Evolutionary Perspectives on Religion

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Abstract

Recent work in biology, cognitive psychology, and archaeology has renewed evolutionary perspectives on the role of natural selection in the emergence and recurrent forms of religious thought and behavior, i.e., mental representations of supernatural agents, as well as artifacts, ritual practices, moral systems, ethnic markers, and specific experiences associated with these representations. One perspective, inspired from behavioral ecology, attempts to measure the fitness effects of religious practices. Another set of models, representative of evolutionary psychology, explain religious thought and behavior as the output of cognitive systems (e.g., animacy detection, social cognition, precautionary reasoning) that are not exclusive to the religious domain. In both perspectives, the question remains open, whether religious thought and behavior constitute an adaptation or a by-product of adaptive cognitive function.

INTRODUCTION

Understanding religious thought and behavior as consequences of human nature is an old project, perhaps as old as the systematic, reflective examination of belief in gods and spirits. A notion of "natural religion" as the result of fundamental human propensities is familiar, for instance, in both Western and Muslim traditions (Pailin 1984, Reinhart 1986). Understanding religion as a result of evolution by natural selection is obviously a more recent research program, even though the first rudiments of such a project can be found in Darwin himself (Darwin 1871). In the past 20 years, a number of psychologists, anthropologists, religious scholars, and evolutionary biologists have put forward a new evolutionary perspective, understanding religion as one among the many domains of cultural activity that were shaped by human evolutionary history (Hinde 1999).

THE RELIGIOUS DOMAIN

What the term religion denotes is widely disputed in contemporary anthropology and religious studies (Saler 1993), so it may be of help to start with a rough demarcation of the field of inquiry. Evolutionary models are supposed to explain a whole collection of behaviors and mental representations that are found in many different human groups, including the following:

- mental representations of nonphysical agents, including ghosts, ancestors, spirits, gods, ghouls, witches, etc., and beliefs about the existence and features of these agents;
- artifacts associated with those mental representations, such as statues, amulets, or other visual representations or symbols;
- ritual practices associated with stipulated nonphysical agents;
- moral intuitions as well as explicit moral understandings that people in a particular group connect to nonphysical agency;
- specific forms of experience intended to either bring about some proximity to nonphysical agents or communicate with them;
- ethnic affiliation and coalitional processes linked to nonphysical agents; and
- evolutionary models, such as other explanatory models in anthropology, assume cross-cultural commonalities in each of these domains of thought and behavior.

Does this collection of features constitute a domain of "religion"? As we demonstrate below, the models described here do not assume that the features listed above are always found together. The only assumption is that evolution provides the context for understanding some or many of the phenomena listed. In this sense the term religion is to an evolutionary anthropologist what "tree" is to an evolutionary botanist, a common prescientific category that may need to be replaced with other, causally grounded, scientific categories.

Are religious phenomena sui generis? A related but distinct question is whether "religious" is a specific property of the phenomena listed above, such that they would all differ from their "nonreligious" counterparts. For instance, is a religious ritual different from a nonreligious one, and religious morality intrinsically different from the nonreligious kind? The models reviewed here make no strong assumption about that. Indeed, most of them lead to deflationary accounts of religion, in which the phenomena in question are explained in terms of processes that would operate in the same way in other contexts (Lawson & McCauley 1990). In this sense, what explains religious thought or behavior may also explain many other domains of cultural thought and behavior (Saler 1993). This pits evolutionary models, like most other anthropological accounts, against classical assumptions in the study of religion, following which there is a specific quality of religious phenomena (thought, experience, emotion, etc.) that requires explanation [see Eliade (1959), Otto (1959) and a discussion in Wiebe (1998)].

Are there religious universals? Some features of religion may well constitute substantive cultural universals (Brown 1991). This however

is not crucial to using evolutionary models, whose aim is to explain the variance observed in terms of some common factors. Thus explanations should be sought for all cultural phenomena whose recurrence is clearly above chance. In many domains, evolution resulted in dispositions that render humans sensitive to particular contextual input, but evolved human dispositions do not always result in uniform behaviors or cultural outputs.

Was religion present in ancestral times? If religion, or at least the phenomena described above, were influenced by natural selection, we should expect at least some of these behaviors to be ancient as well as widespread. In the archaeological record, we find evidence for a variety of nonpragmatic behaviors, such as elaborate burial procedures, from the earliest stages of the Paleolithic and perhaps also in Neanderthals (Trinkaus & Shipman 1993). Also, we find evidence for supernatural concepts, chimeras for instance, from early stages of modern human cultures (Mithen 1999). Did these behaviors and concepts already constitute "religion"? The question only makes sense if we assume that "religion" stands for a natural kind, an integrated package, which is probably not the case. More important, the archaeological evidence shows that many of the phenomena discussed here appear at the same point (about 50 kya) along with other phenomena typical of modern humans, such as regional "cultural" differences (Richerson & Boyd 2006), sophisticated tool-equipment (Mithen 1996), body ornamentation and make-up (Hovers et al. 2003), and probably the first musical instruments (Falk 2000).

What was early "religion" like? There is no straightforward way of connecting inferred past practices to their modern equivalents, especially to the beliefs and experiences associated with religious thoughts. Some of the evidence, such as rock art similar to the visual phenomena induced by trance and altered states of consciousness (Pearson 2001), would point to a Paleolithic form of shamanism (Hayden 2003) and ecstatic experience (Dornan 2004). This would be consistent with a traditional assumption made by religious scholars that shaman-

ism is the most archaic form of religious behavior (Eliade & Trask 1964, Shirokogoroff 1935). However, such inferences are fraught with problems, as we discuss below (see Experience and Commitment). Cues to special experience do not necessarily indicate that such experience was interpreted in terms of nonphysical agency or that religious specialists like modern shamans existed.

Most evolutionary approaches to religion actually eschew speculation on archaic forms of religious behavior and experience. Rather, a common strategy is to identify the capacities and behaviors universally involved in religious thought or behavior and to relate them to plausible selective pressure. In this sense, evolutionary anthropologists of religion adopt the same strategy as other evolutionary behavioral scientists do—that of measuring the contributions of various behaviors and behavioral strategies to fitness.

EVOLUTIONARY BACKGROUND

Genetic and Cultural Evolution

The theoretical background to models of religion is a specific approach to cultural phenomena and was developed in the past 20 years by evolutionarily inspired cultural anthropologists (Boyd & Richerson 1985, Durham 1991, Lumsden & Wilson 1981, Sperber 1985). A common assumption among these different, partly overlapping frameworks is that what we observe as cultural representations and practices are variants (of cultural traits), found in roughly similar forms in a particular place or group because they have resisted change and distortion through innumerable processes of acquisition, storage, inference, and communication.

In these models, the spread of specific variants of cultural representations (such as a particular religious belief or concept represented by a human mind) is seen as partly analogous to the spread of alleles in a gene pool. In particular, the tools of population genetics can be applied to the spread of cultural traits and allow

us to predict their spread, given such parameters as the initial prevalence of a trait, the likelihood of transmission, and various biases (Boyd & Richerson 1985). Such models allow scholars to describe formally the different possible connections between genetic evolution and cultural transmission (Durham 1991). Particularly relevant to modeling the cultural transmission of religion are specific cognitive and behavioral biases that result from evolution, such as for instance a frequency bias (a general trend toward cultural conformism) and a prestige bias (toward imitation of successful models) (Boyd & Richerson 1985, 1996).

Epidemiological models of cultural transmission (Sperber 1985, 1996) also aim to describe a number of evolved biases that constrain cultural transmission. They focus specifically on a cognitive description of the communicative processes involved in cultural learning, as well as the evidence for a host of specialized cognitive dispositions that canalize emergent representations and inferences. Human communication never consists in the downloading of information among brains or in straightforward imitation of others' behavior. Rather, it consists in complex processes whereby people build new mental representations as a result, among other causes, of information inferred from other people's behavior and speech (Sperber 1996, 2000). This process is highly entropic—communication creates many different representations in different minds—so that the existence of commonalities, of "cultural" information found in roughly similar versions in different minds, requires a special explanation (Sperber 1985). This is where cognitive dispositions are relevant. In many domains, people's representations are similar—despite exposure to nonidentical input—because their inferences are guided by tacit principles that happen to be identical in all normal minds (see Sperber & Hirschfeld 2004 for more detail, and see Cognitive Turn, below, for an application to religion).

In sum, genetic evolution produced a suite of psychological dispositions, typical of modern *sapiens*, that provides a vast amount of information (mostly from conspecifics), but also creates dispositions for acquiring certain kinds of information. Evolutionary models do not assume that acquiring more information from the environment implies less information specified in the genome. On the contrary, as comparison among species invariably confirm, acquiring more information from the environment requires richer cognitive dispositions to render such information sensible, and therefore requires more genetic specification.

How does this perspective relate to ethnographic evidence? In contrast with most mainstream cultural anthropology, but in parallel to linguistic anthropology or archaeology, evolutionary models of culture are crucially dependent on cross-cultural comparisons. A common strategy in the field consists in (*a*) identifying specific adaptive challenges encountered by *Homo* in its ancestral conditions of evolutionary adaptation; (*b*) specifying information-processing mechanisms that could meet these challenges and accrue fitness benefits—on the basis of what is independently established in experimental psychology, neuroscience, etc.; (*c*) designing new experimental protocols to establish or disconfirm the existence of these specific information-processing mechanisms; (*d*) specifying the kind of concepts and norms that would be widespread among humans, if these mechanisms operated as theoretically expected; and (*e*) testing the latter prediction against the ethnographic record from scientific publications or databases. Obviously, this is a normative ideal and the distinct steps are often shuffled out of order in actual scientific work. The main point, however, lies in the appeal to external, independently established models of mental functioning (step *b*, above). In this view, the concepts and norms specific to a given population of study are the outcome of the encounter between a unique history and the common dispositions of the species.

Two Reductive Strategies

All evolutionary models are reductive in the sense that they attempt to show that a number

of variables account for a significant part of the variance in the cultural phenomena at hand. It is important at the outset to be specific about this reductive enterprise. In the social sciences, the strategy of evolutionary modeling is often misconstrued as one of "just-so" storytelling, that is, observing a particular human behavior and then producing a posthoc evolutionary story whereby that particular behavior could have been adaptive (Kurzban 2001). True, this *ex post facto* approach was typical of early applications of Darwinism to social phenomena, including models of religious behavior (Wilson 1975). For instance, Reynolds and colleagues collected comparative data on potential fitness consequences of membership in different modern religious traditions (Reynolds & Tanner 1983). Given that most religious systems include moral prescriptions about sexuality, contraception, polygamy, and infanticide, one should expect some impact on reproductive potential. Despite this empirical grounding, such studies were ultimately unsatisfactory for several reasons. First, fitness differences between historically evolving, recent traditions occur on such a short timescale that genetic evolution is an unlikely factor in accounting for these differences. Second, these studies could not address the more general question of the evolutionary background of religion, beyond cultural differences.

The strategy of current evolutionary modeling is to analyze natural function in terms that lead to nontrivial predictions that can then be tested against the evidence (Ketelaar & Ellis 2000). Two main explanatory strategies have been developed in this direction. One considers cross-culturally recurrent features of religious behaviors and their potential or actually measured effects on fitness. The other focuses on the evolved psychology that led to religious thought and behavior. Although both types of models hinge on the notion of evolved adaptations, they differ in the emphasis placed on proximate causation (if any) that is involved in such adaptations and the empirical consequences (if any) that follow. The first strategy tries to proceed directly from religious behav-

ior to hypotheses about evolutionary processes that would have led to such phenomena. This is close to the general approach of early sociobiology (Wilson 1975) and behavioral ecology (Krebs & Davies 1984). Alternatively, religious behavior may be explained in terms of underlying capacities or dispositions, which themselves are seen as outcomes of evolution. This is closer to the general approach in recent nonhuman sociobiology (Kacelnik 2003) and in evolutionary psychology (Kirkpatrick 2006). Here, we discuss these two strategies.

COST AND COMMITMENT

Commitment and Signals

A striking characteristic of most religious thought and behavior is that it does not seem to confer any direct fitness advantage on the practitioners. So, from an evolutionary viewpoint, most religious phenomena might seem to be either maladaptive or adaptively neutral (Durham 1991). However, evolutionary biology also documents specific ways in which fitness costs can become adaptive. This is particularly so in the case of signaling, an area of intense work in recent evolutionary biology (Grafen 1990). Signaling requires the coevolution of sender and receiver capacities (Rowe 1999). A central problem is the evolution of honest signals, which reliably inform an organism about qualities of others. In recent years, biologists have focused especially on costly signals, which are reliable because they are difficult to fake and thereby provide direct indices of the fitness qualities they are supposed to advertise (Zahavi & Zahavi 1997). For example, gazelles advertise their strength and dexterity by stotting (high-jumping) in front of a predator. The direct fitness cost of this relative vulnerability is offset if the predator chooses to redirect its attention to less nimble prey. Under such specific conditions, costly signaling can become an evolutionarily stable strategy (Grafen 1990). Some human cultural behaviors may also be described in these terms, as costly signals that provide ultimate fitness advantages.

Signals are especially important in intensely social species like humans, who can be said to live in the "cognitive niche" (Tooby & DeVore 1987), that is, to survive on information extracted from the natural and social environment. Information about conspecifics is crucial to social exchange, especially information about their intentions and dispositions, because there are clear and immediate rewards for opportunistic defection, that is, for reaping the benefits of social exchange without paying its costs. So how could exchange and cooperation ever evolve? A number of capacities may be involved. Reciprocal altruism, for instance, simply requires one to recall which individuals cooperated and which defected, together with a disposition to return the favor (Trivers 1971). However, human cooperation goes much further than that, and people often display costly, nonopportunistic behaviors. Humans are more altruistic than expected utility would predict. This disposition to cooperate is manifest in economic games (Smith 2003) and everyday behaviors (Frank 1988). Why is that the case?

Cooperation often requires that people sacrifice an immediate benefit for a delayed reward, an arrangement that goes against the grain of evolved discounting strategies (Ainslie 2005, Rachlin 2006). A possible solution is to evolve a system of emotions that provide immediate negative rewards (e.g., guilt) for opportunistic behaviors and positive ones (e.g., pride) for cooperation. However, these dispositions are worthwhile only if they override rational self-interest and are honestly signaled. This may be why some emotions and moral feelings associated with cooperation are neither rational nor easy to conceal (Frank 1988). According to Frank, they constitute commitment devices whereby one ties one's own hands to signal a disposition to cooperate, thereby garnering the benefit of being seen as a reliable partner (Frank 1988).

Another possible factor is the evolution of "tribal instincts" (Richerson & Boyd 2001). Humans are notable for their demonstration of strong reciprocity, typically within small ethno-linguistic groups or within modern nations that mimic the language of tribal affiliation (common ancestry territory, mores, etc.) (Gintis 2000, 2003). The specific norms of the community become the object of great emotional commitment (Nichols 2002), and norm violations trigger punitive attitudes (Price et al. 2002). Modern humans may have evolved a propensity to cooperate within groups that share common norms, a propensity that may have spread by group selection at the cultural, not genetic, level (Boyd & Richerson 1990). This would provide the background against which sharing or other nonopportunistic dispositions naturally develop in human beings.

Religion as Signals

Is religion a form of costly signaling? As one author has noted, "most religions are expressed in elaborate rituals that are costly in time and sometimes in other ways" (Irons 2001). Initiation rites are generally painful, and many rites require expensive preparations. In a more general way, religious thought and behavior would seem to mobilize cognitive resources away from survival and reproduction, being focused on nonphysical imagined agency. Assuming that religious activity is costly, does it provide signals? To a large extent it does, given that most activity of this kind is both public and formalized, so that people's commitments to the local ritual system are observable by all (Sosis 2003). On the basis of a comparative study of small communities, Sosis showed that cost is indeed an important factor. Religious groups that require a greater investment in costly rituals tend to remain more cohesive (Sosis & Bressler 2003).

This framework requires a significant change of perspective in our understanding of religious activity. First, it describes religion mostly in terms of communication rather than internal beliefs. What matters here is what people demonstrate to others. Second, it suggests that internal states, beliefs, and emotions may be tools recruited in the development of such demonstrations, which is why this approach is

best seen as a complement to commitment and strong reciprocity models.

In its current formulation, the costly signal hypothesis suggests that religion is a straightforward adaptation. Dispositions to entertain religious thought and communicate them to others emerged because of their impact on fitness (Bulbulia 2004), distinct from the notion that religious solidarity provides benefit to the group (Wilson 2002). Obviously, such a strong claim requires equally strong empirical evidence, which in turn depends on more precise hypotheses. First, one must specify to what extent "religion" is actually costly and signaling, in the precise sense required by biological models (Cronk 2005). Second, the framework implies that costly behaviors are the original ones, and noncostly ones are a by-product. This way of thinking might imply psychological predictions, e.g., as to the relative impact of costly vs. noncostly practices on receiver psychology, on the mental states of potential believers. These models perhaps need to be supplemented with the psychological proximate causation that is currently missing.

EXPERIENCE AND BELIEF

What is the role of exceptional experience in the acquisition and transmission of religious concepts and behaviors? This is an old theme in the study of religion, which William James saw as foundational: people having such experiences becoming inspired leaders or prophets (James 1902). Experience might be a powerful factor in the diffusion of religious belief because it provides undeniable subjective grounding to concepts and norms acquired from other people. Diverse attempts have been made to relate evolutionary history and prehistory to a disposition for religious thought and behavior. However, one must first be specific about the range of "experience" considered relevant. Religious scholars sometimes extend the notion of "experience" to long-term processes of conversion (Edwards & Lowis 2001), whereas the anthropological or psychological understanding of the term is narrower, denoting such phenomena as trance, possession, and the feeling of a supernatural presence (Argyle 1990, Boyatzis 2001). Although such experiences are very diverse, potential similarities include a loss of control, positive valence, benevolence and compassion, a bird's eye perspective on one's surroundings, and an impression of personal, actual, though nonphysical presence of supportive agents (Moehle 1983).

The occurrence of such experiences is beyond doubt, but many anthropologists and religious scholars have debated their relevance to religion, asking first whether such experience is *sui generis*, and second whether it has anything to do with the persuasive power of religious cognition. On the first front, it is very difficult to argue that what is described as religious experience forms a natural kind, distinct from other kinds, of altered states of consciousness (e.g., those experienced by nonreligious individuals) (Pyysiäinen 2004, Ratcliffe 2006). Although a number of recent studies have documented the specific neural correlates of meditation and trance (Azari et al. 2001, Persinger 1999), these states do not require that individuals perceive any link to nonphysical agency. Indeed, disciplines of meditation and trance can support diametrical interpretations, either in terms of powerful agency (Sufism) or agency as an illusion (Lamaism).

Exceptional experience could be related to the evolution of religion if it had an impact on belief and commitment. Some archaeologists and anthropologists assume that experience-based commitment was a general feature of archaic religion (Dornan 2004, Winkelman 2000). This however remains hypothetical. Although altered states of consciousness were not absent among early modern humans (Hayden 2003), we do not know how widespread these practices were. In all modern groups, such states are exceptional in one's lifetime and are typically the preserve of specialists (James 1902) or particular subgroups (Bourguigon 1973). More important, most religious rituals in most places do not require exceptional experience. "Sensory pageantry" in religious ritual often includes aesthetic displays, music, euphoria, and fear or

torture, but little if any disruptions of consciousness (McCauley & Lawson 2002). So the persuasive power of extraordinary experience may constitute only one of the many factors in the general diffusion of religious concepts and norms.

One may also wonder about the possible evolutionary background to a general capacity for religious belief. This question is difficult for several reasons. First, most people (including anthropologists and religious scholars) think of belief in terms of conscious, deliberate, evidence-based decisions and thereby ignore a vast complexity of underlying cognitive processes (Stich 1983). Second, our best models of mental functioning are still altogether rudimentary, as far as belief fixation is concerned (Gazzaniga 1998, Stich 1990). It is tempting to assume that acceptance of one's local religion stems from a general tendency to accept all culturally transmitted material (Dawkins 1998), but this is probably not sufficient to explain the recurrent features of religious thought, or indeed of cultural transmission in general (Sperber 1996).

In religious scholarship, commitment to religious ideas is often construed in terms of the relative weighing of belief vs. unbelief, given a set of accessible arguments (Vergote 1985). However, this way of thinking about commitment may be a residue of defensive, post-Enlightenment religious institutions, in which "religion" is construed as an intellectual territory to be defended against other forms of knowledge more than a property of belief in general. Indeed, it would seem that for most people in most human groups, norms and concepts are made compelling by processes that largely escape conscious scrutiny, which may explain why the notion of "belief" is alien to most religious traditions (Needham 1972).

Cognitive scientists have emphasized two features of everyday beliefs that may be relevant here. First, to entertain a representation, e.g., of a particular situation, inferences are generated (possible causes, consequences, associations with similar situations) that would determine if the representation was true, even in cases where that representation is clearly perceived as false (Gilbert 1991). Second, most religious statements are represented not as simple propositions but as complex formulae of the form "Proposition p is x," in which the "x" may stand for "true," "guaranteed by the ancestors," "said by the prophets," etc. Such statements are meta-represented (Cosmides & Tooby 2000, Sperber 1997). They constitute "reflective beliefs," distinct from intuitive beliefs (e.g., that a table is a solid object) by the fact that reflective beliefs are explicitly represented along with comments on their validity (Sperber 1997).

This view would suggest that two processes are involved in generating commitment to religious statements. First, particular statements are meta-represented so that the propositional content is specifically linked to particular authorities, which may strengthen their plausibility even when the content is not entirely elucidated (Koenig et al. 2004). Second, people establish particular associations among these socially transmitted statements, particular events, and background cognitive principles (Boyer 1994)—a process we describe in the following section.

THE COGNITIVE TURN

Domain-Specific Dispositions

A proper understanding of cultural phenomena should start with an understanding of the cognitive processes whereby cultural representations are acquired, stored, and transmitted (Sperber 1996). In the past 15 years, this "cognitive turn" has resulted in what could be called a standard cognitive model of religious thought (Atran 2002; Barrett 2000, 2004; Boyer 1992, 2001; Lawson & McCauley 1990; Pyysiainen 2001). This is the consequence of remarkable progress in experimental psychology, developmental psychology, and cognitive neuroscience, which are converging toward a description of mental functioning as the operation of many different functional systems, each of which is geared to representing a particular domain of reality (Hirschfeld &

Gelman 1994). For instance, children develop from infancy an understanding of physical and mechanical processes (Baillargeon 2004) and number (Feigenson et al. 2004, Xu et al. 2005), as well as early understandings of biological animacy (Rochat et al. 1997) and the mental states of other agents (Song et al. 2005). All these processes are based on specific epigenetic principles that initialize domain-specific learning processes (Gelman 1994, Gelman & Brenneman 1994). Young humans are disposed to extract enormous amounts of information from their social and natural environment precisely because they are equipped with sophisticated prior principles that guide learning and development (Boyer & Barrett 2005). Despite important developmental changes in knowledge, these early principles also inform adult intuitive expectations about physical objects, intentional agents, and biological processes.

As a result of these largely tacit learning principles, some types of representations and associations are intrinsically easier to acquire, remember, and communicate than others. This would suggest a fractionated model of religion, in which different aspects of religious thought and behavior activate different mental capacities.

Religious Ontologies: Agents and Objects

The central feature of religious thought and behavior is a set of beliefs about nonphysical agents. In cognitive terms, such beliefs are a subset of a larger repertoire of supernatural concepts, found in religion but also in fantasy, dreams, superstitions, etc. Supernatural concepts are highly constrained by domain-specific assumptions about persons, solid objects, and biological beings. For instance, a spirit is a special kind of person, a magic wand a special kind of artifact, a talking tree a special kind of plant. Such notions are salient and inferentially productive because they combine specific features that violate some default expectations for the domain with nonviolated expectations held by default as true of the entire domain (Boyer

1994). These combinations of explicit violation and tacit inference are culturally widespread and constitute a memory optimum (Barrett & Nyhof 2001, Boyer & Ramble 2001). This may be because explicit violations of expectations are attention-grabbing, whereas preserved nonviolated expectations allow one to reason about the postulated agents or objects (Boyer 1994).

A notion of god or spirit combines salient, explicitly transmitted violations of expectations (a god can move through physical objects, be at several places at one, etc.) and tacit, standard expectations of intuitive psychology (a god perceives what happens, remembers what he perceived, believes what he remembers, acts to bring about desired states of affairs, etc.). The human imagination tends to project human-like and person-like features onto nonhuman or nonperson-like aspects of the environment; such representations are attention-grabbing or enjoyable; they are found in all religious traditions (Guthrie 1993). But anthropomorphism in religious concepts is also rather selective. That is, the domain of intuitions and inferences that is projected is intentional agency, more frequently and consistently projected than any other domain of human characteristics (Barrett & Keil 1996).

In this sense, concepts of religious agency can be described as derived from (and a possible by-product of) evolved dispositions to represent physical objects and intentional agents. But what is remarkable in religion is not just the production of supernatural concepts but also their social and emotional importance, which in a cognitive account also derives from evolved dispositions to morality and social interaction (Boyer 2000).

Morality and Religion

In many human groups, supernatural agency is associated with moral understandings. This may take the form of explicit moral codes supposedly laid down by gods or ancestors or stories of exemplary semimythical ethical paragons. More generally, people assume that supernatural agents keep a watch on them and

are concerned about moral behavior (Boyer 2001). A cognitive-evolutionary account may explain why this latter assumption is "natural" enough to be found in nonliterate groups but also in the spontaneous religious thinking of most religious believers.

Developmental evidence suggests that young children have an early understanding of moral imperatives. In particular, even preschoolers judge that moral norms, especially concerning justice or harm to others, are compelling whether or not they are expressed by an authority, apply to all places and contexts, and justify punishment when violated (Turiel 1983). These intuitions are remarkably stable across cultures (Song et al. 1987, Yau & Smetana 2003). Moral understandings, far from being dependent on socially transmitted (e.g., religious) conceptual frames, develop before such concepts are intelligible to children, and regardless of which religious concepts are entertained by adults around the child (indeed, regardless of whether there are any religious concepts in the child's cultural environment).

Interestingly, many early-developing and strongly emotional norms focus on social coordination (e.g., norms about sharing, cooperating, not harming others) and coalitional signals (e.g., norms about etiquette, disgust at strangers' typical behaviors) (Nichols 2002, Stich 2006). This is why it makes sense to describe the development of moral feelings and intuitions in the context of evolved dispositions for social interaction (Katz 2000, Krebs 1998). Moral understandings are an outcome of the commitment and solidarity mechanisms described above (see Costly Signals section). In this view, it is not surprising that moral intuitions exist prior to and outside of religious commitment, in much the same form across individuals, and with the same compelling force (Krebs & Van Hesteren 1994). Nor should it be surprising, then, that when people associate their moral understandings with nonphysical agency, the association tends to be a posthoc rationalization. Although religious believers generally hold that nonphysical agency is the origin of morality, a cognitive model would suggest

the reverse: that our moral feelings emerge independently but are consequently recruited to lend plausibility to the moral notions of religious agents.

Religious morality is special only in that it adds an imagined agent (a god or ancestor) as a morally competent witness of one's own actions. In a series of experiments with children and adults, Bering has demonstrated that subjects readily consider nonphysical or dead agents as participants in their current situation. Children and adults are prepared to entertain the notion that nonphysical agents are trying to communicate with them, and—importantly—these agents are generally (though implicitly) construed as having full access to morally relevant aspects of a situation, such as people's motivations and the moral value of their actions. Supernatural agents thereby come to be involved in representing how our actions would appear to others, particularly in terms of moral judgment (Bering 2002, 2006; Boyer 2001).

Ritualized Behavior

Central to our intuitive definition of religion is the performance of rituals, more or less directly connected to beliefs about nonphysical agents. The notion of "ritual" is notoriously ambiguous, a fact that some authors see as a manifestation of a highly flexible form of symbolism (Bell 1992). Others have argued that the vagueness lies in our categories and that all sorts of behaviors could be considered rituals by virtue of a very loose family resemblance so that the term is effectively useless (Lienard & Boyer 2006). By contrast, there are some precise empirical criteria for what could more selectively be called "ritualized behavior" (Rappaport 1979). We can detect that specific sequences of action, in a particular human group, are compelling (one must perform them, given particular circumstances), rigidly scripted (one must perform them in the precise manner described), divorced from goals (specific actions are performed without connection to usual empirical goals) and often internally redundant (the actions are reiterated, often a prescribed number

of times) (Rappaport 1979). Also, recurrent features of ritualized behavior include the use of special colors, a focus on numbers, the urge to delimit a specially protected space, an interest in cleansing and purity, and an insistence on order and symmetry (Dulaney & Fiske 1994, Fiske & Haslam 1997). These themes are found in socially acquired ceremonial behaviors, including religion, but also in obsessive-compulsive pathologies (Freud 1906[1948]) and in normal child development (Evans et al. 1997).

Classical anthropology and psychology of religion assumed that rituals made it possible to convey deep symbolic meanings (Bell 1992, Gluckman 1975, Turbott 1997). This view seems less than compelling to cognitive anthropologists, given that many rituals include vague, incoherent, paradoxical, or just plain meaningless elements (Humphrey & Laidlaw 1993, Staal 1990). Indeed, ritualization reduces rather than increases the amount of information potentially conveyed (Bloch 1974). So why should there be a disposition for such behaviors?

Several authors have proposed that ritualized behavior is, in fact, derivative. First, ritual scripts activate an intuitive understanding of action that is also present in the representation of ordinary, nonritual behavior (Lawson & McCauley 1990). Second, the particular themes of ritualized behavior may emerge from evolved cognitive and motivational systems geared to the representation of indirect threats to fitness (Lienard & Boyer 2006). Humans can detect indirect cues of unobservable danger, such as the potential presence of predators and enemies (Barrett 2005), the risk of contagion (Siegal 1988), and threats to status and coalitional protection (Harcourt & de Waal 1992). The ritualized behaviors of patients and young children seem to include many behavioral routines that are appropriate, species-specific preparations against such dangers. Culturally transmitted ritual sequences may be attention-grabbing and compelling to the extent that they implicitly trigger associations with these protective routines (Lienard & Boyer 2006).

This notion would explain the cultural spread of these ritualized sequences in epidemiological terms, as a consequence of their cognitive effects on evolved dispositions. In this view, there is no special urge or capacity to perform rituals, religious or not. Rather, human minds are such that any sequence of action that is thematically related to precautionary concerns and explicitly associated with invisible danger will appear attention-grabbing and potentially more compelling than action sequences that lack these characteristics (Lienard & Boyer 2006). Over long-term cultural transmission, this would result in apparently compelling, highly prescribed sequences of nonpragmatic actions that people can readily associate with their concepts of nonphysical agency.

Magic and Misfortune

The themes of magical routines and recipes very often overlap with the precaution themes listed above. Many forms of magic constitute precautionary behaviors against real but unobservable dangers (Sørensen 2002), yet a recurrent finding is that the actions prescribed seem to have little direct causal connection to the desired result; no intermediate mechanism is represented (Needham 1976). This may not be so surprising, given that magical prescriptions typically effect changes on invisible objects, such as sources of contamination or other people's mental states. Indeed, this may be a general feature of precautionary thinking. In the domains of contagion, predation, or social relations, people are prepared to accept as plausibly efficacious recipes whose causal mechanisms are opaque (Fiddick 2004).

Magical associations also frequently activate social cognitive capacities, particularly in the representation of misfortune. People assume that the ancestors or gods are involved in various occurrences (bad crops, illness, death, etc.) but generally do not bother to represent in what way they bring about those states of affairs. That is, people's reasoning, when thinking about such situations, is entirely centered on the reasons why an ancestor would want them to fall ill or have many children and not on the causal process by which they make it happen (Boyer 2000).

This is also true of the explanation for mishaps and disorders in terms of witchcraft. Witchcraft and evil eye notions may not really seem to belong in the domain of religion, but they show that there is a tendency to focus on the possible reasons for why some agents would cause misfortune, rather than the processes whereby they could do it. In a great majority of cases, the expression of these reasons is supported by our social exchange intuitions. People refused to follow God's orders, they polluted a house against the ancestors' prescriptions, they had more wealth or good fortune than their God-decreed fate allocated them, and so on (Boyer 2000). All this supports what anthropologists have been saying for a long time on the basis of evidence gathered in the most various cultural environments: Misfortune is generally interpreted in social terms. But by itself, this familiar conclusion conceals the deeper indications that the evolved cognitive resources people bring to their understanding of interaction are crucial to their construal of misfortune.

Social Cognition

The foregoing cognitive examples indicate that, in principle, people's concepts of gods or ancestors may recruit or exploit any of the diverse psychological systems that govern social relations, simply by virtue of the gods' representations as social agents. Various other programs of research have begun teasing out additional aspects of social cognition that appear to interact meaningfully with people's notions of supernatural agents.

For example, one line of inquiry has suggested that people can form "attachment relationships" with God or other noncorporeal agents (Granqvist 2006, Kirkpatrick 2005). These proposals draw from a rich literature on attachment dynamics in cognitive development and show that under some circumstances gods or spirits can simulate a real-world attachment figure: that is, offer a safe emotional haven in times of distress, enable a sense of security, and provide a secure base from which to explore life. Such a perspective illuminates certain aspects of religion that are not easily explained by the dynamics of coalition or social exchange. For example, the need for physical proximity to icons, churches, or written texts; the importance of prayer in moments of extreme psychological distress; the importance of spiritual relationships to those in a state of bereavement all receive some explanatory purchase from attachment dynamics.

Other aspects of religious cognition, such as teleological reasoning and afterlife beliefs, may also be rooted in basic operational characteristics of social cognition (Bering 2006, Kelemen et al. 2005). Consistent with an interpretation of misfortune in social terms, an overarching bias to perceive events generally as manifestations of intentionality may contribute to a chronic sense of supernatural presence and intentional activity—a bias demonstrated even by children, e.g., with regard to the origin of natural objects (a view dubbed "intuitive theism") (Kelemen et al. 2005). Taking intentionality and social considerations a step further, another proposal considers that afterlife beliefs may originate from the interplay of theory of mind capacities, overperception of intentionality, and prosocial concerns regarding "moral" behavior vs. opportunistic behaviors (Bering 2006).

Some of these new avenues of inquiry take the big religions as their empirical purview (e.g., Christianity), so it remains to be seen to what extent their explanatory reach will extend to other forms of religion.

RELIGIOUS INSTITUTIONS

Most of humankind now lives in large-scale societies where religion is widely institutionalized. People acquire their religious concepts and practices from large-scale institutions with specially trained, officially sanctioned religious officers, rather than from face-to-face interactions with personally known ritual specialists. Also, many religious concepts and norms are acquired through literacy and electronic media rather than via oral transmission. To what extent do these changes affect the relevance of evolutionary approaches?

Two Aspects of Religious Thought and Behavior

Anthropologists have long emphasized the contrast between doctrinal systems, such as those of the "world religions," which are supported by large scale institutions, and "traditional" systems, such as village or tribe-based ancestor cults (Weber 1922), a distinction sometimes expressed as "great" vs. "small traditions." These labels denote important differences in terms of types of institutions, kinds of practices, and the kinds of concepts and norms. First, the competence of tribal religious specialists is typically sanctioned by their audience or clients rather than by an impersonal institution. Second, the services that tribal specialists provide are highly variable and often attached to particular locations or groups. All this changes with the appearance of large-scale agrarian states, which produce religious institutions as we know them (Gellner 1989). These changes may seem beyond the scope of evolutionary approaches because they have occurred only in recent historical times. However, evolutionary considerations are still relevant for two reasons.

First, experimental studies show that institutional or organized religion has only a limited effect on people's religious cognitions, even in modern societies. Believers cultivate an explicit representation of their own beliefs that is largely in agreement with official doctrine, what Barrett has called "theological correctness" (Barrett & Keil 1996). But implicit tests show that their spontaneous, everyday judgments are based not on doctrine but on intuitive expectations similar to the various domain-specific principles described above (Barrett 2001, 2002), regardless of differences in religious traditions (Barrett 1998, Malley 2004, Slone 2004). Thus, religion as a cognitive phenomenon is generally much closer to the tribal version than to the official one. These findings are crucial for a cognitively valid anthropology of religion. They show that the raw material of much anthropological description, people's explicit statements about their own beliefs, is a fragmentary and highly misleading

source of information about people's religious thoughts.

Second, the way religious institutions are built, work, and perpetuate themselves illustrates particular cognitive adaptations that predate these historical developments. Institutions themselves are constrained by evolved cognitive capacities and therefore fall within the remit of an evolutionary perspective.

Priestly Guilds and Doctrines

Kingdoms and city-states gradually evolved out of the tribes and chiefdoms that were more typical of incipient agricultural societies (Maryanski & Turner 1992). They provided economic niches for individuals and groups specialized in the provision of specific services, such as lineages or castes of specialized craftsmen, servants, functionaries, and scribes. Groups of craftsmen or other specialists are generally organized in ways that optimize each member's potential share of a limited market. This is why we find that the development of large polities with tradesmen and craftsmen also heralds the development of guilds and other such professional groups (Greif 2006). Among these are groups of "priests" as distinct from local specialists. Priests are exclusive providers of particular religious services, whose competence is guaranteed by an impersonal institution.

Institutionalization has a deep influence on religious concepts and on the use of particular cognitive capacities. Reformulating Weber's contrast between traditional and routinized forms of religion (Weber 1922), Whitehouse points out that most organized religion is centered on "doctrinal religiosity," with frequently repeated rituals and explicit religious statements taught in the form of tightly argued propositional sermons (Whitehouse 2000). These rituals are usually not ethnically or locally based, they potentially recruit members far from their point of origin, they maintain a high degree of uniformity, and they generally involve specialized personnel with a centralized organization. They recruit semantic memory in the

construction of elaborate doctrines, as opposed to the unexplained, salient, "imagistic" episodes of many tribal rituals (Whitehouse 2004).

The differences in doctrine may be seen as a consequence of the specific markets and commodities involved. Religious specialists supply something (rituals, a guarantee that rituals are efficacious, a specific link to supernatural agents) that could be easily provided by competitors. Indeed, in most places with castes of religious priests, are other providers exist: local witch doctors, healers, shamans, holy men, and knowledgeable elders whose claims may be just as persuasive (Gellner 1994). An optimal path for priestly guilds is to gain political influence and use it against local, informal competition, a universal phenomenon in religious history. Also, most priestly groups try to turn their services into a brand, that is, a type of service that is (*a*) delivered by all providers from a same organization in the same form, (*b*) exclusive to that organization, and (*c*) recognized as such (Giannias & Giannias 2003). The effort toward greater coherence and stability in the religious concepts and practices, as well as the systematic use of literacy, which strengthens coherence and logical structure (Goody 1986), may be a response to this new market for religious services.

The special conditions of modern industrial societies reinforce the dynamics of competition and branding (Ekelund et al. 2006), as sociologists of religion have noted, mostly on the basis of modern U.S. religion (Greeley 1982). Such economic behavior is deeply influenced by evolved cognitive capacities, a point many economists have recently emphasized (McCabe & Smith 2001, Smith 2008).

EPILOGUE

Evolutionary accounts of religious concepts and behaviors stand in contrast to other traditions in the study of religion. First, the varieties of evolutionary-cognitive framework outlined here are clearly reductionistic. Their aim is not to describe what it feels like to entertain religious thoughts, or in what way these thoughts could make sense, but to explain their occurrence and their contents (Spilka et al. 1985). Second, this account suggests that religious processes are not *sui generis*. They do not require that we assume a specific religious organ or religious mode of function in the mind (Boyer 1992). Third, even though there is a strong social demand for explaining religion in terms of a unique "origin," evolutionary and cognitive models suggest that this project makes little sense. Religion denotes a variety of behaviors and cognitive processes likely with different evolutionary backgrounds.

Evolutionary considerations are relevant beyond early, archaic religion because they illuminate cognitive processes generally present in the transmission of culture, either in ancestral times or in modern societies. They may also help address some of the current issues that confront modern attitudes toward religion. The apparent resurgence of religious extremism and its tragic consequences has prompted a flurry of commentary on how religion leads to self-sacrifice and murder. Reflection on these issues may benefit from a better description of what is involved in religious affiliation and its fundamentalist varieties (Marty & Appleby 1991, 1994). Biologically inspired models of commitment and affiliation explain how people can be persuaded of the value of extremist action (Sageman 2004) and why the connection between religion and self-sacrifice is less direct than we generally presume (Pape 2005).

Is religion an adaptation? An evolutionary perspective implies that manifest behaviors are enabled and supported by functional systems, which are the outcome of natural selection. Some of these functional systems can be construed as adaptations, that is, reliably developing capacities or traits that provide evidence of complex functional design and confer potential reproductive advantages (or did so under ancestral conditions) (Symons 1992, Williams 1966). Also, the trait would have evolved gradually from previous versions; adaptive advantages would have been conferred by each incremental change because evolution does not look ahead. These stringent criteria indicate that few

of the features involved in serving some function can be described as evolutionary adaptations. Many features of organisms can be parsimoniously explained in terms of preadaptations and by-products of adaptations, as well as the outcome of genetic drift and other nonevolutionary processes (Buss et al. 1998). As far as religion is concerned, one can distinguish between models that tend to present religion (or some part thereof) as an adaptation (like the capacity to learn a natural language) (Irons 2001, Wilson 2002) and models couched in terms of by-products (like the capacity to read and write) (Barrett 2004; Boyer 1992, 2001). However, note that general statements about adaptations and by-products are conclusions, not starting points. Before we can say anything about the adaptive function of religious thoughts or behaviors, we must analyze what makes them possible, which is the substantial contribution of the models reviewed here.

So far, traditional cultural anthropology, contrary to archaeology and other subfields, has made little use of the tools and findings of evolutionary biology (Durham 1991). Indeed, the field has evinced a considerable hostility to the introduction of evolution and genetics in the study of culture (Brown 1991, Cronk 1999, Fox 1975, Tooby & Cosmides 1992). More generally, a widespread reluctance to entertain explanatory scientific reduction (D'Andrade 1995) has hindered an integration of cultural phenomena in the study of human nature (Wilson 1998). Resolution of such paradigmatic disputes lies less in philosophical debates than in comparing the relative explanatory power of different approaches. That is why proponents of an integrated, evolutionary-cognitive approach to cultural phenomena will need to provide more empirical evidence, particularly more cross-cultural studies, to overcome the discipline's preference for "segregation" models, which depict human cultures as lying outside the influence of evolution and genetics.

Religion may be a particularly apposite test case for the evolutionary cognitive approach. The domain is a priori unconstrained—people might let their imaginations run freely when it comes to representing nonphysical agency. But we do find an impressive set of recurrent features, for which classical anthropological theory has no coherent, predictive, independently based explanatory hypotheses. By contrast, the models reviewed above show that evolutionary perspectives can help us make sense of specifically human, and otherwise puzzling, cultural phenomena. Religion is only one among various domains in which very different socially transmitted input results in highly similar, recurrent cultural traits. Notions of nonphysical agency, their powers, and their connections to human beings are so widespread that explanations couched purely in terms of local knowledge are clearly missing the point. What is needed is a more detailed investigation into an evolved psychology shaped by natural selection.

DISCLOSURE STATEMENT

The authors are not aware of any biases that might be perceived as affecting the objectivity of this review.

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