Belief, Ritual, and the Evolution of Religion

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Abstract and Keywords

This chapter outlines an evolutionary scenario for the emergence of religion. From cognitive science, four mental prerequisites of religious cognition are discussed: (1) hyperactive agency detection, (2) theory of mind, (3) imagination, and (4) altered states of consciousness. Evidence for these prerequisites in nonhuman primates suggests their presence in our early hominin ancestors. From comparative psychology, evidence of ritual behavior in nonhuman primates and other species is reviewed. Archeological evidence of ritual behavior is also discussed. Collectively, these data indicate that the first step toward religion was an elaboration of primate social rituals to include group synchronized activities such as dancing, chanting, and singing. Control of fire, pigment use, and increasing brain size would have intensified group synchronized rituals over time, which, in the context of increased intergroup interactions, eventually led to the first evidence of supernatural ritual at about 70,000 years before present.

Keywords: agency detection, burial, cave art, costly signals, evolution, religion, ritual, synchronized movement, theory of mind

Anyone interested in probing the evolutionary origins of religion faces a formidable challenge: Belief is central to religion, and belief does not fossilize in the archeological record. Looking at a half-million-year-old Acheulean hand axe may tell us something about the maker’s technical skills, diet, hunting practices, and lifestyle, but very little about his or her beliefs—let alone the supernatural beliefs inherent to most religions. But there are guiding parameters that the investigator can use to make reasonable inferences about when, where, and why religious beliefs likely arose during hominin evolutionary history. First, the very fact that religion is rooted in supernatural belief means that certain requisite mental abilities must be present for one to even entertain such beliefs. You cannot believe that which you cannot think. Dogs do not sweat over differential equations or theodicy because they literally cannot conceive of either. Second, religion does not just involve belief, it also involves behavior—specifically ritual behavior—and ritual can leave archeological traces. It is along these theoretical lines that a tentative, and hopefully testable, evolutionary history of religion can be written.

As far as we can tell, no other animal on earth has religion. Thus mentally, religion's beginnings reside somewhere along the 7-million-year journey from the mind of the common ancestor to that of modern humans—with the chimpanzee mind serving as the common ancestor's best proxy. Behaviorally, religion resides somewhere between the vast repertoire of nonhuman primate social rituals and human religious rituals, with the rituals of traditional societies serving as our hominin ancestors' best proxy.

The Religious Mind

Religious cognition appears to be built on at least four mental attributes: (1) a hyperactive agency detection device, or HAAD; (2) theory of mind, or TOM; (3) altered or ecstatic states of consciousness; and (4) general imaginative ability (imagination). All four of these attributes are present to some degree in our primate relatives, suggesting that their elaboration into forms capable of supporting full-blown religious cognition was not necessarily improbable or extra-ordinary.

Hyperactive Agency Detection Device

First among the mental building blocks of religion is something called HAAD: the hyperactive agency detection device (Barrett, 2011; S. Guthrie, 1993). Agency detection is (as the name implies) the ability to recognize or infer the presence of an agent, that is, another goal-directed organism. For social species especially, agents are highly fitness relevant as protectors (e.g., parents, other group members), prey, or predators. It is unsurprising, then, that many species have highly sensitive agency-detection mechanisms, including humans. We are quick to attribute the slightest creak of a floorboard or crunch of a leaf to the approach of a malevolent stranger. Seeing faces in the clouds and silhouettes in the shadows, and hearing voices in the wind are, to one degree or another, manifestations of HAAD. While HAAD may make us more vigilant and paranoid than necessary, it is probably better to be safe than sorry given that just one failure to detect a truly dangerous agent could be fatal.

It has been argued that our religious tendencies stem in part from HAAD (Barrett, 2011; S. Guthrie, 1993; Tremlin, 2006, pp. 75–80). Our natural tendency to overextend HAAD could easily have led our ancestors to attribute seemingly mysterious natural events (storms, illness, droughts, rainbows, etc.) to the actions of superagents. Obviously, there is much about religion that HAAD leaves unexplained; but it does provide a conceptual building block—a potentially necessary but insufficient precondition for religious cognition.

The HAAD does not appear to be unique to humans. An analogous form of HAAD seems widespread in the animal kingdom. Cats interpret nearly any moving object (smaller than themselves) as prey. Rhesus monkeys will form strong emotional bonds with cloth-covered, but quite inanimate, “mother” monkeys; and male chimpanzees produce dominance displays to roaring waterfalls, thunderclaps, or loud motor cars (Whiten et al., 2001). In each case, the animal appears to be doing something quite similar to humans—that is, responding as if they are in the presence of another agent (prey, protector, or rival) on the basis of minimal cues. This suggests that HAAD is a relatively simple cognitive mechanism, and possessing a HAAD capable of supporting religious cognition probably arose fairly early in hominin evolution.

Theory of Mind

One reason why HAAD alone is incapable of explaining religious cognition is that humans do far more than merely assume that a natural event is agent-caused. We further assume that the agent behind the event had knowledge, emotions, and goals motivating its action. The ancestors are not just responsible for the drought; they are angry that taboos have been violated and require certain rituals and sacrifices be performed as restitution. Moving from agency attribution to agent motivation requires a second, related mental ability: theory of mind (TOM). Theory of mind refers to the ability to infer mental states in others and to assign them as causal, motivational forces driving action.

Theory of mind does not appear in human children until about 3 or 4 years of age (Wimmer & Perner, 1983). The extent to which it is present in our closest primate relatives has been a source of debate. Some studies indicate that chimpanzees do not understand what others may or may not know (Povinelli & Eddy, 1996). Other studies using more naturalistic testing procedures, however, suggest otherwise (Hare, Call, Agnetta, & Tomasello, 2000). In their review, Tomasello, Call, and Hare (2003) conclude that chimpanzees understand some mental states, such as goals and desires, but not more sophisticated ones such as beliefs and inferences. The important point—one which echoes that found earlier with the HAAD—is that TOM’s presence (albeit in limited form) in our primate relatives suggests that it was also present in early hominins as well.

Altered or Ecstatic States of Consciousness

William James (1961/1902) argued that the mystical experience was foundational to religion. Indeed, nearly all religious traditions cultivate forms of contemplative or meditative practices in order to better relate to the supernatural. Moreover, ritually induced trance is central to shamanism, thought by many to be humanity's oldest form of religious practice (Lewis-Williams, 2002; Rossano, 2007; Whitley, 2006). The altered state of consciousness associated with shamanism may also have contributed important fitness-enhancing health and healing effects, providing a selective advantage to those hominins with a greater capacity for altered states (McClenon, 2002). However, as with HAAD and TOM, altered states are not absent from our primate relatives.

For example, a relaxed, pacific mental state conducive to social bonding accompanies grooming in nonhuman primates, resulting from the release of endogenous opiates (Keverne, Martinez, & Tuite, 1989). Altered states have also been associated with social conflict. Jane Goodall described how a young male chimpanzee, challenging for ascendancy in the social hierarchy, ritualistically "rocked" himself into an agitated state (the human equivalent of a pregame "psych-up") prior to a raucous aggressive display (Goodall, 1971, pp. 112–114). Similarly, male mandrills will sometimes consume the iboga root, which appears to have a powerful excitatory effect on them, in preparation for conflicts with other males (Samorini, 2002, p. 58). Evidence of altered states of consciousness has also been found in nonprimate species such as rats and rabbits (see Rossano, 2010, p. 136). It is therefore likely that early hominins also had some capacity for altered states.

Imagination

That imagination is central to religion seems indisputable. Gods, spirits, souls, heaven, hell, and the myriad other supernatural concepts integral to religious belief are not things that (most) people directly encounter. Instead, we envision them. But what exactly is imagination? In this context, imagination is defined as the ability to create situational models unconstrained by the realities of the immediate present (Harris, 2000, p. 192; Hauser, 2006, p. 203). A situational model is a mental representation of how an object or system operates, or how an event is organized. If this model is unconstrained by the immediate present, then it is free to vary beyond the limits of concrete reality. For example, consider what goes on in the mind of someone reading a story. The immediate reality of reading is momentarily set aside as the person envisions the story's events based on the author's description (e.g., "it was a dark and stormy night"). Having developed this capacity, humans are able to mentally represent not just immediate sensory inputs (what *is* happening), but *models* based on interpretations of those inputs (what *could have* happened, or what *might* happen in the future).

Imaginative capacity emerges early in human development. By age 2 or 3, most children are able to engage in pretend play, where they understand how objects are redefined to fit with imagined events and scenarios (Harris, 2000, pp. 11–13). By age 3 or 4, most children can engage in counterfactual thinking (Harris, German, & Mills, 1996). There is only scant evidence that nonhuman primates might have a similar, but more limited, capacity.

Two studies have shown that great apes will select tools in anticipation of using them hours later in order to obtain food, suggesting that they can plan for (and possibly envision) the future (Mulcahy & Call, 2006; Osvath & Osvath, 2008, but see also Osvath & Persson, 2013). Primatologists Dorothy Cheney and Robert Seyfarth propose that because chimpanzees and bonobos live in fission-fusion communities, where group members are often separated from each other for hours or days, they may have evolved a (limited) capacity to envision future encounters with other group members (Cheney & Seyfarth, 2007, p. 279). Since most other primates, including nearly all monkeys, live in more static communities, it is not surprising that evidence of future-planning in them is largely lacking. All of this suggests that our early hominin ancestors very likely possessed a primitive imaginative capacity. However, it seems that this capacity was well short of religious imagination. It was probably not until the ecological stresses of the late Pleistocene that this primitive imaginative capacity flowered into something more akin to religious imagination.

Evolving the Religious Mind

Many important mental building blocks for religious cognition were likely present at the outset of hominin evolution. An important question is why these building blocks eventually coalesced into full-blown religion in our ancestors and not in other primates. Undoubtedly, brain size played some role.

Hominin brain evolution is punctuated by two periods of particularly large gains in size: one at around 2.5 million years before present (mybp) with the emergence of the genus *Homo*, and a second at around .5 mybp with the emergence of *Homo heidelbergensis* (McHenry, 1994; Ruff, Trinkhaus, & Holliday, 1997). A combination of climatic, ecological, and social factors conspired in creating the conditions for these size increases (see Geary, 2005, pp. 54–61, for discussion). A bigger brain could support more sophisticated cognition, including (potentially) religious cognition. However, as is discussed shortly, there is no convincing evidence of supernatural belief until around 70,000 ybp, and this was probably catalyzed primarily by social factors.

Ritual and Emergence of Religious Cognition

Having a brain capable of religious cognition does not necessarily ensure the emergence of religion. To actualize this potential might require certain social conditions: specifically, a threshold level of social complexity. Essential to achieving the requisite level of social complexity is ritual. Ritualized behaviors have deep evolutionary roots as a means of regulating social life. Throughout the animal kingdom, ritualized acts are used for sending clear, unambiguous social signals when cautious, precise communication is required.

For example, among elk and other large ungulates, females generally avoid mature males. For mating purposes, however, males must (obviously) find a way to get in close proximity to a female without frightening her. This is accomplished using the “low stretch ritual,” which serves to signal nonaggressive intentions (R. Guthrie, 2005, p. 68). The stretch position emulates that of a calf wanting to nurse and puts the female at ease while allowing the male to better detect estrus odors. Similarly, among many waterfowl, ritualized mating dances are used both for selecting mates and building social bonds between them (Kraaijeveld & Mulder, 2002). Finally, many dog owners are familiar with the “play bow ritual” often seen at the opening of a roughhouse play session. The dog lowers its head to the ground between its front paws with its hind end raised and tail wagging. The bow conveys the important message that seemingly aggressive acts (growling, chasing, biting, etc.) are not to be misconstrued as real aggression—they are for play.

As highly social creatures, our primate cousins have an array of ritualized behaviors for regulating their social lives. For example, when chimpanzee, bonobo, and spider monkey foraging parties reunite, they engage in ritualized acts of welcoming and social reaffirmation including mutual embracing, kissing, group pant-hooting, and grooming (Goodall, 1986). Gelada baboons use rhythmic back-and-forth approach vocalizations to signal benign intent during close-quarter feeding sessions. These vocalizations allow two baboons to peacefully feed near one another without threat (Richman, 1987). Finally among chimpanzees, reconciliation between combatants is signaled by submissive bows, plaintiff vocalizations, and the hand-out begging gesture (on the part of the loser) followed by embraces and kisses (from the winner; de Waal, 1990).

These examples highlight the important features that characterize ritualized behaviors. They are typically repetitious, exaggerated, attention-getting gestures designed to send important social signals (for more in-depth discussion, see Rossano, 2012). Ritualized behaviors are not the same as rituals. In rituals, ritualized behaviors are embedded within symbolic, ceremonial, and traditional cultural elements in order to heighten their emotional impact and memorability. Whereas many species have ritualized behaviors, only humans have true rituals.

Given their primate heritage, our ancestors were preadapted with a rich repertoire of ritualized behaviors for regulating social life. However, when we compare human ritualized behaviors with those of other primates, an important religiously relevant difference stands out: Humans are able to move together as a group in coordinated and synchronized ways. Put more simply, humans dance, sway, march, and chant together; other primates do not. This ability to synchronize on a groupwide scale may have been the first step toward creating the social context from which religion could arise.

Learning to Move Together

Religious rituals frequently involve group synchronized actions. In mosque worship, people bow, kneel, and fall prostrate together. In churches across the globe, people sing hymns, kneel, and pray in unison. Indeed, there are reasons to suspect that humanity's earliest religious rituals involved energetic group singing, dancing, and chanting around roaring fires. Genetic analyses indicate that three traditional societies—the !Kung San of Southern Africa, the Andaman Islanders of Southeast Asia, and the Australian Aborigines —very likely represent humanity's most ancient populations, with the latter two possibly tracing back to the earliest "out of Africa" migration of *Homo sapiens* (Endicott et al., 2003; Hudjashov et al., 2007; Kumarasamy et al., 2003; Wade, 2009, pp. 99–102). Common to all three are religious rituals involving highly emotive night-long sessions of vigorous singing and dancing (Wade, 2009, p. 118). This may be significant in that it suggests that our ancestors' earliest religious rituals may have been similar.

Moving in synchrony has powerful social/emotional effects on participants. A number of studies have shown that people who move together emotionally bond together. For example, Wiltermuth and Heath (2009) had subjects engage in either synchronized motor movements (walking in step, singing in synchrony, singing and moving in synchrony), nonsynchronized movements (walking at individual paces, singing and moving individually), or no movements at all. Later, all subjects played an economic game where they could extend varying levels of trust and cooperation to other players. Subjects who engaged in synchronized movements were found to be more trusting and cooperative compared with others. Later studies have found that moving together enhances perceived similarity, likability, and the sharing of sacred values, all of which can motivate within-group altruism (Fischer, Callander, Reddish, & Bulbulia, 2013; Valdesolo & DeSteno, 2011). Finally, synchronized movement has been found to increase pain tolerance, potentially allowing group members to achieve difficult, collective goals (Cohen, Ejsmond-Frey, Knight, & Dunbar, 2010).

Moving in synchrony is not uncommon across the animal world. Fiddler crabs, frogs, fireflies, and dolphins all appear capable of synchronous movement (see Rossano, 2013, pp. 116–119 for discussion). Among our primate relatives, however, collective synchrony is almost never observed in the wild. More controlled settings, however, reveal some capacity for synchrony. Japanese macaques trained individually on a button-pressing task, spontaneously synchronized their button-pressing when paired later with another (Nagasaka, Chao, Hasegawa, Notoya, & Fujii, 2013). Furthermore, Hattori, Tomonaga, and Matsuzawa (2013) found that one of three chimpanzees was able to synchronize her motor movements to an external beat, although somewhat less flexibly than humans.

These findings are consistent with the observation of Wolfgang Kohler (1927, pp. 314–316), who reported that while playing, a group of chimpanzees began to "march in an orderly fashion in a single file around and around the post … a rough approximate rhythm develop[ed] and they tend[ed] to keep time with one another." Kohler remarked that nothing he had seen before from the chimps so strongly reminded him of the dancing of some primitive tribes. However, Kohler also noted how he usually needed to supply the rhythmic driver for the chimpanzee movement by stamping his foot. When he ceased, the chimps usually halted their dance (with great disappointment).

The nonhuman primate brain may place some limits on their ability to synchronize with one another. An imaging study found evidence that rhesus macaques are sensitive to surface-level rhythmic grouping, but (unlike humans) are not responsive to induced beat, thus limiting their ability to coordinate to a common external rhythm (Honing, Merchant, Haden, Prado, & Bartolo, 2012). Larsson (2012, 2014) has provided theoretical arguments for the facilitative effect of committed bipedalism on the evolution of synchronous movement.

Thus, rhythmically coordinating group-level movements appears to be something just beyond the ability of our closest primate relatives. Given that chimpanzees can almost move in synchrony, and given how easily synchrony appears to arise in nature, it seems that moving together in dance and song was probably not terribly difficult for our hominin ancestors to achieve. However, identifying when our ancestors began to sing and dance together is problematic given these behaviors do not fossilize. What *does* fossilize is the potential venue for such activities: the campfire.

Controlling Fire

The communal religious rituals of traditional societies frequently occur around fires. Thus, where we see evidence of the controlled use of fire—especially what appear to be large, communal fires—we have the possibility of religious ritual similar to those found today among traditional people.

The first possible evidence of the use of fire is dated to around 1.2 mybp from Swartkrans Cave in South Africa (Brain & Sillent, 1988). Evidence of fire dating between 1 and 0.8 mybp has also been reported at Wonderwerk Cave in Southern Africa (Berna et al., 2012) and Gesher Benot Ya'aqov Cave in Israel (Alperson-Afil, Richter, & Goren-Inbar, 2007). However, even if these very early instances of fire use are genuine, they are sporadic. Habitual fire use would be necessary if it were to have important, lasting effects on human evolution.

Both a review of the European record and a recent longitudinal analysis of Tabun Cave in Israel have found evidence for habitual fire use beginning sometime between 300,000 and 400,000 ybp (Roebroeks & Villa, 2011; Shimelmitz, et al., 2014). Moreover, the occurrence of stone-lined hearths is not widespread until about 250,000 ybp, where they are found in both Africa and Eurasia (Klein & Edgar, 2002, pp. 156–157). Clearly then, by the time of *Homo sapiens* and Neanderthals (roughly 200,000 ybp), fire was not only under control but also available as a venue for regular collective ritual activity. Despite this, there is evidence that *Homo sapiens* and Neanderthals did not always use fire similarly.

For example, a comparison of the Mousterian (Neanderthal) and Aurignacian (*Homo sapiens*) layers at Klisoura Cave in Southern Greece (Karkanas et al., 2004) found that Mousterian hearths were relatively unstructured and composed of discrete fire episodes. By contrast, the Aurignacian hearths were composed of much thicker ash accumulations, indicative of more intense occupation and continuous fire use.

Additionally, Sandgathe et al. (2011) have argued that the intermittent lack of evidence of fire at the Mousterian sites of Pech de l'Aze' IV and Roc de Marsal in southwestern France is hard to attribute to natural processes, changes in site use, or overlooked evidence. Instead, they contend it is more likely due to the local Neanderthals' reliance on naturally occurring combustive events, rather than their own fire-creation. This would explain why evidence for fire is not present during the coldest periods, when conditions for naturally occurring fires would have been poor. Similar evidence has been documented at other Neanderthal sites such as Combe-Capelle Bas and possibly Jonzac and La Quina. These data stand in contrast to evidence from later *Homo sapiens* sites where fire use intensified during harsher conditions (Thery-Parisot, 2002).

Along with more consistent fire use, there is also evidence that *Homo sapiens* occasionally built larger fires than Neanderthals. Some of the best-studied Neanderthal hearths are located at Abric Romani, a rock shelter near Barcelona, Spain, dated to between 70,000 and 40,000 ybp (Vallverdu, et al., 2010). Here, numerous hearths were discovered, all of which were small (less than 0.3 meters) and shallow, indicating the presence of short-duration, low-temperature fires. Most are associated with domestic activity such as knapping, butchering, or sleeping. The largest Neanderthal fires, measuring about 1 meter in diameter, have been found at Kebara Cave (dated to 60,000–44,000 ybp) in modern-day Israel (Meignen, Goldberg, & Bar-Yosef, 2007). The Kebara hearths are about half the size of those attributed to *Homo sapiens* at Sibudu Cave (65,000–58,000 ybp) in South Africa (Wadley, 2012). Here, a number of hearths measuring over 2 meters in diameter have been found.

Large, presumably communal fires, similar to those of Sibudu, have been found at other *Homo sapiens* sites. For example, at the Abri Pataud rock shelter site in southwestern France (about 23,000 ybp), Cro-Magnons built large hearths over a meter in diameter and lined them with cobbles gathered from a nearby river. Hearths of nearly 2 meters in diameter have also been reported from Chauvet Cave, presumed to be around 30,000 years old (Whitley, 2006, p. 66). Even more impressive are the hearths found at the Dolni Vestonice (23,000 ybp) site in the Czech Republic (Vandiver, Soffer, Klima, & Svoboda, 1989). Hearths over 2 meters in size with deposits over 40 cm thick have been found there. Furthermore, some of the hearths are associated with the shattered remains of carved clay figurines and pellets, apparently made to explode when heated. Two stone-age “kilns”—clay structures used for firing clay—have also been found capable of generating very hot fires.

It is clear from Dolni Vestonice that fire had taken on more than just practical significance for the *Homo sapiens* living there. The clay pellets and shattered figurines were likely used in some ceremony involving fire; possibly—as archeologist Bryan Hayden contends—in religious rituals invoking animal spirits (Hayden, 2003, pp. 134–135). Thus, Dolni Vestonice provides us with some of the earliest compelling evidence for the social use of fire: as a venue for communal rituals.

It is certainly possible that hominins were dancing around fires prior to Dolni Vestonice. However, based on hearth presence and size, the strongest cases for communal ritual activity prior to Dolni Vestonice are restricted to particular *Homo sapiens* sites beginning about 65 thousand years ago (kya).

Religious Ritual as Costly Behavior

A feature of religious ritual that often distinguishes it from non-religious ritual and can leave archeological traces is cost (Sosis, 2004). Religious ritual is often costly, requiring considerable time, energy, risk, or resources for little—if any—utilitarian payback. This costliness, however, serves an important community- and trust-building function (Xygalatas, Mitkidis, Fischer, Reddish, Skewes, Geertz, Roepstorff, & Bulbulia,2013). Using costly ritualized acts for social bonding purposes has deep evolutionary roots. For example, male baboons use a “scrotum-grasp ritual” as a means of cementing friendships. It is effective for this purpose precisely because it entails an obvious cost—participants literally place their reproductive success in another’s hands (Whitham & Maestripieri, 2003).

Costly ritualized displays are present among a wide range of species. Examples include peacock’s tails, frog’s croaks, and the energetic stotting of Thompson’s gazelles (Welch, Semlitsch & Gerhardt, 1998; Zahavi & Zahavi, 1997). Costly rituals are also common among traditional societies, where rites of passage, peacemaking, and dispute settling can often be physically and psychologically taxing ordeals (see Rossano, 2009 for summary). Importantly, the rituals of traditional societies nearly always have some spiritual dimension. Thus, evidence of costly ritual behavior in the hominin archeological record may also serve as an indicator of supernatural belief. This evidence often takes the form of ritually-relevant remains requiring considerable time, energy, or effort in their procurement or creation.

Red Ochre

Ochre is a general term for a pigmented iron oxide mineral that can be ground into powder and mixed with various liquids to produce a paint-like substance. Red ochre is used extensively in traditional societies for ritual purposes to color the body, weapons, tools, and other artifacts (Power, 1999; Power & Aiello, 1997; Watts, 2002). Some have argued that red’s symbolic importance rises to the level of a universal human archetype for such things as blood, sex, life, and death (James, 1957; Marshack, 1981; Wreschner, 1980). However, ochre can also have practical applications in tool making and hide tanning, and as medicine (Velo, 1984; Wadley, Hodgskiss, & Grant, 2009). Thus, the mere presence of ochre, even red ochre, in the archeological record does not immediately imply ritual use.

The oldest sites bearing red ochre date to about 300,000 years ago (Barham, 2002). From the Middle Stone Age (MSA) in Africa (roughly 280,000–25,000 ybp), at least 74 sites have been found bearing substantial amounts of ochre (Watts, 1999). Indeed, the amounts found at some sites such as Twin Rivers (estimated over 30,000 pieces, nearly 70 kg), Sibudu (5,000 pieces, over 15 kg), Blombos Cave (8,000 pieces, 5.8 kg), and the European site of Grotte du Renne (1,500 pieces, 18 kg) are striking. Some archeologists (Barham, 2002; Watts, 2009, 2010) have argued that such vast quantities of specifically red ochre (when other colors were equally or more easily available) clearly indicate ritual use. However, not everyone is convinced of this. In her studies at Sibudu, Lyn Wadley (Wadley et al., 2009) has shown that red ochre is useful in producing the adhesives necessary for hafting. Thus, large amounts of red ochre could be explained in a purely utilitarian manner.

There is, however, a potential weakness to this argument. Wadley's own studies show that coarse-grained ochre is not merely useful, but *essential* to successful hafting. Nevertheless, at Sibudu, coarse-grained ochre is the least common type throughout the entire period of occupation at the site (Hodgskiss, 2012, p. 107). Thus, at no time were the residents of Sibudu preferentially selecting the coarsest grain ochre (sandy ochres) over others, as might be expected if hafting were its main use (Hodgskiss, 2012, pp. 112–113). Similar preferences for fine-grained (not coarse-grained) ochre are also documented at Blombos, Pinnacle Point, Diepkloof, Qafzeh, and Skhul (Dayet, Texier, Daniel, & Porraz, 2013; d'Errico, Salomon, Vignaud, & Stringer, 2010; Henshilwood, et al., 2001, p. 431; Hovers, Ilani, Bar-Yosef, & Vandermeersch, 2003, p. 502; Marean et al., 2007, p. 906; Watts, 2010, p. 409). Thus, at numerous sites, hominins were intentionally procuring a form of ochre that was not well suited for practical ends.

Furthermore, procuring the desired form of ochre also required considerable travel. At Twin Rivers, hominins traveled 20 km or more to find their ochre. At Blomobs it was 30–40 km; at Pinnacle Point it was 60 km, and at Qafzeh it was 80 km. Once brought back to the site, the ochre had to be worked—ground into a power, heated, and mixed with various liquids to form paint. The most favored ochres (specularite and hematite) are quite hard, and studies show that grinding them into power is effortful and time-consuming (Wadley, 2005). Thus, on a range of dimensions—amount, time, distance, and effort—the presence of ochre represents a highly costly behavior whose practical value is, at best, suspect.

Beads

Beads are perforated shells or animal teeth, presumably worn as body decoration. Among traditional societies, beads often serve as social markers (indicative of one's tribe or status within the tribe), or as gifts in reciprocal interactions with other groups (Kuhn & Stiner, 2007). Beads are also used in ritual activities such as burials (Vanhaeren & d'Errico, 2005; R. White, 1993). The earliest evidence of beads dates to just before 100,000 ybp (Vanhaeren et al., 2006).

As with ochre, there are a number of sites where the amount of beads unearthed is remarkable. For example, at Ksar' Akil, Ucagizli, Fumane Cave, and Riparo Mochi, beads number from 500 to 1,000 (Douka, Bergman, Hedges, Wesselingh, & Higham, 2013; Peresani, Vanhaeren, Quaggiotto, Queffelec, & d'Errico, 2013; Stiner, 2003). At other sites there are fewer beads, but acquiring them required considerable travel or possibly trade with other groups. The 71 beads at Blombos came from 20 km away, while the 38 beads from Grotte de Pigeons originated about 70 km from the site (d'Errico et al., 2009; Henshilwood, d'Errico, Vanhaeren, van Niekerk, & Jacobs, 2004). Beads were either intentionally perforated (requiring skill and patience) or intentionally selected for proper size and appropriate naturally occurring perforations—qualities that were often rare in the environment (Henshilwood et al., 2004; Kuhn, Stiner, Reese, & Gulec, 2001; Stiner, 2003). Thus, as with ochre, in terms of the amounts gathered and the time and effort expended in procurement and modification, beads represent a costly behavior with little utilitarian use.

Caves

Penetrating into deep cave recesses for artistic, religious, or other potentially ritual purposes has been well documented for *Homo sapiens* during the Upper Paleolithic (40,000–10,000 ybp). Accessing deep cave sites was often risky and dangerous. For example, reaching the painted chambers at Montespan Cave required trekking through frigid waters for more than a kilometer. To access Nerja Cave in Spain, hominins had to negotiate a steep climb up a sheer rock face. The painted shaft at Lascaux required a 16-meter rope descent into pitch darkness, and the Salon Noir chamber at Niaux Cave was accessible only after traversing a 450-meter passage and making a 200-meter climb. Compounding the danger was the fact that while making these ventures, hominins were carrying torches, artistic supplies, and ladders, and often had children in tow (see R. White, 2003, for summary). In addition, *Homo sapiens* often expended considerable time, energy, and resources in the deep cave chambers creating paintings or constructing ritual venues, such as the elaborate El Juyo "sanctuary" in northern Spain (Arias, 2009; Freeman & Gonzalez Echegaray, 1981). Thus, there is little question that Paleolithic spelunking was a costly endeavor.

Although the most well-known and arguably the most impressive ritual use of caves occurred during the later Upper Paleolithic (Altamira, Lascaux, El Juyo, etc.), *Homo sapiens* started penetrating deep into caves at the very outset of the Upper Paleolithic. Cave paintings at Chauvet date to before 30,000 ybp (Chauvet, Deschamps, & Hillaire, 1996), and recent finds at El Castillo Cave in Spain push the earliest cave art back to around 40,000 ybp (Pike et al., 2012). A recent genetic analysis has confirmed that El Castillo was more likely created by Cro-Magnons than Neanderthals (Wood et al., 2014), which suggests that this form of costly ritual behavior was part of the *Homo sapiens*' repertoire prior to their exodus from Africa, and indeed recent evidence confirms this. At Rhino Cave in Botswana (Southern Africa), evidence has been found for some of the earliest cave rituals, dating as far back as 70,000 ybp (Coulson, Staurset, & Walker, 2011).

Rhino Cave is located in the Tsodilo Hills of Botswana in southern Africa. It is situated high on the northernmost ridge of what is called Female Hill. Its prominent location (the Hills are the only major outcropping for over 100 km in any direction) prompted Coulson et al. (2011) to argue that it was a likely assembly site for hominin communities in the region. Though it is visually prominent, gaining access to the cave is not easy: One must climb over or squeeze between large boulders, crawl through a narrow passage, and then navigate down a steep drop leading to the cave floor. Though the cave is not deep, the surrounding boulders and high walls effectively block out any direct sunlight.

Inside the cave, there is a natural snake-like outcropping. The outcropping was intentionally modified to enhance its serpentine qualities, and flickering torch light gives it the illusion of undulating movement, producing an environment highly conducive to the trance states associated with shamanistic rituals. It may also be significant that the serpent plays a prominent role in the creation myths of the San, who are indigenous to the region.

The snake-rock is not the only curious aspect of Rhino Cave. There are also an unusually large number of burned and broken tools in the cave produced from colorful, nonlocal raw materials ("exotic" tools). These raw materials were transported to the cave from distances ranging from 50 to several hundred kilometers (Coulson et al., 2011). At the cave, the raw materials were fashioned into tools (points) and then intentionally destroyed and burned. From a practical standpoint, this behavior is odd and costly. Time, energy, and potentially valuable material resources were exhausted for no clear utilitarian gain. But, as Coulson et al. (2011) point out, these are precisely the hallmarks of human ritual.

The modifications to the "serpent" outcropping have been dated to the Middle Stone Age (280–30 kya). The burned, broken points at Rhino Cave have been indirectly dated (using similar finds in the region) to around 70,000 years ago. Both climatological and genetic evidence indicate that the last 150,000 years in Africa were particularly unstable, leading to resource deprivations and population crashes among hominins (Ambrose, 1998; Li & Durbin, 2011; Scholz et al., 2007). Potentially in response to these stresses, some of the first evidence of extensive trade networks also emerges during this time (Ambrose, 2010; Ambrose & Lorenz, 1990). Given that intergroup rituals often play an important role in establishing and maintaining reciprocal trade alliances, Rhino Cave may have been a site where different groups gathered to spiritually cement social and commercial relations.

Deep cave ventures are not only notable for their behavioral costs; the art left behind is significant as well. A number of researchers have argued that some cave art provides evidence of early shamanistic rituals (Hayden, 2003; Lewis-Williams, 2002; Whitley, 2006; Winkelman, 2010). Therianthropic images (human/animal chimera) found in many deep cave sites, such as the "sorcerer" image from Les Trois Freres or the "bird-man" image from Lascaux, are consistent with the shamanistic theme of "soul flight," where in the midst of trance, the shaman's soul leaves his/her body and unites with that of a spiritually powerful animal. Additionally, cave and rock art often depict geometric forms that are thought to represent the entopic images associated with the trance state central to shamanistic rituals. The remote location of much of this art also tends to support the shamanistic theory. According the shamanistic world view, deep cave venues are not only visually and acoustically conducive to trance induction but they also serve as sensitive entry points to the spiritual underworld. Finally, the universality of shamanistic practices among traditional societies suggests deep historical roots—possibly indicating humanity's earliest form of religious expression.

Given the evidence from Rhino Cave and the antiquity of some cave art (dating to the very beginning of the Upper Paleolithic), it is likely that shamanism did not emerge among *Homo sapiens* in Europe, but instead was a practice they brought with them from Africa.

Postmortem Processing

Postmortem processing, such as careful defleshing of bones or secondary burial, represents effortful, nonutilitarian mortuary behavior compared to simple abandonment or disposal of the dead. However, some postmortem processing can be purely practical in nature, such as nutritive cannibalism. Practicality, not ritual, appears to explain most instances of postmortem processing prior to the Upper Paleolithic, including those documented at Gran Dolina for *H. antecessor* (Carbonell et al., 2010; Fernandez-Jalvo, Diez, Caceres, & Rosell, 1999), El Sidron and Moula Guercy for Neanderthals (Defleur, White, Valensi, Slimak, & Cregut-Bonnoure, 1999; Lalueza-Fox et al., 2011), and Klasies River for *Homo sapiens* (Deacon, 2001).

Only two instances from the Middle Paleolithic (250,000–40,000 ybp) vary from this pattern: (1) the defleshed skulls from Herto, Ethiopia, associated with *Homo sapiens*, and (2) the postmortem processing from Krapina associated with Neanderthals.

Herto Skulls

Dated to about 160,000 ybp, the three skulls from Herto, Ethiopia, represent some of the oldest *Homo sapiens* fossils (T. White et al., 2003). All three skulls have cut marks indicative of defleshing (Clark et al., 2003). Two of the skulls also show evidence of scraping or polishing, indicative of extensive handling or carrying (possibly in a natural fabric bag). Thus, the skulls were deliberately defleshed (whether the flesh was consumed or not is unclear) and then either handled or carried for some time after, possibly as part of ritual activity.

Krapina

The remains of over 40 Neanderthals, dated to around 130,000 ybp, were found at Krapina, Croatia. Some of the remains bear cut marks indicative of secondary postmortem processing (Russell, 1987; Trinkaus, 1985). This conclusion was further supported in a later analysis of a single skull (Krapina #3; Frayer, Orschiedt, Cook, Russell, & Radov, 2006). Frayer and colleagues found that the 35 mostly parallel cut marks on this cranium were inconsistent with defleshing, cannibalism, scalping, or other known postmortem behavior. Instead, they interpreted the marks as funerary ritual behavior. The person performing the ritual would have placed the skull in his or her lap (most likely) and deliberately incised the cuts in a series of strokes going either front-to-back, vice-versa, or both.

The most notable instance of what appears to be ritual postmortem processing in the Upper Paleolithic is probably Gough's Cave in England. *Homo sapiens* remains found at Gough's Cave (roughly 12,000 ybp) show the classic evidence of cannibalism; that is, butchery cut marks similar to those used on prey animals (Andrews & Fernandez-Jalvo, 2003). However, instead of being smashed and broken in a manner typically associated with cannibalism, a few skulls were intentionally preserved and meticulously fashioned into bowl-like shapes (Bello, Parfitt, & Stringer, 2011). Care and effort were required to preserve and carefully modify the Gough's Cave skulls, suggesting that they might have been seen as trophies or objects of veneration.

Burials

Intentional burial with evidence of ritual activity such as grave goods and decorated bodies would also qualify as costly, nonutilitarian behavior. Presently, the earliest claim of intentional burial is that of Sima de los Huesos or the "pit of bones" in the Atapuerca Mountains in north-central Spain, dated to 400,000 ybp. At the bottom of the pit, the remains of 30 or more individuals have been found, identified as *Homo heidelbergensis* but with many pre-Neanderthal characteristics (Arsuaga et al., 1997; Bischoff et al., 2007). Some have argued that the bodies were intentionally interred (Carbonell & Mosquera, 2006). However, there is evidence indicating that natural processes such as felid carnivory combined with mud flows into the pit are more likely explanations for the accumulation of bones (Andrews & Fernandez Jalvo, 1997; Fernandez Jalvo & Andrews, 2003).

During the Middle Paleolithic, both Neanderthals and *Homo sapiens* sometimes buried their dead (although the reality of Neanderthal burial has been questioned; see Gargett, 1989, 1999). Very little difference in how the species handled their dead is evident. Both species often put bodies in small pits and (apparently) placed simple, readily available grave goods (lithics, bones, and rocks) with the bodies (see Riel-Salvatore & Clark, 2001, for review). Considerable discussion has taken place regarding the degree of intention behind these burials (Pettitt, 2002).

By contrast, however, Upper Paleolithic burials associated with *Homo sapiens* leave little doubt concerning ritual intent. At sites such as Sungir, Le Madeleine, Dolni Vestonice, Saint-Germain-la-Riviere, or the famous "Red Lady" burial at Paviland, highly elaborate burials have been found. Bodies, often covered in red ochre and lavishly adorned with bracelets, necklaces, and headbands containing tens to thousands of carefully manufactured beads and pendants, were interred with copious graves goods such as ceremonial tools, weapons, and animal bones. In some cases, hundreds to thousands of hours of labor were required to complete the burial (Dickson, 1992; Klima, 1988; Vanhaeren & d'Errico, 2001, 2005; R. White, 1993). In addition, at Cussac Cave in France, a rare deep cave burial has been found. *Homo sapiens* apparently lugged multiple bodies 200 meters deep into the cave (Aujoulat et al., 2002). Among traditional societies, such elaborate, effortful burials are typically associated with ancestor worship (Hayden, 2003, pp. 115–118, 132–133).

An Evolutionary Scenario

Combining archaeology and cognitive science, we can state a number of empirically grounded observations and from them outline a potential evolutionary scenario for the emergence of religion.

Step 1: Moving Together

The earliest step toward religion was an elaboration of social rituals to include group-wide synchronous activities. This is based on the following observations.

1. As primates, our hominin ancestors were highly social with a rich repertoire of ritualized behaviors for regulating social life.
2. Synchrony is widespread in the animal world, and nonhuman primates show a limited capacity for synchronous movement. Committed bipedalism may contribute importantly to this ability. Hominins were fully terrestrial and bipedal by the time of *Homo erectus* (about 1.8 mybp).

Thus, with the emergence of *Homo erectus* or shortly thereafter, hominins were singing, dancing, and chanting together. These rituals had important social bonding effects, but may not have had any clearly understood supernatural elements to them.

Step 2: Intensifying the Ritual Experience

Four other observations point to a progressive intensification of synchronized ritual activity over time:

1. Many important mental building blocks of religious cognition are present in rudimentary form in nonhuman primates, indicating that they also would have been present in our earliest hominin ancestors.
2. Increases in hominin brain size very likely led to the elaboration of these building blocks into a more human-like form beginning by about 500,000 ybp.
3. By 300,000 ybp, hominins had control of fire. Campfires provided a compelling venue for social ritual activity and potentially enhanced the consciousness-altering effects of these activities.
4. By 200,000 ybp, other ritually intensifying elements, such as the use of pigments to color bodies and artifacts, could be incorporated into group singing, dancing, and chanting.

These four observations point to a progressive intensification of groupwide synchronous rituals beginning about 500,000 ybp. Fire and pigments would have contributed significantly to this intensification, heightening their social bonding and consciousness-altering effects. Although rather singular and ambiguous, the Herto skulls and the postmortem processing at Krapina suggest that the supernatural was only obliquely and occasionally included in these intensified rituals. More often, the collective ritual behavior of hominins from 500,000 to70,000 ybp was highly spirited (though only vaguely spiritual) synchronous singing, dancing, and chanting around campfires, which resulted in strong social bonding effects, altered states of consciousness, and potential health and healing benefits (Rossano, 2006).

Step 3: Adding the Supernatural

A further observation specifies approximately when the supernatural was added to group ritual activity.

1. Ritual behavior appears likely at Rhino Cave in Africa, and the context of the cave is consistent with shamanism. It has been tentatively dated to around 70,000 ybp—a time of resource stress and increased intergroup interactions in Africa.

This observation suggests that humanity's oldest religious practice is shamanism, which arose in Africa at around 70,000 ybp. Shamanism may have been a response to increased intergroup interactions, both cooperative and competitive, arising from the resource stress brought on by deteriorating climatic conditions. *Homo sapiens* took shamanism with them from Africa to Europe.

Step 4: Costly Rituals and the Neanderthal Challenge

As *Homo sapiens* faced the challenges of new territories and competitors (e.g., Neanderthals), their shamanistic practices expanded and became more costly. This is supported by three observations.

1. The earliest cave art, some with shamanistic themes, is solely attributable to *Homo sapiens* and dates to the very beginning of the Upper Paleolithic.
2. *Homo sapiens* built larger, more frequent fires than Neanderthals, and in one case (Dolni Vestonice) a fire is associated with communal ceremony or festivity.
3. Whereas Middle Paleolithic burials (both *Homo sapiens* and Neanderthal) are simple and largely devoid of convincing evidence of ritual or supernatural belief; in

the Upper Paleolithic, only *Homo sapiens*' burials become unambiguously elaborate, consistent with ancestor cults of traditional societies.

These observations suggest that as *Homo sapiens* moved into Europe and encountered Neanderthals, the scale and intensity of some of their collective rituals reached a unique, unprecedented level. The powerful emotional bonding effects of these rituals may have given *Homo sapiens* a social advantage over Neanderthals in the form of larger, more organized, and cooperative communities. Shamanism and ancestor cults were two religious elements contributing to the *Homo sapiens*' social advantage.

Admittedly, there is considerable and unavoidable speculation in this proposed scenario. However, there is also specificity to it that can lend itself to potentially testable hypotheses. For example, this model predicts that rituals become more costly and overtly religious where resource instability is high, intragroup cohesion is stressed, and intergroup interactions (both cooperative and competitive) are more frequent. Additionally, while group-synchronized rituals without religious elements should be fairly common, religious group rituals without synchronized movements should be quite rare.

Conclusion: Why Supernaturalize?

Religion is both belief and behavior, neither of which can be easily discerned in the remains of our long-extinct ancestors. Belief, however, has cognitive and neurological underpinnings, some of which may be simpler and more ancient, others more recent and derived. Likewise, behavior can leave archeological traces, whose chronology can be reconstructed. Elucidating religion's prehistory therefore need not be mere fanciful storytelling. Relevant evidence can provide guiding parameters. This chapter has been an attempt to both identify relevant evidence from across a range of interconnected disciplines and piece together the guiding parameters emergent from that evidence. Undoubtedly, this review has neglected important pieces of the puzzle that could dramatically reshape the proposed evolutionary scenario. Even so, some important lessons can be drawn from what we presently know.

First, despite its singularity, there is nothing to indicate that religion's emergence is an awkwardly surprising event that ought to trouble the evolutionist. Its cognitive foundations are shared with other species, some quite widely, and its behavioral hallmark, ritual, has deep evolutionary roots. As with other apparent human oddities, such as language and music, the vexing question about religion is not from where its constituent elements arose, but how and why they were knitted together as they were.

Second, debates over religion’s adaptiveness need to consider the level at which this function is thought to operate. For the individual, specific religious behaviors may not be adaptive. Venturing into a deep cave to contact spiritual forces could have been fatal 20,000 years ago, just as handling snakes can be today. But if *personally* risky actions and their associated beliefs create more cooperative, well-functioning *groups*, then the detrimental effects on the few may be offset by the benefits accrued to the many over time, especially under conditions of intergroup competition.

Third, just as there is no compelling evidence for religion in other species (apart from *Homo sapiens*), there is little to indicate religion in any other hominin as well. Indeed, a recent review has concluded that only *Homo sapiens* engaged in the costly ritual activity characteristic of religion, and this activity became especially acute in the Upper Paleolithic as they encountered Neanderthals (Rossano, 2015). This may have both theoretical and predictive significance. Theoretically, it suggests that adding supernatural belief to ritual behavior is catalyzed by intergroup interactions, especially competitive interactions. If so, we would expect to see archeological evidence of religion as *Homo sapiens* moved into territories where other hominins were present (such as in Europe), but far less evidence (at least on initial arrival) in unoccupied territory such as the Americas.

Finally, religion as it exists today is only minimally useful in understanding its evolutionary past. Institutionally regulated, theologically sophisticated global religions are recent developments that only vaguely reflect the beliefs and practices that we would expect to find in our ancestors. Instead, the animistic, shamanistic, and ancestor worship practices prevalent among traditional societies provide a far better model. Importantly, these practices (unlike those of global religions) are seamlessly integrated into the social lives of their adherents. For traditional hunter-gatherers (and similarly, our hominin ancestors), religion is not practiced—it is simply lived on a daily basis. Thus, the relevant evolutionary question is not when (and why) did our ancestor become religious? It is when (and why) did their lives become “supernaturalized”?

More specifically then, the evolutionary model being proposed claims that religion emerged when the supernatural was grafted onto already existing social rituals. Why add the supernatural? The answer is that it made rituals better. Ritualized behaviors have important trust-building, social bonding, health, and healing effects. Empirical studies have consistently found that all these effects are enhanced when the supernatural is incorporated into the ritual activities (for review/discussion, see Rossano, 2009, 2010, pp. 151–173).

In an evolutionary context of increasing intergroup interactions and competition, groups whose ritual lives included the supernatural would have been more internally cooperative and well organized compared with more “secular” groups. Furthermore, most individuals within those supernaturalized groups would have enjoyed better health and reproductive success compared with most individuals in more “secular” groups. Religion emerged as a human universal for the simple reason that groups with supernaturalized social rituals outcompeted groups that lacked such rituals over the course of hominin evolution. For adaptive purposes, whether the gods are actually up there or not is secondary to *believing* they are up there.

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