, but they are often instrumental in facilitating social change (e.g. Native American Ghost Dances, Black Churches in the Civil Rights Movement).

If religions are responsive to changing circumstances, why do religions often appear to be so resistant to change? Why is religion often viewed as a conservative social force? One of the remarkable features of religion is its ability to adapt to local environmental conditions while adherents experience partaking in an eternally consistent and changeless tradition. Rappaport (1999) argues that religion achieves this through a hierarchy of religious discourse, for there is an inverse relationship between the material specificity of a religious claim and the durability of the claim. Religious ideas are hierarchically organized within communities and at the apex of a community's conceptual hierarchy is what Rappaport refers to as ultimate sacred postulates, such as the *Shahada, Shema*, or *Vandana Ti-sarana* for Muslim, Jewish, and Buddhist communities, respectively. These ultimate sacred postulates lack material specificity and are highly resistant to change. However, below ultimate sacred postulates in the religious hierarchy are various cosmological axioms, ritual proscriptions, commandments, directives, social rules, and other religious assertions that do experience varying levels of change, depending on their material specificity.

While the rules of religions change throughout time, those who experience such adjustments consider them as an intensification of their own religious acceptance (Rappaport 1999). Religions rarely invalidate the old completely; change occurs by adding to previous practices and beliefs, and also by elaborating upon them, while other beliefs and practices slip away unnoticed. Once sacralization is internalized, it is indeed very difficult to convince adherents that something consecrated is no longer holy. Hence, when undergoing change, religions often retain the most sacralized elements and augment them. For example, Jewish prayers appear in the Catholic Mass and when proselytizing to indigenous populations, missionaries often retain the dates of indigenous ritual celebrations and tolerate the continued commitment to indigenous ancestral spirits. Change for adherents therefore is not experienced as something radically new. It is rather experienced as an increased acceptance of eternal and personally relevant truths that, for the practitioner, have always been part of their religious tradition.

Intuitively, it may seem that once sacred texts became an essential part of religious systems, as they are in contemporary world religions, that the permanence of these texts would make religions more inflexible. In fact, as a testament to the adaptability of religious systems, textual resources often facilitate change.

Religious texts that endure do so because they are open to multiple literary interpretations. They tend to make use of metaphor and poetry that engage subconscious processes of personal significance and create contextual meaning. As a result, each new generation reinterprets religious texts in relation to their own meaningful experiences, thereby keeping them living, relevant, and fresh. Past interpretations are not necessarily rejected per se, but are instead transformed or ignored by the community. They nonetheless remain available should cultural change make their message relevant again. Indeed, the sacred writings of contemporary religious traditions are vast repositories that leaders draw upon, emphasizing aspects that are socially and politically

expedient, and disregarding those that are not. While religious radicals often revive past interpretations to justify their radicalization and violence (Sosis et al. 2012), use of these latent literary resources is not always so contrived and manipulative. For example, the writings of twelfth century condemned heretic, Peter Abelard, were largely forgotten until his ecumenical voice was "rediscovered" in the nineteenth century, when his writings received a more welcome reception than they did during his lifetime (Armstrong 1993; Carroll 2001).

Two other misconceptions about the inflexibility of religion are worth mentioning here. First, evolutionary signaling models of religion predict a diversity of beliefs within religious communities, which reflect variance in group commitments (Sosis 2006). And indeed, most religious communities, even fundamentalist communities, are not homogeneous in their beliefs. Moreover, not only is variance in belief predicted by signaling models, but they also anticipate false displays of religious belief since signaling systems can remain stable despite the unreliable signaling of some individuals (Johnstone 1997). Consistent with these expectations, survey and ethnographic work reveal agnostics and atheists living (deceptively) even within highly religious populations (Margolese 2005; Sosis 2009; Winston 2005). Goody (1996) has also shown that doubt is widespread in world and indigenous religions and thereby argues that doubt is an inherent part of religious communities and individual belief. Theologians have made similar claims (Lamm 1985; Tillich 1957). Second, observers often expect religious actors who have articulated and ritually displayed their priorities—typically implying that their religious commitments are their ultimate concern—to behave in ways that directly reflect this ordering of priorities, even when apparently harmful to themselves. In fact, religious cognition appears to be strongly encapsulated, preventing most religious actors from pursuing fitness destroying behaviors (Bulbulia 2006). Thus, while many may express extreme religious commitments, even martyrdom, the actions of most who articulate such views do not match the enthusiasm of their rhetoric.

3.3 Why religion is often not about beliefs

Rappaport (1999) argued that ritual is "the basic social act," and hence religious systems are the foundation of social life. For Rappaport, belief is unknowable—it is an internal state—and too unstable to provide an edifice for human sociality. As mentioned above, he distinguished between belief and acceptance and places a much greater role on the latter for the maintenance of religious systems. Similar to the conclusions of evolutionary signaling models, he argued that religious systems require some level of belief among the population, but religious systems can endure even if considerable numbers do not believe. However, without acceptance, religious systems will become nothing more than historical footnotes.

To understand why Rappaport maintained that acceptance was critical for religious systems, we must examine his approach to religious signaling. Rappaport (1999) claimed that religious rituals, markers, and taboos are indexical signals; that is, they are

signals that refer to what they denote by being truly affected by them (e.g. weathervanes denote wind direction). He argued that while ritual behaviors appear to be shrouded in mystery, they are deliberate and their message to other adherents is clear: participation in a ritual performance indexically signals acceptance of (and not necessarily belief in) the moral values encoded in the ritual. He contends that, regardless of whether or not individuals believe in the moral values encoded in a ritual performance, by participating they are signaling that they accept the moral code of the community, and can be held accountable if these rules are compromised. Rappaport insightfully observed that whereas belief is a private, internal state, acceptance is a public, external state. Participating in a public ritual demonstrates acceptance of rites and the moral tenets that underlie them.

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

To take a more familiar ritual, consider a wedding. During a wedding ceremony the bride and groom send a public signal that they accept the moral values, as defined by the community, incumbent upon the institution of marriage. This signal is indexical: by performing the ritual the performers can't help but indicate their acceptance of the moral code. Nonetheless, despite their acceptance the newlyweds may not believe in the moral code's virtues. Moreover, acceptance does not imply compliance; a newlywed may have a tryst with his neighbor's wife, but by virtue of accepting the moral codes through the ritual performance of marriage, his action is now defined as adultery.

3.4 The role of beliefs in religious systems

We have described religious belief as one element among many within the religious system and have sought to emphasize the interrelationship between these elements. We are, however, at risk of underplaying the importance of belief within religious systems. It is indeed one element among many, but it is an element that is typically central to the dynamics of religious systems. Here we examine its role within the Hutterite religious system, which has particular interest for evolutionary biologists. Despite the unique character of the Hutterite religious system, it is an instructive example since belief functions similarly in many religious systems. Specifically, belief is a proximate mechanism that motivates adaptive behavioral responses and, critically, it is often the glue that holds the entire religious system together.

In a brief commentary on group selection, anthropologist Lee Cronk raised an intriguing evolutionary puzzle: "Considering the phenomenal reproductive rates of Hutterites, the real mystery for evolutionary biology is why the rest of us are not trying to join their colonies" (Cronk 1994b: 615). Indeed, given the extraordinary reproductive success of Hutterites, and provided that natural selection designed us to maximize our fitness, why are most of us unwilling to join the Hutterites to achieve these reproductive gains? In considering this question, let us consider first the costs and benefits of the Hutterite lifestyle. Hutterites engage in a variety of ritual practices, such as fasting, daily church worship, and thrice-daily communal meals that are preceded and followed by prayer. They also face a wide assortment of restrictions on their behavior, such as prohibitions on owning or using musical instruments, radios, jewelry, tobacco, and other material items. Additionally, dancing and gambling are forbidden, and colonies impose constraints on contact and communication with non-Hutterites (Hostetler 1997). These requirements of the Hutterite lifestyle are collectively rather costly (Sosis and Bressler 2003), but presumably these costs have few, if any, negative impacts on their fertility. Furthermore, while Hutterite rituals are often costly, nonbelievers *can* perform them, which raises additional inquiries. If membership in a group that requires ritual practices genuinely results in net fitness gains, why do others not simply perform the rituals required for membership, even if they do not believe the doctrine that gives meaning to the rituals? If the net gains from joining a group outweigh any ritual costs that are required to join the group, how do the costs of the ritual practices serve as deterrents of free-riders who do not believe in the teachings of a religion? Conversely, if rituals must be costly enough to prevent free-riders from entering a population, why is it beneficial for anyone to pay the costs of group membership?

A straightforward and insightful answer is offered by the traditional Jesuit maxim: Give me the child until he is seven, and I'll give you the man. Put simply, Hutterites are Hutterites and we are not because of fundamental differences in how we were raised. We are not Hutterites because we do not believe in the teachings of the Hutterites, and the only way to perceive the *net* in-group benefits of the Hutterites is to truly believe in their way of life. This of course begs the question of why we do not believe in Hutterite theology. It seems that the only way to achieve such devoutness is to actually live like a Hutterite *and* initially possess either beliefs similar to their own or highly ambiguous ones. Otherwise, simply attempting to observe Hutterite religious obligations will be perceived as too costly, and hence will be avoided or discontinued if attempted. In other words, there are genuine gains to be achieved by joining the Hutterites, but without "belief" our assessment of these potential gains suggests significant costs. Hutterites, on the other hand, are able to maintain their own faith, and consequently perceive short-term benefits, through the performance of the many rituals that fill their lives. Ritual performance during childhood minimizes the opportunity costs perceived by group members later in life, increasing their ability to tolerate costly constraints on their lives. As a Hutterite man from Montana commented, "It seems you have to be born with the Hutterite way, to be brought up

from childhood on, to abide by these rules. . . If you are brought up like this, you're not used to all these things you see in town" (Wilson 2000:22). As the Hutterite example indicates, ritual performance fosters and maintains religious beliefs, and beliefs in turn enable rituals to be effective signals of commitment by lowering the perceived costs of ritual performance, thus preventing free-riders from gaining the benefits of religious groups. Accordingly, religious belief is undoubtedly important for group membership, but belief itself is a proximate mechanism that facilitates the production of adaptive ritual behaviors.

4 Implications

So, what does the complex adaptive systems approach tell us about the veracity of and warrant for religious beliefs? Here we focus on four conclusions concerning religious beliefs derived from the above discussion: 1) beliefs are not unchanging individual states, 2) beliefs are not homogeneous within religious communities, 3) religious beliefs cannot be understood independently of the religious system in which they are expressed, and 4) religions are more than beliefs.

4.1 Belief is not a constant internal state

Beliefs are an internal state of an individual and, as Rappaport (1999) observes, they are subject to the whims of daily life and are therefore volatile. Consequently, religious systems that overemphasize the belief states of individuals will be short lived. It appears that enduring religious systems rely instead on public displays of belief, for while belief is unknowable, public ritual displays can signify acceptance.

Accordingly, an evolutionary understanding of religion suggests that most religious systems can withstand the instability of beliefs. After all, doubt appears to be an inherent quality of religious belief and it certainly emerged long before evolutionary explanations could be ascribed as a contributing cause. Above all, however, the stochasticity of human religious beliefs suggests that asking about the veracity of religious propositions is misguided. Humans generally don't believe in religious propositions in the same way they understand that the earth is round, 1+1=2, or that Boston is situated in Massachusetts. Indeed, recent cognitive and evolutionary experiments show that when primed to think analytically, commitments to religious claims diminish (Pennycook et al. 2012; Shenhav et al. 2011). In other words, adherents do not attain their religious commitments through analytical contemplation; rather, they derive and sustain them by expressing them through rituals, symbols, myths, and other elements of the religious system. By living their beliefs, adherents display acceptance of their truth, even when doubt about the veracity of such beliefs is genuine. As Rappaport emphasizes concerning a related matter, "That this is logically unsound should not trouble us for, although it may make problems for logicians, it does not trouble the faithful" (1979:217).

4.2 Religious beliefs are not homogeneous within any religious community

Our examination of religion as a complex adaptive system revealed that beliefs are rarely, if ever, homogeneous within a population. It is instructive to consider Whitehouse's pioneering work, because he emphasizes that attempts to homogenize beliefs only arises late in the evolution of human religious systems. In his Modes Theory of Religion, Whitehouse (2004) distinguishes between imagistic and doctrinal modes of religion. The imagistic mode centers on rarely performed rituals that are high in sensory pageantry, whereas the doctrinal mode centers on highly repetitive rituals that are less evocative. Whitehouse contends that cultures within the imagistic mode place little emphasis on consistent meanings and beliefs of the rituals they perform. Spontaneous exegetical reflection, as Whitehouse refers to it, results in individuals arriving at their own interpretation and meaning of the rituals they are participating in. In contrast, he argues that within the doctrinal mode a hierarchy of religious authority emerges that defines right thinking and polices against heretics.

Some have argued (Carroll 2001:188–9) that religion itself does not demand uniformity of belief, but rather it is political forces (e.g. uniting disparate geographical areas where divergent beliefs naturally emerge) that demand religious orthodoxy. Whitehouse is nevertheless likely right that religious institutional forces often encourage consistency of belief. Yet, there is also considerable variance in belief, even in doctrinal religious systems. Judaism, for example, which clearly lies within the doctrinal mode, tolerates vastly different authoritative conceptions of God, including theistic, deistic, pantheistic, and panentheistic conceptions, some of which are at complete odds with each other. It has been argued that Judaism has been able to maintain a diversity of beliefs which are all perceived as authoritative because they are all derived from sacred texts. Halbertal writes:

> The centrality of the text takes the place of theological consistency. Jews have had diverse and sometimes opposing ideas about God: the anthropomorphic God of the Midrash, the Aristotelian unmoved mover of Maimonides and his school, the Kabbalah's image of God as a dynamic organism manifested in the complexity of his varied aspects, the sefirot. These conceptions of God have little in common and they are specifically Jewish only insofar as each is a genuine interpretation of Jewish canonical texts (1997:1–2).

Even in Christianity, where the doctrinal model would seem to be most apt, the early stages of development evinced a multiplicity of religious beliefs and tolerance for theological diversity. Moreover, in highly religious contemporary communities, variation is evident, although it tends to be underappreciated by outsiders who see people dressed similarly and performing the same rituals. Insiders, however, seem to be well aware of such variation (Sosis unpublished data). And there is good reason for group members to pay close attention to internal variation: evolutionary signaling theory suggests that an individual's deviation from community norms indicates deficient group commitment, which is likely to have fitness consequences.

4.3 Religious beliefs cannot be understood as independent propositional claims

The complex systems approach to understanding religion emphasizes that religious beliefs are not independent propositional claims about the world. Religious beliefs emerge from within a cultural system and they must be understood within that system. In other words, religious belief, as an element of a larger religious system, cannot be analyzed independently of the system in which it is embedded. To do so is like evaluating a symphony when you can hear only one instrument. Moreover, similar to a symphony, religious systems have emergent properties and thus religion cannot be reduced to independent propositional claims.

Interestingly, the emergent nature of religious beliefs, especially in relation to myth, is a point of potential agreement between some atheists and theologians. Dennett (1991), for instance, argues that telling stories is fundamental to humanity. Notably, he writes "Our tales are spun, but for the most part we don't spin them; they spin us. Our human consciousness, and our narrative selfhood, is their product, not their source" (1991:418). Protestant theologian, Paul Tillich, would likely agree. For him religions employ myth "because symbolic expression alone is able to express the ultimate" (1957:41). Myths are not history—and Tillich (1957) warns that mistaking myth for history is idolatrous—but myths remain powerful because they are able to transcend themselves and express group values and identity (Mecklenburger 2012), a point in which Dennett would likely be in agreement.

4.4 Religions are more than beliefs

Belief is only one element within the religious system, and not always the most important one. When we consider religious beliefs in an evolutionary and historical context, it appears that there is an increasing emphasis on belief as religions developed and transformed from tribal, chiefdom, and archaic level religions to contemporary world religions. The focus on belief in world religions, especially Christianity, has probably resulted in an overemphasis on belief in the scientific study of religion. Belief is rarely a concern of tribal religions. As Marett observed long ago concerning tribal religions, "it is something not so much thought out as danced out" (1914:xxxi). Although stated in an entirely different context, Isadora Duncan's famous quip seems particularly apt: "No, I can't explain the dance to you; if I could say it, I wouldn't have to dance it!" Indeed, while tribal religions offer rich mythologies and intricate ritual displays, they are not concerned with articulated dogma or systematically developed theologies. As Rappaport (1999) notes, the central concern of religions at all phases of historical development—because they are all designed to solve the same problems of commitment and norm naturalization—is acceptance rather than belief.

5 Conclusions

Our central thesis is that because religious systems everywhere comprise more than belief, challenges to the modality of religion by evolutionary science—or any other scientific paradigm—do not cast doubt on religious commitments. Indeed, if history is any indication, religious systems are flexible enough to respond to the real and alleged challenges posed by evolutionary science. We suspect that just as past religious systems have withstood other challenges from science and philosophy, as well as social and political trends, contemporary religions will not crumble at the feet of evolutionary science. Moreover, similar to the way that religious systems throughout history have adjusted and reinterpreted themselves in light of the leading knowledge of their respective eras, so too will contemporary religions ultimately incorporate and embrace evolutionary findings and narratives into their religious worldviews.

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References

Alcorta, C. S. and Sosis, R. (2005). 'Ritual, Emotion, and Sacred Symbols: The Evolution of Religion as an Adaptive Complex', *Human Nature*, 16: 323–59.

Alcorta, C. S. and Sosis, R. (2007). 'Rituals of Humans and Animals', in Marc Bekoff (ed), *Encyclopedia of Human-Animal Relationships* (vol. 2). Westport, CT: Greenwood Publishers, 599–605.

Armstrong, K. (1993). *A History of God*. New York: Ballantine Books.

Armstrong, K. (2009). *The Case for God*. New York: Random House.

Atran, S. (2002). *In Gods We Trust: The Evolutionary Landscape of Religion*. New York: Oxford University Press.

Barrett, J. (2004). *Why Would Anyone Believe in God?* Lanham, MD: Altamira Press.

Barrett, J. (2008). 'Theological Implications of the Cognitive Science of Religion', in J. Bulbulia, R. Sosis, E. Harris, R. Genet, and K. Wyman (eds), *The Evolution of Religion: Studies, Theories, & Critiques*. Santa Margarita, CA: Collins Foundation Press, 393–400.

Barrett, J. (2009). 'Cognitive Science, Religion, and Theology', in J. Schloss and M. Murrary (eds), *The Believing Primate: Scientific, Philosophical, and Theological Reflections on the Origin of Religion*. Oxford: Oxford University Press, 76–99.

Barrett, J. (2012). *Born Believers*. New York: Free Press.

Bek, J. and Lock, S. (2011). 'Afterlife Beliefs: Category Specificity and Sensitivity to Biological Priming', *Religion, Brain & Behavior*, 1:5–17.

Bellah, R. (2011). *Religion in Human Evolution*. Cambridge: Harvard University Press.

Bering, J. (2006). 'The Folk Psychology of Souls', *Behavioral and Brain Sciences*, 29:453–98.

Bloom, P. (2009). 'Religious Belief as an Evolutionary Accident', in J. Schloss and M. Murray (eds), *The Believing Primate: Scientific, Philosophical, and Theological Reflections On the Origin of Religion*. Oxford: Oxford University Press, 118–27.

Boyer, P. (2001). *Religion Explained: The Evolutionary Origins of Religious Thought*. New York: Basic Books.

Bulbulia, J. (2004). 'Religious Costs as Adaptations that Signal Altruistic Intention', *Evolution and Cognition*, 10:19–38.

Bulbulia, J. (2006). 'Nature's Medicine: Religiosity as an Adaptation for Health and Cooperation', in P. McNamara (ed), *Where God and Science Meet* (vol. 1). Westport: Praeger, 87–121.

Bulbulia, J. and R. Sosis (2011). 'Signaling Theory and the Evolution of Religions', *Religion*, 41:363–88.

Carroll, J. (2001). *Constantine's Sword*. Boston: Houghton Mifflin Co.

Cronk, L. (1994a). 'Evolutionary Theories of Morality and the Manipulative Use of Signals', *Zygon*, 29:81–101.

Cronk, L. (1994b). 'Group Selection's New Clothes', *Behavior and Brain Sciences*, 17:615–16.

D'Aquili, E. G., Laughlin, C. D., and McManus, J. (1979). *The Spectrum of Ritual*. New York: Columbia University Press.

Dennett, D. (1991). *Consciousness Explained*. Boston: Little, Brown & Co.

Durkheim, E. (1995 [1912]). *The Elementary Forms of Religious Life*. New York: The Free Press.

Emlen, S. (1997). 'Predicting Family Dynamics in Social Vertebrates', in J. Krebs and N. Davies (eds), *Behavioural Ecology: An Evolutionary Approach* (4th edn). Oxford: Blackwell Scientific Publications, 228–53.

Fincher, C. and Thornhill, R. (2012). 'Parasite-Stress Promotes In-Group Assortative Sociality: The Cases of Strong Family Ties and Heightened Religiosity', *Behavioral and Brain Sciences*, 35:61–79.

Geertz, C. (1973). *The Interpretation of Cultures*. New York: Basic Books.

Ginges, J., Hansen, I., and Norenzayan, A. (2009). 'Religion and Support for Suicide Attacks', *Psychological Science*, 20:224–30.

Goody, J. (1996). 'A Kernel of Doubt', *Journal of the Royal Anthropological Institute*, 2:667–81.

Halbertal, M. (1997). *People of the Book: Canon, Meaning, and Authority*. Cambridge, MA: Harvard University Press.

Heimola, M. (2012). *Religious Rituals and Norms in the Making of Adaptive Systems*. Doctoral thesis, University of Helsinki.

Holland, J. H. and Miller, J. H. (1991). 'Artificial Adaptive Agents in Economic Theory', *American Economic Association Papers and Proceedings*, 81:365–70.

Hostetler, J. (1997). *Hutterite Society.* Baltimore: Johns Hopkins University Press.

Irons, W. (2001). 'Religion as a Hard-to-Fake Sign of Commitment', in R. Nesse (ed), *Evolution and the Capacity for Commitment*. New York: Russell Sage Foundation, 292–309.

Johnson, D. (2005). 'God's Punishment and Public Goods: A Test of the Supernatural Punishment Hypothesis in 186 World Cultures', *Human Nature*, 16:410–46.

Johnstone, R. (1997). 'The Evolution of Animal Signals', in J. Krebs and N. Davies (eds), *Behavioural Ecology: An Evolutionary Approach* (4th edn). Oxford: Blackwell, 155–78.

Klass, M. (1995). *Ordered Universes: Approaches to the Anthropology of Religion*. Boulder: Westview Press.

Lamm, N. (1985). *Faith and Doubt: Studies in Traditional Jewish Thought*. New York: Ktav.

Marett, R.R. (1914). *The Threshold of Religion*. Ithaca, NY: Cornell University Press.

Margolese, F. (2005). *Off the Derech: How to Respond to the Challenge*. Jerusalem: Devora Publishing.

McCauley, R. N. (2011). *Why Religion is Natural and Science is Not*. New York: Oxford University Press.

Mecklenburger, R. (2012). *Our Religious Brains*. Woodstock, VT: Jewish Lights Publishing.

Miller, J. H. and Page, S. E. (2007). *Complex Adaptive Systems: An Introduction to Computational Models of Social Life*. Princeton: Princeton University Press.

Murray, M. (2008). 'Four Arguments that the Cognitive Psychology of Religion Undermines the Justification of Religious Belief', in J. Bulbulia, R. Sosis, E. Harris, R. Genet, C. Genet, and K. Wyman (eds), *The Evolution of Religion: Studies, Theories, & Critiques*. Santa Margarita, CA: Collins Foundation Press, 365–70.

Murray, M. (2009). 'Scientific Explanations of Religion and the Justification of Religious Belief', in J. Schloss and M. Murray (eds), *The Believing Primate: Scientific, Philosophical, and Theological Reflections on the Origin of Religion*. Oxford: Oxford University Press, 168–78.

Norenzayan, A., Atran, S., Faulkner, J., and Schaller, M. (2006). 'Memory and Mystery: The Cultural Selection of Minimally Counterintuitive Narratives', *Cognitive Science*, 30:531–53.

Pennycook, G., Cheyne, J. A., Seli, P., Koehler, D. J., and Fugelsang, J. A. (2012). 'Analytic Cognitive Style Predicts Religious and Paranormal Belief', *Cognition*, 123:335–46.

Purzycki, B. G. and Sosis, R. (2009). 'The Religious System as Adaptive: Cognitive Flexibility, Public Displays, and Acceptance', in E. Voland and W. Schiefenhövel (eds), *The Biological Evolution of Religious Mind and Behavior*. New York: Springer Publishers, 243–56.

Purzycki, B. G. and Sosis, R. (2010). 'Religious Concepts as Necessary Components of the Adaptive Religious System', in U. Frey (ed), *Interdisciplinary Perspectives on Philosophy: Evolution and Religion*. Marburg, Germany: Tectum Verlag, 37–59.

Purzycki, B. G., Haque, O. and Sosis, R. (2014). 'Extending Evolutionary Accounts of Religion beyond the Mind: Religions as Adaptive Systems', in F. Watts and L. Turner (eds), *Evolution, Religion, and Cognitive Science: Critical and Constructive Essays*. New York: Oxford University Press, 74–91.

Rappaport, R. A. (1979). Ecology, Meaning, *and Religion*. Richmond, VA: North Atlantic Books.

Rappaport, R. A. (1999). *Ritual and Religion in the Making of Humanity*. Cambridge: Cambridge University Press.

Rossano, M. (2010). *Supernatural Selection*. New York: Oxford University Press.

Ruffle, B. and Sosis, R. (2007). 'Does It Pay to Pray? Costly Rituals and Cooperation', *The BE Press of Economic Policy and Analysis (Contributions)*, 7:1–35.

Schloss, J. P. and Murray, M. J. (2011). 'Evolutionary Accounts of Belief in Supernatural Punishment: A Critical Review', *Religion, Brain & Behavior*, 1:46–99.

Shenhav, A., Rand, D. G., and Greene, J. D. (2012). 'Divine Intuition: Cognitive Style Influences Belief in God', *Journal of Experimental Psychology*, 141:423–8.

Smith, E. A., Borgerhoff Mulder, M., and Hill, K. (2001). 'Controversies in the Evolutionary Social Sciences: A Guide for the Perplexed', *Trends in Ecology and Evolution*, 16:128–35.

Soler, M. (2012). 'Costly Signaling, Ritual and Cooperation: Evidence From Candomblé, an Afro-Brazilian Religion', *Evolution and Human Behavior*, 33:346–56.

Sosis, R. (2003). 'Why Aren't We All Hutterites? Costly Signaling Theory and Religion', *Human Nature*, 14:91–127.

Sosis, R. (2006). 'Religious Behaviors, Badges, and Bans: Signaling Theory and the Evolution of Religion', In P. McNamara (ed), *Where God and Science Meet* (vol. 1). Westport, CT: Praeger, 61–86.

Sosis, R. (2009). 'The Adaptationist-Byproduct Debate on the Evolution of Religion: Five Misunderstandings of the Adaptationist Program', *Journal of Cognition and Culture,* 9:315–32.

Sosis, R. (2011). 'Why Sacred Lands are Not Indivisible: The Cognitive Foundations of Sacralizing Land', *Journal of Terrorism Research*, 2:17–44.

Sosis, R. and Alcorta, C. (2003). 'Signaling Solidarity and the Sacred: The Evolution of Religious Behavior', *Evolutionary Anthropology*, 12:264–74.

Sosis, R. and Bressler, E. (2003). 'Cooperation and Commune Longevity: A Test of the Costly Signaling Theory of Religion', *Cross-Cultural Research*, 37:211–39.

Sosis, R. and Bulbulia, J. (2011). 'The Behavioral Ecology of Religion: The Benefits and Costs of One Evolutionary Approach', *Religion*, 41:341–62.

Sosis, R., Kress, H., and Boster, J. (2007). 'Scars for War: Evaluating Alternative Signaling Explanations for Cross-Cultural Variance in Ritual Costs', *Evolution and Human Behavior*, 28:234–47.

Sosis, R., Philips, E., and Alcorta, C. S. (2012). 'Sacrifice and Sacred Values: Evolutionary Perspectives On Religious Terrorism', in T. Shackelford and V. Weekes-Shackelford (eds), *The Oxford Handbook of Evolutionary Perspectives on Violence, Homicide, and War*. New York: Oxford University Press, 233–53.

Souza and Legare, C. (2011). 'The Role of Testimony in Religious Experience', *Religion, Brain & Behavior*, 1:146–53.

Strassmann, B. I. (1992). 'The Function of Menstrual Taboos among the Dogon: Defense Against Cuckoldry?' *Human Nature*, 3:89–131.

Strassmann, B. I. (1996). 'Menstrual Hut Visits by Dogon Women: A Hormonal Test Distinguishes Deceit from Honest Signaling', *Behavioral Ecology*, 7:304–15.

Strassmann, B. I., Kurapati, N. T., Hug, B. F., Burke, E. E., Gillespie, B. W., Karafet, T. M. and Hammer, M. F. (2012). 'Religion as a Means to Assure Paternity', *PNAS*, 109:9781–5.

Tillich, P. (1957). *Dynamics of Faith*. New York: Harper and Row.

Visala, A. (2011). *Naturalism, Theism, and the Cognitive Study of Religion*. Burlington, VT: Ashgate.

Whitehouse, H. (2004). *Modes of Religiosity: A Cognitive Theory of Religious Transmission*. New York: Alta Mira Press.

Wilson, D. S. (2002). *Darwin's Cathedral*. Chicago: University of Chicago Press.

Wilson, L. (2000). *Hutterites of Montana*. New Haven: Yale University Press.

Winston, H. (2005). *Unchosen: The Hidden Lives of Hasidic Rebels*. Boston: Beacon Press.

Winterhalder, B. and Smith, E. A. (1992). 'Evolutionary Ecology and the Social Sciences', in E. A. Smith and B. Winterhalder (eds), *Evolutionary Ecology and Human Behavior*. New York: Aldine de Gruyter, 3–23.