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Abstract and Keywords

People in all cultures entertain beliefs in supernatural agents and engage in ritual behaviors that are related to those beliefs. This suggests that religion is a product of a shared evolutionary history. Currently researchers employ three major evolutionary frameworks to study religion—evolutionary psychology, behavioral ecology, and dual-inheritance theory—each with different assumptions, methods, and areas of focus. This chapter surveys these approaches and describes the major sources of disagreement between them. Two of the largest sources of disagreement among evolutionary scholars of religion are: (1) whether or not religion is a cognitive byproduct, or a manifestation of adaptive behavioral plasticity, and (2) whether or not individual or group-level selection processes are a more potent evolutionary force in shaping the significant features religion. The authors suggest that integrative frameworks that incorporate aspects of all these perspectives offer the best potential for real progress.

Keywords: behavioral ecology, dual-inheritance theories of religion, evolutionary psychology of religion, evolutionary theory of religion, group selection, religion as by-product

Chapter Summary

- People in all cultures engage in ritual behaviors and hold beliefs in supernatural agents. This universality suggests that religion is a product of a shared evolutionary history.

- Although there has been a recent surge in the evolutionary study of religion, this has not been a unified endeavor.

- Currently researchers employ three major evolutionary frameworks to study religion —evolutionary psychology, behavioral ecology, and dual inheritance theory—each with different assumptions, methods, and areas of focus.

- Two of the largest sources of disagreement between evolutionary scholars of religion are: (1) religion as cognitive by-product vs. manifestation of adaptive behavioral plasticity; and (2) individual- vs. group-level selection processes as forces shaping religion.

- Integrative frameworks that incorporate aspects of all perspectives offer the best potential for real progress.

The Evolutionary Science of Religion

Evolutionary theorists generally view religion as ritual behavior that is motivated and/or rationalized by appeals to supernatural agents (e.g. Purzycki/Sosis 2013).[1] Both rituals (p. 125) and supernatural beliefs exist in nearly all known human societies, and across cultures religions are structurally quite similar (Boyer 2001; Bulbulia 2005; Rappaport 1999). The universality and shared structure of religions beg evolutionary investigation. It is thus perhaps unsurprising that evolutionary approaches to the study of religion have flourished in recent years, as part of a general rise of evolutionary thinking across the sciences, and continue to inspire considerable empirical work. However, efforts to apply Darwinian theory to the study of religion do not represent a single unified endeavor or research program.

The focus of study is often a critical factor in determining how researchers interpret the effects of natural selection on religion. When, for instance, researchers concentrate on the cognitive requirements of religious thought, they typically conclude that religious beliefs are merely by-products of psychological adaptations designed for other purposes (e.g. Boyer 2001; Guthrie 1993). On the other hand, when researchers examine the social consequences of ritual behavior, the adaptive benefits of religion become quite clear (e.g. Alcorta/Sosis 2005). And when research emphasizes individual variation in religious behavior, it is obvious that these adaptive benefits are not equally achieved; some benefit more than others (e.g. Cronk 1994). However, research focused on group-level dynamics reveals that some religious groups are more successful than others, and this may be, in part, because they are better able to minimize individual self-interested behaviors and instead motivate behaviors that result in benefits for the group. Scholars pursuing such research argue that religious groups function as adaptive units that are subject to cultural group selection (e.g. Norenzayan 2013; Wilson 2002).

These differences in research foci roughly correspond to three relatively distinct evolutionary approaches to the study of human behavior: evolutionary psychology, human behavioral ecology, and dual inheritance theory (Smith 2000). Here we describe how each

of these evolutionary subfields has approached the study of religion. We then suggest that viewing these approaches as complementary, rather than contradictory, offers the greatest potential to explain the complex phenomenon of religion (Sosis 2009; Sosis/ Bulbulia 2011). Since evolved cognitive faculties, memory and its organization, behavioral expression, interpersonal social psychological responses, and the social and natural environments are all at play in the formation of religious systems, diverse approaches are necessary if we wish to uncover the evolutionary origins and development of religion.

Evolutionary Psychology of Religion

Evolutionary psychologists use the theory of natural selection to generate hypotheses about panhuman psychological design; they contend that the human mind consists of (p. 126) several cognitive systems designed to solve specific adaptive problems that ancestral human populations faced (Tooby/Cosmides 1992; cf. Barrett et al. 2014; Samuels 1998). Because the human brain consists of cognitive adaptations to solve ancestral problems, and because modern environments often differ substantially, cognitive adaptations can produce thoughts and behaviors that are now neutral, maladaptive, or even unrelated to the problems they arose to solve. Indeed, the majority of evolutionary psychologists of religion hold that the human tendency for supernatural beliefs is an evolutionary by-product of cognitive systems that evolved to solve adaptive problems unrelated to religion (Bulbulia 2004; Sosis 2009). That is, the human proclivity for belief in the supernatural is the result of an evolved panhuman psychological design, but the cognitive architecture that supports supernatural belief did not arise because believing in supernatural agents itself was adaptive. The research questions evolutionary psychologists address include the developmental trajectories of the cognitive abilities assumed to contribute to supernatural belief, their presence in adults, and their cross-cultural prevalence, and they generally test their assumptions with laboratory experiments and/or survey research.

Evolutionary psychologists of religion assume that several cognitive systems contribute to our propensity for belief in the supernatural. Notably, Guthrie (1993) argues that the human tendency to anthropomorphize arose as a result of selection pressures that favored the ability to perceive agents and agency in the environment and that these abilities contribute the human propensity to interpret events in terms of supernatural agency. He suggests that perceiving agents, even when there are none, is advantageous insofar as *not* detecting agents that are present would be deleterious (e.g. not detecting a nearby mountain lion). While this promiscuous agency detection did not emerge for purposes relating to religion, and the evolutionary roots of this capacity run quite deep, it is nonetheless the ability to perceive unseen agents that gives rise to religious perceptions and explanations of the mysterious (Barrett 2004). Furthermore, myths, spirits, and god perceptions are the natural by-product of such a sensitive system; we

explain the world in terms of agency, and frequently believe that events are caused by supernatural agents.

Human social interactions require the ability to understand and appreciate what others are thinking and feeling. Indeed, human sociality is built on the cognitive ability to interpret other individuals as having their own distinct perceptions, desires, and beliefs. This capacity, known as theory of mind (ToM—Premack/Woodruff 1978), arose for reasons unrelated to religion, but now contributes to the human propensity to believe that supernatural agents have minds with their own wishes and desires. But perceiving and thinking about such entities would contribute little to human sociality without tapping into moral cognition as well (see Haley/Fessler 2005; Nettle et al. 2013). Some evidence suggests that they do, even when the gods are not thought of as concerned with moral behavior (Purzycki 2013).

Other work suggests that humans are primed from an early age to accept teleological explanations. Deborah Kelemen, for example, suggests that children are 'intuitive theists' who believe that things in the natural world have been purposefully designed (p. 127) (Kelemen 2004). Her studies show that children readily assert that both natural objects and artifacts exist for a reason. Moreover, this bias is not limited to children; less educated adults show this same tendency (Casler/Kelemen 2007), and under conditions of high cognitive load, even scientifically trained adults exhibit these same biases (Kelemen/Rossett 2009). Although 'promiscuous teleology' is thought to be the result of cognitive modules that evolved to reason about the biological world (e.g. Atran 1995), it also renders belief in a creator intuitive, and leads to interpretations that events happen for a purpose, an interpretative framework that many religions share.

While the mainstream view among evolutionary psychologists is that religious representations are evolutionary by-products, a few scholars have proposed that selection processes have resulted in psychological adaptations for religion specifically. For example, Bering (2006) and Bloom (2009) have shown that humans are intuitive dualists, and unless formally taught otherwise, they exhibit a tendency to conceptually separate minds from bodies. This propensity leads to the belief that minds and/or souls can continue to exist after death (Bering 2006). Additionally, Johnson and Bering (2006) argue that the human tendency to fear supernatural punishment is an adaptation that arose because those individuals who feared supernatural punishment were able to inhibit self-interested behavior and social transgressions that would have been punished by other group members. As god-fearing individuals were more successful at reaping the benefits of cooperation in ancestral environments, selection favored these propensities. Others argue that religions evolved, at least in part, to support mate discrimination, or finding other individuals who prefer monogamous long-term relationships and high fertility (Slone 2008; Weeden et al. 2008). Indeed, several authors interpret the lower promiscuity and higher fertility levels of religious people as an outcome of such strategies (Blume 2010; Bulbulia et al. 2015; Frejka/Westoff 2008; Kaufmann 2010).

Human Behavioral Ecology of Religion

Whereas the majority of evolutionary psychologists of religion speculate that religious beliefs and behaviors are a by-product of cognitive systems that evolved to respond to selection pressures in ancestral environments (and that these selection pressures were unrelated to those that now motivate religious beliefs and behaviors), behavioral ecologists assume that selection has produced behavior-generating mechanisms that enable individuals to respond optimally to diverse environmental conditions, and that cross-cultural variation in behavior represents a manifestation of this behavioral plasticity. Contrary to the majority of cognitive approaches, behavioral ecologists begin their analyses by assessing how behaviors are adapted to current ecological settings. For the behavioral ecologist, determining adaptiveness means measuring the costs and benefits of a behavior, given available alternatives, in an effort to understand the selection pressures at work in any given environment. In general, behavioral ecologists of religion start by testing hypotheses derived from models that assume an individual's behavior is (p. 128) adaptive in its current environment. Human behavioral ecologists are typically anthropologists who engage in long-term ethnographic research and use data derived from field experiments and systematic behavioral observation to test hypotheses. They attempt to address research questions about the adaptiveness of individuals' religious behavior in a particular environment. While the behavioral ecology of religion is still in its infancy (Sosis/Bulbulia 2011), research to date has been both diverse and fruitful. Here we focus on just a few of these research programs.

At first glance, religious behavior appears maladaptive; it is often materially, energetically, and temporally expensive and thus superficially appears to be detrimental to individuals' immediate somatic and reproductive self-interest. However, behavioral ecologists interpret these costs as investments that return material benefits which positively impact fitness. To explain the adaptive benefits of ritual behavior, behavioral ecologists borrow two key insights from social theorists. First, Durkheim (2001 [1915]) speculated that the effervescent nature of collective rituals serves to bond group members and increase within-group cohesion. Second, Rappaport (1999) argued that rituals are able to increase social solidarity because they communicate adherence to a moral code and commitment to a social order, which in turn promotes trust, and hence cooperation.

Like all collectivities, religious groups are prone to exploitation by freeriders, or those who reap the benefits of group cooperation without pulling their own weight. Irons (2001) argued that the costliness of ritual behavior functions as a commitment device and serves to minimize the freerider problem because only those who are truly committed to the group would be willing to incur such costs. In other words, individuals who engage in costly ritual behavior communicate, or signal, their commitment to the group, in turn

benefit from increased cooperation, and these material benefits are ultimately translated into reproductive success.

This theoretical framework, known as the costly signaling theory of religion, suggests that religious groups that require costly ritual behaviors of their members will exhibit high levels of cooperation. For example, Sosis and Bressler (2003) found that nineteenth-century United States religious communes that demanded more costly behaviors of group members out-survived those with fewer costly obligations. Moreover, the ritual costs associated with group membership vary across environments and increase as a function of the risks of exploiting these resources via freeriding. Perhaps the greatest risks of freeriding occur amongst groups engaged in warfare, where shirking on one's commitment to the group might mean death to other group members. Indeed, Sosis et al. (2007) found that cultures engaged in endemic warfare have the most taxing religious rites. In general, a significant body of empirical research now provides support for the premise that costs paid in ritual performance return high levels of cooperation (e.g. Ruffle/Sosis 2007; Soler 2012; Sosis/Ruffle 2003; 2004).

Behavioral ecologists have also explored the socio-ecological conditions that have favored specific religious behavioral patterns. For example, Strassmann's work with the Dogon of Mali (1992; 1996) examines the manner in which religious taboos and rituals surrounding sexual activity, such as attending menstrual huts, reduce (p. 129) the risks of cuckoldry. Specifically, she and colleagues have shown how the various religions practiced by the Dogon differentially impact cuckoldry rates (Strassmann et al. 2012).

In other studies, Fincher and Thornhill (2008; 2012) demonstrate that religious diversity varies as a function of environmental variance in disease prevalence. In every environment organisms are constantly engaged in an evolutionary arms race between greater virility and greater immunity. In high disease environments, such as the tropics, selection acts to reward limited dispersal and infrequent interaction with out-group members, as both represent increased risk for encountering novel diseases. Religions, Fincher and Thornhill argue, can provide the social barriers to limit social engagement with outside groups. Over time, in high disease environments, limited interaction with outsiders results in increased religious diversity. Conversely, in environments with relatively low disease levels, interaction with outsiders is not as deleterious. These environments therefore allow for greater dispersal, which ought to result in a decrease in religious diversity. Consistent with their predictions, in a cross-cultural analysis Fincher and Thornhill (2008) found religious diversity to be positively correlated with disease prevalence.

Dual Inheritance Theories of Religion

While the aforementioned evolutionary approaches to the study of religion focus on the individual-level evolutionary forces that led to the emergence of religious belief and behavior, a third group of scholars place emphasis on how selection that operates at the level of groups might explain the appearance and proliferation of religions. Specifically, dual inheritance theory (DIT) posits that genes and culture provide separate, but interacting, forms of inheritance. These theorists suggest that cultures, like genes, exhibit the three necessary conditions for evolution by natural selection: variation, inheritance, and fitness consequences. Because people acquire a significant amount of information from other group members, and cultures differ, the information accumulated by some groups allows them to better overcome adaptive problems, and thus spread at the expense of less successful ones (Boyd/Richerson 1985). Proponents of DIT are typically evolutionary biologists, anthropologists, and economists who rely upon computer simulations to test their mathematical models of cultural evolutionary processes. Many DIT scholars suggest that religious groups are subject to these cultural evolutionary processes.

Notably, evolutionary biologist D. S. Wilson (2002) argues that because religious groups limit self-interested behavior, but provide secular utility to members, religious groups function as adaptive units. When groups of individuals function as units, they are subject to the forces of cultural group selection; better adapted religions spread at the expense of those less equipped to overcome socio-environmental challenges. In support of his model, Wilson shows how religions, such as Calvinism and Jainism, (p. 130) provide material benefits for their members, while limiting self-interested behaviors and encouraging altruism toward other group members.

Other cultural evolutionary theorists share with evolutionary psychologists the assumption that supernatural beliefs are by-products of cognitive systems such as HADD (Hyperactive Agency Detection Device), ToM, and teleological reasoning, but also argue that variants of supernatural belief, and religious groups, are subject to cultural selection (e.g. Atran/Henrich 2010; Norenzayan 2013; Shariff et al. 2010). These theorists note that groups committed to omniscient high gods who intervened in human affairs and punished non-cooperators were more successful than groups whose belief systems did not promote cooperation as effectively. Thus, cultural evolutionary processes led to the current global pattern of limited religious diversity—more than half of the world's population practice Christianity or Islam, which center around belief in an omniscient high god that can punish uncooperative behavior. In support of these assertions, DIT theorists use the results of experimental studies that show that people are more cooperative under perceived social monitoring (e.g. Bering et al. 2005), that religious primes decrease cheating behavior and increase generosity, fairness, cooperation, and the punishment of

non-cooperators (Norenzayan/Shariff 2008), and that religious individuals are trusted more than non-religious individuals (Purzycki/Arakchaa 2013; Tan/Vogel 2008).

Norenzayan (2013), who has most extensively developed this argument, recognizes that the widespread cooperation among non-kin in large-scale human societies is a significant evolutionary puzzle. He speculates that Big Gods, and their ability to promote prosocial behavior, enabled large-scale societies to emerge. Specifically, Norenzayan posits that through processes of cultural evolution, groups that embraced watchful and omniscient gods were able to cooperate and out-compete other groups that were unable to extend cooperation beyond kin and reciprocal relations.

Dual inheritance theorists also assume that humans are endowed with psychological adaptations for general-purpose learning, which allow for rapidly gathering fitness-relevant information from other group members. These evolved abilities contribute to the cultural accumulation of solutions to significant fitness concerns, such as techniques for tool construction or methods of agricultural production. These strategies work by biasing an individual's attention toward group members who ought to hold fitness enhancing information and then copying their strategies (Boyd/Richerson 1985; Richerson/Boyd 2005). One of these biases is the 'frequency bias' which increases the probability of learning information insofar as it appears frequently throughout the social environment. In terms of religious beliefs, the more people believe something and express that belief, the more likely one is to learn this belief and act upon it as well. Another such bias is the 'prestige bias,' which focuses on the specific source of informational transfers. Like parents and successful hunters, priests, rabbis, shamans, lamas, mullahs, and other religious leaders are likely to transfer information with high fidelity, as it is assumed that selection has favored learning mechanisms that encourage us to copy the behavior of successful individuals.

(p. 131) Toward Synthesis

Two of the largest sources of disagreement among evolutionary scholars of religion, then, are: (1) whether or not religion is a cognitive by-product, or a manifestation of adaptive behavioral plasticity, and (2) whether or not individual- or group-level selection processes are a more potent evolutionary force in shaping the significant features religion. We contend that these are not insurmountable disagreements and conclude this chapter by briefly describing some ways to unite multiple evolutionary perspectives.

As stated above, evolutionary psychologists largely focus on how evolved cognitive systems produce, retain, and transmit religious thought. Conversely, behavioral ecological approaches emphasize variation in the costs and benefits to ritual behavior. Thus, these two perspectives differentially emphasize some features of religions while largely neglecting others. However, religions are comprised of both features—and a host of others—including emotionally evocative symbols, myths, and taboos. Some recent

evolutionary approaches recognize that these core elements of religion constitute an adaptive system designed for promoting cooperation (Sosis 2009). Such an approach views beliefs as highly flexible, though constrained, cognitive processes that motivate adaptive responses to diverse environments (Alcorta/Sosis 2005; Purzycki/Sosis 2009; 2010). Moreover, these researchers seek to understand how selection favored the coalescence of religion's core features into an adaptive system. This approach incorporates the insights from all three evolutionary perspectives and aims to explain the central elements of religion with consideration of the local environment in which people operate.

A second major difference between evolutionary approaches is that some focus on individual-level selection pressures, while others focus on group-level evolutionary processes. It is likely, however, that both forces have shaped and continue to influence contemporary religions. We suggest that one of the most significant ways to reconcile evolutionary approaches is to collect data that can assess the effects of both levels of selection in a particular environment (Richerson/Newson 2008; Shaver 2015). Sober and Wilson (1998) outline a multilevel selection model that involves detailing phenotypic variation both within and between groups, and the heritability and fitness consequences of this variation. What is promising about such an approach is that it will enrich our understanding of the ways that religious behavior varies within and between populations. When combined with the view that religion is an adaptive system, such a research program will help to unify the perspectives and goals of all evolutionarily approaches. Indeed, all evolutionary scholars are united in their belief that Darwinian theory is a powerful framework for analyzing religion; the differences between approaches ought to be seen as offering complementary tools for advancing our understanding of the complex phenomenon of religion.

(p. 132) **Glossary**

Adaptation
process of phenotypic modification by natural selection, as well as the products of that process.
Adaptive
a trait is adaptive if it confers reproductive benefits upon its bearer in a particular environment.
By-product
a feature of an organism not designed for functional purpose, but one that exists because of the constraints and designs of the organism's adaptations.
Group selection
natural selection that operates on groups of individuals.
Individual selection
natural selection that operates on individual organisms.
Multilevel selection

natural selection that operates on both individuals and groups simultaneously.

Natural selection

evolutionary change that occurs when individuals vary, variation is heritable, and some variants are more likely to survive and reproduce.

Trait

the quantifiable features of organisms.

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Further Reading

Alcorta/Sosis 2005 [*This paper describes religion as an adaptive complex comprised of supernatural beliefs, communal ritual, the separation of the sacred and profane, and adolescence as an experience expectant period for ritual the conditioning of sacred symbols*.]

Boyer 2001 [*This book argues that supernatural beliefs are a by-product of cognitive modules designed for purposes such as agency detection, and that supernatural concepts in all religious systems share a similar structure due to their cognitive appeal*.]

Bulbulia 2004 [*A paper that describes both by-product and adaptationist explanations of religious cognition and argues in favor of the latter*.]

Frey, Ulrich, ed. 2011. *The Nature of God: Evolution and Religion*. Marburg: Tectum Verlag

[This edited volume is comprised of works that employ a Darwinian perspective to address questions about cognitive origins, the development of religious cognition of children, and reproduction in religious communities, among others.]

Guthrie 1993 [*One of the first applications of a cognitive and evolutionary approach to the study of religion, Guthrie argues that religion is a result of the human tendency to anthropomorphize the world*.]

Norenzayan 2013 [*Written from the perspective of both evolutionary psychology and dual inheritance theory, this book attempts to explain the rise of large-scale cooperative human societies, and the reasons for the success of the world's major religions*.]

(p. 136) **Sosis 2009** [*The paper surveys and responds to criticisms of adaptationist approaches to religion that have been levied by by-product theorists*.]

Voland, Eckhart and Wulf Schiefenhövel, eds. 2009. *The Biological Evolution of Religious Mind and Behavior*. New York: Springer-Verlag

. [An edited volume that describes the selection pressures that may have given rise to the physiological, cognitive, and emotional processes that contribute to religion.]

Watts, Fraser and Leon Turner, eds. 2014. *Evolution, Religion, and Cognitive Science: Critical and Constructive Essays*. Oxford: Oxford University Press

. [This edited volume, with contributions from authors of multiple disciplines, describes major controversies in evolutionary and cognitive approaches to religion.]

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