

example, there are only limited references in the Hebrew Bible (Old Testament) to an afterlife. Many Jews believe that Judaism focuses more on the here and now, rather than on life after death (Klenow & Bolin 1989–1990; Zedek 1998) – despite the fact that certain Jewish authorities, such as Maimonides, considered belief in life after death to be a critical part of Jewish faith (Lamm 2000).

It is also possible that the practice of different religions involves different emotions. There are many other emotions that may be involved in religion, and that could provide fitness benefits. We will briefly discuss disgust as one possibility, and speculate about the evolutionary relevance of disgust in religion.

The substance of blood has special meaning in many religions. We note that purity concerns, some centered on blood, are common in many religions. For example, in Hinduism, Islam, and Judaism, menstruation imparts ritual impurity. Such taboos might reduce the spread of diseases that are blood-borne. Furthermore, from an evolutionary point of view, menstrual taboos might impact fertility (Gardin 1988). As Morris (1996; 1997) has pointed out, there are two types of religions. In religions of assent (Islam, Christianity, and Buddhism, among the major world religions), participation in a religion is accomplished by accepting a set of beliefs. In religions of descent (Hinduism and Judaism, among the major world religions), participation is accomplished by a blood tie to ancestral members of the religion. In religions of descent, purity and blood are major considerations, and the emotion of disgust plays a special role in guarding against material contamination and its moral consequences. Such moral disgust can be approached as a pre-adaptation in cultural evolution (Rozin et al. 1999).

General remarks. Religion is a human quasi-universal. Although there may be dimensions of religion that have explanatory value cross-culturally (e.g., Jensen 1998), religion takes vastly different forms. Consider the difficulty in generating a definition of religion that covers both Buddhism and Evangelical Christianity – let alone the religious practices of traditional societies. The field of psychology of religion has for most of its history tried to define religion in ways that would apply in all religions, but has recently come to appreciate that this might not be possible. Many theorists in psychology of religion have recently argued for a more contextually grounded, or particularistic, approach. Some have argued that religions can be compared to each other only in limited ways because of their fundamental differences (e.g., Hill & Pargament 2003; Moberg 2003; Shuman & Meador 2003). Similarly, we propose that the emotions involved in religion vary in important ways among religions.

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The embodied bases of supernatural concepts

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Abstract: According to embodied cognition theory, our physical embodiment influences how we conceptualize entities, whether natural or supernatural. In serving central explanatory roles, supernatural entities (e.g., God) are represented implicitly as having extraordinary properties that nevertheless do not violate our sensorimotor interactions with the physical world. We conjecture that other supernatural entities are similarly represented in explanatory contexts.

Atran & Norenzayan (A&N) assert that conceptual processes underlying knowledge and reasoning about the natural world also

support these functions when applied to the supernatural worlds central to religious beliefs (cf. Barrett & Nyhof 2001 and Boyer 2001). We endorse this claim, but from a theoretical perspective different from the one adopted by A&N. They describe conceptual processes as hardwired (i.e., shaped predominantly by phylogenetic factors) and modularized (i.e., divided into independent knowledge domains). In contrast, conceptual processes are highly dynamical and grounded in the principles of embodied cognition. By this view, perceptual simulations – partial reenactments of sensory and motor states derived fundamentally by our sensorimotor interactions with the physical world – underlie human conceptual knowledge and reasoning (Barsalou 1999). Two main corollaries follow from the embodiment view: (1) knowledge is highly constrained by the physical structure of the body and environment, and (2) object concepts remain linked to particular situations within which these objects have been perceived and acted upon, thus affording a rich array of contextual information that licenses situation-based inferences about the concept. The embodiment view has important implications for the cognitive science of religion.

Empirical evidence for embodied cognition is diverse and accumulating. Here we present representative findings (for reviews, see Barsalou 2003; Barsalou et al. 2003a; 2003b). Tucker and Ellis (1998) demonstrated that viewing an object automatically potentiates motor representations for actions that are functionally consistent with the object's physical affordances. Similarly, when conceptualizing nonpresent objects, subjects exhibit physical actions reflecting real-world interactions with the concepts' referents. For example, subjects tend to look up when generating properties of the concept BIRD and tend to look down when generating properties of the concept WORM (Barsalou et al., in preparation). A similar effect is reported by Bargh et al. (1996), who showed that subjects walk more slowly after being primed with words related to stereotypes of elderly adults than when these stereotypes are not primed. In short, embodied accounts of knowledge representation provide a unifying explanatory framework within which these findings can be biologically grounded.

Supernatural concepts also appear to be influenced by physical embodiment. Barrett and colleagues (Barrett 2000; Barrett & Keil 1996) present evidence that people do not adhere to a "theologically correct" conception of God (i.e., omnipresent, omnipotent) when reasoning about divine intervention. Instead, experimental subjects conceive of God much like a natural agent, describing His interventions in the world as being constrained both spatially (i.e., being in one place at a time) and temporally (i.e., helping individuals one at a time). The embodiment view offers an account of the cognitive mechanisms underlying Barrett and Keil's findings. The concepts of God that enter into these cognitive processes reflect the constraints of physical embodiment. Although God is represented implicitly as "able to hear things from long distances" and "able to move rapidly from one place to another," He is not represented as truly omniscient and omnipresent (Barrett & Keil 1996). Those properties that are represented implicitly are no doubt unordinary, but they do not fit A&N's definition of *counterintuitive*. It may be the case that in using a supernatural concept such as God for purposes of explanation and understanding, its counterintuitive aspects manifest themselves as bizarre, unordinary properties that nevertheless do not violate our embodied experiences. Thus, our physical embodiment constrains our conceptual abilities.

This analysis can be extended to other supernatural concepts. To illustrate, consider the concepts of GHOST and ZOMBIE, both of which are counterintuitive ideas that fit the putative recipe for mnemonic and cultural success (Atran 2002a; Boyer 2001). Both concepts activate the ontological category of PERSON. Whereas ghosts lack physical substance and therefore violate our intuitive physical knowledge of PERSON, zombies lack a mind and therefore violate our intuitive psychological knowledge of PERSON. It is not clear, however, that counterintuitive properties of these concepts are implicitly represented, just as counter-

intuitive properties of God (i.e., the “theologically correct” versions) are not implicitly represented in explanatory contexts. Moreover, under these explicit, “supernaturally correct” conceptualizations, it is difficult to explain how these concepts could become sufficiently salient to entrench themselves in a culture’s belief system. Lacking physical substance, ghosts should not be able to act on the physical world. Lacking minds, zombies should not perceive nor should they adapt their behavior in a goal-directed manner. But despite these defining properties, it appears that ghosts are commonly represented implicitly, for instance, as being supported by surfaces and making noises, implying physical substance. Similarly, zombies seem to be represented implicitly as “coming after us with murderous intentions,” implying goal-directed behavior. It is these properties of ghost and zombies that elicit emotions and capture attention. Therefore, as with God concepts (Barrett & Keil 1996), similar inconsistencies arise for other supernatural entities between their explicit, counterintuitive representations and those used implicitly for explanation (e.g., ominous sounds in the night caused by ghosts, mysterious murders committed by zombies). Importantly, the latter representations do appear to be shaped by constraints of our physical embodiment.

To conclude, we argue that supernatural concepts are governed by the same principles of physical embodiment as mundane concepts. We interpret Barrett’s findings as evidence for perceptual simulations of embodied states underlying implicit concepts of God in explanatory contexts. We hypothesize that implicit concepts of other supernatural entities (e.g., ghosts, zombies) should be consistent with and derive specifically from our sensorimotor interactions with the physical world. When evoked in explanatory contexts, supernatural agents and objects should be conceptualized in similar ways as natural agents and objects (see Ward 1994 for a similar conclusion regarding imaginary creatures). We predict that similar empirical tests with a broader array of supernatural concepts will provide additional support in related domains (e.g., representation of supernatural concepts in nonexplanatory contexts). In short, the embodiment principles that constrain how we perceive and act upon objects in our environment should determine the form supernatural concepts take when they serve cognitive and affective functions.

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Consciousness and emotions are minimized

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Abstract: In the case of religion, explanations based on emotion should be privileged over those based on “cold” cognition. The origins of religious beliefs are as critical to understanding religion as are the group phenomena which sustain them. In addition, religion’s relationship to the growth of knowledge is neglected by the target authors. The balance between the costs and benefits of religion will vary depending upon the phase of an individual society’s cultural evolution.

Atran & Norenzayan (A&N) present a strong case for interplay among evolution, psychology, and religion. They avoid promoting a single-factor theory (e.g., “pancultural foundations,” “building blocks,” and “stipulative working framework”). Yet, while they discredit the credibility of a variety of commitment, group selection, memetic, and traditional psychological and sociobiology theories, their formulation relies implicitly and explicitly on the constructs of these theories. It is thus unclear whether the differences they ascribe to their view and that of competitors is really substantive. While emotional factors (e.g., uncertainty, potential threats) are

discussed, A&N favor “automatic” cognitions related to a range of factors.

A&N’s principal focus is how religion is sustained as a group phenomenon (e.g., shared beliefs, costly commitments), but they do not make clear how such phenomena came about. Thus, they do not offer a full evolutionary account of religion. The origin of religious constructs and beliefs should be addressed in any comprehensive formulation. At various places A&N point to the question of origin of religion but do not explicitly consider how language, evolving culture, and especially self-awareness and self-consciousness (as per management of emotions) fit in. These factors, and not just mechanics of folk biology, need explicit attention if their view is to have validity.

The physical and psychological vulnerabilities inherent in Environment of Evolutionary Adaptiveness (EEA) (e.g., threats to safety of individual and group in ancestral environments) were instrumental in evolution of self-awareness or identity, culture, cognition, language, and religion. Cultural knowledge and social practices involving religion and sickness/healing evolved in association with understanding of self in harsh worlds, the significance of which was coming to be understood (Fabrega 1997; 2002; 2004). In the target article, cognition (agency detection, truth, validation, and the like) is given more emphasis than emotional and self-regulatory factors (but see below).

The ease of learning religious beliefs during childhood is important in any evolutionary account. However, the role of the psychology and biology of enculturation, attachment, and mother/infant socialization in conditioning how religious constructs and other aspects of culture are learned are given insufficient emphasis in the target article. The satisfaction of basic needs, including emotional comfort and regulation, as well as protection from psychological traumas, seem more important than purely cognitive matters. The way religious ideas are spread and maintained through group activities is described well, but solitary pursuits, the personal, private, subjective dimension of religious experience, which often involves counteracting negative emotions, are omitted. The possibility of deception, desertion, social breakdown are cited as important factors generating and maintaining indirect reciprocity and religion, but are these best explained as resting on purely cognitive factors? Addressing the neurological connections between strictly cognitive, category construction, meta-representation compared to brain centers relating to fear, anxiety, and satisfaction would help restore balance.

The logical precision of A&N’s arguments is not tight enough. In some places “religion” is handled as an object that has motivating power but later, the authors treat religion as derivative. Early in the target article they suggest that supernatural concepts or agents trigger assignment of supernatural agents, whereas it would appear that the former are attributions resulting from workings of the latter. That, in humans, the concept of agency is innate and hard wired (i.e., hair triggered) to respond to environmental uncertainty and threats (among other objects, situations), does imply that emotional factors are crucial to origins of religion; however, A&N appear to give pure cognitive considerations greater importance. “Meta-representation” plays a far more important role in their argument than cognitive modules and intuitive ontology, although modules are foundational and of longer ancestry. The connection between modules and meta-representation is not articulated clearly, particularly in relation to emotional factors. The implications of meta-representation are mentioned later: that it represents a basic feature of human cognition and is necessary for the generation of symbolic and technological culture. This concept of meta-representation has so many ramifications, it seems equivalent to human cognition itself.

When A&N do address the nature of mindfulness and self-awareness they seem to privilege individualistic minds, envisioning a self calculating about supernatural agents, elaborating and calibrating “minimally” counterintuitive worlds, supernatural agents, and guarding against deception. The notion of a social mind, with motivation and self-awareness connected to family and