Extending Evolutionary Accounts of Religion beyond the Mind: Religions as Adaptive Systems

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Abstract: Current cognitive approaches to religion maintain that religion evolved as a by-product of cognitive mechanisms that were naturally selected for functions unrelated to religion. In the present chapter we argue that it is necessary to widen the scope of analyses to encompass religious concepts, behavior, and sharedness, and how they interact with each other and with the environment. This approach offers a more dynamic evolutionary explanation of religion that is not only able to account for a greater number of recent findings, but is also more plausible amidst competing theories. We discuss some of the strengths and weaknesses of the leading evolutionary explanations of religion and show that there are both promising avenues of research which lie ahead, as well as important steps in evaluating, integrating, and extending such accounts.

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1. Introduction

Scholars and lay people alike have characterized religion as serving a number of functions. Many have argued that because we are profoundly ignorant of our surroundings, mythologies and religious beliefs developed to satisfy our curiosity by providing explanations for a complex and mysterious universe (e.g., Darwin 2000 [1879]:117; Durkheim 2001 [1915]:29-30; Geertz 1973:108). Some propose that religion's essential function is to allow us to cope with death and other forms of psychological suffering (e.g., Becker 1973:203-204; Spiro 1987:172), while others maintain that religion serves to establish and sustain the social order (e.g., Radcliffe-Brown 1965).

Within anthropology and related fields, such functionalist explanations have been in decline for decades. Among other deficiencies, functionalist theories often incorrectly assume that particular institutions are essential parts of the societies in which they operate (Collier et al. 1997 [1982]:73). Moreover, functionalist theories typically lack any consideration of feedback mechanisms that can account for the maintenance of benefits to social actors (Elster 1983, 2007; Sperber 1996). However, anthropologists, psychologists, and biologists who employ evolutionary models avoid such pitfalls by beginning with and providing explanatory frameworks grounded in the selective retention of useful effects (e.g., Dennett 1995; Owens and Wagner 1992; Smith and Winterhalder 1992). Boyer (2003) nevertheless correctly cautions those seeking evolutionary explanations of religion:

> Most attempts at an evolutionary account of religion have proved unsatisfactory because a single characteristic identified as crucial to the origin of religion is not in fact general. The attempt to find the single evolutionary track for religion is another manifestation of a general urge to identify the single mechanism that motivates religious thought or makes it plausible to believers (123).

We heed Boyer's cautionary advice and approach religion from a more holistic and multivariate perspective than currently offered by the evolutionary and cognitive sciences of religion. Indeed, we argue that an evolutionary approach to religion requires that religion be viewed as a dynamic *system*; isolating particular features of religion for analysis without understanding their influence on the full religious system can be misleading and generate trivial results. The present chapter examines the functional logic of religious systems and explains how they solve adaptive problems. As argued elsewhere (Alcorta and Sosis 2005; Purzycki and Sosis 2009, 2010, 2011; Sosis 2009), the religious system is comprised of cognitive and emotional mechanisms that produce, retain, and motivate commitments to shared supernatural ideas, and behavioral procedures—rituals—that enact, reproduce, and encode these ideas. These components appear to lock into place and form a universal social system with remarkable cross-cultural similarities, as well as predictable differences. Here, we further elaborate how such a system evolves and how the content of its constituent parts adapt to socioecological changes in order to maintain a suitable social niche in which ritual performance can publicly demonstrate group commitments.

2. By-Product Accounts

There has been considerable debate regarding whether or not religion meets biological criteria for an adaptation (e.g., Bulbulia et al. 2008; Pyysiäinen and Hauser 2010; Sosis 2009). Remarkably, those on all sides of the debate are in agreement on the nature of religious cognition and its prosocial effects. Scholars involved in the debate primarily disagree on whether religion is an adaptation, a functional by-product of other adaptations known as an exaptation, or a functionless by-product. The *sine qua non* of any selectionist analysis is explaining how a particular trait increases the likelihood that its bearer's genes replicate. Adaptations—traits forged by natural selection—often have multiple effects and may be composed of a number of other traits that are either a direct or indirect (i.e. a by-product) result of natural selection (e.g., the color of blood). Moreover, adaptations to past environments can be maladapative—meaning they confer a fitness *disadvantage*—in present ones (e.g., a taste for fatty foods and the overpowering urge to privilege learning over procreation; Richerson and Boyd 2005:148-190). Alternatively, presently adaptive traits may have been less so in past environments.

Various authors have argued that religious concepts are by-products of evolved cognitive architecture and that religion is therefore an evolutionary by-product (Atran 2002; Boyer 1994, 2001; Barrett 2004; Dawkins 2006; Dennett 2006). These scholars argue that religious concepts co-opt psychological mechanisms that evolved for purposes unrelated to religion, and these concepts tap into emotional and other strategic systems to powerfully motivate behavior. Boyer (2003), for instance, argues that because religious concepts exist by virtue of "neural systems" that function for very specific purposes outside of religion, religious thought is a by-product of these systems. Atran (2002) acknowledges that religious behavior may result in fitness benefits for participants, but similar to Boyer, he asserts that "religions are not adaptations and they have no evolutionary functions as such. There is no such entity as 'religion' and not much sense in asking how 'it' evolved. Unlike the case for language, for religion there is no integrated set of cognitive principles that could represent a task-specific evolutionary design" (264-265). In other words, there is no domain-specific module (or set of genes) for religion and therefore the question of whether or not it is an adaptation is meaningless (Kirkpatrick 1999). The common thread woven throughout by-product accounts of religion is the claim that religion exploits cognitive faculties designed for other, mundane operations, and therefore religion is a by-product of our evolved minds.

A number of by-product accounts which employ this reasoning are prevalent in the evolutionary and cognitive science of religion literature. Among some of the more influential ones are: a) supernatural agent concepts emerge from mind-detection mechanisms (Barrett 2004; Guthrie 1980, 1995), b) religious concepts predominantly consist of ideas which violate default assumptions about objects, artifacts, plants, animals and persons in our world (Atran 2002; Barrett 2004, 2008a; Boyer 1994, 2001; Boyer and Ramble 2001; Norenzayan et al. 2006; Pyysiäinen 2004), c) supernatural agent concepts exploit emotional attachment systems (Kirkpatrick 2005; Granqvist and Kirkpatrick 2008; Granqvist et al. 2010), and d) ritual behavior is a by-product of hazard precaution systems (Boyer and Liénard 2006, 2008; Liénard and Boyer 2006). The general logic of these accounts is that because features of religion are analogous to or exploit extant psychological systems, religion is not an evolved trait. While such views offer

compelling mechanistic explanations of certain features of religion, they cannot explain four key aspects often encountered in religious systems. First, they fail to account for the recurrent cross-cultural coalescence of many of religion's core features. Second, they specifically fail to account for coupling of supernatural agent concepts with rituals that are essential to all religious traditions. Third, they fail to account for patterned cross-cultural differences in religious traditions. Fourth, by-product accounts derived from cognitive studies which focus merely on the mental representations of religious concepts and ritual operate in an analytical vacuum at the expense of accounting for what religion actually does.

3. Adaptationist Accounts

Humans are composed of many systems, which are comprised of even smaller sub-systems. While our stomachs are evolved adaptations for food-processing, the stomach itself is composed of numerous systems of cells, their interactions, and the emergent properties of their collectivity we call "tissue". Not only do we consist of various interacting systems, but we also regularly participate in systems far larger than ourselves. No one who embraces evolution by natural selection would argue that the immune system is *not* an adaptation, yet we find no one claiming that there is a particular locus of this adaptation since the system is composed of a number of interacting units and they must function together to maintain the defensive capabilities of organisms against infectious microorganisms. Moreover, no one would deny that our own immune systems are any less adaptive because they served different functions or had different forms in our evolutionary past.

Similarly, what we have been calling the "religious system" is composed of constituent parts. These constituent parts consist of evolved cognitive, emotional, developmental, and behavioral traits. At its most basic level, this system is composed of ritual behaviors and the supernatural agents to which people appeal. Yet, this system of course has other constituent parts, such as myths, symbols, taboos, sacred values, all of which must operate together in order for individuals to reap the benefits from participation. Adaptive accounts of religion do not disagree with the central and often empirically supported claim of by-product accounts that religious concepts are made possible by evolved psychological mechanisms which evolved as a consequence of selective pressures that are in all probability unrelated to religion. However, an adaptive approach goes a few steps further. First, it gives equal attention to human universals and cross-cultural variation as both are explicable by evolutionary analysis. Second, it emphasizes the functional *effects* of coupling religious concepts, emotions, and behaviors over time on human social interactions. Third, it emphasizes the remarkable recurrence, convergence, and non-random distributions around the world of these features.

3.1. Religious Ritual as a Signal of Commitment

Pinker and Bloom (1992) suggest that "Supplementing the criterion of complex design, one can determine whether putatively adaptive structures are correlated with the ecological conditions that make them useful, and under certain circumstances one can actually measure the reproductive success of individuals possessing them to various degrees" (457). Indeed, there is a significant amount of evidence that affiliation with a religious community is positively

correlated with fertility (Blume 2009, 2010; Frejka and Westoff 2008; Kaufmann 2010). The mechanisms driving this effect, however, are unclear. Quite possibly, individuals with a genetic predisposition toward religiosity find like-minded individuals with whom to mate. The norms and practices of religious communities may serve as solutions to coordination problems for persons who prefer a monogamous, high-fertility mating strategy. Indeed, attitudes towards sex and mating behaviors are very strong predictors of attendance at a house of worship (Weeden at al. 2009). Religious communities may provide places for individuals to find like-minded individuals, such as others with similar mating strategies. This approach, however, fails to explain how religious non-kin and non-mates are also remarkably cooperative with each other. Consideration of religion as a form of communication helps provide a more fruitful approach.

There are undoubtedly forms of communication that we share with our non-human relatives. Animals regularly communicate with others using various signals (Hauser 1996; Searcy and Nowicki 2005). Otte (1974) defines signals as "behavioral, physiological, or morphological characteristics fashioned or maintained by natural selection because they convey information to other organisms" (385). These signals can vary in form, content, cost, intensity, frequency, and reliability. Human facial expression of emotion, for instance, is a reliable, difficult-to-fake signal of an internal emotional state (Frank 1988; Pinker, 1997), but of course there are individual differences in the intensity of expression of emotions. Organisms regularly engage in behaviors that reliably convey various messages.

For instance, Zahavi and Zahavi (1997) detail risky behaviors organisms perform in order to reliably demonstrate their fitness. The so-called "Handicap Principle" predicts variation in the ways animals will signal their fitness to potential mates, same sex competitors, and/or predators. These signals are generally reliable because they come at a cost to individuals bearing them and thus accurately communicate the message which they are designed to convey. Humans, for instance, regularly engage in conspicuous consumption in order to "sufficiently put [their] opulence in evidence" (Veblen 2007 [1899]:53; see also Miller 2009) just as male bowerbirds collect and arrange attractive colorful trinkets to display hard-to-fake information about their attributes, and so can attract females. While humans can convey their opulence by spending their resources on symbols of wealth (e.g., fast cars, jewels, etc.), bower birds demonstrate their fitness by using energy and time expenditures to amass a hoard of equally apparently useless objects. The real utility, of course, lies in the payoffs for engaging in such behavior (e.g., prestige and mates, respectively).

Signaling theories of religious behavior contend that religious rituals also act as signals of an individual's solidarity with the religious tradition, and more importantly, with the specific individuals engaged in that tradition (Alcorta and Sosis 2005; Bulbulia 2009; Irons 2001; Sosis and Alcorta 2003). Cooperative relationships face the inherent problem of exploitation by cheaters: those who free-ride (i.e., profit at others' expense) can take advantage of others' generosity (Axelrod 1984; Dawkins and Krebs 1979; Iannaccone 1992, 1995). Religious rituals are one mechanism that minimize free-riding on the cooperative efforts of others. The costs of ritual performance, including time, energy, risk, material, and opportunity costs, enable religious behaviors to serve as reliable signals of in-group commitments. In other words, one who pays the costs of a supernaturally rationalized rite, indicates his or her commitment to the

mores of one's tradition, and those who share that tradition. Religious rituals can therefore be a means to communicate trustworthiness (Sosis 2005).

Tan and Vogel (2008), for example, found that religiosity predicts trustworthiness and willingness to trust others in economic games. If one is perceived to be more trustworthy, then cooperative relations are likely more reliable, and one can reap the benefit of such cooperative relations. Of course, costly signals are used as signals of commitment in atheistic and secular contexts as well. Tattooing onto one's body, for example, the logo of the atheist "Brights" movement, one's fraternity letters, Captain Beefheart lyrics, etc., are all demonstrations of costly commitment in secular contexts. However, what costly religious signals do is communicate commitment to social contracts perceived to be mediated by sacred and often eternal beings. There is ever-growing evolutionary modeling (Dow 2008; Henrich 2009; Wildman and Sosis 2011) and empirical evidence that supports the hypothesis that ritual's adaptive function is to strengthen social bonds through costly signals.

Sosis and Bressler (2003; Sosis 2000), for example, demonstrated that religious communes outlive secular communes, and that among religious communes, but not secular communes, costly rituals are positively correlated with commune longevity. Religious concepts are therefore likely to be necessary for this prolonged cohesion; when rituals are rationalized in secular terms, they can be explained away. Successful religious concepts are by nature unverifiable and thus provide people with a stable, albeit otherworldly, incentive to participate (Rappaport 1999). As such, religious concepts appear to be a necessary component for the prosocial effects we see in religious groups (Purzycki and Sosis 2010). In related work, Sosis and Ruffle (2003, 2004) found members of religious kibbutzim to be more generous in economic games than their secular counterparts. Similarly, Soler (2008a, 2008b) found that religiosity is positively correlated with in-group generosity among Afro-Brazilians. Moreover, the cost of religious ritual increases with frequency in warfare, suggesting that the greater the organizational need, the greater the ritual cost (Sosis et al. 2007). While costly rituals appear to be important for strengthening cohesion in diverse groups, recent laboratory studies have shown that simply exposure to religious concepts, or concepts that are similarly unverifiable, can promote prosocial behavior (Norenzayan and Shariff 2008).

3.2. Supernatural Punishment

As Murray and Moore (2009) note, in many religious contexts there are third-party sanctions against behaviors deemed religiously unacceptable. When violations of sacred taboos may be punished by a community, there is little need for costly rites that overcome the problems of cooperation (Sosis 2005). As discussed below, supernatural agents may serve this function in specific contexts. An evolutionary account of how selection favored commitments to moralistic gods, known as the "Supernatural Punishment Hypothesis", predicts that engaging supernatural agent concepts minimizes antisocial behavior and/or promotes prosocial behavior (Bering and Johnson 2005; Johnson and Bering 2006; Schloss and Murray 2011).

In a number of important studies, researchers have found priming of religion-associated concepts increases prosocial behavior. For example, Shariff and Norenzayan (2007) found that implicit priming of religious concepts positively affected generosity in economic games (though secular authority primes had a similar effect, which suggests a common causal mechanism in

reputation monitoring). Moreover, Bering et al. (2005) found that individuals were less likely to cheat in an experiment when primed with a ghost story. Johnson (2005) found a significant correlation between a number of indices of cooperation and commitment to a moralizing high god in a massive cross-cultural sample. While Norenzayan and Shariff (2008) suggest that the cooperative effects of religion make them more attractive to people and this is why individuals commit to them, Bering and Johnson (2005) argue that this evidence suggests an adaptation is at work and that this behavior may suggest something about our species' past.

Over the years, researchers have found again and again that the complexity of state societies correlates with omniscient, moralistic, and often singular deities (Johnson 2005; Lahti 2009; Sanderson 2008; Stark 2001, Swanson 1960; Wallace 1966), but as noted above, there are many examples of non-state societies with moralistic supernatural agents. The Nuer, for instance, believe in an omniscient moralizing god similar to the Abrahamic deity (Evans-Pritchard 1956); the Ju/'Hoansi of the Kalahari believe their ancestors' spirits know when they misbehave and make them sick if they do (Lee 2003); and the spirits among the Netsilik (Inuit) make people sick for violating taboos (Balikci 1970:226). Nevertheless, the anonymity provided by complex state political systems minimizes accountability. However, if a moralistic omniscient deity is watching, individuals may be less likely to engage in antisocial behavior. Yet many supernatural agents simply do not care about morality and do not necessarily punish people.

Among the Christian Maisin in Papua New Guinea, for example, "With the somewhat ambiguous exception of the Christian god, spiritual entities are ultimately amoral. They can aid, harm, or ignore the living as they please" (Barker 2008:122). In Inner Asia, Tyvan spirit-masters are particularly concerned about ritual behavior and resource preservation and not human morality (Purzycki 2010, 2011). The people of Ifaluk believe in malevolent and benevolent spirits, but divine wrath is explained by virtue of the spirits' malevolence, not necessarily by human misconduct. In fact, human misconduct is explained by spirit possession. On Ifaluk, residents direct individual aggression toward culturally sanctioned targets (Spiro 1952). In such cases, there seems to be little to no supernatural response to human immorality.

One of the underappreciated and therefore underexploited values of this ethnographic research is that it suggests that not only does religious content change to accommodate new socioecological contexts, but that the functions of specific religions may actually shift under new ecological conditions and challenges (Rossano 2006, 2007, 2009; Wright 2009). As noted above, increasing anonymity in densely populated state societies made the monitoring of ritual performance difficult, thus moralistic supernatural agents developed to overcome the new challenges to cooperation. Quite likely, this system was modified from one of stimulating and rationalizing (i.e., explaining costly behaviors with appeals to unverifiable agents) religious ritual—as found in traditional societies—to one of a transcendent monitoring system which has indeed been shown to affect prosocial behavior (Purzycki and Sosis 2011). However, more specifically, we find considerable variation around the world in a) the form of supernatural agents (e.g., human-like, animal-like, etc.), b) the objects of supernatural agents' concerns, c) the breadth of knowledge, d) how this variation informs religious behavior, and e) how these religious complexes make sense in their socioecological contexts.

3.3. Religion beyond Mind

Bulbulia (2008) characterizes religion as its own "niche" describing it as "a system of organized behavior and knowledge, together with whatever artifacts and other symbolic structures (musical scores, texts, religious architecture) that is supported, retained, improved, and transmitted at least in part because we possess cognitive capacities to believe and morally commit to supernatural realities and purposes" (21). We are all part of interconnected and interpenetrating niche-systems: whether it is the economic, academic, religious, or political, individuals engage in systems which are (at least analytically) isolatable. Our shared representations and behaviors actually forge a context within which we navigate our social lives. Alcorta and Sosis (2005) argue that "religion may best be understood as an evolved complex of traits incorporating cognitive, affective, behavioral, and developmental elements selected to solve an adaptive problem" (325). These traits make the essential elements of religion possible. As Chomsky (1996) rightly notes, "Organs do not evolve independently, of course, and a viable organism has to hang together in complicated ways; breeders know how to breed bigger horses, but it won't help if size increases without highly intricate corresponding changes in the brain, the circulatory system, and much more" (16). Like horse breeding, religions can change through the deliberate efforts of religious leaders, but religious traditions also change outside of conscious decisions of individual agents in response to socioecological changes. Communities share religious concepts, and how this sharedness affects behavior is of utmost significance in understanding religion as a dynamic system.

Perceived sharedness in belief and/or behavior is arguably necessary to reap the benefits of the religious system. In order to be of any adaptive utility, one's worldview—religious and secular—must have an appropriate degree of compatibility with others' in contexts where a) such compatibility or lack thereof has fitness consequences, b) a demonstration of sharedness and commitment is expected, and c) such demonstrations have costs. As we cannot directly see peers' models and motivations, behaviors often need particular costs in order to demonstrate commitment to such models, regardless of belief. Rituals contain these qualities (Alcorta and Sosis 2005; Sosis 2003, 2006) and their performance can consequently produce adaptive outcomes. But we have little understanding of how shared perceptions are achieved. Nor do adaptive or by-product accounts of religion inform us why the religious system's constituent parts recurrently coalesce across cultures (Sosis 2009). As detailed above, virtually all religions consist of an essential supernatural agent-ritual coupling. Whether the agent is a god, ancestor spirit, totemic animal, demon, etc., one essential component of religion is commitment to a supernatural agent. Supernatural agent concepts are used in contexts where costly rituals need to be rationalized with appeals to unverifiable, highly ambiguous notions. Standard psychological methods employed by cognitively oriented researchers are ill-equipped to address these concerns, but even more dynamic systems approaches are likely to only get so far. There are undoubtedly complex principles at work which current approaches fail to address.

Commenting on standard modeling procedures, Miller and Page (2007) quip that "The ability to collect and pin to a board all of the insects that live in the garden does little to lend insight into the ecosystem contained therein" (10). Likewise, detailing the essential organs of the religious system will ultimately shed little light on the internal dynamics and co-dependencies of that system and how it interacts with external constraints and influences. Rather, emphasizing the *interactions* between the components of the religious system and the

individuals participating in them suggest that the whole is indeed greater than the sum of its parts. There may be emergent properties of these components that are wholly unrecognized by most current approaches to understanding religion (for further discussion see Holland 1995; Miller and Page 2007:44-53).

Relatively recent trends in computational modeling, typically employed in artificial intelligence and economics, focus on understanding the laws governing complex adaptive systems. Religion is a complex adaptive system *par excellence* as:

> (*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. An agent in such a system is *adaptive* if it satisfies an additional pair of criteria: the actions of the agent in its environment can be assigned a value (performance, payoff, fitness, or the like); and the agent behaves so as to increase this value over time. A complex adaptive system, then, is a complex system containing adaptive agents, networked so that the environment of each adaptive agent includes other agents in the system (Holland and Miller 1991:365).

Even outside of state societies' correlation with moralistic high gods, we find that the *content* of religion changes through time and space in similar and predictable ways in non-state traditions as well; religious traditions show striking similarities given the socioecological context in which they operate (e.g., Sierksma 1963; Snarey 1996; Wallace 1966). Moreover, there is significant evidence to suggest that specific religious traditions function to regulate resource use by virtue of emergent properties which are largely otherwise unknown to individual constituents (e. g., Atran et al. 2002; Lansing 2007; Lansing and Kramer 1993). In other words, properties which exist at the level of the population may indeed affect individuals' fitness. Native scholars have consistently emphasized the inextricable relationship between a people, their religious beliefs, and natural resources (Battiste and Henderson 2002:97-116; Deloria Jr. 2003). In fact, local indigenous populations have globally appealed to their respective religious traditions to resist ecological overexploitation and development (Klubniken et al. 2000; LaDuke 2005). How do these relationships develop?

Religious systems regularly converge around very practical concerns ranging from life history events (Reynolds and Tanner 1995) and the coordination of access to valuable resources (Atran et al. 2002; Lansing 2007; Lansing and Kremer 1993) to motivating people to organize against a colonial power (Carrol 1975; Wallace 1956) and fostering in-group cooperation (Sosis and Bressler 2003). Religion is—at least in traditional societies—inextricably linked to all social life and may become of heightened significance during time of organizational need (Finkel et al. 2010). Not only does the complex adaptive systems perspective reemphasize the importance of the "secular utility" of religion (Durkheim 2001[1915]; Wilson 2002), but it also hints at the possibility of a devoted study of the phylogeny of religion based on ecological context that is not reducible to sociological or non-religious categories alone. Through time, religious systems often acclimate in order to solve particular socioecological problems for their constituents. Individual actors in these systems are not necessarily conscious of these changes but may

nevertheless reap the benefits from participation. This also suggests that there are properties of religion that emerge beyond the awareness of individual constituents and exist only at the level of a collectivity. The coming challenges will be to systematically investigate if the specific content of the defining components of religion—commitment to supernatural agents and ritual behaviors—respond to socioecological changes in predictable ways.

4. Conclusion

As many have argued, the evolutionary emphasis on how ecological factors shape response patterns illustrates why the nature-nurture dichotomy is a false one; genotypes do not occur in a vacuum but rather are expressed as phenotypes through ontogenetic processes that are sensitive to environmental conditions (Barkow et al. 1992; Pinker 2003; Ridley 2004). While the search for a "religious gene" or "religion module" is likely futile, there is good reason to ask about the heritability of religious psychological propensities. It has been demonstrated in twin-studies, albeit consistently ignored in the social scientific literature, that religiosity (but not religious affiliation) is partly heritable (Bouchard 2004; Bouchard and McGue 2003). As with the significant heritability of political attitudes, the direct as well as indirect action of the genes in question likely give rise to *predispositions* for religious commitment which the environment mediates. However, these facts about religious commitment may be used in other contexts as well; by-product accounts may demand evidence that these genes are exclusively *for* religious commitment rather than ideological or political commitment generally (see Kirkpatrick 2003). As discussed above, adaptive accounts do not require such exclusivity. Again, while the quest for finding any essential mechanisms that specifically evolved for religion will likely fail, chalking religion up to an exclusively learned phenomenon misrepresents what we now know about human cognition.

The cognitive science of religion raises important new questions about the nature of religious concepts and processing, but its experimental work heavily relies on Western populations. This renders *a priori* generalizations from empirical work difficult (Henrich et al. 2010). The present work begins to map out the space of variation in the expression of religious systems, as this will provide clues about the interdependencies among its elements. This is where a dynamic systems approach will shed more light on all of the components of religion, but also how the content of these components will change in accordance with how people interact with their socioecological environments. Moreover, while there are notable exceptions in the theoretical literature (McCauley and Lawson 2002; Whitehouse 2004), the cognitive sciences of religion have focused primarily on how we represent and process religious concepts and propositions (see Barrett and Keil 1996; Boyer and Ramble 2001). While these approaches shed light on the nature of the religious mind, the conclusion that religion is a by-product does not follow from the idea that religion is possible by virtue of otherwise mundane cognitive mechanisms. Just the fact that religious concepts correlate with ritual and these rituals may have effects on individual fitness indicates that more is at work than by-product accounts suggest.

A dynamic systems approach to religion encompasses both religious mind and behavior and treats them as inextricably linked components of an ever-changing social system. The next step in our quest to understand the evolution of the religious system will be to further explore

not only how religious systems persist across ecological contexts, but also how they respond to environmental changes. Only by giving equal attention to the nature of the human mind, the natural and social environments, history, and all of the forces which exert influence upon them and their relationships will we be able to come to terms with explaining why humans do the things that they do. More specifically, we need to understand these dynamic relationships in order to understand why humans are religious. Even more specifically, these dynamics inform why *particular* traditions are the way they are, and the natural laws that have forged their paths.

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