

Exploring the natural foundations of religion

Justin L. Barrett

A new cognitive approach to religion is bringing fresh insights to our understanding of how religious concepts are maintained, acquired and used to motivate and direct actions. This approach suggests that seemingly extraordinary thoughts and behaviours can be supported by quite ordinary cognition and may thus be termed 'natural'. Simultaneously, this research is expanding the domain of concepts and causal reasoning in general. This review examines recent research into religious rituals, communication and transmission of religious knowledge, the development of god-concepts in children, and the origins and character of religious concepts in adults. Together, these studies consistently emphasize and support the notion that the cultural phenomena typically labeled as 'religion' may be understood as the product of aggregated ordinary cognition. The new cognitive science of religion should eventually provide a fuller account of the distinctive and apparently extraordinary properties of religion.

Are god-concepts much different from gorilla-concepts? Is performing a religious ritual a profoundly different action from sending a greeting card to a friend? Perhaps not. When considering the kind of cognitive resources required for representing and acquiring these concepts and actions, the sacred and the profane may be less discriminable than is commonly assumed.

The scientific study of religion has historically focused on what might distinguish religion from ordinary life: special ecstatic experiences, peculiar brain states, uncommon emotional commitments, and beliefs in supernatural agents. What has been largely ignored until recently are the natural foundations of religion. Regardless of metaphysical claims, what we observe as religion is still a constellation of human phenomena communicated and regulated by natural human perception and cognition.

The new cognitive science of religion was motivated by a dissatisfaction with the vagueness of previous theories of religion, and thus their inability to be empirically tested, as well as by a desire to extend the psychological scholarship concerning concepts and causation. It differs from previous approaches to the study of religion by insisting that much of what is typically called 'religion' may be understood as the natural product of aggregated *ordinary* cognitive processes. This perspective may be called the 'naturalness-of-religion thesis'. Much as language is naturally acquired as a result of cognitive preparedness plus exposure to a typical socio-linguistic environment, ordinary cognition plus exposure to an ordinary environment goes a long way towards explaining religion. Of course, this observation does not imply that any particular religion is independent of cultural considerations any more than particular languages are independent of culturally variable inputs.

Anticipated by Sperber¹, this subfield is only about ten years old and still consists of a small number of religionists, an-

thropologists, philosophers and psychologists. Neuroscientists, linguists and computer scientists are yet to contribute to the discussion.

In this review, the emerging story about the natural origins of religion is summarized, and theoretical and empirical gaps that exist in this young enterprise are noted. The naturalness-of-religion thesis is currently focused on three main issues: (1) how people represent concepts of supernatural agents; (2) how people acquire these concepts; and (3) how they respond to these concepts through religious action such as ritual. The review concludes by suggesting areas that might be fruitful for future research. For the purpose of discussion here, 'religion' designates a shared system of beliefs and actions concerning superhuman agency.

This review does not concern the more sensational faces of religion, such as bizarre experiences, visions, or altered states of consciousness. Consequently, neurological studies that address religious topics such as possible connections between epilepsy and mystical experiences², and the suggestion that religious visions reflect the activity of temporal lobe structures³, are not discussed. The study of religion from the perspective of personality and social psychology is also outside the scope of the present review.

Representing supernatural concepts

Religious concepts may be more 'natural' than they seem. Though theories around the world include enormously complex concepts, these are not the concepts that typically occupy the working minds of religious people. Much as folk science differs from true science, religious concepts often differ from theological ones in their relative conceptual simplicity^{4,5}. For example, even in a theological system that posits a non-temporal god, believers will represent the god as experiencing time much like any human does, when they are

J.L. Barrett is at the Department of Psychology, Calvin College, Grand Rapids, MI 49546, USA.

tel: +1 616 957 6745
fax: +1 616 957 8551
e-mail: jbarrett@calvin.edu

engaging in real-time problem solving or casual reasoning⁴. This tendency to entertain religious concepts that are simpler than their theological counterparts is not merely an issue of expertise. The complexity of the concept used appears to vary based largely on the cognitive demands of the context in which it is used⁴. For example, theologians might fully appreciate that the god Shiva knows their every thought before conceived, but will still intuitively feel it necessary to make Shiva aware of their thoughts through prayer. The simplification of concepts from the theological to the religious level appears to consist of a systematic distortion of features such that they more closely resemble intuitive ontological assumptions, and is not simply a matter of shedding superfluous features.

Over the past 20 years, researchers in the area of concepts, categorization, and cognitive development have amassed considerable evidence supporting the idea that people have a large number of often tacit, intuitive assumptions about the sorts of properties different things possess, based on ontological category membership⁶. For example, when encountering a completely novel animal, even six-year-old children make a host of assumptions about unobserved characteristics; for example, because it is a bounded physical object, it cannot pass directly through other solid objects and cannot occupy more than one location at a time. By virtue of being a living thing, it is automatically assumed to have nutritional needs and is composed of natural materials with parts designed for particular functions. As an animal it can move itself in purposeful ways to satisfy its desires⁷. These intuitive assumptions appear to be largely invariant across cultures, and allow rapid categorization of novel things, as well as generation of predictions and explanations^{8–11}.

If this characterization of conceptual structures is accurate, much as they constrain creativity^{12,13}, these categorical intuitions also limit the sorts of religious concepts that may be successfully used to generate inferences during on-line processing. As an illustration of this constraint, Barrett and Keil found that when adults in India and the United States reflected on their theological ideas about supreme beings, they generated abstract, theologically correct, descriptions of gods that have no physical or spatial properties, are able to know and attend to everything at once, and have no need to rely on sensory inputs to acquire information. However, when comprehending narratives about the same deities, the same adults mistakenly remembered the god of the narratives as having a single location in space, as being unable to attend to multiple events at once, and as needing to see and hear in order to complete otherwise fallible knowledge. In other words, the gods of theological reflection contained many violations of intuitive assumptions for intentional agents, but the god-concepts used in the narrative comprehension task appeared to be very similar to an ordinary intentional agent – a person^{14–16}. Tacit assumptions about the ontological category of intentional agents constrained the way gods were represented in both cultural groups tested.

One consequence of this cognitive constraint is that people might only represent religious concepts that have a limited number of features that violate intuitive assumptions. That is, despite sophisticated theology, religious concepts might only be minimally counterintuitive^{17–19}.

Acquiring supernatural concepts

The idea that religious concepts are minimally counterintuitive in the sense of violating few intuitive assumptions for their ontological categories, underlies a second sense in which religion might be deemed natural. People seem to be naturally receptive to religious concepts, and concepts for which people are more receptive are more likely to become widespread and part of shared cultural concepts⁹. Thus, as Boyer argues, the finding that people are receptive to religious concepts can help to explain why these concepts are so prevalent^{20–22}. The following sections explore the evidence for the contention that people are naturally receptive to religious concepts.

Religious concepts in childhood

Researchers in child development frequently note that children easily adopt ideas about gods, ghosts, Santa Claus and other agents possessing supernatural properties, and use ordinary conceptual resources for reasoning with these concepts²³. Furthermore, many of the properties that set religious entities apart from natural agents might actually be easily accommodated by children's less developed conceptual systems. Recent developmental work using false-belief and perspective-taking tasks suggests that four- and five-year-olds can understand that, unlike people, God does not have false beliefs²⁴. Regarding God's creative power, preschoolers appear to be capable of understanding that God creates natural things but not artifacts, whereas humans create artifacts but not natural things²⁵. Although available data is still limited, it appears that many concepts central to major religious traditions are not as opaque to young children as often thought.

Memorability and transmission of cultural concepts

Natural receptivity to religious concepts is not limited to children. Adults appear to find minimally counterintuitive concepts, of which religious concepts are a subset, both easily represented (as discussed above) and highly memorable.

Adults from various cultures have been tested for the recall of concepts, and the sorts of concepts that are more likely to be remembered and transmitted successfully to others have been noted²⁶. The results showed that concepts that violate one of a number of category-level assumptions (e.g. a dog that passes through solid objects) are better remembered and transmitted than concepts that either satisfy assumptions (e.g. a brown dog) or that violate basic-level assumptions (e.g. a dog weighing five tons). That is, concepts with a counterintuitive feature are more memorable than either mundane or bizarre concepts that do not challenge categorical assumptions. Together with the finding that concepts that have too many counterintuitive features will be reduced to more intuitive forms in on-line processing^{14,15}, it appears that minimally counterintuitive concepts have a transmission advantage. Minimally counterintuitive concepts attain a 'conceptual optimum' such that they are understood and represented without allocating too many cognitive resources, but are also challenging enough to require extra attention to assimilate into conceptual schemes²⁷. As a class of minimally counterintuitive concepts, religious concepts are likely to enjoy this advantage as well^{21,22}.

However, counterintuitive concepts such as invisible sofas rarely occupy important (if any) roles in religious systems.

Box 1. Boyer’s conceptual catalog of the supernatural

In the face of apparent enormous diversity in religious concepts, Boyer (Ref. a) has argued that supernatural concepts typically share five representational similarities:

- [1] A lexical label.
- [2] Implicit classification in an intuitive ontological category.
- [3] Explicit representation of a violation of intuitive expectations for that category, either: (3a) a breach of relevant expectations for the category, or (3b) a transfer of expectations associated with another category.
- [4] Implicit default expectations for the category.
- [5] Additional encyclopedic information.

For example, a ‘ghost’ [1] is categorized [2] as a Person, that can violate [3] intuitive physics for solid objects by passing through walls, but meets intuitive psychological assumptions for persons [4], and might be understood as likely to return to where it once lived [5]. What separates supernatural concepts from natural concepts is a violation of intuitive expectations for a given ontological category [3]. Supernatural concepts, therefore, are not wholly novel or determined by cultural instruction but exist as minor aberrations of natural concepts.

These violations of expectations may be in one of three intuitive knowledge domains: intuitive psychology, intuitive biology, or intuitive physics. For categories that assume a domain (e.g. ‘Plant’ assumes intuitive biology and intuitive physics), violations will consist of breaches of expectations for the domain (as in an invisible fern, a breach of intuitive physics for a Plant). However, for categories that do not assume a domain (e.g. Plant does not assume intuitive psychology), violations may consist of transfers of expectations from another domain (as in a pensive shrub, a Plant having intuitive psychological properties).

Given three domains of knowledge and five primary ontological categories from which supernatural concepts are drawn, the vast majority of supernatural concepts that become part of cultural knowledge can be categorized in a 3×5 matrix. Table I gives examples of each of the 15 possible types of supernatural concepts

Reference

a Boyer, P. Evolution of a modern mind and the origins of culture: religious concepts as a limiting case. In *Evolution and the Human Mind: Modularity, Language and Meta-Cognition* (Carruthers, P. and Chamberlain, A., eds), Cambridge University Press (in press)

Table I. Categories of supernatural concepts

Ontological categories	Intuitive-knowledge-domain violations		
	Psychology	Biology	Physics
Person	A person who knows everything	A person requiring no food to live	A person who is invisible
Animal	A snail that uses language	A dog that is immortal	A bear that can be in two places at once
Plant	A flower that listens to people’s requests	A shrub composed of metal	A tree that is weightless
Artifact	A hammer that feels neglected	A shoe that sprouts roots	A car that can drip through a sieve
Natural, non-living	An icicle that enjoys music	A diamond that was born	A rock that passes through solid objects

Adapted from Ref. a.

Counterintuitive beings or objects of commitment in religious belief systems are most often intentional agents. They may be people with unusual physical or biological properties (such as an invisible person), or non-humans with human-like abilities (such as a statue that can listen)²⁶ (see Box 1). Perhaps counterintuitive *agent* concepts are more common because they enjoy additional selective advantages by being remembered and transmitted. But why might agent concepts have such advantages?

Hyperactive agent-detection device (HADD)

On the basis of ethnographic data and psychological research, Guthrie argues that people have a bias towards detecting human-like agency in their environment that might not

actually exist^{28–30}. Thus, people are particularly sensitive to the presence of intentional agency and seem biased to over-attribute intentional action as the cause of a given state of affairs when data is ambiguous or sketchy^{31,32}. These observations suggest that whatever cognitive mechanism people have for detecting agency might be extremely sensitive; in other words, people can be said to possess hyperactive agent-detection devices (HADD). According to Guthrie, such a biased perceptual device would have been quite adaptive in our evolutionary past, for the consequences of failing to detect an agent are potentially much graver than mistakenly detecting an agent that is not there.

The implication for religion is that the HADD might lead people to posit agents, perhaps of a counterintuitive sort,

that are then well-transmitted because of their easy fit within intuitive conceptual systems. Similarly, counterintuitive-agent concepts would be more likely to receive attention and be transmitted than non-agent concepts, because agent concepts are more likely to resonate with agents posited by the HADD. For example, someone might be told that an invisible person lives in the forest and trips intruders. This story could become salient because it reminds the person of having tripped in the forest and wondering, 'Who did that?' (because of the HADD). Alternatively, a story about an invisible rock is less likely to be spread because the hypothesis, 'Did I trip over an invisible rock?' is unlikely to be expressed, albeit a more testable hypothesis. Because of the human tendency to seek intentional explanations for a given state of affairs, counterintuitive agents provide ready explanations in ways that non-agents do not. In this way, selective pressure of the HADD might contribute to the prevalence of religious-agent concepts over other counterintuitive concepts. Furthermore, when individuals talk about these agents they may cite empirical evidence consistent with the agents' existence.

Acting on supernatural concepts

Religions are not merely collections of shared concepts, but also include action in response to those concepts. Indeed, religious practice often more than religious belief strikes outside observers as peculiar and in need of explanation. Furthermore, people spread religious concepts in the context of shared religious actions. Religious actions such as rituals seem quite unnatural in many respects. Nevertheless, cognitive scientists of religion argue that, here too, ordinary cognition both structures religious practices and underlies the representation (and thus the execution) of religious actions in participants' and observers' minds.

Cognitive contributions to religious events

Whitehouse has argued that many aspects of a given religious event might be, in part, a consequence of mnemonic and other cognitive dynamics^{33–36}. These include the frequency of performance, the degree of sensory and emotional intensity (or 'sensory pageantry' hereafter), the potential for producing group solidarity, the potential for encouraging spontaneous exegetical reflection, and the potential for transmitting theology. For an event to become part of a religious system, its procedures must be repeatedly performed in such a way that various instances are identifiable as the same event. Procedures without mnemonic aids that are infrequently performed are unlikely to be remembered. In oral traditions, a primary mnemonic aid is sensory pageantry. Use of elaborate sights, sounds, smells, tastes and feelings set an event apart from mundane life as something special and worthy of memory resources. Additionally, intensely arousing events, such as initiation rites that serve to 'terrorize' initiates through physical and emotional torment, may elicit 'flashbulb' memories for the participants³⁷. Such dramatic and traumatic events are unlikely to be easily forgotten³⁸. However, as flashbulb memory research has indicated, only certain components of such an event are likely to be remembered well³⁷. Participants in highly dramatic events tend to form strong imagistic and episodic memories regarding the sequence of events (thus enabling repeat performances after long delays), who was a co-participant

(increasing likelihood of group cohesion), and salient visual features of the event (providing symbolic materials for later reflection)³⁹. However, long theological (i.e. conceptually complex) treatises are unlikely to be remembered accurately. Consequently, events with a high degree of sensory pageantry typically include little sophisticated theological communication to justify or explain the event, and so participants are left to speculate why the event, in all its drama, was performed. In contrast, frequently repeated events need not require such resource-intensive, high sensory pageantry, and may include more complicated theological communication including an explicit rationale for the event.

The case of religious rituals

In contrast to Whitehouse's analysis, which applies to religious events generally, the most developed cognitive theory of religious rituals in particular is that put forward by Lawson and McCauley^{30,40}. Rituals may be regarded as a subclass within religious events, and are distinguished by being represented as an agent acting upon someone or something (a 'patient') to bring about some state of affairs, by virtue of invoking supernatural causation. For example, for most Catholics, baptism is a religious ritual because an agent (the priest) acts (sprinkles water) upon a patient (an infant) for God to accept the child as part of the Church. In contrast, while possibly including rituals, Protestant worship services are religious events but not rituals.

Rather than cultural inputs wholly determining knowledge about rituals, their structures, and their potential effectiveness, Lawson and McCauley observe that the representation of religious ritual actions depends upon cognitive mechanisms for the representation of actions generally. In their view, religious rituals are distinguished from ordinary actions by the presence of supernatural agency represented in the action structure. A baptism is only a man wetting an infant except that the man is understood to be acting in the place of a superhuman agent. Because ordinary cognitive resources are drawn upon to make sense of religious rituals, little cultural knowledge is necessary for groups of people to have converging ideas about what are the important features of a ritual structure, or what makes a ritual 'well-formed' and likely to be successful.

Indeed, as predicted by this account, Barrett and Lawson demonstrated that ritually naive adults have converging intuitions that the most important components for a religious ritual to be successful in bringing about the intended consequences are, first, that superhuman agency is represented in the action structure; and second, that an appropriate agent, capable of the right intentions, initiates the action⁴¹. Unlike popular conceptions of magic, having the right agent is more important than performing precisely the correct action. Note that the priority of agent over action is not characteristic of natural mechanistic causation (e.g. it does not matter who strikes a window with a hammer, the action will have the same result). It is, however, characteristic of social causation: being the right person with the right intentions might make more difference in the consequence of an action than the particular action. For example, a woman who receives flowers to which she is allergic is likely to respond very differently if they were sent by a bitter ex-lover who

Box 2. Lawson and McCauley's theory of ritual competence

Lawson and McCauley's theory of religious ritual (Ref. a) begins by observing that on one level of representation, rituals are merely actions of the form: An agent acts upon a patient by means of an instrument to produce a consequence. This basic action may be represented as shown in Fig. 1a.

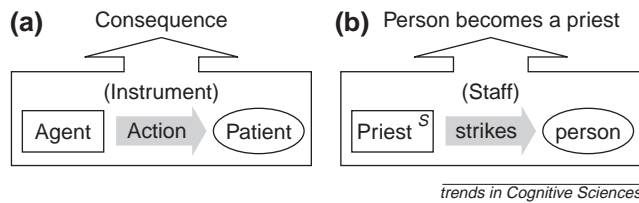


Fig. 1. Lawson and McCauley's theory of religious ritual. (a) Representation of the basic action. **(b)** The surface representation of the ritual.

What distinguishes religious rituals from ordinary actions, and is essential for a well-formed ritual, is superhuman agency being represented somewhere in the action structure. Either the agent, instrument, or patient must have special properties by virtue of a represented relationship with a deity. For example, typically a priest is a special agent by virtue of having been given special power or authority by a god. This specialness may be designated by an S-marker in the action structure.

Thus, the surface representation of the ritual, 'A priest strikes a person with a staff and the person becomes a priest,' may be illustrated as shown in Fig. 1b.

This surface representation is likely to presume the effectiveness of previous rituals, most notably the ritual that resulted in the officiating priest becoming a priest. Commonly, S-markers are endowed on the basis of previous rituals. For example, a complete representation of the ritual above might be that in Fig. 2.

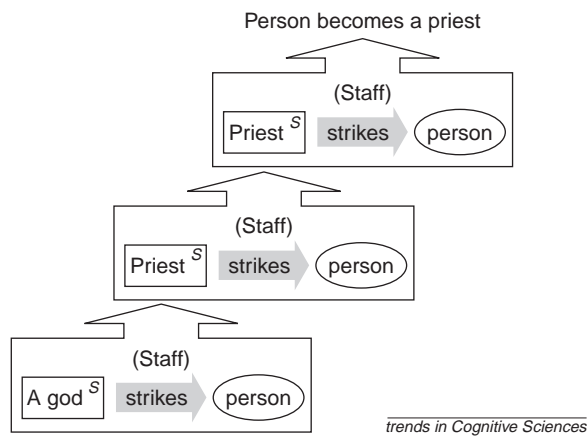


Fig. 2. A complete implicit representation of the same ritual, with the addition of S-markers (see text for explanation).

The succession of embedded rituals in this example ends with the third action because it is represented as having been performed by a divine being who has an S-marker by virtue of ontological essence and not previous action. Similar series of previous rituals may be represented as having precipitated the use of a sacred object as an instrument or patient of a ritual, all ending with a god acting.

Lawson and McCauley argue that these structural considerations are sufficient for religious ritual observers or participants to generate at least four specific predictions about particular rituals. Deliberate enculturation is not needed. The first prediction depends upon number of embedded rituals implicitly represented. Religious rituals vary in their degree of centrality or importance for a particular tradition (e.g. the Lord's Supper is generally considered more central than the marriage ritual). Lawson and McCauley argue that judgments of relative centrality are directly related to the number of embedded predecessor rituals. The longer the chain of assumed rituals, the less central a ritual will be to a tradition. Put another way, rituals that have more direct connections to a god will be more central.

The remaining three predictions are tied to location of S-markers in the immediate, surface representation, whether an S-marker occurs in the agent position or not, and are depicted in Table 1. These predictions are based not on enculturation but on considerations of ritual form.

Reference

a Lawson, E T. and McCauley, R.N. (1990) *Rethinking Religion: Connecting Cognition and Culture*, Cambridge University Press

Table 1. Characteristics of rituals in relation to S-marker position

	S-marker in agent position	S-marker not in agent position
Repeatability		
Can the ritual be performed for a given participant more than once?	No	Yes
Reversibility		
Can the consequence of the ritual be ritually undone or reversed?	Yes	No
Sensory pageantry		
What relative degree of motion-evoking spectacle and adornment is there likely to be in performing the ritual?	High	Low

knows of her allergies than by an innocent and adoring new suitor. What these findings suggest is that the ordinary cognitive structures that religious rituals draw upon may be those of social causal cognition. (For further discussion, see Box 2.)

Future directions

Cognitive scientists of religion are making large strides in demonstrating that much of religious cognition, including the representation of god-concepts, successful transmission of religious concepts, and the development of practices based on religious concepts, is largely reliant on ordinary cognition. No special domain for religious thought need be postulated.

Religion is, in some ways, quite natural. However, the current story is not complete in either its coverage of issues or in its empirical support.

Cross-cultural investigations of many of the claims discussed above are still needed. For example, while it is plausible, the claim that people sometimes spontaneously account for events by reference to unseen agents needs systematic examination, as do many of the claims regarding ritual intuitions made by Lawson and McCauley. While receiving some ethnographic support, Whitehouse's claims about how sensory pageantry and memory dynamics interact to produce different sorts of religious events have not been examined in a controlled fashion.

Outstanding questions

- How do truth-claims interact with the representation and transmission of religious concepts and practices? Are minimally counterintuitive concepts easier or harder to believe than other concepts? How is the success of rituals evaluated and how does this evaluation feed into whether or not the ritual is repeated?
- If religious concepts are so naturally accommodated by cognitive structures, why do they sometimes seem difficult to entertain? (For some preliminary thoughts on this issue, see Ref. 5.)
- How does cognition constrain and inform other classes of religious phenomena, such as petitionary prayer, worship and conversion?
- If children easily represent properties of superhuman agents, why do adults seem to have great difficulty in many contexts?
- From a cognitive perspective, does religious ritual differ (cognitively) from superstitious observances or from magic?
- Could recent advances in understanding social kinds bear upon how religious roles and special religious people such as priests, prophets and shamans are represented?

Conclusion

The new cognitive approach to religion has begun to demonstrate that religion is not a wholly different, intractable domain of human experience but one that may be productively explored using the tools of the cognitive sciences. Rather than being seen as extraordinary, the area of religious phenomena may be seen as grounded in quite ordinary forms of cognition. Although the youth of this field of research precludes a full account at present of the cognitive processes underlying religious belief, it is hoped that further experimental and ethnographic work will provide rigorous empirical data to support the claims of this new science of religion. Research in this area is also extending what is known about conceptual systems in general to include non-natural concepts and intentional explanations of natural events.

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