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COUNTERINTUITION, COMMITMENT,
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Religion’s evolutionary landscape: Counterintuition, commitment, compassion, communion

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Abstract: Religion is not an evolutionary adaptation per se, but a recurring cultural by-product of the complex evolutionary landscape that sets cognitive, emotional, and material conditions for ordinary human interactions. Religion exploits only ordinary cognitive processes to passionately display costly devotion to counterintuitive worlds governed by supernatural agents. The conceptual foundations of religion are intuitively given by task-specific panhuman cognitive domains, including folkmechanics, folkbiology, and folkpsychology. Core religious beliefs minimally violate ordinary notions about how the world is, with all of its inescapable problems, thus enabling people to imagine minimally impossible supernatural worlds that solve existential problems, including death and deception. Here the focus is on folkpsychology and agency. A key feature of the supernatural agent concepts common to all religions is the triggering of an “Innate Releasing Mechanism,” or “agency detector,” whose proper (naturally selected) domain encompasses animate objects relevant to hominid survival – such as predators, protectors, and prey – but which actually extends to moving dots on computer screens, voices in wind, and faces on clouds. Folkpsychology also crucially involves metarepresentation, which makes deception possible and threatens any social order. However, these same metacognitive capacities provide the hope and promise of open-ended solutions through representations of counterfactual supernatural worlds that cannot be logically or empirically verified or falsified. Because religious beliefs cannot be deductively or inductively validated, validation occurs only by ritually addressing the very emotions motivating religion. Cross-cultural experimental evidence encourages these claims.

Keywords: agency; death anxiety; evolution; folkpsychology; Maya; memory; metarepresentation; morality; religion; supernatural

1. Introduction

In every society,1 there are

1. Widespread counterfactual and counterintuitive beliefs in supernatural agents (gods, ghosts, goblins, etc.)

2. Hard-to-fake public expressions of costly material commitments to supernatural agents, that is, offering and sacrifice (offerings of goods, property, time, life)

3. Mastering by supernatural agents of people’s existential anxieties (death, deception, disease, catastrophe, pain, loneliness, injustice, want, loss)

4. Ritualized, rhythmic sensory coordination of (1), (2), and (3), that is, communion (congregation, intimate fellowship, etc.)

In all societies there is an evolutionary canalization and convergence of (1), (2), (3), and (4) that tends toward what we shall refer to as “religion”; that is, passionate communal displays of costly commitments to counterintuitive worlds governed by supernatural agents. Although these facets of religion emerge in all known cultures and animate the majority of individual human beings in the world, there are considerable individual and cultural differences in the degree of religious commitment. The question as to the origin and nature of these intriguing and important differences we leave open.

This theoretical framework drives our program of research.2 The framework is the subject of a recent book (Atran 2002a). Here, a more comprehensive set of experimental results and observations is introduced to support in-
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tegration within an evolutionary perspective that envisions religion as a converging by-product of several cognitive and emotional mechanisms that evolved for mundane adaptive tasks (for somewhat similar, independently researched, views of religion as an emergent by-product of numerous domain-specific psychological mechanisms, see Boyer 2001; Kirkpatrick 1999b).

The current experiments suggestively support this long-term research program. We hope the findings will stimulate further tests and refinements to assess the empirical viability of this framework. The aim of this paper is to foster scientific dialogue between the fields of cultural anthropology, cognitive, developmental and social psychology, and evolutionary biology regarding a set of phenomena vital to most human life and all societies. The present article is mainly concerned with the first and third criteria of religion listed above. In this introductory section, we present in general terms the overall intellectual framework that interrelates all four criteria, discuss some obvious objections to these generalizations, and offer some caveats.

The criterion (1) of belief in the supernatural rules out commitment theories of religion as adequate, however insightful the latter may be. Such theories underplay or disregard cognitive structure and its causal role. Commitment theories attempt to explain the apparent altruism and emotional sacrifice of immediate self-interest accompanying religion in terms of long-term benefits to the individual (Alexander 1987; Irons 1996; Nesse 1999) or group (Boehm 1999; Wilson 2002) – benefits that supposedly contribute to genetic fitness or cultural survival. They do not account for the cognitive peculiarity of the culturally universal belief in beings who are imperceptible in principle, and who change the world via causes that are materially and logically inscrutable in principle. They cannot distinguish Marxism from monotheism, or secular ideologies from religious belief (Atran 2002a).

The criterion (2) of costly commitment rules out cognitive theories of religion as inadequate, however insightful they may be. Cognitive theories attempt to explain religious beliefs and practice as cultural manipulations of ordinary psychological processes of categorization, reasoning, and remembering (Andresen 2000; Atran & Sperber 1991; Barrett 2000; Boyer 1999; Lawrence & McCauley 1999; Pyysiäinen & Anttonen 2002). They do not account for the emotional involvement that leads people to sacrifice to others what is dear to themselves, including labor, limb, and life. Such theories are often short on motive and are unable to distinguish Mickey Mouse from Moses, cartoon fantasy from religious belief (Atran 1998, p. 602; cf. Boyer 2000; Norenzayan & Atran 2004). They fail to tell us why, in general, the greater the sacrifice – as in Abraham offering up his beloved son – the more others trust in one’s religious commitment (Kierkegaard 1843/1955).

We extend the idea (first suggested by Sperber 1975b) that religious thought and behavior can be explained as mediated by ordinary mental mechanisms, which can be scientifically studied regardless of whether religions are true or not true in a metaphysical sense. In this “mentalist” tradition, the focus so far has been on cognition and culture; that is, on how religious ideas are mentally constructed, transmitted across minds, and acquired developmentally. To be sure, there have been recent attempts by cognitive scientists studying religion to consider the role of emotion, and growing realization that religion cannot have a purely cognitive explanation that fails to take into account the social dilemmas motivating religious beliefs and practices (McCauley & Lawson 2002; Pyysiäinen 2001; Whitehouse 2000). But there is still little analytic or empirical integration of (1) and (3).

Religions invoke supernatural agents (Horton 1967; Taylor 1871/1958) to deal with (3) emotionally expressive existential anxieties (Malinowski 1922/1961), such as death and deception (Becker 1973; Feuerbach 1843/1972; Freud 1913/1990). All religions, it appears, have “awe-inspiring, extraordinary manifestations of reality” (Lowie 1924, p. xvi). They generally have malevolent and predatory deities as well as more benevolent and protective ones. Supernatural agent concepts trigger our naturally selected agency-detection system, which is trip-wired to respond to fragmentary information, inciting perception of figures lurking in shadows and emotions of dread or awe (Guthrie 1983; cf. Huné 1757/1956). Granted, nondeistic “theologies,” such as Buddhism and Taoism, doctrinally eschew personifying the supernatural or animating nature with supernatural causes. Nevertheless, common folk who espouse these faiths routinely entertain belief in an array of gods and spirits that behave counternaturally in ways that are inscrutable to factual or logical reasoning. Even Buddhist monks ritually ward off malevolent deities by invoking benevolent ones, and they perceive altered states of nature as awesome.

Conceptions of the supernatural invariably involve the interruption or violation of universal cognitive principles that govern ordinary human perception and understanding of the everyday world. Consequently, religious beliefs and experiences cannot be reliably validated (or disconfirmed as false) through consistent logical deduction or consistent empirical induction. Validation occurs only by (4) collectively satisfying the emotions that motivate religion in the first place. Through a “collective effervescence” (Durkheim 1912/1995), communal rituals rhythmically coordinate emotional validation of, and commitment to, moral truths in worlds governed by supernatural agents. Rituals involve sequential, socially interactive movement and gesture, and formulaic utterances that synchronize affective states among group members in displays of cooperative commitment. Through the sensory pageantry of movement, sound, smell, touch, and sight, religious rituals affectively coordinate actors’ minds and bodies into convergent expressions of public sentiment (Turner 1969) – a sort of N-person bonding that communicates moral consensus as sacred, transcending all reason and doubt (Rappaport 1999). Sensory pageantry also ensures the persistence and transmission of the religious beliefs and practices it infuses.

These four conditions do not constitute the necessary and sufficient features of “religion.” Rather, they comprise a stipulative (working) framework that delimits a causally interconnected set of pan-cultural phenomena, which is the object of our study. One may choose to call phenomena that fall under this set of conditions “religion” or not; however, for our purposes the joint satisfaction of all four conditions is what we mean by the term religion. Nevertheless, we offer this working framework as an adequate conceptualization that roughly corresponds to what most scholars consider religion. This framework is concerned with the pan-cultural foundations of religion; accordingly, our conceptualization is broad in scope. Surely, religions are manifested in culturally diverse ways and are shaped by local
cultural contexts. Elsewhere, scholars have examined how the distinctive paths that religions take shape psychological tendencies (e.g., Weber 1946; Shweder et al. 1997). Our framework is not incompatible with these approaches. Indeed, it offers candidates for the psychological building blocks of religion, which then are culturally exploited in distinct but converging paths.

More critical are the many ethnographic reports which interpret that some people or some societies make no hard and fast distinction between (1), the natural and supernatural, or between (2), costly sacrifice and the social redistribution of material or social rewards; or that (3) religions are as anxiety-activating as they are anxiety-assuaging, or that (4) they are sometimes devoid of emotional ritual. In addition, (5) there is considerable psychological and sociological evidence for the health and well-being benefits of religion, which suggests that religion may be adaptive and not simply a by-product of evolutionary adaptations for other things. We address each of these objections next.

1.1. The natural versus the supernatural

We base our argument regarding the cognitive basis of religion on a growing number of converging cross-cultural experiments on "domain-specific cognition" emanating from developmental psychology, cognitive psychology, and anthropology. Such experiments indicate that virtually all (non brain-damaged) human minds are endowed with core cognitive faculties for understanding the everyday world of readily perceptible substances and events (for overviews, see Hirschfeld & Gelman 1994; Pinker 1997; Sperber et al. 1995). The core faculties are activated by stimuli that fall into a few intuitive knowledge domains, including: folkmechanics (object boundaries and movements), folkbiology (biological species configurations and relationships), and folkpsychology (interactive agents and goal-directed behavior). Sometimes operation of the structural principles that govern the ordinary and "automatic" cognitive construction of these core domains are pointedly interrupted or violated, as in poetry and religion. In these instances, counterintuitions result that form the basis for construction of special sorts of counterfactual worlds, including the supernatural; for example, a world that includes self-propelled, perceiving, or thinking mineral substances (e.g., Maya sastun, crystal ball; Arab tilsam [talisman]) or beings that can pass through solid objects (angels, ghosts, ancestral spirits) (cf. Atran & Sperber 1991; Boyer 1994).

These core faculties generate many of the universal cognitions that allow cross-cultural communication and make anthropology possible at all. For example, even neonates assume that a naturally occurring rigid body cannot occupy the same space as another (unlike shadows), or follow discontinuous trajectories when moving through space (unlike fires), or change direction under its own self-propelling initiative (unlike animals), or causally effect the behavior of another object without physical contact (unlike people) (Spelke et al. 1995). When experimental conditions simulate violation of these universal assumptions, as in a magic trick, neonates show marked surprise (longer gaze, intense thumb sucking, etc.). Children initially expect shadows to behave like ordinary objects, and even adults remain uncertain as to how shadows move. This uncertainty often evokes the supernatural.

All known societies appear to partition local biodiversity into mutually exclusive species-like groupings (Atran 1990; Berlin 1992; Darwin 1859; Diamond 1966), and to initially identify nonhuman organisms according to these groupings rather than as individuals (unlike the immediate focal identification of individual human faces and behaviors; Atran 1998; cf. Hirschfeld 1996). Individualized pets and taxonomic anomalies, such as monsters, become socially relevant and evocative because they are purposely divorced from the default state of "automatic" human cognition about the limited varieties of the readily perceptible world, that is, "intuitive ontology" (Atran 1989; Boyer 1997; cf. Sperber 1975b). This commonsense ontology is arguably generated by task-specific "habits of mind," which evolved selectively to deal with ancestrally recurrent "habits of the world" that were especially relevant to hominid (and in some cases, pre-hominid) survival, that is, inanimate substances, organic species, and persons.

What testable evidence there is indicates that, sometime after age three and except for severe autistics, most any person understands that most any other person can entertain perceptions, beliefs, and desires different from one's own, and that these different mental states differentially cause people's behaviors (Avis & Harris 1991; Baron-Cohen 1995; Knight et al. 2004; Wimmer & Perner 1983). Granted, there is experimental evidence for cultural variations in causal attribution of social behavior to personality traits versus social situations (Choi et al. 1999), and there are anecdotal interpretations of cultural behaviors indicating an inability to distinguish between true and false beliefs, or reality from desire (cf. Lévy-Bruhl 1923/1966; Lillard 1998). But contrary to the anecdotal evidence, experimental evidence suggests that children growing up in very different cultures soon develop similar understanding of core aspects of human behavior as a function of beliefs and desires (Avis & Harris 1991; Flavell et al. 1983). Furthermore, there is no generally accepted body of evidence indicating that our simian cousins can simultaneously keep in mind the thoughts of others, or, equivalently, entertain multiple possible and different worlds from which to select an appropriate course of action (Premack & Woodruff 1975; Hauser 2000; cf. Hare et al. 2001 for intriguing experiments suggesting rudimentary perspective taking in chimps). Without the ability to entertain multiple possible worlds, belief in the supernatural is inconceivable.

Within the emerging work on domain specificity there are controversies and doubts, as in any young and dynamic science. But the findings sketched above are widely replicated. Admittedly, there are alternative approaches to understanding cognition, such as connectionism, artificial intelligence, and phenomenology. Using any of these other approaches to model religion would no doubt present a different picture than the one we offer. We leave it to others to work the alternatives.

1.2. Costly sacrifice versus redistribution

One evolutionary problem with religion is explaining how and why biologically unrelated individuals come to sacrifice their own immediate material interests to form genetically incoherent relationships under an imagined permanent and immaterial authority. Altruism occurs when an organism's behavior diminishes its own fitness and enhances the fitness of some other organism or organisms. Fitness is a measure of an organism's reproductive success. The sacrifice of an
organism for its relatives – a mother for her children, a brother for his siblings, an ant for its colony, a bee for its hive – lowers an organism’s individual fitness (also called “classical” or “Darwinian” fitness) because it compromises the individual’s ability to bear and raise offspring. Nevertheless, such kin altruism may also enhance the individual’s “inclusive fitness” by allowing surviving relatives to pass on to many of the individual’s genes to future generations (Hamilton 1964). But what motivates the sort of non-kin cooperation characteristic of human religious commitment?

Unlike other primate groups, hominin groups grew to sizes (Dunbar 1996) that could not function exclusively on the basis of kin selection (commitment falls off precipitously as genetic distance increases between individuals) or direct reciprocity (ability to directly monitor trustworthiness in reciprocation decreases rapidly as the number of transactions multiply). Larger groups of individuals out compete smaller groups in love and war (Axelrod 1984). A plausible hypothesis, then, is that the mechanisms for successful promotion of indirect reciprocity – including both religious and nonreligious behaviors – were naturally selected in response to the environmental problem-context of spiraling social rivalry among fellow conspecifics, or “runaway social competition” (Alexander 1989). As “fictive kin” (Nesse 1999), members of religious groups perform and profit from many tasks that they could not do alone, one by one, or only with family. Thus, “Among the Hebrews and Phoenicians . . . the worshipper is called brother (that is, kinsman or sister of the god)” (Robertson Smith 1891/1972, p. 44, note 2). “Brotherhood” is also the common term applied today among the Christian faithful and to the fraternity (ikhwan) of Islam.

Indirect reciprocity occurs when individual X knows that individual Y cooperates with others, and this knowledge favors X cooperating with Y. Consider a population whose individuals have the option to cooperate or not. Suppose individual X randomly meets individual Y. If Y has a reputation for cooperation, and if X cooperates with Y, then X’s reputation likely increases. If X does not cooperate with Y, then X’s reputation likely decreases (see Nowak & Sigmund 1998 for various simulations). The basic idea is to help those who are known to help others. Reputation for religious belief is almost always reckoned as sincere social manipulation characteristic of human religious commitment.

Although calculations of economic or political utility often influence religious practices (Stark 2000), to conclude that all is there to religious commitment and sacrifice is unwarranted. In religious offerings, there is usually a nonrecoverable cost involved both in the selection of the item offered and in the ceremony itself. Thus, for the Nuer of Sudan, substituting a highly valued item (cow) by one that is less valued (fowl or vegetable) is allowable only to a point, after which “a religious accounting might reveal that the spirits and ghosts were expecting a long overdue proper sacrifice, because accounts were out of balance, so to speak” (Evans-Pritchard 1940, p. 26). Religious sacrifice usually costs something for the persons on whose behalf the offering is made. That is why “sacrifice of wild animals which can be regarded as the free gift of nature is rarely allowable or efficient” (Robertson Smith 1894, p. 466). In many cases, the first or best products of one’s livelihood goes to the gods, as with the first fruits of the Hebrews or the most perfect maize kernels of the Maya. Most, if not all, societies specify obligatory circumstances under which religious sacrifice must be performed, regardless of economic considerations. Reviewing the anthropological literature, Raymond Firth (1963, p. 16) surmises, “In all such cases the regular religious need to establish communication with god or with the spirit world . . . would seem to be pressing and primary. ‘Afford it or not.’”

In sum, religious sacrifice generally runs counter to calculations of immediate utility, such that future promises are not discounted in favor of present rewards. In some cases, sacrifice is extreme. Although such cases tend to be rare, they are often held by society as religiously ideal: for example, sacrificing one’s own life or nearest kin. Researchers sometimes take such cases as prima facie evidence of “true” (nonkin) social altruism (Kuper 1996; Rappaport 1999) or group selection, wherein individual fitness decreases so that overall group fitness can increase (relative to the overall fitness of other, competing groups) (Sober & Wilson 1998; Wilson 2002). But this may be an illusion.

A telling example is contemporary suicide terrorism (Atran 2003a). Through indoctrination of recruits into relatively small and closed sets – emotionally tight-knit “brotherhoods” – terror organizations create a “family” of cell mates who are just as willing to sacrifice for one another as a mother for her children. Consider the “Oath to Jihad” taken by recruits to Harkat al-Ansar, a Pakistan-based ally of Al-Qaida, which affirms that by their sacrifice, they will help secure the future of their “family” of fictive kin: “Each [martyr] has a special place – among them are brothers, just as there are sons and those even more dear.” These culturally contrived cell loyalties mimic and (at least temporarily) override genetically based fidelities to family kin while securing belief in sacrifice to a larger group cause. The mechanism of manipulation resembles the one used by our own army to train soldiers in small groups of committed buddies who acquire willingness to sacrifice for one another, and, derivatively, for glory and country (motherland, fatherland). In the case of religiously inspired suicide terrorism, these sentiments are purposely manipulated by organizational leaders, recruiters, and trainers to the advantage of the manipulating elites rather than the individual (much as the fast-food or soft-drink industries manipulate innate desires for naturally scarce commodities like fatty foods and sugar to ends that reduce personal fitness but benefit the manipulating institution). No “group selection” is involved, only cognitive and emotional manipulation of some individuals by others.

1.3. Relieving versus provoking anxieties

Often the naturally eruptive anxieties that bring on the supernatural are artificially (purposely) excited, then assuaged (Durkheim 1912/1995). It might seem, then, that the problem of religion’s ability to neutralize suffering is akin to the wag about the salesman who throws dirt on the rug in order to demonstrate the vacuum cleaner’s ability to remove it. Consider initiation rituals that involve “rites of terror” (Whitehouse 1996), as among Native American Cheyenne and Arapaho (Lowie 1924), Wallbiri (Meggitt 1965) and other aboriginals of the Central Australian Desert (Spencer & Gillen 1904), Mountain Ok Baktaman (Barth 1975) and Ialibita Arapesh of Highland Papua New Guinea (Tuzin 1982), and Candomblé Nago sects of
African-Brazilian Bahia (Carneiro 1940; Omari 1994). These arouse existential anxieties by culturally mimicking and manipulating seemingly capricious and uncontrollable situations that naturally provoke them: terror and risk of death from unidentified sources, the menace of infirmity and starvation through physical ordeal and deprivation, the injustice of whimsical oppression, sudden isolation, and loneliness. Often initiates temporarily manifest behaviors and cognitions associated with persons clinically diagnosed as suffering abuse, stress, or trauma, including re-experiencing the events (nightmares, intrusive memories, flashbacks), avoidance (amnesia of the event, refusal to talk or think about it), and hyperarousal (startle response, fitful sleep, poor concentration) (cf. Newport & Nemeroff 2000).

Still, there are important differences between such initiations and stress syndromes (e.g., posttraumatic stress disorder). Stress sufferers who permanently lose memory and undergo reduced immune response often suffer from chronic stress and lack of effective social support (Dhabhar & McEwen 1999; Khansari et al. 1990). By contrast, even the most severe and emotionally aversive religious initiations end in positive exhibitions of social acceptance:

Boys and girls are made to recognize members of The People [Navajo] and are introduced to full participation in ceremonial life. . . . The first boy is led out beside the fire. The figure in the white mask makes a mark on each shoulder with sacred cornmeal. . . . Then, using a different fa latte cry, the black-masked figure lightly strikes . . . other places on the body, and the one who uses the reeds varies the time interval between touching the boy and uttering his cry, so its unexpectedness causes the boy to start convulsively. . . . Then the one who wore the black mask places it over the face of each child in turn. . . . All the children are told to look up and always remember the Holy People. The reversal of the masks is a very intelligent psychological act, for it allows the child to see that the dread figure is actually someone he knows, or at least a human being, and thus the ritual is robbed of some of its terror. . . . The ceremony closes with the admonition to each child not to betray to uniniti ates what he has seen. (Kluckhohn & Leighton 1946/1974, p. 207–208; cf. Turnbull 1962, p. 225)

Through the stress that these exaggerated sensual displays induce, rites of passage furnish emotionally costly and memorable — but ultimately satisfying — commitments to the group and its supernatural agents.

In brief, these life rehearsals incite the very emotions and existential anxieties that motivate religious beliefs and quests for deliverance. Then, by assigning and resolving the ensuing distress, successful completion of the ritual performance authenticates the religious thoughts and actions. This confirms the efficacy of religious belief and ritual performance in fusing cosmos to culture by overcoming the dreads and uncertainties of both spontaneously occurring natural events and the manipulated happenings of the social world.

1.4. Emotional ritual

Although there is wide variation in the degree of sensory pageantry associated with religious rituals (McCauley & Lawson 2002; Whitehouse 2000), religious rituals habitually — perhaps invariably — include displays of social hierarchies and submission typical of primates and other social mammals (outstretched limbs bearing throat and chest or genitals, genuflection, bowing, prostration, etc.). Even priests and kings must convincingly show sincere submis-
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All human societies pay a price for religion's material, emotional, and cognitive commitments to unintuitive, factually impossible worlds. Functional evolutionary ("adaptationist") arguments for religion often try to offset its clear functional disadvantages with greater functional benefits. There are many different and contrary explanations for why religion exists in terms of beneficial functions served. These include functions of social (bolstering group solidarity, group competition), economic (sustaining public goods, surplus production), political (mass opiates, rebellion's stimulant), intellectual (e.g., explain mysteries, encourage credulity), health and well-being (increase life expectancy, accept death), and emotional (terrifying, allaying anxiety) utility. Many of these functions have obtained in one cultural context or another; yet all also have been true of cultural phenomena besides religion.

Such descriptions of religion are not wrong; however, none of these accounts provides explanatory insight into cognitive selection factors responsible for the ease of acquisition of religious concepts by children, or for the facility with which religious practices and beliefs are transmitted across individuals. They have little to say about which beliefs and practices— all things being equal—are most apt to survive within a culture, most likely to recur in different cultures, and most disposed to cultural variation and elaboration. None predicts the cognitive peculiarities of religion, such as

Why do agent concepts predominate in religion?
Why are supernatural-agent concepts culturally universal?
Why are some supernatural-agent concepts inherently better candidates for cultural selection than others?
Why is it necessary, and how it is possible, to validate belief in supernatural agent concepts that are logically and factually inescrutable?

How is it possible to prevent people from deciding that the existing moral order is simply wrong or arbitrary and from defecting from the social consensus through denial, dismissal, or deception?

Our argument does not entail that religious beliefs and practices cannot perform social functions, or that the successful performance of such functions does not contribute to the survival and spread of religious traditions. Indeed, there is substantial evidence that religious beliefs and practices often alleviate potentially dysfunctional stress and anxiety (Ben-Amos 1994; Worthington et al. 1996) and maintain social cohesion in the face of real or perceived conflict (Allport 1956; Pyszczynski et al. 1999). It does imply that social functions are not evolutionarily responsible for the cognitive structure and cultural recurrence of religion. This article addresses these and related issues with cross-cultural experiments and observations.

2. The supernatural agent: Hair-triggered folkpsychology

Religions invariably center on supernatural agent concepts, such as gods, goblins, angels, ancestor spirits, jinns. In this section, we concentrate on the concept of agency, a central player in what cognitive and developmental psychologists refer to as "folkpsychology" and the "Theory of Mind" (ToM). Agency, we speculate, evolved hair-triggers in humans to respond "automatically" under conditions of un-
certainty to potential threats (and opportunities) by intelligent predators (and protectors). From this perspective, agency is a sort of “Innate Releasing Mechanism” (Tinbergen 1951) whose proper evolutionary domain encompasses animate objects, but which inadvertently extends to moving dots on computer screens, voices in the wind, faces in the clouds, and virtually any complex design or uncertain circumstance of unknown origin. This insight into the supernatural as the by-product of a hair-triggered agency detector was first elaborated by Guthrie (Guthrie 1993; cf. Hume 1756/1957). We further ground it in the emerging theory of folkpsychology.

A number of experiments show that children and adults spontaneously interpret the contingent movements of dots and geometrical forms on a screen as interacting agents who have distinct goals and internal motivations for reaching those goals (Bloom & Veres 1999; Csibra et al. 1999; Heider & Simmel 1944; Premack & Premack 1995). Such a biologically prepared, or modular, processing program would provide a rapid and economical reaction to a wide – but not unlimited – range of stimuli that would have been statistically associated with the presence of agents in ancestral environments. Mistakes, or “false positives,” would usually carry little cost, whereas a true response could provide the margin of survival (Geary & Huffman 2002; Seligman 1971).

Our brains, it seems, are trip-wired to spot lurkers (and to seek protectors) where conditions of uncertainty prevail (when startled; at night; in unfamiliar environments; during sudden catastrophe; or in the face of solitude, illness, or prospects of death, etc.). Plausibly, the most dangerous and deceptive predator for the genus Homo since the Late Pleistocene has been Homo itself, which may have engaged in a spiraling behavioral and cognitive arms race of individual and group conflicts (Alexander 1989). Given the constant menace of enemies within and without, concealment, deception, and the ability to generate and recognize false beliefs in others would favor survival. In potentially dangerous or uncertain circumstances, it would be best to anticipate and fear the worst of all likely possibilities: presence of a deviously intelligent predator. How else could humans have managed to constitute and survive such deadly competitive groups as the Iatmul head-hunters of New Guinea (Bateson 1958) or the Naga of Nagaland (north-eastern India)?

All the Naga tribes are, on occasion, head-hunters, and shrink from no treachery in securing these ghastly trophies. Any head counts, be it that of a man, woman, or child, and entitles the man who takes it to wear certain ornaments according to the custom of the tribe or village. Most heads are taken . . . not in a fair fight, but by methods most treacherous. As common a method as any was for a man to lurk about the water Ghât of a hostile village, and kill the first woman or child who came to draw water. . . . Every tribe, almost every village is at war with its neighbour, and no Naga of these parts dare leave the territory of his tribe without the probability that his life will be the penalty. (Crooke 1907, p. 41–43.)

Throughout the world, societies cast their enemies as physically or mentally warped supernatural beings, or at least in league with the supernatural. Originally, nîga “applied to dreaded mountain tribes, and [was] subsequently used to designate monsters generally” (Werner 1932/1961, p. 294). The dragons of ancient India (nîga) and their Chinese derivatives (lung) are often depicted as creatures half human and half animal who emerge from the clouds to wreak havoc on humankind. Similarly, serpent-like devils and demons are culturally ubiquitous (Munkur 1983), perhaps evoking and addressing a primal fear shared by our primate line (Mineka et al. 1984). From an evolutionary perspective, it is better to be safer than sorry regarding the detection of agency under conditions of uncertainty. This cognitive proclivity would favor emergence of malevolent deities in all cultures, just as the countervailing Darwinian propensity to attach to protective caregivers would favor the apparition of benevolent deities. Thus, for the Carajá Indians of Central Brazil, intimidating or undesirable regions of the local ecology are religiously avoided:

The earth and underworld are inhabited by supernaturals. . . . There are two kinds. Many are amiable and beautiful beings who have friendly relations with humans. . . . The others are ugly and dangerous monsters who cannot be placated. Their woods are avoided and nobody fishes in their pools. (Lipkind 1949, p. 249)

Nearly identical descriptions of supernaturals can be found in ethnographic reports throughout the Americas, Africa, Eurasia, and Oceania (Atran 2002a).

In addition, humans conceptually create information to mimic and manipulate conditions in ancestral environments that originally produced and triggered our evolved cognitive and emotional dispositions (Sperber 1996). Humans habitually “fool” their own innate releasing programs, as when people become sexually aroused by make-up (which artificially highlights sexually appealing characteristics), fabricated perfumes, or undulating lines drawn on paper or dots arranged on a computer screen, that is, pornographic pictures. Indeed, much of human culture – for better or worse – can be arguably attributed to focused stimulations and manipulations of our species’ innate proclivities.

These manipulations can activate and play upon several different cognitive and emotional faculties at once. Thus, masks employ stimuli that trigger our innate, hyperactive facial-recognition schema. Masks also employ stimuli that activate, amplify, and confound emotions by highlighting, exaggerating, or combining certain facial expressions. Moreover, like two-dimensional drawings of the Nekker cube for which there is no stable three-dimensional interpretation, masks can produce feelings of unresolved anxiety or “uncanniness.” In many religious ceremonies, for example, as a mask rotates away (e.g., clockwise) from an onlooker, who now gazes on the mask’s hollow back, the onlooker perceives a three-dimensional face emerging in the other direction (counterclockwise) from inside the back of the mask (cf. Dawkins 1998). Such manipulations can serve cultural ends far removed from the ancestral adaptive tasks that originally gave rise to those cognitive and emotional faculties triggered, although manipulations for religion often centrally involve the collective engagement of existential desires (e.g., wanting security) and anxieties (e.g., fearing death).

Recently, numbers of devout American Catholics eyed the image of Mother Theresa in a cinnamon bun sold at a shop in Tennessee. Latinos in Houston prayed before a window of the dried remnants of melted ice cream on a pavement. Cuban exiles in Miami spotted the Virgin in windows, curtains, and television afterimages as long as there was hope...
of keeping young Elian Gonzalez from returning to godless Cuba. And on the day of the World Trade Center bombing, newspapers showed photos of smoke billowing from one of the towers that "seems to bring into focus the face of the Evil One, complete with beard and horns and malignant expression, symbolizing to many the hideous nature of the deed that wreaked horror and terror upon an unsuspecting city" ("Bedeviling: Did Satan Rear His Ugly Face?", Philadelphia Daily News, 14 Sept. 2001). In all these cases, there is culturally conditioned emotional priming in anticipation of agency. This priming, in turn, amplifies the information value of otherwise doubtful, poor, and fragmentary agency-relevant stimuli. This enables the stimuli (e.g., cloud formations, pastry, ice cream conformations) to achieve the minimal threshold for triggering hyperactive facial-recognition and body-movement recognition schemata that humans possess.

In sum, supernatural agents are readily conjured up because natural selection has trip-wired cognitive schema for agency detection in the face of uncertainty. Uncertainty is omnipresent; so, too, is the hair-triggering of an agency-detection mechanism that readily promotes supernatural interpretation and is susceptible to various forms of cultural manipulation. Cultural manipulation of this modular mechanism and priming facilitate and direct the process. Because the phenomena created readily activate intuitively given modular processes, they are more likely to survive transmission from mind to mind under a wide range of different environments and learning conditions than entities and information that are harder to process (Atran 1998; 2001b). As a result, they are more likely to become enduring aspects of human cultures, such as belief in the supernatural.

3. Counterintuitive worlds

In this section we unpack the idea of the supernatural as a counterintuitive world that is not merely counterfactual in the sense of physically implausible or nonexistent. Rather, the supernatural literally lacks truth conditions. A counterintuitive thought or statement can take the surface form of a proposition (e.g., "Omnipotence [i.e., God] is insubstantial"), but the structure of human semantics is such that no specific meaning can be given to the expression and no specific inferences generated from it (or, equivalently, any and all meanings and inferences can be attached to the expression).

The meanings and inferences associated with the subject (omnipotence = physical power) of a counterintuitive expression contradict those associated with the predicate (insubstantial = lack of physical substance), as in the expressions "the bachelor is married" or "the deceased is alive."11

All the world's cultures have religious myths that are attention-arresting because they are counterintuitive.12 Still, people in all cultures also recognize that such beliefs are counterintuitive, whether or not they are religious believers (Atran 1996). Among Christian communities all over the world, for example, Catholics and non-Catholics alike are unquestionably aware of the difference between Christ's body and ordinary wafers, or between Christ's blood and ordinary wine. Likewise, Native American Cowlitz are well aware of the difference between the deity Coyote and everyday coyotes, or between Old Man Wild Cherry Bark and ordinary wild cherry bark (Jacobs 1934, p. 126–33).

Religious beliefs are counterintuitive because they violate what studies in cognitive anthropology and developmental psychology indicate are universal expectations about the world's everyday structure, including such basic categories of intuitive ontology (i.e., the ordinary ontology of the everyday world that is built into the language learner's semantic system) as person, animal, plant, and substance (Atran 1989). They are generally inconsistent with fact-based knowledge, though not randomly. Beliefs about invisible creatures who transform themselves at will or who perceive events that are distant in time or space flatly contradict factual assumptions about physical, biological, and psychological phenomena (Atran & Sperber 1991). Consequently, these beliefs more likely will be retained and transmitted in a population than random departures from common sense, and thus become part of the group's culture. Insofar as category violations shake basic notions of ontology, they are attention-arresting, hence memorable. But only if the resultant impossible worlds remain bridged to the everyday world can information be stored, evoked, and transmitted.

As a result, religious concepts need little in the way of overt cultural representation or instruction to be learned and transmitted. A few fragmentary narrative descriptions or episodes suffice to mobilize an enormously rich network of implicit background beliefs (Boyer 1994). For instance, if God is explicitly described as being jealous and able to move mountains, He is therefore implicitly known to have other emotions, such as anger and joy, and other powers, such as the ability to see and touch mountains or to lift and sight most anything smaller than a mountain, such as a person, pot, pig, or pea.

Invocation of supernatural agents implicates two cognitive aspects of religious belief: (1) activation of naturally selected conceptual modules, and (2) failed assignment to universal categories of ordinary ontology. Conceptual modules are activated by stimuli that fall into a few intuitive knowledge domains, including: folkmechanics (object boundaries and movements), folkbiology (species configurations and relationships), and folkpsychology (interactive and goal-directed behavior). Ordinary ontological categories are generated by further, more specific activation of conceptual modules. Among the universal categories of ordinary ontology are: person, animal, plant, substance.13

To give an example, sudden movement of an object stirred by the wind may trigger the agent-detection system that operates over the domain of folkpsychology, and a ghost may be invoked to interpret this possibly purposeful event. In normal circumstances, a sudden movement of wind might activate cognitive processing for agents, but would soon deactivate upon further analysis ("it's only the wind"). But in the case of (bodiless) supernatural agents, the object-boundary detectors that operate over the domain of folkmechanics, and which are required to identify the agent, cannot be activated. The same cognitive conditions operate when supernatural beings and events, like ghosts or gods, are evoked in religious ceremonies, whether or not there is any actual triggering event (e.g., a sudden movement of unknown origin or other uncertain happening). In such cases, assignment to the person or animal category cannot be completed because ghosts and gods have
counterintuitive properties (e.g., movements and emotions without physical bodies). This results in a potentially endless, open-textured evocation of possible meanings and inferences to interpret the event. However, the process can be provisionally stopped, and the semantic content somewhat specified, in a given context (e.g., a Sunday sermon that fixes interpretation of a Biblical passage on some particular community event in the preceding week).

Ordinary ontological categories always involve more specific processing over the folkmechanics domain (nonliving objects and events).

Only substance involves further processing that is exclusive to folkmechanics.

Plant involves additional processing over the folkbiological domain (every organism is assigned to one and only one folk species).

Animal involves supplemental processing over the domains of folkbiology (every animal is assigned uniquely to a folk species) as well as folkpsychology (animal behavior is scrutinized as indicating predator or prey, and possibly friend or foe).

Person involves more specific processing over the folkpsychological domain (human behavior is scrutinized as indicating friend or foe, and possibly predator or prey) and the folkbiological domain (essentialized group assignments, like race and ethnicity).

The relationship between conceptual modules and ontological categories is represented as a matrix in Table 1. Changing the intuitive relationship expressed in any cell generates what Boyer (2000) calls a “minimal counterintuition” (cf. Barrett 2000). For example, switching the cell (folkpsychology, substance) to (folkpsychology, person) yields a thinking talisman, whereas switching (+ folkpsychology, person) to (folkpsychology, person) yields an unthinking zombie.

These are general, but not exclusive, conditions on supernatural beings and events. Intervening perceptual, contextual or psycho-theretic factors, however, can change the odds. Thus, certain natural substances—mountains, seas, clouds, sun, moon, planets—are associated with perceptions of great size or distance, and with conceptions of grandeur and continuous or recurring duration. They are, as Freud surmised, psychologically privileged objects for grandeur and continuous or recurring duration. They are, by association, counterintuitively large or far away. This advantage, even if small at the start, accumulates from generation to generation of transmission leading to massive differences in cultural survival at the end.

4. Cultural survival: A memory experiment

Many factors are important in determining the extent to which ideas achieve a cultural level of distribution. Some are ecological, including the rate of prior exposure to an idea in a population; physical, as well as social, facilitators and barriers to communication and imitation; and institutional structures that reinforce or suppress an idea. Other factors are psychological, including the cognitive and emotional ease with which an idea can be accommodated, represented, and remembered; the intrinsic interest that it evokes in people so that it is processed and rehearsed; and motivation and facility to communicate the idea to others.

One complex of psychological factors concerns the apparent sensitivity to religious ideas in young children. Studies of American and European children indicate that most children through grade 1 (ages 6–7) think that God is present everywhere, can hear prayers and see everything, and is near when one feels troubled or happy. This lends credence to the Jesuits’ mantra of “Give me a child till the age of seven and I’ll give you a Believer for life.” Sentiments about God’s pervasiveness in life seem to degrade with age unless institutionally supported, and God’s presence and guidance become associated more with danger and difficulties (Goldman 1964; Tamminen 1994; Thun 1963).

Of all cognitive factors, however, mnemonic power may be the single most important one at any age (Sperber 1986). In oral traditions that characterize most of human cultures throughout history, an idea that is not memorable cannot be transmitted and cannot achieve cultural success (Rubin 1995). Moreover, even if two ideas pass a minimal test of memorability, a more memorable idea has a transmission advantage over a less memorable one (all else being equal). This advantage, even if small at the start, accumulates from generation to generation of transmission leading to massive differences in cultural success at the end.

One of the earliest accounts of the effects of memorability on transmission of natural and nonnatural concepts was
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Bartlett's (1932) study of how British university students remembered and then transmitted a culturally unfamiliar story (a Native American folk tale). Over successive retellings of the story, some culturally unfamiliar items or events were dropped. Other unfamiliar items were distorted, being replaced by more familiar items (e.g., a canoe replaced by a rowboat). Bartlett reasoned that items inconsistent with students’ cultural expectations were harder to represent and recall, hence less likely to be transmitted than items consistent with expectations.

Recent studies, however, suggest that under some conditions counterintuitive beliefs are better recalled relative to intuitive beliefs (Boyer & Ramble 2001). Barrett and Nyhof (2001) asked people to remember and retell Native American folk tales containing natural as well as nonnatural events or objects. Content analysis showed that participants remembered 92% of minimally counterintuitive items, but only 71% of intuitive items.14

Although suggestive, these studies leave several issues unresolved. For one: Why don’t minimally counterintuitive concepts occupy most of the narrative structure of religious, folktales, and myths? Even casual perusal of culturally successful materials, like the Bible, Hindu Veda, or Maya Popul Vuh, suggests that counterintuitive concepts and occurrences are a minority. The Bible is a succession of mundane events – walking, eating, sleeping, dreaming, copulating, dying, marrying, fighting, suffering storms and drought, and so on – interspersed with a few counterintuitive occurrences, such as miracles and appearances of supernatural agents like God, angels, and ghosts.

An answer to this puzzle may lie in examining memorability for an entire set of beliefs taken as a single unit of transmission, rather than individual beliefs. Accordingly, we conducted a study to examine the memorability of intuitive (INT) and minimally counterintuitive (MCI) beliefs and belief sets over a period of a week (see Table 2 for examples). One group of 44 U.S. students rated these beliefs on degree of supernaturality using a 6-point Likert scale. Counterintuitive ideas were viewed as more supernatural than intuitive ones. F(45) = 14.93, p < .001 (M = 2.51 vs. M = 4.62). Another group of U.S. students recalled these items over time. INT beliefs showed better recall rates than MCI beliefs, both immediately (Fig. 1) and after a one-week delay (Fig. 2). F(4,104) = 9.51, p < .001. Because the two kinds of beliefs were matched (each term was equally likely to occur in an intuitive and counterintuitive belief), the intuitiveness factor, not other unknown factors left to vary, contributed to the recall advantage of the intuitives (Norenzayan & Atran 2004; Norenzayan, Atran, Faulkner, & Schaller, under review).

We replicated this finding with a different set of ideas, where a sharper distinction was made between counterintuitive ideas and ideas that are intuitive but bizarre, and between degrees of counterintuitiveness. A group of 107 U.S. participants from another university received ideas that were (1) intuitive and ordinary (INT), (2) intuitive but bizarre (BIZ), (3) minimally counterintuitive (MCI), and (4) maximally counterintuitive (MXCI). Two-word or three-word statements that represented INT, BIZ, MCI, MXCI-Control, and MXCI beliefs were generated (Table 2). Each statement consisted of a concept and one or two properties that modified it. INT statements were created by using a property that was appropriate to the ontological category (e.g., closing door). BIZ statements were created by modifying the concept with an intuitive but bizarre property (e.g., blinking newspaper). MCI statements were created by modifying with a property transferred from another ontological category (e.g., thirsty door). Finally, MXCI statements were created by modifying a concept with two properties taken from another ontological category (e.g., squinting wilting brick). For each MXCI statement, a matching statement was generated, only one of the properties being counterintuitive (e.g., chattering climbing pig). Participants received one of two different versions. Intuitive ideas (INT) had the highest recall; maximally counterintuitive ideas (MXCI), the lowest (Fig. 3). Most distortions occurred within the same ontological category (39 items, or 55%), the majority being within the minimally counterintuitive (MCI) category (23 items = 59% of all same-category distortions). For example, “curious horse” was remembered as “laughing horse” (both MCI). For distortions that crossed ontological boundaries, the most common was from counterintuitive to intuitive (14 distortions = 20%). The least common distortion was from intuitive to counterintuitive: Only one such distortion was found (1.4%). Results for distorted items, with a preference for rendering counterintuitive beliefs intuitive, follows the main lines of Bartlett’s (1932) study.

One finding that converges with previous studies was that minimally counterintuitive beliefs degraded at a lower
rate after immediate recall. Minimally counterintuitive beliefs may have a potent survival advantage over intuitive beliefs: once processed and recalled, they degrade less than intuitive ones. Disadvantage in recall may be offset by resilience, so that over generations of transmission, an idea that is less remembered, but also less degradable, may prevail over an idea that is initially remembered well but eventually dies out because of a higher rate of degradation.

As to belief sets, the one that was mostly intuitive, combined with a few minimally counterintuitive ones, had the highest rate of delayed recall and the lowest rate of memory degradation over time (Fig. 4).15 This is the recipe for a successful transmission of cultural beliefs, and it is the cognitive template that characterizes most popular folktales and religious narratives. Critically, the belief set with a majority of minimally counterintuitive beliefs had the lowest rate of delayed recall and highest level of memory degradation. In fact, this is a cognitive template rarely encountered in existing culturally successful materials. Thus, the way natural and non-natural beliefs are combined is crucial to the survival of a cultural ensemble of beliefs, such as those that form the core of any religious tradition.

With Yukatek Maya speakers we found the same recall pattern as in the U.S. follow-up. Also, minimally counterintuitive beliefs were again more resilient than intuitive ones, confirming the U.S. pattern. Finally, we found no reliable differences between the Yukatek recall pattern after one week and after three months (Fig. 5). These results indicate cultural stabilization of that pattern.

In sum, minimally counterintuitive beliefs, as long as they come in small proportions, help people remember and

Table 2. Examples of intuitive statements (INT) and bizarre (BIZ), and minimally counterintuitive (MCI) and maximally counterintuitive (MXCI) counterparts in counterbalanced design

<table>
<thead>
<tr>
<th>Version 1</th>
<th>Version 2</th>
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<tbody>
<tr>
<td>INT</td>
<td>INT</td>
</tr>
<tr>
<td>1. Crumbling Ice</td>
<td>1. Crystallizing Ice</td>
</tr>
<tr>
<td>2. Crystallizing Glass</td>
<td>2. Crumbling Glass</td>
</tr>
<tr>
<td>5. Grazing Cow</td>
<td>5. Wandering Cow</td>
</tr>
<tr>
<td>BIZ</td>
<td>BIZ</td>
</tr>
<tr>
<td>7. Nauseating Cat</td>
<td>7. Dangling Cat</td>
</tr>
<tr>
<td>8. Dangling Squirrel</td>
<td>8. Nauseating Squirrel</td>
</tr>
<tr>
<td>MCI</td>
<td>MCI</td>
</tr>
<tr>
<td>12. Sobbing Oak</td>
<td>12. Giggling Oak</td>
</tr>
<tr>
<td>13. Cursing Horse</td>
<td>13. Admiring Horse</td>
</tr>
<tr>
<td>15. Solidifying Lady</td>
<td>15. Melting Lady</td>
</tr>
<tr>
<td>MXCI-Control</td>
<td>MXCI-Control</td>
</tr>
<tr>
<td>17. Cheering Limping Turtle</td>
<td>17. Chattering Climbing Turtle</td>
</tr>
<tr>
<td>18. Chattering Climbing Pig</td>
<td>18. Cheering Limping Pig</td>
</tr>
<tr>
<td>MXCI</td>
<td>MXCI</td>
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presumably transmit the intuitive statements. A small proportion of minimally counterintuitive beliefs gives the story a mnemonic advantage over stories with no counterintuitive beliefs or with far too many counterintuitive beliefs, just as moderately spiced-up dishes have a cultural advantage over bland or far too spicy dishes. This dual aspect of supernatural beliefs and belief sets – commonsensical and counterintuitive – renders them intuitively compelling yet fantastic, eminently recognizable but surprising. Such beliefs grab attention, activate intuition, and mobilize inference in ways that greatly facilitate their mnemonic retention, social transmission, cultural selection, and historical survival.

5. Metarepresenting counterintuitive worlds: A Theory of Mind experiment

Thus far we have claimed that the presence of minimally counterintuitive beliefs in religious belief sets favors the production, transmission, and cultural survival of those belief sets over time. We have also provided initial experimental support for the claim, although clearly much more needs to be done. This claim leaves open the issue of how counterintuitive beliefs can be formed at all. If counterintuitive beliefs arise by violating innately given expectations about how the world is built, how can we possibly bypass our own hardwired concepts to form counterintuitive religious beliefs? The answer is that we don’t entirely bypass commonsense understanding but conceptually parasitize it to transcend it. This occurs through the species-specific cognitive process of metarepresentation.

Humans have a metarepresentational ability, that is, they form representations of representations. This ability allows people to understand a drawing or picture of someone or something as a drawing or picture and not the real thing. It lets us enjoy novels and movies as fiction that can emotionally arouse us without actually threatening us. It lets us think about being in different situations and deciding which are best for the purposes at hand, without our having to actually live through (or die in) the situations we imagine. It affords us the capacity to model the world in different ways, and to conscientiously change the world by entertaining new models that we invent, evaluate, and implement. It enables us to become aware of our experienced past and imagined future as past or future events that are distinct from the present that we represent to ourselves, and so permits us to reflect on our own existence. It allows people to comprehend and interact with one another’s minds.

Equally important for our purposes, metarepresentation allows humans to retain half-understood ideas (Atran & Sperber 1991; Sperber 1985). By embedding half-baked (quasi-propositional) ideas in other factual and commonsense beliefs, these ideas can simmer through personal and cultural belief systems and change them. Children come to terms with the world in similar ways when they hear a new word. A half-understood word is initially retained metarepresentationally, as standing in for other ideas the child already has in mind. Initially, the new word is assigned an ontological category. For example, if “andro chases balls,” then andro must be an animal or person, like Fido or Fred.

After Dennett (1975), most researchers in folkpsychology, or “theory of mind” (ToM), maintain that attribution of mental states, such as belief and desire, to other persons requires metarepresentational reasoning about false beliefs. Only when the child can understand that other people’s beliefs are only representations – not just recordings of the way things are – can the child entertain and assess other people’s representations as veridical or fictional, truly informative or deceptive, exact or exaggerated, worth changing one’s own mind for or ignoring. Only then can the child appreciate that God thinks differently from most people, in that only God’s beliefs are always true.

In one of the few studies to replicate findings on ToM in a small-scale society (cf. Avis & Harris 1991), Knight et al. (2004) showed 48 Yukatek-speaking children (26 boys, 22 girls) a tortilla container and told them, “Usually tortillas are inside this box, but I ate them and put these shorts inside.” They asked each child in random order what a person, God, the sun (k’in), principal forest spirits (yumil k’ax’ob’, “Masters of the Forest”), and other minor spirits (chiichi’) would think was in the box. As with American children (Barrett et al. 2001), the youngest Yukatek (4 years) overwhelmingly attributed true beliefs to both God and people in equal measure. After age 5, the children attributed mostly false beliefs to people but attributed mostly true beliefs to God (Fig. 6). Thus, 33% of the 4-year-olds said that people would think tortillas were in the container versus 77% of 7-year-olds. In contrast, no significant correlation was detected between answers for God and age, r(46) = .06.

Collapsing over ages, Yukatek children attributed true beliefs according to a hierarchy of human and divine minds, one in which humans and minor spirits are seen as easier to deceive. Mental states of humans were perceived as different from those of God (Z = 3.357, p = .001) and those of Masters of the Forest and the Sun Deity (Z = 1.89, p = .06 for both). God was seen as all-knowing, and local religious entities were somewhere in between (Fig. 7).

In a follow-up with 7 female and 7 male Itza’ Maya adults in Guatemala’s Peten rainforest, all (but one man) responded that God had a true belief because, as several respondents stated, “He can see through the basket as if it were transparent.” All (save the same man) thought a person coming upon the basket would have a false belief about its contents. Six men and four women thought the forest spirits (arux) would know the basket’s true contents. Overall (for men as well as women), mental states of humans...
were perceived as different from those of God \( (Z = 3.307, p = .001) \) and forest spirits \( (Z = 3.000, p = .003) \), but God and forest spirits were not significantly different from one another. For Itza’ adults (but significantly more so for men who venture into the forest than women who generally do not) beliefs in forest spirits have measurable behavioral consequences for biodiversity, forest sustainability, and so forth (Atran et al. 2002). In brief, from an early age people may reliably attribute to supernaturals cognitions that they believe are different and truer than those attributed to humans.

6. From false belief to costly commitment

In this section, we argue that the human metarepresentational ability to deceive and defect has been managed by communicative displays of passionate commitment to omniscient supernatural agents, who unlike humans do not succumb to false beliefs and thus can act as guarantors for future in-group cooperation. Expression of religious prescriptions performatively signals and establishes cognitive and emotional commitment to seek convergence, but it doesn’t specify (the propositional content of) what people should converge to. The truth about religious prescriptions is accepted on faith and communicated through ritual display, not discovered or described as a set of factual or logical propositions. The result of such convergence is to perpetuate a stable community of cooperators who sacrifice for the group in the short run, but benefit from it in the long run.

One plausible evolutionary story is that understanding agency, together with metarepresenting false belief and deceit, emerged as a later development of intentional communicative displays that signaled possibilities for hominids to cooperate (or deceive) in a wide variety of situations (Leslie & Frith 1987). Autistic children, who selectively fail at false belief tasks, seem to miss intentional communicative display. Although they can often imitate a gesture, and so represent it, they can’t go beyond this primary representation to infer that the gesture stands for something else.

Thus, unlike non-autistic 1-year-olds (Baron-Cohen 1995; Masur 1983), older autistic children can’t signal communicative intent by pointing (as only humans can; see Premack & Woodruff 1978; Povinelli 2000). They can’t metarepresent the relation intentionally communicate, between a person as an agent (mother), a stimulus situation (upturned palm oriented towards a vase of flowers), and an inferred situation (child giving flowers to mother). Neither, apparently, can they entertain counterfactual beliefs. This can be particularly striking in children suffering from Asperger’s Syndrome, a high-functioning form of autism.17

Religious acts of faith incorporate universal, metarepresentational features of pragmatic communication, including: pretend (that \( p \) and promise (to do \( p \)). These are social acts common to all normally interacting human agents. A principal difference between religious and nonreligious employments of these behaviors is that the situation that is represented \( (p) \) in a religious act is not a state of affairs by which the truth, adequacy, or accurateness of the representation is evaluated. Rather, a religious representation (statement or other display) is always right, and the situation to which it is properly applied is made to conform to what is conventionally stipulated to be the case.

In pretense, a person believes that \( [p \text{ is false}] \) because \( not-p \) is demonstrably or verifiably the case. In faith, a person believes that \( [p \text{ is true}] \) because \( p \) is the Word of God, and because God always speaks the truth. Faith, like pretense, necessarily involves metarepresentation, namely, the representation in the brackets, where \( p \) is metarepresented. In pretense, though, \( p \)’s content is well understood, and the state of affairs it represents is assessable by observation for truth or falsity (e.g., \( p = \text{‘this banana is a telephone’} \)). In faith, \( p \) is not well understood, and the supposed state of affairs it represents cannot be assessable by observation (e.g., \( p = \text{‘this wine is Christ’s blood’} \) (Sperber 1975b; cf. Ayer 1950 on religious ‘pseudo-propositions’). Nonetheless, because the word of God is always true, religious believers are not concerned with whether \( p \) is true or not, but with what \( p \), which is true, could possibly mean (connote) for them in each situation.

As with pretense, religious acts of faith involve exaggerated gestures that are intended to connote a situation that goes beyond the one perceptually manifest. For example, the act of receiving the host during Mass is an extraordinary eating display, where people are typically fed on their knees with no chewing of the wafer allowed. It is obvious to everyone that the intended goal of the display is not eating, but communion (Rappaport 1999). The meaning of an act of faith like communion is not an inference to specific propositions, but to an emotionally charged network of partial and changeable descriptions of counterfactual and counterintuitive worlds.

In sum, human metarepresentational abilities, which are intimately bound to fully developed cognitions of agency and intention, also allow people to entertain, recognize, and evaluate the differences between true and false beliefs. Given the ever-present menace of enemies within and without, concealment, deception, and the ability to both generate and recognize false beliefs in others would favor survival. But because human representations of agency and intention include representations of false belief and deception, human society is forever under threat of moral defection.

If some better ideology is likely to be available some-
A mother and her son are leaving home in the morning. A mother and her son are leaving home in the morning. A mother and her son are leaving home in the morning.

2 She is taking him to visit his father's workplace. She is taking him to visit his father's workplace. She is taking him to visit his father's workplace.

3 The father is a laboratory technician at Victory Memorial Hospital. The father is a laboratory technician at Victory Memorial Hospital. The father is a laboratory technician at Victory Memorial Hospital.

4 They check before crossing a busy road. They check before crossing a busy road. They check before crossing a busy road.

5 While walking along, the boy sees some wrecked cars in a junk yard, which he finds interesting. While crossing the road, the boy is caught in a terrible accident, which critically injures him. While walking along, the boy sees a well-dressed man stop by a homeless woman, and self-conscious interest. Especially in times of vulnerability and stress, social deception and defection in the pursuit of self-preservation is therefore more likely to occur, as Ibn Khaldun recognized centuries ago (Ibn Khaldun 1318/1958, II, iii, p. 41). Religion passionately rouses hearts and minds to break out of this viciously rational cycle of self-interest and to adopt group interests that may benefit individuals in the long run. Commitment to the supernatural underpins the "organic solidarity" (Durkheim 1912/1995) that makes social life more than simply a contract among calculating individuals. Commitment to the supernatural is further sustained by the relieving of pervasive existential anxieties, to which we now turn.

7. Existential anxiety: A motivation experiment

If supernatural agents are cognitively salient and possess omniscient and omnipotent powers, then they can be invoked to ease existential anxieties such as death and deception that forever threaten human life everywhere. This section summarizes an experiment (Norenzayan & Hansen, under revision), linking adrenaline-activating death scenes to increased belief in God's existence and the efficacy of su-

<table>
<thead>
<tr>
<th>Neutral</th>
<th>Death</th>
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<tr>
<td>1 A mother and her son are leaving home in the morning.</td>
<td>A mother and her son are leaving home in the morning.</td>
<td>A mother and her son are leaving home in the morning.</td>
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| 5 While walking along, the boy sees some wrecked cars in a junk yard, which he finds interesting. | While crossing the road, the boy is caught in a terrible accident, which critically injures him. | While walking along, the boy sees a well-dressed man stop by a homeless woman, and self-conscious interest. Especially in times of vulnerability and stress, social deception and defection in the pursuit of self-preservation is therefore more likely to occur, as Ibn Khaldun recognized centuries ago (Ibn Khaldun 1318/1958, II, iii, p. 41). Religion passionately rouses hearts and minds to break out of this viciously rational cycle of self-interest and to adopt group interests that may benefit individuals in the long run. Commitment to the supernatural underpins the "organic solidarity" (Durkheim 1912/1995) that makes social life more than simply a contract among calculating individuals. Commitment to the supernatural is further sustained by the relieving of pervasive existential anxieties, to which we now turn.
| 6 At the hospital, the staff are preparing for a practice disaster drill, which the boy will watch. | At the hospital, the staff prepares the emergency room, to which the boy is rushed. | At the hospital, the boy's father shows him around his lab. The boy listens politely, but his thoughts are elsewhere. |
| 7 An image from a brain scan machine used in the drill attracts the boy's interest. | An image from a brain scan machine used in a trauma situation shows severe bleeding in the boy's brain. | An image from a brain scan that he sees reminds him of something in the homeless woman's face. |
| 8 All morning long, a surgical team practices the disaster drill procedures. | All morning long, a surgical team struggles to save the boy's life. | On his way around the hospital, the boy glances into the hospital's chapel, where he sees the well-dressed man sitting alone. |
| 9 Make-up artists are able to create realistic-looking injuries on actors for the drill. | Specialized surgeons are able to reattach the boy's severed feet, but cannot stop his internal hemorrhaging. | With elbows on his knees, and his head in his hands, the man moves his lips silently. The boy wants to sit beside him, but his father leads him away. |
| 10 After the drill, while the father watches the boy, the mother leaves to phone her other child's preschool. | After the surgery, while the father stays by the dead boy, the mother leaves to phone her other child's preschool. | After a brief tour of the hospital, while the father watches the boy, the mother leaves to phone her other child's preschool. |
| 11 Running a little late, she phones the preschool to tell them she will soon pick up her child. | Barely able to talk, she phones the preschool to tell them she will soon pick up her child. | Running a little late, she phones the preschool to tell them she will soon pick up her child. |
| 12 Heading to pick up her child, she hails a taxi at the number nine bus stop. | Heading to pick up her child, she hails a taxi at the number nine bus stop. | Heading to pick up her child, she hails a taxi at the number nine bus stop. |
pernatural intervention in human affairs. The experiment is also aimed at commitment theories of religion that neglect special attention to the supernatural.

Our experiment builds on a study by Cahill and colleagues dealing with the effects of adrenaline (adrenergic activation) on memory (Cahill et al. 1994). They showed college students a series of slides and a storyline about a boy riding a bike. Some subjects were exposed to an uneventful story: The boy rides his bike home, and he and his mother drive to the hospital to pick up his father (who is a doctor). For the other participants, the story begins and ends in much the same way, but the middle is very different: The boy is hit by a car and rushed to the hospital’s emergency room, where a brain scan shows severe bleeding from the boy’s brain and specialized surgeons struggle to reattach the boy’s severed feet. After exposure to the stories, and before being tested for recall, half the subjects were given either a placebo pill or a drug (propranolol) that blocks the effects of adrenaline. The placebo and drug groups recalled the uneventful story equally well. Only the placebo group, however, remembered the emotional story more accurately than the uneventful one.

Our hypothesis was that existential anxieties (particularly about death) not only deeply affect how people remember events but also their propensity to interpret events in terms of supernatural agency. We primed each of three groups of college students with one of three different stories (Table 3): Cahill et al.’s uneventful story (neutral prime), Cahill et al.’s stressful story (death prime), and another uneventful story whose event-structure matched the other two stories but which included a prayer scene (religious prime). Afterwards, each group of subjects read a New York Times article (2nd October 2001) whose lead ran: “Researchers at Columbia University, expressing surprise at their own findings, are reporting that women at an in vitro fertilization clinic in Korea had a higher pregnancy rate when, unknown to the patients, total strangers were asked to pray for their success.” The article was given under the guise of a story about “media portrayals of scientific studies.” Finally, students rated strength of their belief in God and the power of supernatural intervention (prayer) on a 9-point scale.

Results show that strength of belief in God’s existence (Fig. 8), and in the efficacy of supernatural intervention (Fig. 9), are reliably stronger after exposure to the death prime than after the neutral and religious primes, $F(1, 74) = 7.44, p < .01$, and $F(1, 74) = 3.85, p = .05$, respectively (no significant differences between either uneventful story). This effect held even after controlling for religious background and prior degree of religious identification.

Terror Management Theory (TMT) maintains that cultural worldview is a principal buffer against the terror of death. Accordingly, TMT experiments show that thoughts of death induce people to reinforce their cultural (including religious) worldview and derogate alien worldviews (Greenberg et al. 1990; Pyszczynski et al. 1999). According to the worldview-defense hypothesis, then, awareness of death should enhance belief in a culturally familiar deity, but diminish belief in a culturally unfamiliar deity. Our view suggests that the need for belief in supernatural agency is possibly a qualitatively distinct buffer against the terror of death that overrides worldview defense needs.

To test this idea, in a follow-up, 73 American undergraduates were told that the prayer groups were Buddhists in Taiwan, Korea, and Japan. Supernatural belief was measured either shortly after the primes, or after a significant delay between the primes and the belief measures. When the primes were recently activated, as expected there was a stronger belief in the power of Buddhist prayer in the death prime than in the control prime, $F(1, 33) = 6.65, p = .01$. Remarkably, the mostly Christian death-primed subjects who previously self-identified as strong believers in their religion were more likely to believe in the power of Buddhist prayer, $r(16) = .68, p < .01$. In the neutral (control) condition, there was no correlation between religious identification and belief in Buddhist prayer among a similar group of mostly Christian subjects. Given a choice between supernatural belief versus rejecting an alien worldview (Buddhism), Christians chose the former. This finding is difficult to explain in terms of cultural worldview bolstering, but it possibly reflects a strong belief in immortality as a buffer against death, as articulated in TMT (Solomon et al. 1991).

In a cross-cultural extension, 75 Yukatek-speaking Maya villagers were tested, using stories matched for event structure but modified to fit Maya cultural circumstances. They were also asked to recall the priming events. We found no differences among primes for belief in the existence of God and spirits (near ceiling in this very religious society). However, subjects’ belief in the efficacy of prayer for invoking the deities was significantly greater with the death prime than with religious or neutral primes, $\chi^2(2, N = 75) = 10.68, p = .005$. Awareness of death more strongly motivates religiosity than mere exposure to emotionally non-stressful religious scenes, like praying. This supports the claim that emotionally eruptive existential anxieties motivate supernatural beliefs.
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We found no evidence for differences in recall of priming events after subjects rated their strength of belief in God and the efficacy of supernatural intervention. With this in mind, note that uncontrollable arousal mediated by adrenergic activation (e.g., subjects chronically exposed to death scenes) can lead to posttraumatic stress syndrome if there is no lessening of terror and arousal within hours; however, adrenergic blockers (e.g., propranolol, guanfacine, possibly antidepressants) can interrupt neuronal imprinting for long-term symptoms, as can cognitive-behavioral therapy (work by Charles Marmar discussed in McReady 1999, p. 9). Heightened expression of religiosity following exposure to death scenes that provoke existential anxieties may also serve this blocking function (Atran 2002b). We plan to test the further claim that existential anxieties not only spur supernatural belief, but that these beliefs are in turn affectively validated by assuaging the very emotions that motivate belief in the supernatural.

All of this isn’t to say that the function of religion is to promise resolution of all outstanding existential anxieties any more than the function of religion is to neutralize moral relativity and establish social order, to give meaning to an otherwise arbitrary existence, to explain the unobservable origins of things, and so forth. Religion has no evolutionary function per se. It is rather that existential anxieties and moral sentiments constitute – by virtue of evolution – ineluctable elements of the human condition; and that the cognitive invention, cultural selection, and historical survival of religious beliefs have resulted, in part, from success in accommodating these elements. There are other factors in this success, involving naturally selected elements of human cognition, such as the inherent susceptibility of religious beliefs to modularized (innate and universal) conceptual and mnemonic processing.

8. Conclusion: Evolution’s canalizing landscape

Think metaphorically of humankind’s evolutionary history as a landscape formed by different mountain ridges. This landscape functions everywhere to canalize, but not determine, individual and cultural development. It greatly reduces the possible sources of religious expression into structures that constantly reappear across history and societies.

This landscape is shaped by natural selection. It is ancestrally defined by specific sets of affective, social, and cognitive features – different mountain ridges. Each ridge has a distinct contour, with various peaks whose heights reflect evolutionary time. One such evolutionary ridge encompasses panhuman emotional faculties, or “affect programs.” Some of these affect programs, such as surprise and fear, date at least to the emergence of reptiles. Others, such as grief and guilt, may be unique to humans. Another ridge includes social-interaction schema. Some schema may go far back in evolutionary time, such as those involved in detecting predators and seeking protectors, or which govern direct “tit-for-tat” reciprocity (“you scratch my back, I’ll scratch yours”). Other social-interaction schema seem unique to humans, such as committing to nonkin. Still another ridge encompasses panhuman mental faculties, or cognitive modules, like folkmechanics, folkbiology, folkpsychology. Folkmechanics is this ridge’s oldest part, with links to amphibian brains. Folkpsychology is the newest, foreshadowed among apes. Only humans appear to metarepresent multiple models of other minds and worlds (Tomasello et al. 1993), including the supernatural.

Human experience lies along this evolutionary landscape, usually converging on more or less the same life paths – much as rain that falls anywhere in a mountain-valley landscape, drains into a limited set of lakes or rivers (Kauffman 1993; Sperber 1996). As humans randomly interact and “walk” through this landscape, they naturally tend towards certain forms of cultural life, including religious paths. Cultures and religions don’t exist apart from the individual minds that constitute them and the environments that constrain them, any more than a physical path exists apart from the organisms that tread and groove it and the surrounding ecology that restricts its location and course. Individual minds mutually interact within this converging landscape in an open-ended time horizon, exploiting its features in distinctive ways. The result is socially transmitted amalgamations that distinctively link landscape features with cognitive, affective, and interactional propensities. This produces the religious and cultural diversity we see in the world and throughout human history.

Nevertheless, all religions follow the same structural contours. They invoke supernatural agents to deal with emotionally eruptive existential anxieties, such as loneliness, calamity, and death. They have malevolent and predatory deities as well as more benevolent and protective ones. These systematically, but minimally, violate modularized expectations about folkmechanics, folkbiology, and folkpsychology. And religions communally validate counterintuitive beliefs through musical rituals and other rhythmic coordinations of affective body states. Finally, these landscape features are mutually constraining. They include evolved constraints on emotional feelings and displays, modularized conceptual and mnemonic processing, and social commitments that attend to information about cooperators, protectors, predators, and prey.

NOTES

1. We make no conceptual distinction between “culture” and “society” or “mind” and “brain.”
2. This framework is also informed by the first author’s (Atran’s) ethnographic sojourns among Lowland Maya (Mesoamerica), Druze mountaineers (Middle East), Fiyashm nomads (Central Asia), Tamil Hindu farmers (South India), and Ladakhi Buddhist tanshumants (Himalaya), and by the second author’s (Norenzayan’s) familiarity with the religious civil wars of Lebanon (1975–1991).
3. Evolutionarily, at least some basic emotions preceded conceptual reasoning: surprise, fear, anger, disgust, joy, sadness (Darwin 1872/1965; Ekman 1992). These may have further evolved to incite reason to make inferences about situations relevant to survival decisions. Existential anxieties are by-products of evolved emotions, such as fear and the will to stay alive, and of evolved cognitive capacities, such as episodic memory and the ability to track the self and others over time. For example, because humans are able to metarepresent their own selves and mentally travel in time (Wheeler et al. 1997), they cannot avoid overwhelming inductive evidence predicting their own death and that of persons to whom they are emotionally tied, such as relatives, friends, and leaders. Emotions compel such inductions and make them salient and terrifying. This is “The Tragedy of Cognition.” All religions propose a supernatural resolution in some minimally counterfactual afterlife.
4. Although the Buddha and the buddhas are not regarded as gods, Buddhists clearly conceive of them as “counter-intuitive agents” (Pyysiäinen 2003). The Chinese Buddhist Pantheon in-
5. Experiments with adults in the United States (Barrett & Keil 1996) and India (Barrett 1998) further illustrate the gap between theological doctrine and actual psychological processing of religious concepts. When asked to describe their deities, subjects in both cultures produced abstract and consensual theological descriptions that map poorly onto their actual domain. A parrot trained to respond to stimuli known to be semantically meaningful for the Buddha and the buddhas

6. One distinction between fantasy and religion is knowledge of its source. People know or assume that public fictions (novels, movies, cartoons, etc.) were created by specific people who had particular intentions for doing so. Religious believers assume that utterances or texts connected with religious doctrines are anchored in the speaker's true intentions or check on whether God is lying or lacking information (Sperber & Wilson 1986).

7. As Dan Sperber (1996) asked in an open communication to the Evolution and Human Behavior Society: "Is fitness a matter of what is involved with ancestral task demands. Like clouds and wind, moving dots on a screen do not belong to its proper domain because they could not have been involved with ancestral task demands. Like clouds and wind, moving dots on computer screens belong to its actual domain. A parallel example is food-catching behavior in frogs. When a flying insect moves across the frog's field of vision, bug-detector cells are activated in the frog's brain. Once activated, these cells in turn massively fire others in a chain reaction that usually results in the frog shouting out its tongue to catch the insect. The bug-detector

8. For each natural domain, there is a proper domain and (possibly empty) actual domain (Sperber 1994). A proper domain is in-formed by cognitive and communicative modules that condition to process. The actual domain of a module is any information in the organism's environment that satisfies the module's input conditions whether or not the information is functionally relevant to ancestral task demands - that is, whether or not it also belongs to its proper domain. For example, cloud formations and unexpected noises from inanimate sources (e.g., a sudden, howling gush of wind) readily trigger inferences to agency among people everywhere. Although clouds and wind occurred in ancestral environments, they had no functional role in recurrent task problems or texts connected with religious doctrines are anchored in the speaker's true intentions or check on whether God is lying or lack-

9. Psychoanalytic (Freud 1913/1990; Erikson 1963) and attachment (Bowlby 1969; Kirkpatrick 1998) theories hold that primary deities are surrogate parents who assuage existential anxieties. But ethnographic reports indicate that malevolent and predatory deities are as culturally widespread, historically ancient, and socially supreme as benevolent deities. Examples include cannibalistic spirits of small-scale Amazons, sub-Saharan African, and Australian aboriginal societies, as well as bloodthirsty deities of larger-scale civilizations that practiced human sacrifice, such as Moloch of the Ancient Middle East, the death goddess Kali of tribal Hindusth, and the Maya thund armistick. Psychological findings on false-belief tasks (see below) further indicate that beliefs about people are not the basis of beliefs about God because the developmental trajectories of these two belief sets diverge from the outset.

10. Another example from ethology offers a parallel. Many bird species have nests parasitized by other species. Thus, the cuckoo deposits eggs in passerine nests, tricking the foster parents into incubating and feeding the cuckoo's young. Nestling European cuckoos often dwarf their host parents (Hamilton & Orians 1965): "The young cuckoo, with its huge gape and loud begging call, has evidently evolved in exaggerated form the stimuli which elicit the feeding response of parent passerine birds..." This, like lipstick in the courtship of mankind, demonstrates successful ex-

11. Aristotle (1963) was the first to point out in his Categories that such counterintuitive expressions cannot even be judged false because no set of truth conditions could ever be definitively associated with them. He gave the example of "two-footed knowledge." According to him, "two-footed" could be sensibly (truly or falsely) applied to all animals but not to any sort of knowledge. This is because knowledge falls under the ontological category of nonsubstantial things, whereas being two-footed falls under the altogether distinct ontological category of substantial things. Trying to put together things from different ontological categories produces a category mistake. For Aristotle, the world that could be prop-

12. Science, like religion, uses metarepresentation in cosmology building: for example, in analogies where a familiar domain (e.g., solar systems, computers, genetic transmission) is used to model some initially less familiar system (e.g., atoms, mind/brain, ideational transmission). In fact, science and religion may use the same analogies; however, there is a difference in these uses. Science aims to reduce the analogy to factual description, where the terms of the analogy are finally specified, with no loose ends remaining and nothing left in the dark: Atoms are scientifically like solar systems if and only both can be ultimately derived from the same set of natural laws. Whereas science seeks to kill the metaphor, religion strives to keep it poetic and endlessly open to further evocation. In religion, these ideas are never fully assimilated with factual and commonsensical beliefs, like a metaphor that metarepresents the earth as a mother but not quite, or an angel as a winged youth but not quite.

13. According to Boyer (1994; 1997; 2000), bodiless supernaturals are counterintuitive because they think and act but lack physical substance. The matter is not so simple. First, experiments with infants and adults indicate that ordinary intuitions about causal agents do not require knowledge or perception of material
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substance, only the expectation (perhaps never actually realized) that there ultimately is a physical source of intentional action (Csibra et al. 1999). Ontological violations block such expectations being realized even in principle (e.g., invisible agents versus heard but unseen beings). They counterpart rules for eventual processing, not actual perception. Second, not all mental states are equally bound to ordinary intuitions about bodies. Recent studies indicate that children from 5 years on up more readily attribute epistemic mental states (see, think, know) to beings in the afterlife than psychobiological mental states (hunger, thirst, sleepiness) (Bering & Bjorklund 2002). Ordinary distinctions between mind and body (e.g., dreaming) thus seem to provide at least some intuitive support for extraordinary beings with disembodied minds (Hobbes 1651/2001).

14. Barrett and Nyhof (2001, p. 79) list as common items: “a being that can see or hear things that are not too far away”; “a species that will die if it doesn’t get enough nourishment or if it is severely damaged”; “an object that is easy to see under normal lighting conditions.” Such items fall so far below ordinary expectations that communication should carry some new or salient information that Barrett and Nyhof (2001, pp. 82–83) report: “common items were remembered so poorly relative to other items.... In some instances of retelling these items, participants tried to make the common property sound exciting or unusual.” In other words, some subjects tried to meet minimum conditions of relevance (Sperber & Wilson 1986). For the most part, common items failed these minimum standards for successful communication.

15. Highest degradation was observed in the mostly MCI and all INT conditions, conforming to an inverse quadratic function, $F(3, 80) = 4.49, p < .05$. Memory degraded least in the Mostly INT condition, and increased as the proportion of MCI beliefs increased, resulting in a linear trend, $F(2, 65) = 3.53, p = .06$.

16. Only additional evidence could show whether children “continue” to think of God in the same way after they become aware of false beliefs (as Barrett et al. 2001 intimate), or (as seems more likely) come to have different reasons for thinking that God was not the creator.

17. To deal with deficits in counterfactual thinking, St. Paul’s Church in Alabama (Trenton Diocese) has a special program for autistics: “The church requires that children who receive Holy Communion be able to recognize the difference between ordinary bread and the Eucharist. . . . The St. Paul’s program was designed to teach the difference” (Rev. Sam Siriani, cited in Raboteau 2000).

Open Peer Commentary

Gods are more flexible than resolutions

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Abstract: The target article proposes that “counterintuitive beliefs in supernatural agents” are shaped by cognitive factors and survive because they foster empathic concern and counteract existential dread. I argue that they are shaped by motivational forces similar to those that shape our beliefs about other people; that empathic concern is rewarded in a more elementary fashion; and that a major function of these supernatural beliefs may be to provide a more flexible alternative to autonomous willpower in controlling not only dread but also many other unwelcome urges.

The useful hypotheses in this article include: (1) that religion is a form of motivated belief, that is, that religious beliefs and their attendant practices survive insofar as they serve a purpose; (2) that a principal purpose of religion is to deter “social deception and defection in the pursuit of self-preservation”; (3) that another principal purpose of religion is to control “emotionally eruptive existential anxieties” (sect. 1, para. 7); and (4) that human experience, and religious experience in particular, converges “on more or less the same ordnaries — much as rain that follows anywhere in a mountain-valley landscape, drains into a limited set of lakes or rivers” (sect. 8, para. 3). The authors present a case for how humans may be innately prepared to construct the supernatural beings that populate most religions, because of people’s “hair-triggered” attribution of agency to ambiguous percepts, the increased memorability of “minimally counterintuitive” ideas, and people’s ability to imagine counterfactual omniscient personae. However, this article presents little about what incentive people have to construct these beings — only some unsatisfying data that subjects value religious ideas more in fear-provoking situations.

I agree that supernatural religion is probably an extension of “emotional mechanisms that evolved for mundane adaptive tasks” (sect. 1, para. 2), and that part of its usefulness is sometimes to control selfishness and emotional eruptions. However, I do not think the authors have specified adequate motivational mechanisms to account for these effects. Part of this problem comes from the inadequacy of how behavioral science has come to imagine self-interest and altruism. Rational self-interest is identified with beating out competitors for resources, and rational altruism merely with taking the long view of this competition so as to identify situations where cooperation will be more profitable, heuristically or genetically, than competition (Dawkins 1999; Frank et al. 1993). Given the human openness to seduction by short-term prospects, altruism is sometimes suggested to require self-control (Rachlin 2002), but the point is still to maximize your own survival resources. The authors are right to reject this “mind-blind functionalism” (sect. 1.5); but the role they give to religious belief remains one of controlling an innate tendency toward selfishness, through belief in vigilant gods.

An adequate theory of altruism needs to explain why people start out as highly empathic children (Harris 1987; Zahn-Waxler et al. 1992), who then learn to a variable extent to control empathy as an impulse. That is, why is there a basic self-interest in cultivating vicarious emotional experience, which is then partially displaced by the more “objective” self-interest of (say) economic man? This area is largely terra incognita. Motivational theory has not examined even non-vicarious emotions as rewards until recently (e.g., Lewis & Haviland-Jones 2000); they are awkward targets for controlled research, and it is hard even to theorize about rewards that require no specific stimulus and have many of the characteristics of behaviors. However, mounting evidence that all reward-responsive organisms discount delayed rewards proportionally to this delay (hyperbolically) rather than at fixed rates (exponentially; Kirby 1997) suggests one mechanism for vicarious emotional reward, based on the innate insensitivity that discounting predicts (Ainslie 1995; 2001, pp. 161–86). I can only summarize it here: Emotions are reward-dependent behaviors that have their own appetites and lead to their own innate rewards, rather than being elicited reflexes. Because of a hyperbolic impatience for their rewards, these behaviors are limited by premature satiation, which causes extinction of deliberately emitted emotions; to stay fresh they must be occasioned by uncontrollable events. Such a contingency makes external occasions for emotion valuable, and these occasions seem especially well paced by the apparent experience of other people. Thus, vicarious reward creates an incentive to help the people whose experiences you choose as occasions for emotion, and to resist temptations to exploit them. The recent discovery of “mirror neurons” that initiate copies of other people’s behaviors (Iacoboni et al. 1999) suggests a reason why vicarious experience may stand out from other available occasions for emotion. Whatever the mechanism, empathic engagement with its sometime result of altruism is apparently a primary motivated process.
We perceive other people’s experiences not piecemeal but through mental models, and we construct models of gods in the same way that we construct models of each other. These models reflect our take on what others are going through, modified by projection, transference, and other distortions. Ordinarily we “believe in” other people (as opposed to how we experience fictional characters) only when we can test our models against observations of them. However, when the models are especially evocative, we may lower our threshold for belief and experience a dead relative, or Elvis, or a god as present. Such extra occasions for emotion are valuable in their own right – as valuable as the emotions are – but insofar as they can remain robust without confirmatory evidence from actual people, they may also improve our self-control.

Selfishness that gets too much in the way of vicarious reward is an impetus that needs to be controlled, as are not only “emotionally eruptive existential anxieties” and other corrosive emotions but also the self-destructive urges that get called sins. Most of these cannot be subsumed under selfishness. Of the seven deadly sins of Christianity, for instance (gluttony, lust, wrath, pride, envy, avarice, and sloth), only wrath and avarice could be argued to be as harmful to others as they are to the sinners themselves. Self-control is a broad task, and it is central to religion.

Self-control is usually regarded as the function of willpower; but I have argued elsewhere that willpower is nothing more than the fruit of recognizing a limited-warfare relationship among successive selves – another product of hyperbolic discounting – and that it suffers from the same limitations as other solutions to limited warfare (Ansline 2001, pp. 90–104, 143–60). Specifically, willpower is the technique of regarding choices as test cases for how you will decide in similar future cases; great reliance on this technique leads to rigidity and the risk of permanent damage to willpower in cases where the will fails. That is, autonomous self-control can lead to the kind of lawyerliness that psychologists call compulsiveness and theologians call scrupulosity. But the obvious alternative commitment method, openness to the influence of actual other people, is fallible – this influence is itself impulsive at times, and it is central to religion.

Here is where a felt relationship with a god or even a sentient ancestor (e.g., “I can just hear Mother”) could be a solution. Your sense of being on good terms with this entity from concepts’ intuitiveness pays critical theoretical dividends. To illustrate, as has been demonstrated by developmental psychologists, the understanding that physical objects will fall unless supported arises in infancy and thus becomes an intuitive assumption for physical objects. A solid, physical object that does not require support, but may remain hovering in mid-air would be counterintuitive in this technical sense.

A&N frequently use the terms counterintuitive and counterfactual together. Note, however, that counterintuitive and counterfactual are not the same thing. Though we typically treat our intuitions to give us truthful assumptions about the world, they only serve as best guesses and may be false. Likewise, counterintuitive but factual conditions and properties abound. For instance, Venus flytraps violate our intuitive assumptions regarding the predatory and inanimate character of plants; that invisible microorganisms can kill large mammals is counterintuitive; and that the earth revolves around the sun violates our intuitive evaluation of visual information. Indeed, one of the striking (and valuable) features of science is its ability to demonstrate that the physical world sometimes does not match our intuitive assumptions. Science is frequently counterintuitive (McCauley 2000).

Apart from increasing precision, distinguishing concepts’ factuality from concepts’ intuitiveness pays critical theoretical dividends for a scientific treatment of religion. Most importantly, it liberates the scientist from having to play philosopher, theologian, or anti-theologian and having to decide whether particular meta-physical claims are true or false before being able to consider concepts as religious or not. Such evaluations lie outside the tools of science.

Counterintuitive concepts also must be distinguished from “category mistakes” and contradictions. A category mistake involves modifying a thing with a predicate that does not and may not meaningfully apply to its ontology. For example, a “god that happened yesterday” would be a category mistake but is not counterintuitive (in the technical sense Boyer has coined). Such a no-
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A concept, it opens the concept up to new interpretations. If the mountain hears prayers, perhaps it thinks as well. Maybe it understands different languages. Maybe it has beliefs, desires, and memories.

This conflation of Boyer's notion of counterintuitiveness with category mistakes makes an interpretation of A&N's mnemonic memory experience difficult. In addition to questions of ecological validity—that memory for lists of modified nouns approximates conditions of cultural transmission—the stimuli used do not clearly fall into the groups of counterintuitive versus intuitive concepts. Rather, many pairs that the authors allege to be counterintuitive may be category-based modification mistakes that provide insufficient information to illicit any concept formation (e.g., "Solidifying Lady").

That these tests fail to show a mnemonic advantage for those items called "counterintuitive" is not surprising or clearly inconsistent with previous research (Barrett & Nihof 2001; Boyer & Ramble 2001). Although A&N admirably attempt to answer the question of why counterintuitive concepts are the minority of cultural concepts, given reputed mnemonic advantages, simpler answers are at hand. Intuitive concepts will always remain in the vast majority as long as (1) the things that people typically experience (like rocks and daisies) fit intuitive assumptions (which they seem to do), (2) intuitive assumptions serve as defaults for unknown properties, thereby producing intuitive concepts; and (3) conceptual load problems of reasoning with multiple counterintuitive concepts in any given contexts lead to those concepts degrading into simpler, intuitive ones (Barrett 1999; Barrett & Kel 1996).

A&N suggest that religious concepts' counterintuitiveness is on par with contradiction, but to think so would be a mistake. Though many religious ideas may prove to be contradictory, contradiction is not a distinctive or defining feature of religious thought. "A mountain that hears prayers" may be counterintuitive, but it is not clearly contradictory in the way that "the bachelor is married" is contradictory. Even more esoteric notions, such as "God is omnipotent and immaterial," do not obviously run into contradiction; additional premises concerning the nature of omnipotence and immateriality are required for contradiction to arise. God being able to manipulate material objects without contacting them may be counterintuitive; however, such a claim does not lead to the nonsensical meaning vacuum that surface-level contradiction leads to.

This persistent mislabeling of religious cognition as illogical, inscrutable, and obviously false might give the unwarranted impression that religious thought is qualitatively different from ordinary beliefs. And yet, the strength of A&N's thesis is precisely the notion that religious thought is not particularly special. Rather, universally available properties of human minds and human environments (at least historically) converge to promote the spread of counterintuitive agent concepts that may be invoked to address existential concerns and solidify moral and social arrangements.

Supernatural agents may have provided adaptive social information

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http://www.ualr.edu/tshackelford

Abstract: Atran & Norenzayan's (A&N's) target article effectively combines the insights of evolutionary biology and interdisciplinary cognitive science, neither of which alone yields sufficient explanatory power to help us fully understand the complexities of supernatural belief. Although the authors' ideas echo those of other researchers, they are perhaps the most squarely grounded in neo-Darwinian terms to date. Nevertheless, A&N overlook the possibility to infer supernatural agents' communicative intent behind natural events served an ancestrally adaptive function.

Although Atran & Norenzayan's (A&N's) ideas recapitulate those of other theorists in the cognitive study of religion, most notably Boyer (2001), they are perhaps the most squarely grounded in neo-Darwinian terms to date. A&N rightly point out that recent cognitive approaches to religion are too concentrated in the counterintuitive systems of supernatural memes and have not duly broached "the emotional involvement that leads people to sacrifice to others what is dear to themselves, including labor, limb, and life" (target article, sect. 1, para. 5). Thus, the authors' most significant contribution is their discussion of the emotional factors motivating "minimally counterintuitive" (MC1) religious concept acquisition, transmission, and representation—schematically processes that are loaded with affect (see also McCauley & Lawson 2002; Whitehouse 2000).

Despite their laudable intentions to remove the inexpressible weight of religion from the shoulders of theologians, philosophers, and cognitive anthropologists, the authors appear frequently to stumble under this weight, leaving us with a sense of theoretical inchoateness that we find unsatisfying. Our primary concern is that, like most others before them, including Gould (1991), A&N may be prematurely asserting that "religion has no evolutionary function per se" (sect. 7, last para.). The analysis provided in the target article does not establish this, nor are there sufficient data available that attend specifically to the question of whether behaviors that are limited, per force, to the domain of religion are driven by ancestrally adaptive psychological mechanisms.

The root of the problem can be found in A&N's conclusion that "supernatural agents are readily conjured up because natural selection has trip-wired cognitive schema for agency detection in the face of uncertainty" (sect. 2, para. 8). The authors thus share their interpretation of supernatural attribution with scholars such as Guthrie (1993) and Barrett (2000), both of whom have argued that supernatural attributions are functionless spillover from an evolved hyperactive agency detector. But we believe that there may be more to it than this; we also believe it is possible that explanations deviating from naturalistic causes might have solved key adaptive problems for ancestral humans.

This is because supernatural attribution does more than disambiguate poor and fragmentary agency-relevant information, for example, seeing the face of the Virgin Mary on the condensate windows of an office building, but, more important, it superimposes intentionality on natural events such that ancestrally adaptive behaviors are often promoted once the "sign" is translated for referential meaning. "What is the Virgin Mary trying to tell me? Is this about what I did last night?" Also, if supernatural attributions occur because environmental stimuli "achieve the minimal threshold for triggering hyperactive facial-recognition and body-movement recognition schemata that humans possess" (sect. 2, para. 7), then this cannot account for people's tendency to attribute abstract categories of life events to supernatural agents (Bering 2002). How can being diagnosed with cancer or losing a loved one
in an accident, both textbook examples of the conditions under which individuals make supernatural attributions, be offset by facial-recognition and body-motion recognition schemata? Rather, these are event types that bear no direct perceptual features capable of breaking the “hair trigger” of the authors’ proposed sensory driven hyperactive agency detector. A&N thus overlook the most critical “c” in their account of religion – communication.

Specifically, we hypothesize an evolved psychological mechanism that may have motivated ancestral humans to believe that certain categories of natural events were about some abstract intensional agency’s desire to purposefully share information with them. This does not involve simply detecting agency in the environment, but more important, it has to do with unraveling a supernatural agent’s intentions or “signs” engenders a change in the epistemic content of believers such that these new beliefs are responsible for behavioral change. If such behavioral change tended over long periods of time to increase individual’s genetic fitness, then the psychological processes enabling humans to interpret certain natural events, under certain conditions, as symbolic of supernatural agents’ intentions may have been subjected to selective pressures (see Bering in press; Bering & Johnson, in press).

In a recent series of experiments, one of us (Bering) has begun to explore the developmental emergence of the capacity to find meaning in natural events in response to supernatural agent priming. Supernatural agent concepts may only be endorsed if there is empirical evidence of their behaviors in the natural environment. The ability to translate this information into communicative messages is likely dependent on advances in cognitive development. In one experiment, 3- to 7-year-olds were asked to play a guessing game by placing their hand on one of two boxes that contained a hidden ball (Bering 2003). After an initial training trial, the children were then told a story about an invisible agent (“Princess Alice”) in the room with them who would “tell them, somehow, when they pick the wrong box.” Following this, on two of four counterbalanced trials a random event was simulated in the room (i.e., a light flashing on and off, a picture falling) at the moment a child’s hand first made contact with a box. Only the 7-year-olds reliably moved their hands to the opposite box after these “random” events and gave verbal judgments indicating their belief that Princess Alice was trying to share with them information about the hidden object.

Findings from an ongoing study, however, suggest that even preschoolers interpret seemingly random events as admonitions when they are caught in an act of cheating (Bering 2003). When left alone in a room with a so-called forbidden box that they are told contains something very special, many children will attempt to open the box. However, when told that Princess Alice is in the room with them, and when a light flashes on and off at the moment of their indiscretion, even 3-year-olds will inhibit their cheating response and cease from looking inside. Supernatural agent concepts may have led to adaptive decision making under conditions where the self underestimated the likelihood of “real” social detection by other group members. Although clearly much work remains to be done in this area, we feel it empirically premature to claim that religious beliefs served no independent evolutionary function.

Commentary/Atran & Norenzayan: Religion’s evolutionary landscape

Future research in cognitive science and religion

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Abstract: From a religious studies perspective, Atran & Norenzayan (A&N) succeed in arguing for the influence of evolved cognitive functions in religious phenomena. To develop their argument further, four suggestions are offered: (1) Look beyond the ordinary to the extraordinary; (2) culture matters more than ever; (3) theists need not despair, atheists ought not celebrate; and (4) dreaming is a primal wellspring of religion.

Atran & Norenzayan’s (A&N’s) application of cognitive science to the study of religion is commendable for its measured tone and thought-provoking claims. Without pushing their argument farther than the evidence allows, A&N make a compelling case for the involvement of basic cognitive operations in human religiosity. As a religious studies scholar who is trying to persuade my colleagues to pay greater attention to the findings of contemporary brain–mind science, I welcome such efforts. With an eye toward the future expansion of this area of research, I offer the following four prospective suggestions.

Look beyond the ordinary to the extraordinary. The research program of A&N concentrates on identifying the psychological roots of religious behavior in the ordinary operation of our evolved cognitive capacities (e.g., folkpsychology, folkbiology, folkmechanics). This approach echoes that of Sigmund Freud in Civilization and Its Discontents when he uses psychoanalysis to investigate “the common man and his religion – the only religion which ought to bear that name” (Freud 1930/1961). Aiming at the average and the common, Freud dismisses the possibility that studying the idiosyncratic experiences of the “uncommon man” (or woman) might reveal new dimensions of religious phenomenology, with unfortunate results for his theory of religion. To avoid a similar fate I suggest Atran, Norenzayan, and other like-minded researchers consider expanding their focus and examining more carefully the rare, unusual, and extraordinary dimensions of religious experience – not as the best or only way to study religion (as William James proposes in The Varieties of Religious Experience: James 1958), but rather as a necessary complement to current research on so-called ordinary religion.

Culture matters more than ever. Although A&N’s primary goal is to abstract the “pancultural foundations of religion,” they acknowledge that actual human cultures work to stimulate and manipulate our species’ innate psychological dispositions in a huge variety of different ways. Nothing more is said about this in the article, but I hope the cognitive science of religion will in the future move more boldly into the study of cultural variability. More than anything (and as an extension of my first suggestion), I encourage researchers to consider not only the lowest common denominators found in all cultures everywhere, but also to investigate the ways in which each particular culture has developed its own creative synthesis and novel elaboration of those evolved cognitive capacities. Identifying the psychologival building blocks of religion and culture is a fine achievement. An even greater achievement would be shedding new light on how humans have created with those building blocks.

Theists need not despair, atheists ought not celebrate. A&N’s article is commendably free of either pro- or anti-religious polemics. Still, their work is a contribution to an ongoing and often rancorous social conversation about the relationship between religion and science, and researchers in this area can benefit from a greater historical familiarity with this conversation (which reaches back at least as far as Darwin, who agonized over the religious implications of his evolutionary theory). To my mind, James’s approach in The Varieties remains the most reasonable one to adopt. He says that while scientific psychology can tell us
what is happening on the ‘lither’ side of religious experience (i.e., its psychophysiological rootedness), it can tell us nothing of the ‘farther’ side of such experiences (i.e., their ultimate connection to transcendental powers). Advances in psychological knowledge do not, in James’s view, refute religion because most (though not all) religious traditions already recognize that the divine enters our human-created physical nature.

**Dreaming is a primal wellspring of religion.** No mention is made in A&N’s article of the role of dreaming in religion. However, a sizable literature has developed in recent years regarding the central involvement of dreaming in religious belief, practice, and experience (Buikleley 1994, 1995, 1999, 2001; Harris 1994; Irvin 1994; Jedreg & Shaw 1992; Keesey 1991; Magee 2003; Miller 1994; O’Fallony 1984; Stephen 1995; Tedlock 1957; Young 1999).

At the same time, another sizable literature has arisen on the scientific study of dreaming (Domhoff 1996, 2003; Flanagan 2000; Foulkes 1999; Hartmann 1982, 1989; Jouvet 1999; Kahan 2001; Solms 1997), and recently a special issue of *BBS* was devoted to sleep and dreaming (BBS 2000, Vol. 23, No. 6). For researchers interested in further developing the insights of A&N, combining these two bodies of scholarship offers intriguing possibilities. E. O. Tyler may or may not have been right that dreams are the origin of religion – such propositions are impossible to prove – but the historical and cross-cultural evidence is very clear that dreams are at least reinforcers of religious dispositions, providing experiential verification of ideas about the soul, supernatural beings, alternate dimensions of reality, and life after death. Abundant evidence also shows that dreams are frequently the proximate cause of striking religious innovations, prompting the development of new rituals, new conceptions of the divine, and new forms of social relationship. This prismatic connection between religion and dreaming may now, thanks to the resources of cognitive science, be explored in greater depth than ever before.

**Different religions, different emotions.**

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**Abstract:** Atran & Norenzayan (A&N) correctly claim that religion reduces emotions related to existential concerns. Our response adds to their argument by focusing on religious differences in the importance of emotion, and on other emotions that may be involved in religion. We believe that the important differences among religions make it difficult to have one theory to account for all religions.

Atran & Norenzayan (A&N) rightly emphasize the human proclivity to assign agency to events and the ways in which this could reduce existential concerns, and we wholeheartedly agree. However, we propose that religions vary in the extent to which the religiosity to assign agency to events and the ways in which this could reduce existential concerns, and we wholeheartedly agree. How-

Other emotions, other religions. Although we agree that emotion is an important element of religion, it is interesting to us that emotion plays such a key role in A&N’s discussion. Religion and emotion have not always been seen as inexorably linked. With the Renaissance came a vastly increased scientific understanding of the material world. Perhaps faced with a losing battle in understanding the physical universe, theologians began to confine their purview into the realm of subjective experiences. Emotional experiences became the primary criteria for the evaluation of the truth of religion. Certain religions, such as American Protestantism, have been powerfully affected by the turn to emotions (Cohen & Rozin 2001; Cohen et al. 2003; 2005; Lindbeck 1984; MacIntyre 1988; Milbank 1993; Morris 1996; Taylor 1989).

However, some religions have handed down social and ritual sensibilities since long before the Renaissance. Although emotions are also importantly involved in other religions such as Judaism and Hinduism, they may not have the same centrality as they do in Protestantism. Rather, social connections and ethnic ties may be seen as of key importance, and different emotions may be involved (Cohen et al. 2005; Morris 1996, 1997). The social elements of such religions are relevant to an evolutionary analysis. Other theorists have proposed that religion is adaptive because of its promotion of social cohesion or conformity (e.g., Wilson 2002).

The social and/or emotional focus of religions suggests that agency itself has many forms, and attributions for emotional states vary (e.g., Liu et al. 1992; Smith & Ellsworth 1985). There are the most common agents in social explanation – other individuals, the self. There are other agents, as well – natural forces like the weather and disease, and broad social and economic forces. Cultures prioritize different kinds of agents in their everyday social explanation (Miller 1984; Morris & Feng 1994). And this is evident in the form agents take in specific religions. For example, for Protestants, religious and moral behavior is expected to follow from altruistic and emotional motivations, such as keen awareness of God (Allport & Ross 1967), compassion, or sympathy. However, for members of certain other religions (such as Judaism, Catholicism, and Hinduism), social and duty-based motivations may be more acceptable (Cohen et al. 2005; Miller & Bersoff 1992, 1994; Miller & Luthar 1989; Miller et al. 1990).

In the same vein, the reduction of existential concerns may be more central, for example, in Christianity and Islam than it is in Hinduism, Buddhism, and Judaism. In the context of Judaism, for

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example, there are only limited references to an afterlife in the Hebrew Bible (Old Testament). Many Jews believe that Judaism focuses more on the here and now, rather than on life after death (Klenov & 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 impacts 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. 1989).

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 recognize that this is not 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 ordinary 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 underlie 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 Bargh et al. 2003; Barsalou et al. 2003b; Tucker and Ellis 1998) that demonstrate that viewing an object automatically potentiates motor representations for actions that are functionally consistent with the object’s physical affordances. Similarly, when conceptualizing non-present 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 Barch 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., omnipotent, omnipresent) 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). These 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 psychological 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 would not be able to affect 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., omni- nous 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 non-explanatory 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., “punctual foundations,” “building blocks” and “stipulative working framework”). Yet, while they dis- credit the credibility of a variety of commitment, group selection, mematic, 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 En- vironment 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 prac- tices 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 and beliefs should be addressed in any comprehensive formulation.

The ease of learning religious beliefs during childhood is im- portant 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 empha- sis in the target article. The satisfaction of basic needs, including emotional comfort and regulation, as well as protection from psychologi- cal 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 our agency detection, truth, validation, and the like is given more emphasis than emotional and self-regu- latory factors (but see below).

The logical precision of A&N’s arguments is not tight enough. In some places “religion" is handled as an object that has motivat- ing 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 work- ings 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 im- ply that emotional factors are crucial to origins of religion; how- ever, 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 ontol- ogy, 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 con- cept 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, envision- ing 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...
group, would appear just as relevant. Although social aspects of religion are not neglected, the particular role of social mindfulness (i.e., connectedness to group) in human cognition is not dealt with. Social intelligence theorists emphasize the importance of understanding the self in relation to the way others think and behave. In cultural anthropology, the importance of relationships in conceptions of self is underscored. The idea of a social mind versus an individualistic mind would seem highly relevant to the origin and persistence of religion. The role of culture in “pruning” the characteristics of early cognition toward that of adults’ should apply to understanding religion as well as other cultural phenomena.

A&T neglect the potential influence of alterations in the level of consciousness in the evolution of religion. Trance, dissociation, shamanism, and possession are staple themes in the anthropology of religion. Altered states of consciousness could figure in everyday group coping with danger and threat. Hunter-gatherer studies suggest that these activities are common and involve religion in assignment of negative emotions.

Connections between religion, magic, science, medicine, and “indigenous” psychiatry were not dealt with explicitly in the target article. Such cultural systems are products of the (social) mind’s natural or automatic way of making sense of ambiguity in judgments of uncertainty and existential anxieties of the EEA. The quest for explanation and knowledge underlies the operation of all cognitive architecture. Until modern times, magic, religion, science, and medicine were a single entity. Studies of small hunter-gatherer societies suggest that they live simultaneously in two worlds, the mundane one of making a living and maintaining social relationships in working order, and the spiritual world of religion which regulates, controls, and interpenetrates all aspects of the everyday world. Studies of cuneiform tables suggest that people of Near Eastern Societies had a similar view. Early science and medicine of China (as per Taoism, importance of Heaven and the Way in Han synthesis as per Confucian doctrines) and India (Ayurveda) reflected a grounding of natural, secular “science” of medicine in a spiritual, religious framework. Indeed, one may regard and “conventional” science “as the force behind elaboration of cognition, knowledge, and (proto) culture during human biologic evolution. What religion encompasses can be viewed as the original health promoting system. Religion has many such benefits, and the degree of balance between its costs and benefits may depend on the particular phase of cultural evolution.

In summary, my argument is that “religion” sheds light on human biological and cultural evolution and evolution of cultural psychology, rather than: “Evolutionary psychology illuminates religion.”

Good behavioral science has room for theology: Any room for God?

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Abstract: This excellent outline of evolutionary hypotheses is compromised by severe reductionism. Other writings succeed in granting theology ontological significance without compromising rigor. The discussion of counterintuitiveness neglects coherence in memory. Bearing in mind our severely limited working memory capacity, susceptibility to religious mythologies may comprise an adaptive heuristic approach to summarizing the contingencies of the most far-reaching of life’s problems.

In his revolutionary American Psychological Association presidential address, evolutionary epistemologist Donald T. Campbell considered how the new science of sociobiology might help us understand moral commitments (Campbell 1976). The target article excellently reviews a wide range of plausible hypotheses about religions’ evolutionary bases, including costly commitment, super-natural beliefs, modularity of core faculties, perceptions of agency, and supernormal releasers in religious pageantry. As such, it exemplifies behavioral scientists’ task of explaining how things may often not be what they seem. At the same time, the article’s pervasive nothing-but reductionism comprises a Faustian error.

An example of a viable alternative posture is in Paul Tillich’s writings about religion’s “ontological” content. Tillich steers interestingly between secular presuppositions and elucidations of faith statements (e.g., Tillich 1951, especially pp. 20, 94ff, 168–69, 522; cf. Arther 2001).

Ontology is not a speculative-fantastic attempt to establish a world beyond the world; it is an analysis of those structures of being which we encounter in every meeting with reality. (Tillich 1951, p. 20)

Although Tillich’s existential casting of issues is sometimes obscure, he conveys us that there is more to the structure of reality. In reviewing Tillich’s and Reinhold Niebuhr’s concern with function, Gilkey (2001) sometimes inserts the apologetic phrase “deliteralized theology,” yet avoids “merely-izing” theism. An example of deliteralization even within a tenacious theism is in Heschel’s explanation of “the accommodation of words to higher meanings” (Heschel 1962, pp. 50–52). Niebuhr and Tillich were interested in the reality of history, and of freedom and responsibility, as human phenomena that suggested religious ontology (D. E. Bartlett 1954).

Attempts to join religion to scientific ways of thinking, with no tongue-in-cheek to the former and no loss of rigor to the latter, were pioneered by Ralph Burhoe (1981, cf. Breed 1992, Glassman 1998). The memes Burhoe cultured are evident in the work of his colleagues (e.g., Barbour 1997; Hefner 2002; Peacocke 1993).

While this school of thinking encompasses many traditions, its primary depth within Christianity provides ample challenge to science. The target article, while lucid and informative, displays a positivism that fails to respond to that challenge, by generally ignoring the possibility of extremely large-scale patterns or potentials. But we should tap our hunches about these, for top-down conjectures about observables.

The description of studies of memorability and counterintuitiveness provide a partial exception to my criticism: “As to belief sets, the one that was most intuitive, combined with a few minimally counterintuitive ones, had the... lowest rate of memory degradation” (sect. 4, para. 11). Nevertheless, A&T & Norenzayan’s (1999b) (AN) refute this by dismissing of the numerous powers of counterintuitiveness, for example, in the classic experiments of F. C. Bartlett (1932/1995), which they cite. Bartlett’s findings remain consistent with a great deal of present knowledge of the crucial role of meaning in memory. That is not to deny the roles of uniqueness and surprise in memorability of real-life events, or to deny the possibility of inaccurate memories (Hyman & Neisser 2000), but the target article beg the question of counterintuitiveness versus intuition of counterintuitiveness versus intuition. What keeps us all from descending into sheer silliness in most moments of life? Lemuel Gulliver met a doctor in Laputa who used an attention-arresting technique not all that different from the Cahill et al. (1994) experiment on memory and autonomic arousal (cited in sect. 7 of the target article): because... the favorites of princes are troubled with short and weak memories, the... doctor proposed that whoever attended a first minister, and after having told his business with the utmost brevity and in the plainest words, should at his departure give the said minister a kick by the nose, or a kink in the belly, or... pinch his arm black and blue, to prevent forgetfulness. (Swift 1726/1912, p. 211)

The efficacy of counterintuitiveness in memorability cannot be denied — much of salesmanship, litigation, and some other human endeavors depend upon manipulativeness and distraction — but these are relatively infrequent compromises of the pervasive role of intuitiveness.

An illustration of the role of intuitiveness in our experiential and behavioral coherence is in our routinely transcending the extreme stricture of working memory (WM) capacity to about seven or fewer items. Indeed, this limit is also true of nonhuman species.
Commentary/Atran & Norenzayan: Religion’s evolutionary landscape

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Abstract: In this commentary I attempt to extend the argument made by Atran and Norenzayan in two ways. First, I distinguish between the causes and the consequences of religious belief and speculate on the positive and negative consequences of religion. Second, I raise some questions about individual differences in religiosity and suggest that the origins of nonbelief are worth investigating.

Religion is the most powerful force in human affairs, as exemplified by the wars of religion, both past and present. Because the effects of religion are so consequential, one might imagine that it would be a subject of considerable importance to psychology, but with a few exceptions—William James most obviously—this has not been the case. The present target article by Atran & Norenzayan (A&N) is, therefore, an important and welcome development. I accept the general terms of their argument and suggest that it can be usefully extended by considering two further points: (1) a distinction between the causes and the consequences of religion; and (2) individual differences in the susceptibility to religious belief.

The causes of religion. It is important to distinguish between the causes and the consequences of religion because religion starts at the individual level but functions at the social level. Religion begins with an individual conversion experience, which then results in a personal dedication to a set of beliefs and practices. However, the consequences of religion are seen in the aggregate, at the social level, in group practices. The first question concerns how it is that individuals acquire religious beliefs. The second question concerns the consequences of shared religious belief for human communities.

Freud analyzed religious belief in terms of primary process thinking, which he characterized as vivid, impulsive, emotional, and in the service of the most basic instincts. He also argued that: (a) religious belief is an illusion and something that intellectually honest people should strive to overcome; and (b) secondary process thinking provides the means to dispel the illusion. A&N suggest that people worldwide spontaneously attribute natural phenomena to the influences of supernatural entities both benign and malevolent. Over time, these individual superstitious beliefs become shared in local communities and thus become folk religions. Of course, the spontaneous causal attributions at the beginning of this process are counterfactual—or wrong.

Stanovich and West (2000) distinguish between what they call System 1 and System 2 thinking. System 1 thinking is closely tied to the perceptual system. Both perceptual and cognitive processes (e.g., heuristics) are spontaneously drawn to motivationally relevant and emotionally arousing stimuli and they function by generating impressions of stimuli. Kahneman (2003) describes System 1 thinking as intuitive, as “typically fast, automatic, effortless, associative, implicit . . . and often emotionally charged” (p. 698), and its conclusions are difficult to control or modify. System 2 thinking (or reasoning) is characterized as slow, controlled, effortful, rule-governed, and flexible. Levine and Nosofsky (1992) think similarly of System 2 thinking as serving the quality of the impressions generated by System 1 thinking. But people find careful thinking or reasoning to be effortful, they tire easily, and then rely on whatever plausible impression comes quickly to mind. My not very surprising point is that the spontaneous magical thinking that is the foundation for religious beliefs is a special (but very consequential) case of System 1 thinking. The cause of religion is the often fallible but inherently corrigible result of System 1 thinking.

The consequences of religion. Socioanalytic theory (e.g., Hogan & Smither 2001) argues that people, by virtue of their evolutionary history, are group-living, culture-using animals. At the most general level, they are motivated by needs for social acceptance, the control of resources, and predictability. Life is about trying to get along, get ahead, and find meaning. Organized religion nicely serves all three purposes. Active participation in a religious community affords opportunities for companionship and the acquisition of wealth and power—as a visit to St. Paul’s Church in Rome will quickly reveal. In addition, religious beliefs assign a meaning to otherwise pointless human suffering and provide answers to questions about life’s meaning—questions that the human capacity for metacognition inevitably raises.

Religion also promotes the cohesion of social groups by creating shared values, meaning systems, and rituals and lifestyles. Our values reflect our identities, and we like people who share our values because, in so doing, they affirm our identities.
Commentary/Atran & Norenzayan: Religion’s evolutionary landscape

But there is an even more significant consequence of religion. Religions justify and legitimize morality. The social rules of conduct must be obeyed because a vastly superior being said they should. Moreover, all moralities have approximately the same content (e.g., the Ten Commandments), and groups with settled codes of conduct outperform groups that do not value duty and respect for law and authority (e.g., Sparta vs. Athens, Rome vs. the world). Morality is a slight but unrivaled factor promoting the viability of groups. Imagine two tribes in human prehistory, one of which ignores lying, stealing, and traitorous conduct, and a second that prohibits these behaviors. Now imagine these two groups in competition. One will be able to coordinate its activities, the second will exist in a state of anarchy and be easily defeated in an armed struggle. The history of the world is a history of armed struggles; the winners write history, while the losers risk disappearing from the gene pool.

The role of religion in enhancing the fighting capability of groups leads to the last important consequence of religion. Religion, and shared values, define an in-group. Persons who do not share these values belong to the out-group. The morality of the in-group by definition does not extend to the out-group. Hence the wars of religion and, more often than it is comfortable to acknowledge, genocide. That is, religion promote the well-being of the adherents, but often sanction brutality toward nonbelievers.

Individual differences. The intuitive and emotional thought processes (System 1 thinking) that cause us to see supernatural beings and forces in the world are hard-wired, species-typical characteristics. Moreover, the conclusions of System 1 thinking must be correct more of the time than they are mistaken, or this form of thinking would no longer exist. Nonetheless, System 1 thinking inevitably leads to errors, and religious systems describe phenomena that literally do not exist and justify practices that, to nonbelievers, are indistinguishable from superstition.

System 2 thinking functions to correct the errors of System 1 thought. Individual differences in the use of System 2 thinking are correlated with intelligence, the need to understand the world, and the tendency to overestimate System 2 thinking (Kahneman 2003). Nonetheless, belief is vastly more common than nonbelief (even among academic psychologists). This is consistent with the observation that System 2 thinking is effortful, and that it takes some courage willingly to suspend belief and face the prospect of living in a world without divine purpose. We now know a good deal about the psychological causes and consequences of religious belief. Perhaps it is time to examine the causes and consequences of nonbelief, a position that is inherently harder to attain and maintain.

Countertuition, existential anxiety, and religion as a by-product of the designing mind

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Abstract: In arguing for religion as a side effect of everyday cognition, Atran & Norenzayan (A&N) provide useful analyses of the strengths of the “naturalness-of-religion” position over others; however, experimental shortcomings limit the contributions of their empirical work. A relevant addendum involves considering research on children’s orientation to teleological explanations of natural phenomena, which suggests that relatively minor, for, if the aim is to try and interpret recurrent properties of religious concepts by reference to systematic violations of putatively innate categories of thought, the alternative — that any non-normative concept suffices — must be excluded to maintain explanatory power.

The finding suggesting that existential anxiety motivates religiosity is interesting but also fails to include the appropriate control to rule out the possibility that any kind of potent emotional content induces religious feeling. Specifically, A&N’s particular evolutionary argument would be strengthened if it were found that a condition describing a positively valenced incident (e.g., someone finding $500 on the street) fails to increase feelings of religious belief.

Finally, given its centrality to the theory, experimental evidence further establishing the existence of the agency detection system would have been a welcome supplement to the current work. In addition to originally proposing the bias, Guthrie (1993; 2002) has documented the numerous ways in which art and advertising seem to capitalize on tendencies to perceive human or animal characteristics in visual arrays. However, aside from studies which find that adults and infants often construe the clearly observable movements of nonhuman entities (e.g., computerized blobs) as goal-directed (e.g., Csibra et al. 1999), A&N do not discuss empirical research addressing the more relevant question of whether children and adults are prone to intentional or agency-based interpretations of events that are not readily perceptible and are without any obvious agentive involvement.

Evidence suggestive of this tendency is, however, provided by contemporary research on teleological thought – the bias to view entities and events in terms of a purpose. In addition to a body of findings indicating that preschool and elementary school children (and scientifically uneducated adults) have a promiscuous bias to explain the properties, behavior, and origins of living and nonliving natural entities in teleological terms (e.g., Casler & Kelemen 2003; Kelemen 1999, 2003; Kelemen & DiYanni 2005), Donovan and Kelemen (2003) have recently found that, when asked to re-
call simple descriptions of natural events, 7-year-old children insert purpose information into their recollections despite its absence from the original verbal descriptions. For example, when asked to describe and explain an event sequence in which a storm washes away a crop infestation, children will indicate that the storm occurred in order to rid the crop of insects. Content analysis indicates that this tendency is not a result of any general teleological narrative convention in storybooks popular for this age group. Analyses of parent explanations of natural phenomena also indicate that it is not straightforwardly traceable to family conversations during earlier developmental periods (Kelemen et al. 2005).

These findings, and related results (e.g., Bering 2003; Evans 2001), raise an intriguing possibility not considered in the present article. Perhaps human beings are not simply inclined to respond to fragmentary information by sensing a lurking agent where, potentially, none exists. Perhaps the default tendency is richer than this, and, from early childhood, people are cognitively disposed to broadly interpret many unexplained aspects of their experience in terms of the intentions and designs of some underdetermined and intangible agent (Kelemen 2004). Such a bias would obviously prejudice an empirical substrate for forms of religious cognition that are, as A&N importantly note, a universal feature of all human cultures and, to a significant extent, intrinsic to all individual minds.

Lions, tigers, and bears, oh God!: How the ancient problem of predator detection may lie beneath the modern link between religion and horror

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Abstract: Atran & Norenzayan (A&N) claim that an appreciation of the evolved inferential machinery underlying supernatural beliefs can greatly aid us in understanding regularities in culturally shared conceptions of religion. I explore how their model provides insight into why culturally shared tales of horror (e.g., horror movies) often combine religious and predatory content.

Atran & Norenzayan (A&N) propose that religion is essentially a by-product of an evolved bias towards over-attributing agency as the source of unexplained events (e.g., what was that noise in the bush?). A key feature of their argument (see Atran 2002a for the complete model) is the claim that this bias emerges from the simple evolutionary fact that the recurrent challenge of detecting predators and other dangerous agents can be characterized as a signal-detection problem (Green & Swets 1966) in which a miss would have been far more costly than a false alarm (see Atran 2002a; also Haselton & Buss 2000 for similar insights). Accordingly, they contend that hominids evolved an agency-detection system biased in favor of producing false alarms (crying wolf) rather than misses. A&N claim that one implication of this ancient bias has been the tendency to explain strange events by invoking supernatural agents rather than mundane causes such as physics or biology. After all, if natural events are explained in terms of natural causes, it should not be surprising to observe that unnatural events are explained in terms of supernatural causes (e.g., Gods, Spirits, Ghosts). Although A&N do not claim that the pan-cultural existence of beliefs in supernatural agency is itself an evolutionary adaptation, they do claim that the evolved inferential machinery underlying such beliefs can greatly aid us in understanding regularities in culturally shared conceptions of religion and the supernatural. Along these lines, I argue that A&N’s model can offer insight into why modern humans often combine religion and predators in their culturally shared tales of horror.

A core feature of A&N’s model centers on the claim that interactions with dangerous predators constituted a significant selection pressure that shaped the design of our evolved inference-making machinery. Although the Wizard of Oz trio of modern-day alpha predators – lions, tigers, and bears – has historically been quite capable of stalking and killing large primates, the genus Homo does not currently constitute – and probably never has constituted – a significant portion of the dinner plate of alpha predators when compared to ungulates and small mammals (see Ewer 1973; Sunquist & Sunquist 1989). Nonetheless, the hunting and foraging strategies of hominids and large carnivores would have likely placed these two groups in direct competition for access to scavenged meat at kill sites. Although the much smaller canid predators (wolves, hyenas) may have posed a threat to our ancestors, the canine strategy of hunting in packs likely diminished the ability of ancestral hominids to successfully compete with canine predators for access to meat at their kill sites. By contrast, the more solitary stalk and ambush strategy of large felines (smilodon, dinofelis, homotherium, etc.) may have actually increased competition between social groups of hominids and these solitary big cats. Indeed, the fossil record suggests that ancestral hominids often scavenged the kill sites of feline carnivores and vice versa (Brantingham 1998; Shipman 1986; Treves & Naughton-Treves 1999), leading one to believe that dangerous interactions between hominids and feline predators were quite common in the Pleistocene. Paralleling these fossil findings, lethal interactions with modern-day lions, tigers, and bears most often transpire when humans attempt to chase these large predators from recent kills or scavenging sites (Quammen 2003). It is not inconceivable that recurrent carnivore–hominid interactions of these sorts could have shaped the design of the mental mechanisms that humans employ when making inferences about predators, as A&N claim.

In regard to predator images in modern horror movies, it is not hard to see how a predisposition toward inferring the presence of dangerous animate agents could result in a preponderance of solitary ambush predators as culturally shared fear stimuli. In this regard it is interesting to note how disproportionate sample of horror movie plots begin with a sudden, unexplained occurrence (a person is mysteriously killed or disappears), and the responsible agent is initially presented only in fleeting glimpses (Jurassic Park) or not at all (The Blair Witch Project). Often these supernatural monsters are depicted as little more than solitary ambush predators dressed up in culturally contrived monster attire. Indeed the very term monster implies a large, menacing, unnaturally intelligent animal. Consider, for example, the numerous depictions of exaggerated real-world predators that populate horror movies, ranging from unaturally large sharks (Jaws) and enormous primates (King Kong), to man-eating lions with almost supernatural cunning (Ghost in the Darkness). Finally, horror movie monsters are often depicted as solitary and nocturnal ambush predators (The Blair Witch Project, Psycho), often equipped with fangs and claws (Dracula, The Wolfman). There is even an entire horror movie genre devoted to solitary hominid predators in the form of cunning serial killers (Nightmare on Elm Street, Friday the 13th), many of whom appear desirous of dismembering their victim’s flesh (e.g., Silence of the Lambs, The Shining, etc.). In this regard, A & N’s claim that humans possess a predisposition toward inferring the presence of dangerous animate agents might be a useful starting place for researchers interested in understanding the content of modern horror films and the psychological mechanisms underlying audience reactions to this genre of popular media (see Weaver & Tamborini [1996] for a review of recent research in this area).

Finally, in regard to religious imagery in horror films, it is interesting to note the apparently non-random coupling of religion and monsters. For example, the litany of supernatural horror movie plots (e.g., Dracula, Wolfman, etc.) were often thwarted through instruments of religious significance: Werewolves were killed with special silver bullets, and fanged vampires were repelled by Holy Crosses. More-
The evolutionary social psychology of religious beliefs

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Abstract: Atran & Norenzayan (A&N) argue that religion is an evolutionary by-product, not an adaptation, but do not go far enough. Once supernatural beliefs are enabled by processes they describe, numerous social-cognitive mechanisms related to attachment, social exchange, coalition, psychological status, and dominance, and kinship are crucial for explaining the specific forms religion takes and individual and cultural differences therein.

It has long been speculated – sometimes explicitly but more often implicitly – that humans possess some kind of religious instinct that explains observations such as the apparent universality across human societies, the genetic heritability of religiousness, neurological evidence of a “God module” in the brain, and ethological observations of proto-religious behavior in other species. As I have argued elsewhere (Kirkpatrick 1999b), none of these observations constitutes convincing evidence for a religion as an adaptation, and moreover, such arguments invariably (1) err in identifying the proposed mechanism’s adaptive function (e.g., by falling into traps such as naive group selectionism, confusing psychological benefits with reproductive success, or failing to acknowledge adaptive costs); (2) fail to specify the mechanism’s design (e.g., by clearly describing what exactly it does, the conditions that activate or de-activate it, etc.); and (3) fail to demonstrate that the mechanism meets the defining criteria of an adaptation, such as economy, efficiency, reliability, and precision.

The central insight that religion is not an adaptation, but rather a reliably produced collection of by-products of human evolved psychology, neatly explains those observations that render an adaptationist hypothesis tempting while avoiding the pitfalls. Religious beliefs and behaviors are produced and shaped by a host of evolved psychological mechanisms and systems that were designed for other (mundane) purposes. This insight changes the form of evolutionary explanation from one of identifying design and function to identifying which psychological mechanisms are involved, and explaining how and why these reliably produce the by-product (Buss et al. 1998).

Building on work by Boyer (1994; 2001), Sperber (1996), Guthrie (1993), and others, Atran & Norenzayan (A&N) identify one such crucial set of psychological mechanisms as those designed for understanding and predicting the natural world – those related to so-called folk (or naive, or commonsense) physics, biology, and psychology – which often misattribute agency and human characteristics to inanimate objects or events and thereby give rise to psychological animism and anthropomorphism. This set of evolved mechanisms represents the first crucial step in the religion-as-by-product argument and, as A&N demonstrate, explains why beliefs about supernatural forces and gods are so widespread. However, this is only the first step toward the much larger theory required to explain religion.

I have argued (Kirkpatrick 1999b; in press) that once beliefs about supernatural agents are enabled by the processes described by A&N and others, the door is opened for a plethora of evolved social-cognitive mechanisms to whir into action, producing and shaping specific beliefs about these supernatural agents and our relationships with them. For example, the attachment system appears central to the psychology of many belief systems, wherein God or other divine figures (e.g., Mary or Jesus in various forms of Christianity) function as attachment figures. In other cases, gods are perceived as social-exchange partners who, per reciprocal-altruism principles, provide various benefits to people in exchange for the performance of requisite sacrifices or rituals or observance of specified codes of behavior. In still other cases, gods are processed psychologically by mechanisms designed to negotiate status or dominance hierarchies, with high-status or dominant gods demanding submission and surrender from human subordinates (and sometimes each other). The operation of psychological systems related to kinship and kin-based altruism is evident in such beliefs as God-as-Father and the widespread practice of ancestor worship. Mechanisms of coalitional psychology constitute gods as members or leaders of local groups or tribes in competition with other groups or tribes (and their gods).

In addition to giving detailed form to beliefs about supernatural agents, these same psychological systems underlie other aspects of religious thinking, including the nature of interpersonal (human) relations. For example, human religious leaders, like gods, may be perceived alternatively as attachment figures, high-status individuals, or coalition leaders: fellow worshippers may be perceived as kin (“we are all children of God”) or social-exchange partners. Religion-based morality variously reflects the role of social-exchange thinking (“an eye for an eye”), kinship (fellow worshippers as “brothers and sisters”), and coalitional psychology (“love thy neighbor”) applies only to the in-group. Moving to this social-psychological level of analysis is also essential for addressing the crucial issues, explicitly skirted by A&N, of individual and cross-cultural differences in religion. Such questions can be tackled at (at least) two levels of analysis within this framework. First, religious differences reflect varying combinations of the particular social-cognitive mechanisms that underlie them. Certain forms of Christianity, for example, seem particularly attachment-based, whereas other belief systems more nearly reflect coalitional or social-exchange thinking. Within a given belief system, individual differences can emerge as a consequence of differential activation of these various mechanisms. Second, each of these psychological systems is associated with dimensions of individual differences within its particular domain. For example, the attachment system reliably gives rise to well-documented individual differences in attachment patterns or styles – secure, insecure-avoidant, and the like – which empirical research shows to be predictive of individual differences in religious conversion and other measures of religiosity (see Kirkpatrick 1999a; in press, for reviews). The extraordinary success of religion around the world may owe largely to the fact that, because it draws upon so many different psychological systems and different forms or dimensions of those mechanisms, it offers “something for everybody.”

In recognizing that religiousness does not itself have an adaptive function, but rather reflects a motley collection of evolutionary by-products, we now have a tiger by the tail. A&N have described some crucial components of that tiger – perhaps the powerful rear legs (i.e., the role of folk-physics, etc.) and a couple of other assorted parts (e.g., related to religious commitment and ritual). In my own work I have tried to sketch the outline of what I believe to be the main body of the animal. Much remains to be done, but progress should be swift once we replace the misguided religion-as-adaptation notion with a comprehensive evolutionary psychology of religion-as-by-product.
Commentary/Atran & Norenzayan: Religion’s evolutionary landscape

We need behavioural ecology to explain the institutional authority of the gods

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Abstract: Atran & Norenzayan (A&N) rightly criticize cognitive theories for failure to explain sacrifice and commitment. But their attempt to reconcile cognitivism with commitment theory is unconvincing. Why should imaginary entities be effective in punishing moral defectors? Heavy costs are entailed in enforcing community-wide social contracts, and behavioural ecology is needed to explain how and why evolving humans could afford these costs.

Cognitive theorists have been persuasive in attributing certain universals of religious belief to innate cognitive mechanisms. But, as Atran & Norenzayan (A&N) point out, such approaches “fail to tell us why; in general, the greater the sacrifice – as in Abraham offering up his beloved son – the more others trust in one’s religious commitment” (sect. 1, para. 5). It is heartening to note an emerging consensus that religion is susceptible to Darwinian explanation and that costly signalling theory (Zahavi & Zahavi 1997) must play a central role (Iróns 1996; Knight 1998; Sosis & Alcorta 2003). However, I dispute the claim that commitment theories cannot account for the cognitive peculiarities of religious belief. One of the first attempts to apply Zahavi’s theory to the origins of religion specified a counterintuitive display (“wrong sex, wrong species, wrong time”) as central to humanity’s foundational rituals of initiation (Knight et al. 1995).

Supernatural agents, A&N claim, arise spontaneously as our mind-reading proclivities impinge agency to features of the surrounding world. Somehow, these imaginings then endow themselves with moral authority and institutional support. Observing that “human society is forever under threat of moral defect,” A&N argue that society is saved by the omniscience and omnipotence of such a deity who “can ultimately detect and punish cheaters” (sect. 7). As a materialist, I can only ask: Is this serious? How can an imaginary entity explain anything at all – let alone group-level cooperation between potential rivals? How can a fantasy law-enforcer be either omniscient or omnipotent in real life? Unfortunately, such conceptual slippage between idle fantasies and stable representations of institutional authority is the problematic kernel of these authors’ entire argument.

Evolutionary psychology of the kind espoused by A&N defines the human mind as a metaphorical replacement for empirical research on fossils, artefacts, genes, and climates conceptualised by them as emanating from inside the head.
The motivational underpinnings of religion

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Abstract: Threat management theory and research can rectify shortcomings in Atran & Norenzayan’s (A&N’s) analysis of religion. (1) Religious and secular worldviews are much more similar than the target article suggests: (2) a propensity for embracing supernatural beliefs is likely to have conferred an adaptive advantage over the course of evolution; and (3) the claim that supernatural belief systems serve a terror management function independent of worldview bolstering is not empirically supported.

We agree with Atran & Norenzayan (A&N) that a compelling explanation of religion must recognize the fundamental role religion plays in quelling existential concerns. Indeed, over the last 20 years we have been empirically assessing a theory that explains how and why religion helps to manage the potential for terror engendered by the uniquely human awareness of mortality – terror management theory (TMT; Greenberg et al. 1998; Solomon et al. 1991).

According to TMT, highly adaptive cognitive capabilities, especially self-awareness and temporal thought (Becker 1971; 1973; Deacon 1997), rendered our ancestral forebears aware of the present threat and inevitability of death. This awareness created the potential for debilitating terror, a problem mitigated by the development and maintenance of cultural worldviews: humanly constructed supernatural conceptions of the origin and structure of the universe and the role of humans within that imbue the world with meaning, order, stability, and the promise of death transcendence, either literal or symbolic, to those who fulfill the culture’s prescribed standards of value. Accordingly, investing in an internalized version of the cultural worldview (through the socialization process) and viewing oneself as a valuable contributor to that cosmic scheme confers self-esteem, which enables individuals to function with psychological equanimity from day to day.

The general guiding hypothesis derived from TMT states that if cultural worldviews and the self-worth derived from them function to quell death-related concerns, then heightening the salience of mortality should lead to intensified efforts to uphold the worldview and strive for self-worth. The resulting body of more than 175 studies has established the convergent and discriminant validity of a variety of mortality salience (MS) inductions and their effects on diverse cognitive and behavioral efforts to defend or bolster central aspects of the individual’s worldview and self-worth (Greenberg et al. 1997; Solomon et al. 2004a); it has also delineated the conscious and unconscious processes that produce MS effects (Greenberg et al. 2003; Pyszczynski et al. 1998). Although a review of this work exceeds the current scope, we will discuss a few aspects pertinent to A&N’s perspective on religion (for more, see Greenberg et al., in press; Solomon et al. 2004b).

First, A&N draw too sharp a distinction between religion and culture. Both secular and religious worldviews offer meaning, order, bases of self-worth, and modes of death transcendence, and both include supernatural and counterintuitive elements that are embraced and sustained largely through faith rather than reason. For example, secular systems venerate symbols of widely sanctioned values (e.g., the bald eagle, flags), prescribes codes of conduct that vary between cultures, arbitrarily imbue objects and activities with grand significance (e.g., diamonds, the World Cup), and use intuitively implausible concepts (atoms and genes) and metaphorical narratives (e.g., frogs turning into princes) to explain the mysteries of birth, death, sex, etc. – counterintuitions that their adherents nevertheless accept on faith (Hinde 1990).

That is, although modern secular cultures rely more on science than religious decree, their members typically accept science based on faith more than on understanding. What percentage of people can logically explain how an elevator works or how a child results from sexual intercourse? People assume that there are logical explanations, but they don’t really know them – they put their faith in science.

A substantial body of TMT research supports the idea that religious and secular worldviews both serve a terror management function. As one example, Greenberg et al. (1995) examined how MS affects treatment of religious and secular icons. Results revealed that following MS, American Christian participants became very reluctant and uncomfortable about treating a crucifix inappropriately. However, death-primed participants were equally reluctant to mistreat an American flag. Indeed, research has shown that MS leads to protective practices regarding a wide range of secular objects, concepts, and beliefs (Greenberg et al., in press; Solomon et al. 2004a). That secular and religious worldviews serve the same psychological functions is not surprising given evidence that all worldviews developed out of ancient cultural worldviews that were spiritual in nature. Supernatural aspects of these worldviews undoubtedly emerged in part out of a desire for viewing oneself (and thereby controlling) the causes of survival-relevant events in the world; the inference of benevolent and malevolent agents provided possibilities that these cosmic agents could be appeased via imitative rituals and sacrifice. As Becker (1971; 1973) noted, many empirically false beliefs can be held without severe negative consequences. Investing in the protection of cosmic forces affords an existential security that may confer a significant adaptive advantage by enabling people to avoid a potentially debilitating preoccupation with personal frailty and finitude and thereby engage more effectively in exploratory and instrumental behaviors. Thus, worldviews that most compellingly imbue subjective reality with order, meaning, and the promise of death transcendence were likely to enjoy widespread transmission, and individuals or groups who were able to maintain faith in these schemes were similarly likely to prosper.

From a TMT perspective, the primary difference between religious and secular worldviews is that the former emphasize literal paths to death transcendence through afterlife beliefs, whereas secular cultures offer symbolic modes through offsprings, inheritance, collective identifications, and culturally valued achievements. Thus, the ways in which people sustain faith in their worldview and strive for self-worth will be different, with devoutly religious people focusing on qualifying for the afterlife (and thereby controlling) the causes of survival-relevant events, whereas secular people are psychologically intersubstitutable – yet such an account offers little insight into why people have so often persecuted and annihilated adherents of alien religions. In contrast, TMT has focused squarely on the notion that because our security-providing worldviews are fragile social fictions, those who espouse alternative worldviews challenge the validity of one’s own – and thereby undermine psychological security. Consequently, people react to different others with derogation and violence, particularly when the need for terror management is elevated (Pyszczynski et al. 2003). Indeed, all religions have codes for dealing with those with alternative religious views (Hood et al. 1996), often dismissing them or designating them as evil. Historical examples abound, and a wide range of MS studies have supported this idea, showing that MS increases dislike and even aggression toward different others. For

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example, Greenberg et al. (1990) found that MS led Christians to derogate Jews and Americans to react similarly to critics of the United States.

Finally, we must question A&N’s intriguing claim that their finding (reported in sect. 5) that MS increases Christian participants’ beliefs in the efficacy of the prayers of Buddhists, demonstrates a function of supernatural beliefs independent of worldview bolstering. From our perspective, the evidence of the effectiveness of prayer directed toward any deity can be taken as validation of the existence of one’s preferred deity. Their findings do not imply that the participants believed that Buddha, as opposed to Jesus, answered the prayers. In addition, substantial research (Greenberg et al., in press) shows that MS-induced increases in religion-consistent supernatural beliefs (prayer, spirits, deities, afterlife) are limited to individuals who subscribe to a religious worldview. If supernatural beliefs served a terror management function independent of the individual’s worldview, such effects would not be moderated by whether or not the individual subscribes to a religious worldview.

Despite our reservations, we welcome work such as the target article as a new addition to the study of the evolutionary and psychological sciences. We believe that the target article will stimulate more good work on these issues, and we hope that our commentary will have a similarly stimulating impact.

Toward a new scientific study of religion

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Abstract: Atran & Norenzayan (A&N) have proposed a study of religion based in the cognitive sciences. Their final conclusions, however, incorporate functionalist definitions. Further, key features by which they characterize religion are not instantiated by some historical evidence. Nevertheless, the focus of their arguments are central to any study of religion and should provoke further research and experimentation along the lines suggested.

When an academic study of religion (Religionswissenschaft) was first envisioned towards the end of the 19th century, it arose from the scientific impulse then dominant among many European intellectuals (e.g., Müller 1870). With the disillusion of optimists notions of progress, including those of scientific advances in knowledge, following upon the ravages of World War I, prospects for a scientific study of religion became eclipsed by theological-phenomenological-hermeneutical quests for “meaning” that continue to characterize the study of religion to the present day (Kippenberg 2002; Wiebe 1999, pp. 141–62). In contrast to these contemporary currents in the study of religion, Atran & Norenzayan (A&N) have proposed an explanatory theory of religion as an evolutionary by-product of various cognitive processes formulated in ways that can be experimentally and evidently assessed.

A&N’s definition of religion connects the classic “Tylorian” view, whereby “religious” practices, events, beliefs, and the like, are stipulated to be those legitimated or authorized by claims to some notion of “superhuman” or “counterintuitive” agency (Tylo 1871/1958, 8), with a more “Durkheimian” orientation, whereby those practices, events, and beliefs necessarily involve costly social commitments. Culturally postulated claims to superhuman agency can differentiate religion from ideologies such as Marxism or Freudianism, whereas the nonrecuperable costliness associated with those claims can differentiate them from those postulated of such ubiquitous counterintuitive agents as ghosts or popular ones like superheroes. “Religious” agency, then, is effectively differentiated from a larger domain of culturally distributed representations of superhuman agents without affirming for it any sui generis autonomy.

The question we raise here is not how counterintuitive beliefs might be formed – there is wide consensus among cognitive scientists about the generation of such beliefs by ordinary processes of cognition and, consequently, their naturalness – but why such beliefs, once introduced, are selected for costly recognition and reproduction from among the numerous counterintuitive alternatives also generated by human mental activity. This is a debated issue among cognitive scientists generally. A&N seem to suggest that the selection of such agents and ideas is not a consequence of natural cognitive processes at all but is quite intentional, a purposeful divorce “from the default state of ‘automatic’ human cognition” (sect. 1.1), though the intentional mechanism for that separation remains unclear.

A&N finally revert to the functionalist arguments they initially criticize as nonexplanatory (sect. 1.3). For example, they contend that “religious stories are those that function ‘to ease existential anxieties such as death and deception’” (sect. 7). But to paraphrase their earlier critique, such existential anxieties “are not evolutionarily responsible for the cognitive structure and cultural recurrence of religion” (sect. 1.5), and any assuaging of such anxieties is not unique to religion but is also available from other cultural phenomena (sect. 1.3).

Although initial experimental results offered by A&N are promising, key functions they attribute religion can be questioned in light of the evidential record. Whereas it may be the case that all religions accept some view of a “minimally counterfactual afterlife,” it is not the case that such views always constitute a “resolution” to existential anxieties (sect. 1, note 3), as the consequential views about an afterlife among the ancient Greeks instantiate (e.g., Garland 1985, pp. 48–78) – a not insignificant historical exception. Similarly, the same Greek case calls into question A&N’s generalization that religion functions to validate “moral truths” or a “moral consensus” (sects. 1 & 1.3). For the Greeks, however, morality was the purview of the philosophers who criticized Greek religion precisely for its lack of concern with morality (Attridge 1978; Price 1999, pp. 126–42). Does Greek religion then not really count, for A&N, as religion at all? Greek religion nevertheless did posit a considerable pantheon of superhuman agents; and it did support a complex system of sacrifice – though the costs of these sacrifices seem to have been recompensable by providing their participants a portion of meat otherwise absent from their diet (Rundin 1996). On the other hand, Greek religious formations do provide solid historical evidence for A&N’s contention that fictive kinship groups can account for the existence of altruistic behavior and for solidarity among groups of nonkin (Martin 1997, 2001), though, again, such fictive kin groups were not exclusively religious.

A&N clearly disclosed the reason why the contemporary study of religion continues to be dominated by theological-phenomenological-hermeneutical traditions, for, as they conclude, the “potentially endless, open-textured evocation of possible meanings and inferences” pursued by these traditions is not a characteristic of scientific inquiry but of religious practice (sect. 3), even if those evocations continue to be practiced in the context of the academy. For those who still strive to realize a scientific approach to the study of religion, the present contribution to the recent but burgeoning field of cognitive science of religion is a most welcome and innovative addition, and should provoke further research and experimentation along the lines suggested.

NOTES

1. On this point, see the letter from Charles Darwin to the anthropologist E. B. Tylor (Darwin 1858, p. 151).

2. Tylor’s “minimum definition of Religion” is “the Belief in Spiritual Beings” (Tylor 1871/1958, p. 8), a modified version of which is followed
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by a majority of those researching religion from a cognitive approach, e.g.,
Lawson and McCanley (1990, pp. 5, 61), Guthrie (1993, p. 3), Boyer (2001,
p. 144); Atran (2002a, p. 15) and Pyysiäinen (2001, p. 23). 3. For Durkheim (1915), religion “always presupposes that the wor-
shipper gives some of his substance or his goods to the gods” (p. 285); see
Guthrie (1990, 1993), Lawson and McCanley (1990), McCanley and Law-
son (2002), Pyysiäinen (2001), Whitehouse (1995; 2000; 2004), and a se-
eries—Cognitive Science of Religion—recently announced by AltaMira

Who is mind blind?
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Abstract: The authors attempt to explain the ubiquity and persistence of
human religion by invoking innate, domain-specific cognitive furniture,
while dismissing the potential of other approaches, such as memetics, to
produce “mindful” understandings of religion. This commentary chal-
 lenges the explanatory adequacy of cognitive nativism, suggesting that
memetics has as much claim to utility and “mindfulness” as innate mental
modules do.

And why beholdest thou the note that is in thy brother’s eye,
but considerest not the beams that is in thine own eye?
—Matthew 7:3

Most of the easy explanations for religion’s ubiquity and persis-
tence in human societies are inadequate (Boyer 2001). Religion
does not clearly rationalize the universe, nor consistently assuage
existential anxieties, nor ensure the survival of committed groups
in any way distinct from secular collectivities. (In the words of au-
thors Atran & Norenzayan [A&N], such explanations fail to differ-
centiate “Moses from Mickey Mouse”). Any satisfying account of
religion will need to have the command of both the relevant cog-
nitive and cultural data the authors impressively display.

A&N do not consider religion to be an adaptation. Instead, they
view it as a consistent by-product of interaction between the
world and “modularized (innate and universal) conceptual and
mnemonic processing” (target article, sect. 7, last para., emphasis
added). An example might be humans’ penchant to attribute in-
tentionalities to the world around them in circumstances where
such agency may be implausible. Religion, A&N suggest,
may function to help us self-stimulate behavioral responses that
were adaptive in our evolutionary past—the pervasiveness of gods,
demons, spirits, and the like, is a consequence of the hair-trigger-
ning of innate intentionality-detection faculties by cultural con-
structs that might be collectively understood as agency porn (my
phrase, not theirs!). On the way to arguing this innate modular-
view, A&N explicitly question the utility of what they call func-
tional approaches such as memes, group selection, and con-
nectionism, asserting that the latter cannot explain the “cognitive
peculiarities of religion” (sect. 1.5). This perceived shortcoming
leads the authors to call such approaches “mind-blind.”

A&N do little justice to these alternatives. Indeed, the empiri-
cal evidence they present is entirely consistent with the memetic
model. Moreover, they fail to acknowledge long-standing objec-
tions to the kind of cognitive science that purports to explain any-
thing by positing innate, isolated mental faculties, which, accord-
ing to their most widely recognized theorizer (Fodor 1983), are
largely impenetrable. Just who is “mind blind” here?

To be sure, approaches that lean on the slender reeds of memes
or group selection still have far to go in explaining much of inter-
est to social scientists or humanists (Runciman 1999). Yet the em-
pirical bases for the innate mental modules are also in dispute (e.g.,
Berthier et al. 2000; Elman et al. 1996; Karmiloff-Smith
1992;Wakely et al. 2000). Simply put, although it is widely ac-
cepted that modularized functions emerge in brain development,
that these functions are specified is not. Though a few have tried
(e.g., Marcus & Fisher 2003), no one has convincingly ac-
counted for the genetic preformation of specific knowledge,
whether it be universal grammar, “folkbiology,” or “folkmechanics.” Assertions of the existence of what in the developmental lit-
terature goes as “core knowledge” or “central origins” (Spelke
1985; 1992) seems to occupy a similar status in cognitive science
as “instinct” used to in ethology—a term that stands for explana-
tion more than it actually explains.

This is not the place to rehearse the ongoing dispute between
proponents of domain-specific innate knowledge and general
learning mechanisms in development (Nicastro, under review).
What should be acknowledged, however, is that explaining reli-
gion by positing innate releasing mechanisms rooted in ancient
adaptive imperatives hardly seems like a cognitively rich, mindful
alternative to the so-called mind-blind approaches A&N decry.

With respect to memetics, the authors are bothered that the
lack of a clear definition of a meme. Establishing the nature of the
replicator in memetic evolution has indeed been a matter of great
dispute in this nascent field. Some argue, however, that the disci-
pline need no more define the replicator of a meme than the
engine did at the dawn of evolutionary biology (Blackmore 1999;
Hull 2000). In any case, A&N seem unfamiliar with developments
that help define memes in more empirically useful ways (Aunger
2002; Dawkins 1982). Dawkins’s view of the meme has substan-
tially evolved since his original, somewhat loose conception
(Dawkins 1976). As early as 20 years ago he took to calling a meme
a unit of information residing in a brain” (Dawkins 1992). That
view has been subsequently developed by Aunger, who limits what
he calls a neuromeme to “a configuration in one node of a neu-
ronal network that is able to induce the replication of its state in
other nodes” (Aunger 2002; cf. Heylighen 1991, who likens
memes to simple “if condition, then action” production rules in
artificial intelligence). If we follow A&N in making no conceptual
distinction between “mind” and “brain,” then exactly what is so “mind-
blind” about the meme concept, so defined?

A&N supply empirical evidence of the mnemonic advantages of
“minimally impossible” stories. This material nicely comple-
ments a number of Boyer’s observations about how religious be-
liefs tend to violate normal conceptual categories in consistent
ways. Yet mnemonic advantage can also be adduced to support a
memetic model of religion—that is, a model that posits a “selfish”
cultural replicator that propagates from mind to mind. Obviously,
belief sets that are easier to replicate are more likely to persist for re-
transmission between individuals. Indeed, depending on where
one lays the emphasis, A&N’s conclusion that “the way natural
and non-natural beliefs are combined is crucial to the survival of a cul-
tural ensemble of beliefs, such as those that form the core of any
religious tradition” (sect. 4, para. 11) could be a statement right

Although the authors endeavor to bring a new perspective to
bear on the question of religion, in at least one sense their account
is just the same old vintage in a new wineskin. Speculations on how
fictive kinship or omniscient beings function to protect commit-
ted groups against cheaters and freeloaders surely match our in-
tuitive (dare we say “folkpsychological”) feelings for how reli-
gious work. But they are still vulnerable to a fundamental
objection: The more successful such tricks might be in subordi-
nating the individual’s fitness to the common cause (e.g. modern
suicide terrorism), the more profound the (genetic) selective pres-
Sure ought to be against the kind of sociality that makes people
likely to join such groups in the first place (Krebs & Dawkins
1984). One response A&N might have made to this point is that
ideologies that provoke religious commitment can usually over-
rider asocial proclivities rooted in genes because they can evolve
much faster. Another might be that adaptations necessary to pro-
duce humans resistant to religious ideologies are either develop-
mentally implausible (because genes have little direct influence
on relative degrees of sociality, religious or otherwise) or func-
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Abstract: Some forms of religion may in some cases alleviate existential anxieties and help maintain morality; yet religion can also persist without serving any such functions. Atran & Norenzayan (A&N) are unclear about the importance of these functions for a theory of the recurrence of religious beliefs and behaviors.

Atran & Norenzayan (A&N) want to avoid anthropological functionalism; yet they try to differentiate religion from mere fiction by emphasizing that only religion involves a ritualized and strengthened passionate commitment to the group interests that may also benefit individuals in the long run. Religion creates social cohesion, enhances mental health in individuals, and alleviates existential anxieties related to death and deception (see also Atran 2002a). Yet such functions do not cause the cultural recurrence of religion. Religion is an inevitable by-product of our evolved cognitive structure, a parasite of natural cognitive mechanisms (as also argued by Boyer 1994; 2001). Counterintuitive representations that typify religion (Boyer 1994) are bound to arise because of the fluidity that characterizes human cognition. It is their specific social use that makes them religious.

In the background of A&N’s argument is Atran’s (2002a, p. 169) tentative suggestion that “the more traditionally and continuously religious the person, the less likely to suffer depression and anxiety in the long run.” Yet many extensive literature reviews have shown that results from studies on religion and mental health are mixed and even contradictory. Bergin (1983), for example, found that in 23% of the reviewed studies, there was a negative relationship between religion and mental health, in 47% of the studies there was a positive relationship, and in 30% there was no relationship. Bergin (1983) claims that much of the discrepancy in the findings may be explained by differences in the ways mental health is measured. It is therefore very difficult to find unequivocal causal relationships. Gartner (2002) argues that the studies that found a negative relationship between religion and mental health typically employed personality tests with only limited reliability and validity, whereas the studies that found a positive correlation were based on real-life observations concerning drug abuse, delinquency, and the like. However, it is not clear what it is in religion that in the context of mental health; professing certain counterintuitive beliefs, performing rituals, the social relationships among believers, or what? (Cf. Levin & Chatters 1998.) Thus, George et al. (2002) conclude that “we are far from understanding the mechanisms by which religious involvement promotes health.” Pargament (2002) remarks accordingly that, even when significant results are obtained, they provide only little insight into how religion works.

A&N actually warn: “All of this isn’t to say that the function of religion is to promise resolution of all outstanding existential anxieties any more than the function of religion is to neutralize moral relativity and establish social order” (sect. 7, para. 9). But they are unclear about the other functions religion might have, and ultimately leave the role of functional explanations unspecified. It is not clear, for example, whether they wish to explain the persistence of religion by its functions, or only want to distinguish religion from mere fiction by its functions.

It is more likely that religion persists because in everyday thinking there is little reason to try to eliminate it; this would require the kind of reflective thinking that typifies science, and which is cognitively costly and of little relevance in everyday life (see Barrett 2004; McCanley 2000; Pyysiäinen 2003a; 2004; Sherper & Wilson 1986). Religion persists in the form of everyday thought. This in no way necessitates that religion is useful in the sense of providing an antidote against anxiety or other fears. Some forms of religion may do this in some instances, but this is not a necessary characteristic of religion. A&N’s experiments, for example, only show that a death prime activates religious beliefs, not that they necessarily alleviate anxiety in the face of death. Religious beliefs differ from fictional ones in that only religious beliefs are believed to be capable of guiding actual motor interaction with real objects (see Cruse 2003). It could be speculated that ritual action enhances this belief, irrespective of whether it helps alleviate anxiety. All that is needed is that persons believe that neglecting the ritual duties could be dangerous. This belief arises when people combine randomly generated counterintuitive representations with social practices such as baptisms, weddings, and so forth (see Pyysiäinen 2003b). Religion also does not always have to be in any sense “costly”; non-religion often is more costly.

Does commitment theory explain non-kin altruism in religious contexts?

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Abstract: Atran & Norenzayan (A&N) fail to address several problems with commitment theory as it relates to non-kin altruism in religious contexts. They (1) provide little support for the contention that religious sacrifices function as signals, (2) do not distinguish between religious specialists and lay believers, and (3) confute definitions of cooperation and sacrifice.
I have no problem with Atran & Norenzayan’s (A&N’s) fundamental proposition that religion is a by-product of interacting, evolved psychological adaptations. I also agree that altruistic behavior in non-kin contexts is a ubiquitous characteristic of religion and central to its understanding. However, A&N’s argument that exploitation of psychological adaptations related to indirect reciprocity and costly signals of commitment (hereafter commitment theory) helps explain non-kin altruism in religious contexts is, in my view, unpersuasive and problematic for several reasons.

First, the manner in which A&N characterize the universality of sacrificial behavior (as “hard-to-fake expressions of material sacrifice”; sect. 1.2, para. 3) prematurely steers interpretation in the direction of commitment theory. Religious institutions do often make demands of goods, property, energy, time, reproduction, or even life. In many cases, these demands involve long-term benefits to families that place or cloister members in religious coffers every day.

Further, A&N do not discuss several distinctions that are potentially crucial to evaluating the relevance of commitment theory to religious behavior. The most important is that between a religious specialist, such as a monk or nun, and a lay believer. Is commitment theory equally relevant to these fundamentally different roles? Probably not. In many cases believers are not sacrificing at all, but simply (and rationally) exchanging goods or labor for desired services. In some cases these are relatively mundane services, such as children’s schooling or officiating at marriages and funerals. In others, they are what might be called future considerations. This is easily supported by a look at Christian, Buddhist, and Hindu monastic orders. However, establishing that the demands these institutions make on members and recruits – demands that include labor, forfeiture of wealth, and lifelong vows of celibacy – are hard-to-fake expressions of commitment is much more difficult. It is easy to imagine sacrifice occurring in private or anonymous contexts where signaling motivation, as well as institutional manipulation, is unlikely to be relevant. One example is the early Christian semi-anchorite, who lived alone yet sacrificed resources and labor (Tinko 1990, pp. 110–11). More generally, consider the myriad individuals who anonymously fill congregation plates and church coffers every day.

Finally, A&N interchange the terms cooperation and sacrifice in their discussion of altruism, sometimes in the same sentence. The relationship between these two concepts is, at best, complicated (e.g., Rachlin 2002 and commentaries), so that conflating them risks overlooking important theoretical implications. To whatever extent cooperative behavior entails individual gain (e.g., Toomey 2000, pp. 17–18), it fundamentally differs from some of the previously mentioned terminal categories of sacrificial behavior found in non-kin, religious contexts, and probably does not require commitment or any other special theory as an explanation.

While there is little doubt that religious behavior involves a strong component of non-kin altruism, or that this must be adequately explained in any robust Darwinian interpretation of religious behavior, it is premature to focus on commitment theory. A&N have made a good start at addressing this problem, but there is a need for more empirical testing of alternative models.

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**Religion’s evolutionary landscape needs pruning with Ockham’s razor**

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Abstract: Atran & Norenzayan (A&N) have not adequately supported the epistemic component of their proposal, namely, that God does not exist. A weaker, more probable hypothesis, not requiring that component – that the benefits of religious belief outweigh those of disbelief, even though we do not know whether or not God exists – is available. I counsel them to use Ockham’s razor, eliminate their negative epistemic thesis, and accept the weaker hypothesis.

Why do people continue to believe in God, even though God does not exist? A&N suggest that religion is a by-product of our evolutionarily based emotional, cognitive, and social capacities. Believing in and committing oneself to a supernatural being, even though it does not exist, reduces existential anxiety and promotes social solidarity. Their proposal involves three key elements. First, they offer an unsupported, speculative cost/benefit estimate: The advantages accruing to being religious, despite the falsity of religious belief, outweigh those of being non-religious though possessing true belief. Second, they support the cognitive component of their explanation by experimental findings concerning the ease of learning and remembering such beliefs and their role in alleviating existential anxiety. Third, they argue for their hypothesis that religious beliefs lack epistemic merit.

Religious specialists, on the other hand, typically make much greater and consistent sacrifices of time, energy, material resources, even reproduction and life, for the benefit of the institutions to which they belong. (Although there are also material, status, and fitness benefits associated with their religious affiliation, these tend to accrue primarily to the highest-ranking members, who are often political appointees from outside the institutions; see, e.g., Betzig 1995.) It may be that A&N have specialists in mind when they say that religion “passionately rouses hearts and minds to break out of this viciously rational cycle of self-interest” (sect. 6, para. 8). Commitment theory seems more relevant here, but only to a point. Where the sacrifice is terminal, involving the loss of reproduction or life, the cost seems too high: there will be no subsequent opportunity for signalers to gain the fitness benefits upon which commitment theory is predicated. Other models more easily overcome this objection. More plausible than the exploitation of adaptive mechanisms associated with indirect reciprocity is that of those associated with inclusive fitness, as only kin contexts should engender such dramatic sacrifice. One possibility, suggested by the work of Gary Johnson (1986) and explored in the context of institutionalized celibacy (Qirko 2002, 2004), is the manipulation of kin-recognition cues via institutional practices that reinforce altruistic behavior in non-kin contexts. These practices include the separation of young recruits from kin, the institutional replication of kin roles and terms, and the promotion of phenotypic similarity via uniforms and the like. They are consistently present in religious, military, terrorist, and other organizations that demand terminal altruism from members. While A&N do make mention of fictive kinship, they do not discuss specific adaptive mechanisms that might be involved in kin (mis)identification.

Pruning with Ockham’s razor requires that A&N eliminate their negative epistemic hypothesis. Why do people continue to believe in God, even though God does not exist? A&N suggest that religion is a by-product of our evolutionarily based emotional, cognitive, and social capacities. Believing in and committing oneself to a supernatural being, even though it does not exist, reduces existential anxiety and promotes social solidarity. Their proposal involves three key elements. First, they offer an unsupported, speculative cost/benefit estimate: The advantages accruing to being religious, despite the falsity of religious belief, outweigh those of disbelief, even though we do not know whether or not God exists – is available. I counsel them to use Ockham’s razor, eliminate their negative epistemic thesis, and accept the weaker hypothesis.

Religious specialists, on the other hand, typically make much greater and consistent sacrifices of time, energy, material resources, even reproduction and life, for the benefit of the institutions to which they belong. (Although there are also material, status, and fitness benefits associated with their religious affiliation, these tend to accrue primarily to the highest-ranking members, who are often political appointees from outside the institutions; see, e.g., Betzig 1995.) It may be that A&N have specialists in mind when they say that religion “passionately rouses hearts and minds to break out of this viciously rational cycle of self-interest” (sect. 6, para. 8). Commitment theory seems more relevant here, but only to a point. Where the sacrifice is terminal, involving the loss of reproduction or life, the cost seems too high: there will be no subsequent opportunity for signalers to gain the fitness benefits upon which commitment theory is predicated. Other models more easily overcome this objection. More plausible than the exploitation of adaptive mechanisms associated with indirect reciprocity is that of those associated with inclusive fitness, as only kin contexts should engender such dramatic sacrifice. One possibility, suggested by the work of Gary Johnson (1986) and explored in the context of institutionalized celibacy (Qirko 2002, 2004), is the manipulation of kin-recognition cues via institutional practices that reinforce altruistic behavior in non-kin contexts. These practices include the separation of young recruits from kin, the institutional replication of kin roles and terms, and the promotion of phenotypic similarity via uniforms and the like. They are consistently present in religious, military, terrorist, and other organizations that demand terminal altruism from members. While A&N do make mention of fictive kinship, they do not discuss specific adaptive mechanisms that might be involved in kin (mis)identification.
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Abstract: Atran & Norenzayan’s (A&N’s) analysis fits with other perspectives on evolved culture: Cultural beliefs might emerge simply from the fact that people share a common cognitive architecture. But no perspective on culture can be complete without incorporating the unstoppable role of religion. The evolutionary landscape of culture will be most completely mapped by theories that describe specifically how communication translates evolved cognitive channels into cultural behaviors.

There are few systems of belief and behavior so prototypically cultural as those that define a religion. Just as religion may be a predictable by-product of a canalizing evolutionary landscape, many other features of human culture can also be best viewed as accidental by-products of specific psychological dispositions that emerged for very different reasons altogether. As others (e.g., Tooby & Cosmides 1992) have suggested, in order to crack the complicated code we call culture, we would be wise to first figure out the specific cognitive canals carved by our evolutionary past.

Atran & Norenzayan (A&N) apply this approach cleverly; the useful upshot is a penetrating perspective on several paradigmatic elements of religion. Others may take a broader view of religion and wonder whether an evolutionary canalization approach can also explain the kinds of moral injunctions that show up in, say, the Ten Commandments. It can. Krebs and Janicki (2004) describe how specific evolutionary pressures inclined the human mind toward specific kinds of moral norms. These norms may be codified in somewhat different ways in different religious systems, but the norms themselves appear to be universal. More generally, even when moral thinking appears to appeal to specific religious values, it may actually be a by-product of automatically activated emotional responses – such disgust – that evolved for reasons entirely independent of their cultural consequences (Haidt 2001).

These and other examples suggest that one of the defining features of any culture – its sharedness across a population – can emerge simply from the fact that people share a common cognitive architecture. Widespread cultural beliefs can be evoked by cognition, even in the absence of persuasion, socialization, or other acts of interpersonal information transmission (Tooby & Cosmides 1992). This insight is important, and it surely appeals to our very human preference for parsimony.
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But wait a minute; not so fast. Any pared-down, parsimonious approach to culture leaves out too much reality. The fact is that people do talk. It is one of our most prototypically human attributes. Our proclivity for communication was surely adaptive for very specific reasons that have nothing to do with the creation and perpetuation of culture (e.g., Dunbar 1996). And yet, inevitably, our tendency to talk has unintended cultural consequences. Research on dynamic social impact reveals how seemingly trivial acts of interpersonal communication, repeated across time and social space, create the rudimentary outlines of culture within any human population (Harton & Bourgeois 2004; Latané 1996). Other research shows that the mere act of communication influences stereotypic beliefs about the populations with which we self-identify — thus creating and perpetuating socially shared perceptions of who we are. Our cognitive/interpersonal transmission. Successful stories succeed (and so become popular if it more strongly triggers evolutionarily fundamental responses which motivate religious behaviors. The adaptive value of these constructs resides in their utility as memorable and emotionally evocative primes.

Integrating cognitive and behavioral approaches to the evolutionary study of religion is vital to our progress in understanding religious behaviors and supernatural beliefs. We applaud Atran & Norenzayan’s (A&N’s) efforts toward laying the groundwork for this endeavor. Although we appreciate their theoretical and experimental contributions, we are troubled by their assertion that religious behavior is not adaptive, despite failing to test any adaptive hypotheses.

Before turning to a discussion of the adaptive nature of religion, we wish to correct A&N’s claim that commitment theories cannot distinguish between secular and religious ideologies. More than 30 years ago Rappaport (1971) offered an insightful analysis of why secular rituals and ideologies were less potent at generating trust and commitment than their religious counterparts. Briefly, he argued that religious rituals provide more stable referents than the mixture of secular rituals because religious rituals sanctify unfalsifiable postulates that are beyond the vicissitudes of examination. The ability of religious rituals to evoke enduring emotional experiences differentiates them from both animal and secular rituals and lies at the heart of their efficacy in promoting and maintaining long-term group cooperation and commitment. More recently, Sosis and colleagues’ evaluation of Irons’ (2001) theory of religion as a hard-to-fake signal of commitment has explicitly made use of the distinction between religious and secular groups (Sosis 2000, 2003; Sosis & Bressler 2003), including research on Israeli kibbutzim (Sosis & Ruffle 2003) that specifically evaluated the differences between “Marxism and monotheism.”

A&N’s claim that religion constitutes a “converging by-product of several cognitive and emotional mechanisms that evolved for mundane adaptive tasks” (sect. 1, para. 2), is consistent with accumulating neuroscience research that suggests that a number of nuclei and cortices of the brain interact to generate the affect, cognition, and somatic states of religious belief and practice. Predominant among these are the hypothalamus, amygdala and cingulate cortex, hippocampus, and prefrontal cortex. However, the assertion that the cognitive and emotional mechanisms that produce religious behaviors did not evolve for such purposes, a position we are in agreement with, does not exclude the possibility that religious behaviors are adaptive. As Atran (2002a) has previously noted, the co-opting of pre-existing structures for novel solutions to ecological challenges is a hallmark of evolutionary adaptation.
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Religion's reliance on structures originally evolved for different tasks is evolutionarily parsimonious and parallels numerous other adaptations, such as the co-opting of insulating bird feathers for flight. Both the ubiquity and ritual commonality of religions across cultures indicate that religion is more than a mere by-product. Religious ritualized behavior has its roots in adaptive solutions to inherently problematic social problems (Sosis & Alcorta 2003). Ritual behaviors, from mating displays to greeting rituals, constitute adaptations that facilitate coordination, cooperation, and conflict resolution among conspecifics. Religious ritual represents a uniquely human adaptation for conspecific communication intimately interconnected with the evolution of symbolic systems. Like nonhuman rituals, religious rituals arouse attention, lighten tension, allow assessment, and trigger appropriate neuroendocrine responses in conspecifics (whether affiliative, submissive, or aggressive). We suspect that these components of ritual are adaptive, and the calculus of selection has operated on the individual will have memory-boosting effects. Thus, frightening and physically painful ordeals, such as those endured in rites of passage, will impact memory and belief. Therefore, anxieties may be a likely positive relationship between environmental stress and ritual participation, which would increase adrenergic activation and belief in the tenets of the rituals performed, although we are unaware of studies that directly test this claim.

It is noteworthy that Cahill et al.'s (1994) experiments, which A&N discuss, explicitly tested impacts on memory of neuroendocrine function rather than mental constructs. It is likely that anything eliciting pronounced neuroendocrine responses in the individual will have memory-enhancing effects. Thus, frightening and physically painful ordeals, such as those endured in rites of passage, will impact memory and belief. Therefore, anxieties may not have to be existential; indeed, existential anxieties may have their genesis in early social and/or physical experiences. It is the conditioning of the neuroendocrine response with the associated social behaviors that gives the religious act its emotional power; why does this so frequently take the form of supernatural agents? Evolved mental domains no doubt pattern this, as A&N argue. Rappaport (1999) has noted that the polarization of such agents into gods and demons, and the attribution of impossible powers render them more memorable and emotionally evocative. However, it is important to note that the particular supernatural agents existent within religions systems are not arbitrary; but reflect the particular landscapes of the cultures in which they exist. Rappaport, noted by Durkheim (1912/1995) and supported by Swanson (1960). Whether deities are animal totems, clan ancestors, or hierarchical moralizing gods is dependent upon the social environment inhabited. This suggests that religions, and the emotions they evoke as a result of ritual conditioning, serve to regulate social interactions among conspecifics in relation to resources (whether mates or territories), just as ritualized displays do in other species.

A&N clearly explain how cognitive adaptations channel the conceptual landscape of religions. Their tests provide valuable evidence that some constructs are more memorable than others and have greater cultural transmissibility. The main flaw, however, is in A&N's assumption that the conceptual landscape constitutes the core of religion. While they discuss the importance of emotional verification of religious concepts, and note the centrality of emotionally eruptive existential anxieties in the motivation of supernatural beliefs, they assume the primacy of religious concepts in directing behaviors. If one assumes, however, that such concepts constitute highly memorable, socially relevant, and developmentally primed triggers for conditionally associated neuroendocrine responses, then the adaptive value of religion as a mechanism for the regulation of both in- and out-group social interactions becomes much clearer. The constructs, themselves, constitute associatively conditioned mnemonics that trigger neuroendocrine responses which motivate behaviors. Thus, the adaptive value of these constructs resides in their utility as memorable and emotionally evocative primes. As A&N demonstrate through their experiments, minimally counterintuitive beliefs and belief systems that are mostly intuitive, combined with a few minimally counterintuitive ones, "grab attention, activate intuition, and mobilize inference in ways that greatly facilitate their mnemonic of communicational transmission, cultural selection, and historical survival" (sect. 4).

This perspective explains how religion promotes in-group trust and commitment through common ritual participation regardless of the particular belief system, how it patterns in-group social interactions specific to particular forms of social organization, and how it directs out-group sentiments and beliefs. Far from being an evolutionary by-product, religion constitutes a uniquely human form of ritualized display that regulates social interactions, but also promulgates social cohesion and provides the foundation for social transmission of culture.

Agency, religion, and magic

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Abstract: Atran & Norenzayan (A&N) ask: "Why do agent concepts predominate in religion?" This question presupposes that we have a notion of religion that is (1) well enough defined, and (2) characterized independently of that of supernatural agents. I question these two presuppositions.

A&N ask: "Why do agent concepts predominate in religion?" (sect. 1, their emphasis). This question presupposes that we have a notion of religion that is (1) well enough defined, and (2) characterized independently of that of supernatural agents. I want to question both these two presuppositions.

Today, most anthropologists would agree that "religion" is a polythetic or "family resemblance" notion (Needham 1975) under which it may be convenient to lump together a wide variety of related phenomena, but it is not a natural kind category calling for a unified theory. Laymen and earlier anthropologists who have thought otherwise may have been unduly influenced by the case of centralized religious organization such as Christian Churches, where, or so it seems, everything religious is codified and organized in an integrated way, and where individuals belong to a given Church and have a given religion to the exclusion of others. With its organization, integration, inclusiveness, and insistence on faith, Christianity (or, for that matter, Judaism or Islam) is far from being a good model or a paradigmatic case of religion as found across cultures. Let me illustrate the point with the case of the Dorze of Southern Ethiopia, among whom I did my fieldwork. If asked what their religion was, Dorze would answer that they were Christians, referring to the Ethiopian Orthodox Church, and indeed they had Christian churches and priests, and followed Christian rituals. However, since no Dorze word could, even approximately, translate "religion," you had, in order to ask the question "What is your religion?", to resort to Amharic, the dominant language of Ethiopia, and use the word haymanot, which denotes faith-based integrated constructs, such as Christianity and Islam. The Dorze answer, "We are Christian," was sincere, reasonably accurate, politically prudent, and profoundly misleading. At the same time as
they practiced Christian rituals, the Dorze performed, in every household, prayers, offerings, and sacrifices for their ancestors; they sacrificed to a variety of supernatural agents linked to forests and rivers; and they had spirit possession groups, a complex system of taboos, hereditary village sacrificers, diviners, and so on. To an anthropologist, it goes without saying that all these activities and institutions were religious, and were also political, economic, and kinship-related – with “politics,” “economy,” and “kinship” being, just like “religion,” family resemblance notions. The Dorze themselves had neither the interest nor the lexical tools to lump these religious phenomena under a single label. Most human societies in history have practiced religion in a way more similar to that of the Dorze than to that of empires or nation-states with institutionally integrated religions.

Probably the main criterion used by anthropologists and others for calling some practice or belief religious is the role that supernatural agents play in it. A standard anthropological distinction, going back at least to Tylor (1871/1958) is that between “religion” and “magic”: both involve supernatural powers, but in religion, these powers are typically those of agents (gods and spirits in particular); whereas in magic, they are typically those of mindless substances or objects (e.g., a magic powder or a magic well). Of course, because both religion and magic are family resemblance notions, the agentive or non-agentive character of the supernatural powers involved is not an automatic and absolute criterion: Many religious practices (e.g., the use of relics) are somewhat magical, and many magical practices (e.g., the conjuring of demons) are somewhat religious by that criterion. Still, the question “Why do agent concepts predominate in religion?” has a simple answer: because this very predominance is used to identify religious phenomena. The real question – and the one A&N are in fact addressing – is: why are agent concepts invoked well beyond their empirically justified reach, or, in other terms, why is the “actual domain” (Sperber 1994) of the Theory of Mind Module so extensively peopled by cultural constructs, religious ones in particular?

Would you be surprised if A&N radically disagreed with me regarding the polythetic character of the notion of religion or with my rephrasing of their question about the role of agent concepts in religion. My reason to make the point is neither to express a substantial disagreement nor to recommend a mere reformulation. It is to underscore, with a specific illustration, that special care must be taken, in interdisciplinary research, to avoid confusing the simplistic or obsolete views scholars of one discipline may have of these phenomena or objects (e.g., a magic powder or a magic well). Of course, because both religion and magic are family resemblance notions, the agentive or non-agentive character of the supernatural powers involved is not an automatic and absolute criterion: Many religious practices (e.g., the use of relics) are somewhat magical, and many magical practices (e.g., the conjuring of demons) are somewhat religious by that criterion. Still, the question “Why do agent concepts predominate in religion?” has a simple answer: because this very predominance is used to identify religious phenomena. The real question – and the one A&N are in fact addressing – is: why are agent concepts invoked well beyond their empirically justified reach, or, in other terms, why is the “actual domain” (Sperber 1994) of the Theory of Mind Module so extensively peopled by cultural constructs, religious ones in particular?

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now needed further convincing that what looked really bad was really bad. Luckily for us, waiting in some unused wing of the evolving brain was the kind of psychological mechanism postulated by the error theory, capable of overriding rational doubts about what we morally ought to do.

A&Ns approach to religious capacities offers the beginnings of a more plausible line of response to the unreal reflection to moral beliefs. The error theory of morality is right in that, with the capacity for reflection came the capacity to doubt the imperative moral goodness of cooperating when it looks like we can get away with not cooperating. And this blow to unreflective moral knowledge was certainly a serious blow to unreflective moral motivation. But why not suppose that moral knowledge and motivation were only shaken by this evolutionary event, not destroyed? Like other primates, we are adept at spotting such things as the moral unreasonableness of unjustifiable inequality, and like other primates, we are generally moved to do something about it when we spot it. But being reflective, we are unlikely to be motivated enough, enough of the time, for moral goods to trump individual goods reliably.

But if moral beliefs, commonly both functional and intuitive, can be placed in doubt by reflection, our capacity for religious beliefs psychologically support morality against self-interest is far from sufficient for denying the objectivity of morality. Although A&N flirt with the error theory of morality themselves, asserting that without religion, moral collapse once "people learn that all apparent commitment is self-interested convenience or worse" (sect. 6, para. 8), this assumption is hardly central to their view. Moral commitment may be genuine (Nesse 2001) and religious belief (or something like it) still necessary for moral stability, at least until stronger justifications emerge. While other primates can be ingeniously deceptive, A&N are right to point out that the reflective capacities of human beings raise the potential for deception to a new and much higher level. But again, although new levels of deception might be supposed to have destabilized the capacity for morality in humans, they need not be supposed to have destroyed it. In any case, that counterintuitive beliefs psychologically support morality against self-interest is far from sufficient for denying the objectivity of morality.

Locating the causes of religious commitment

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Abstract: Atran & Norenzayan (A&N) survey a substantial body of theory and evidence on which there is broad agreement in the cognitive science of religion. Some parts of their argument (for instance, concerning the causes of costly commitment to religious beliefs) are more speculative and remain a focus of lively debate and further research.

Atran & Norenzayan (A&N) survey a wide range of features of human cognition that plausibly account for the historical and cross-cultural recurrence of religious behaviour, which they define as "passionate communal displays of costly commitments to counterintuitive worlds governed by supernatural agents" (sect. 1; see also Atran 2002a). Their argument is broadly consistent with a cultural recurrence of religious behaviour, which they define as "religions that maintain elaborate orthodoxies also necessarily deploy routinized rituals as a principal mechanism for doctrinal transmission" (Whitehouse 2004). And most religious traditions that elicit low levels of agreement on the content and origins of cosmological truth, but whose members are also deeply reflective on religious topics, also deploy relatively low-frequency, high-arousal rituals. Furthermore, we may identify many interim scenarios as well, particularly those built around relatively intuitive (and minimally counterintuitive) religious concepts that are neither particularly homogeneous nor a focus for intense, if idiosyncratic, rumination.

NOTE 2. For example, A&N alter and problematize Boyer's widely accepted notion of "minimally counterintuitive beliefs" by describing these as being
A proper faith operates with the acknowledgement of risk, and, hence, a true religion with that of sacrifice

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Abstract: The authors are working with a limited notion of religion. They have confined themselves to a view of it as superstition, “counterintuitive,” as they put it. What they have not seen is that faith does in a real sense involve a paradox in that it projects an impossibility as a methodological device, a fictive play, which in the best interpretation necessarily involves a commitment to the likelihood of self-sacrifice.

Atran & Norenzayan (A&N) are operating with a too narrow and, therefore, distorting concept of religion. A first sign of this is their restricting their definition of faith to virtually one of superstition, but to put the objection in such a form would ignore the error of their starting point. In relying on early 20th-century anthropologists and sociologists (e.g., Durkheim 1915/1976; Malinowski 1922/1961), they fail to see what Clifford Geertz has emphasized: the prior importance of symbolic action as regards religion (Geertz 1973). One can go further than Geertz in claiming that religion can be seen to arise from the very nature of language, that is, what makes us human. Though this claim would form a “commitment theory,” it does not fail to their criticisms that it cannot account for the “imperceptibility” of a deity nor for the demand for sacrifice.

A&N’s discussion of “hair-triggered folkpsychology” (now more commonly referred to, following Barrett 2000, as “hyperactive agent detection”) seems to underplay evidence that the evolution of such mechanisms owed as much to the needs of developing hominid hunting and tracking techniques as to the avoidance of predators (see Mithen 1996).

4. Without disputing this argument, it may be noted that it could have been rendered more precisely. For example, how are nonrecoverable costs to be identified and quantified?
5. Obvious examples of agents assumed to lack any supernatural properties and yet whose teachings have evinced precisely the kinds (and intensities) of commitment that A&N restrict to the religious sphere, would be the 20th-century communist leaders of the USSR, China, Cuba, and elsewhere.
6. Ibid.
Authors’ Response

Why minds create gods: Devotion, deception, death, and arational decision making

Scott Atran and Ara Norenzayan

Abstract: The evolutionary landscape that canalizes human thought and behavior into religious beliefs and practices includes naturally selected emotions, cognitive modules, and constraints on social interactions. Evolutionary by-products, including metacognitive awareness of death and possibilities for deception, further channel people into religious paths. Religion represents a community’s costly commitment to a counterintuitive world of supernatural agents who manage people’s existential anxieties. Religious devotion, though not an adaptation, informs all cultures and most people.

R1. Disentangling notions of counterintuitive, contradiction, counterfactual, and category mistake

R1.1.

Barrett and Kelemen contend that we have mistakenly overextended the notion of “counterintuitive” that Boyer (1994, 2001) uses for religious concepts. A counterintuitive idea in this sense is one that violates innately based, intuitive assumptions about the ontological properties of the everyday world, such as the categorical and relational properties that people in all cultures appear to spontaneously ascribe to intentional agents (folkpsychology), biological kinds (folkbiology), and inert bodies (folkphysics). Barrett and Rottschaefer argue that we confuse this notion of counterintuitive with counterfactual, category mistake, and contradiction.

Response. The general sense of counterintuitive in cognitive psychology (since at least the 1960s) was stated by George Miller as “contrary to what common sense would suggest.”1 One apparently universal aspect of “common sense” found across cultures was the structurally peculiar taxonomic ordering of plants and animals in Linnaean-like hierarchies (Berlin et al. 1973). Sperber’s (1975a) description of how “symbolism” is triggered through “contradiction” of such “universal, necessary truths” was the first step in what has come to be known as the “cognitivist” program in the study of religion.

Universal properties of folkbiological taxonomy are not contingent but necessary truths. . . . Any statement which contradicts [them] is forever paradoxical and can only be assimilated through symbolic processing. The only zoological classifications that are clearly of this type are descriptions of fantastical animals: the minotaur.

Our use of contradiction is clearly consistent with this tradition in the cognitive study of religion. Barrett and Rottschaefer ignore that in common English (and philosophy) the term “contradiction” has the broad sense of “an assertion to the contrary of what has been said or what is.” They suggest the term applies only to its narrow sense in logic, as a statement that is necessarily false. But symbolic thoughts, including religious beliefs, often involve broad and narrow contradictions.

Elaborating on Sperber’s insight, Atran (1986) proposed a series of cognitive principles to distinguish between how the science of biology and biological symbolism emerged as more or less distinct branches of thought from a common universal structure (folkbiology). Here, the more specialized concept of counterintuitive as applied to “mythico-religious beliefs” was first formulated:

The formative analogies of science are superficially like [the symbolic analogies] of myth and religion. . . . To compare, for example, the essential traits of plants with those of animals, or living kinds with mechanical devices, appears to violate categorical constraints on common sense. . . . Violating these fundamental ontological divisions of the everyday world creates phenomenally impossible situations. But the invocation of such phenomenal impossibilities in science is not an open invitation to phenomenal reconstrual of an imaginary world that is forever empirically impossible. Rather, it is a directive to make hitherto independent and only partially understood properties of these categorically distinct subjects mutually, and precisely, intelligible . . . [despite the fact] that both science and symbolism initially speculate about the possible relations between counterintuitive phenomena. (Atran 1986, pp. 161–163; cf. Atran 1990, pp. 218–222)

Pascal Boyer, who pioneered the first full-fledged theoretical account of religious cognition (Boyer 1994), acknowledges how his own original notion of minimal counterintuation builds from these notions:

A metamorphosis between two different categories requires suspending the causal expectations that accompany both ontological domains. As a result, the range of inferences that can be entertained about the object concerned is not restricted enough to make the imaginary entity the object of precise scenarios. This illustrates a more general point made by Atran, on the basis of the connection between folk biology and animal “symbolism”: “Only to the degree . . . that impossible worlds remain bridged to the everyday world can information about them be stored and evoked in plausible grades” (Atran 1990, p. 220). (Boyer 1994, pp. 122–23)

Boyer (2003) also uses the term counterfactual with regard to religious beliefs much as we do:

A good deal of spontaneous reflection in humans focuses on past or future interaction and on counterfactual scenarios. This capacity to run “off-line” social interaction is already present in young children. Thinking about supernatural agents certainly activates such off-line capacities.

Barrett and Rottschaefer restrict “counterfactual” to its narrow sense in the philosophy of science as being contrary to actual facts in this world but not in another (nomologically) possible world. They ignore that in common English (and philosophy) counterfactual has the broad sense of “contrary to actual or possible fact.” Religious notions, say, of afterlife, typically involve broad and narrow counterfactuals.2

The critique of our use of category mistake as “lacking truth conditions” follows in the same vein. From Aristotle and Kant to Gilbert Ryle and A. J. Ayer, a category mistake has been taken to occur when someone applies a concept that violates the necessary conditions of its application. Statements containing category mistakes lack truth conditions in that they can say nothing true or false. They are literally meaningless. Violations of necessary conditions may
involve rupturing the logical, or analytic, structure of conceptual definitions (e.g., “the bachelor is married”), or surrendering the synthetic a priori structure that the mind imposes on understanding the world (e.g., “the dead are resurrected”). Religious belief may involve both violations (e.g., “the dead are alive”), but we are most concerned with misapplication of concepts outside the commonsense ontological domain, or category, to which they meaningfully apply.

**R1.2.**

Kelemen believes we may be rashly generalizing the idea of counterintuitiveness, from areas where there is much agreement in cognitive and developmental psychology about mental modules responsible for innate ontology (folkpsychology and folkphysics), to where there is little agreement (folkbiology).

*Response.* There is much debate about the precise scope and limits of the basic conceptual domains that comprise intuitive ontology; however, a cursory glance over the field reveals hundreds of articles and books that credit the plausibility of a core domain of folkbiology (for review, see Medin & Atran 2004). There is no doubt that application of counterintuitiveness to religious ideas was originally inspired in large part by considering categorical violations of universal folkbiology.

**R1.3.**

Wright argues we think too narrow and “rationalist” a view of religion as counterintuitive, which restricts “definition of faith to virtually one of superstition.” Religious cognitions cannot be “counterintuitive” because religion is a communicative act of commitment that involves risk and sacrifice which is obviously real and, therefore, intuitive.

*Response.* We agree that religion critically involves communicative acts involving real risk and sacrifice. The efficacy of such acts depends crucially upon the counterintuitive framework in which they are embedded. This peculiar metarepresentational framing, which cannot logically or empirically fix content and interpretation, makes possible an “openly imagined goal of faith” (as Wright puts it). It allows people to communicate trust through promissory commitments that require real sacrifices (i.e., without regard to the risks inherent in an uncertain future). We take on “The Mickey Mouse Problem” (see note 1) precisely because we do not think that religion boils down to counterintuitive “superstition.”

**R2. Modular memory and other constraints on the cultural propagation of religious beliefs**

**R2.1.**

Barrett and Kelemen raise concerns about the ecological validity (naturalness) of our measures for assessing the cultural selection of supernatural beliefs.

*Response.* In our experiments, we operationalized minimal counterintuitiveness as the transfer of a property associated with the core conceptual domains of folkphysics, folkbiology, folkpsychology, from an appropriate ontological category of person, animal, plant, substance, to an inappropriate category, or category, to which they meaningfully apply.

Two independent lines of evidence bolster the case that our operationalization of counterintuitive beliefs captures the core definition of supernaturals in cultural narratives and religions. First, in a recent study, we had 44 Canadian students (of various religious backgrounds) rate the degree to which intuitive and minimally counterintuitive beliefs are supernatural (on a 6-point scale). Counterintuitive items were considered more supernatural than intuitive ones, $t(43) = 14.71, p < .001 (M = 1.83 vs. M = 4.39)$. Bizarre but intuitive items were deemed intermediate on supernaturality ($M = 3.53$). Independent judges, who were blind to the purpose of the experiments reviewed in the target article, agreed with our operationalization of counterintuitiveness as a central aspect of supernaturalism.

Second, in a study conducted with Jay Faulknor and Mark Schaller (Norenzayan et al. 2005), we analyzed folktales possessing many of the counterintuitive aspects of religious stories. We examined (1) the cognitive structure of Grimm Brothers’ folktales and (2) the relative cultural success of each tale. Two trained raters, unaware of our hypotheses, read each tale and counted the number of coun-

<table>
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<th>Minimally Counterintuitive</th>
<th>Yes</th>
<th>No</th>
<th>$t$</th>
<th>$p$</th>
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</table>
terintuitive elements in each based on the specific criteria discussed in this article. We measured cultural success in two ways. The number of hits for each of 42 folktales was calculated using the search engine Google, as well as cultural familiarity ratings by university students. In addition, 65 university students read these folktales and rated them on a number of characteristics, including memorability and ease of transmission.

The hypothesized nonlinear relation between the frequency of counterintuitive elements and cultural success was confirmed (Fig. R1). Variability within the successful sample ($sd = 1.65$) was lower than within the unsuccessful sample ($sd = 2.19$), $F (1, 20) = 3.92$, $p = .05$. Among culturally unsuccessful tales, the distribution is relatively flat, and there is no single modal number of counterintuitive elements. In contrast, among culturally successful tales, there is a clear mode: The majority of these tales had a counterintuitive score between 2 and 3, inclusive. Using this range (2–3) to define a set of minimally counterintuitive folktales, it is revealed that 76.5% of minimally counterintuitive tales are in the culturally successful sample. Among stories with fewer counterintuitive elements (scores < 2), only 30% are in the culturally successful sample. Among stories with excessive numbers of counterintuitive elements (scores > 3), only 33% are in the culturally successful sample.

Table R1 summarizes mean ratings of memorability and other psychological variables. Minimally counterintuitive folktales were considered more memorable than folktales containing either too few or too many counterintuitive elements ($p = .02$). Minimally counterintuitive folktales were also rated easier to understand ($p = .003$) and transmit ($p = .05$). Although the two sample distributions clearly differed in terms of counterintuitive elements, investigation of bizarre elements revealed no apparent differences.

Thus, while results indicate that cultural success is a nonlinear, inverted U-shaped function of the number of counterintuitive elements, success is not predicted by unusual narrative elements more broadly. These findings support our idea that the cognitive analysis of counterintuitiveness captures fundamental features of supernatural beliefs found in naturally occurring cultural narratives and is directly tied to memorability and cultural survival.

**R2.2.**

Schaller emphasizes the dual role of communication and cognition in the emergence of culture. *Response. Schaller* rightly points out that constraints on communication have unintended but far-reaching consequences for the propagation of religious beliefs. Understanding the ways by which some ideas but not others achieve a cultural-level distribution involves investigating several sorts of partially interrelated psychological constraints, including memory requirements, modular processing demands, and conformity to social interaction schema, such as dispositions to build social stereotypes (Hirschfeld 1996; Schaller et al. 2002) and preferred mating strategies (Kenrick et al. 2003).

**R2.3.**

Kirkpatrick argues that our account is “only the first step toward the much larger theory required to explain religion.” He suggests that “the main” factor in explaining religion—“and individual and cultural differences therein”—concerns the realm of social interactions, including “attachment, social exchange, coalitional psychology, status and dominance, and kinship.”

*Response.* In our evolutionary landscape of naturally selected “mountain ridges” that canalize human thoughts and experiences into religious beliefs and practices, we included the ridge of emotions and the ridge of social interactions in addition to the ridge of “conceptual modules” that is responsible for intuitive ontology. In our target article we could only touch upon the details involved with each ridge, and the candidate concerns that Kirkpatrick evokes appear reasonable (for details, see Atran 2002a, Ch. 5). Our perspective clearly overlaps with Kirkpatricks; however, our framework diverges from his in de-emphasizing the central role that he gives to “attachment theory,” in explaining religion (note 9 in the target article; Atran 2002a, sect. 3.7).

**R3. Memes and religion**

Nicastro argues that our experimental findings on memory and counterintuitiveness are compatible with a memetic account of religion. Moreover, a memetic account is “mindful” as our “black box” explanation involving dubious notions of cognitive modularity and domain specificity. *Response.* Few, if any researchers, restrict the term “modularity” to perceptual input as described by Fodor (1983) (for reviews, see Barkow et al. 1992; Hirschfeld & Gelman 1994; Medin & Atran 2004; Pinker 1997; Sperber et al. 1995). Nicastro’s characterization of folkbiology, folkphysics, and folkpsychology as “impenetrable” Fodorian modules that “occupy a similar status in cognitive science as ‘instinct’ used to in ethology” is therefore beside the point. Scores of experimental studies now invoke and test claims about conceptual modularity in developmental and cognitive psychology and cognitive anthropology.

The argument for conceptual modules—from the case of folkbiology—involves converging evidence from a number of venues: functional design, ethology (homology), universality, precocity of acquisition, independence from perceptual experience, selective cerebral impairment, resistance to inhibition (hyperactivity), and facilitation of cultural transmission. None of these criteria may be necessary, but presence of all or some is compelling, if not conclusive (for a fuller discussion of criteria for modularity, see Atran 2001a; Hirschfeld & Gelman 1994; for a review of converging empirical evidence in the case of folkbiology, see Medin & Atran 2004).

In contrast, there is little theoretical analysis or experimental study of memes. This is not surprising because there is no consensual—or even coherent—view of what a meme is or could be (Atran 2001b). Derived from the Greek root *mimeme*, with allusions to memory and mimic (and the French word *mêne*, “same”), a meme supposedly replicates from mind to mind in ways analogous to how genes replicate from body to body. Candidate memes include a word, sentence, thought, belief, melody, scientific theory, equation, philosophical puzzle, religious ritual, political ideology, agricultural practice, fashion, dance, poem, and recipe for a meal; or a set of instructions for origami, table manners, court etiquette, a car, building, computers, or cellphones (Blackmore 1999; Dawkins 1976; Dennett 1995).
For genes, there is an operational definition: DNA-encoded units of information that dependably survive reproductive division, that is, meiosis (although crossover can occur anywhere along a strand of DNA, whether at the divisions of functionally defined genes or within them). In genetic propagation, information is transmitted with an extremely high degree of fidelity. In cultural propagation, imitation is the exception, not the rule; the typical pattern is of recurrent, guided transformation. Modular mental structures thus play a central role in stabilizing and directing the transmission of beliefs towards points of convergence, or cultural attractors (Sperber 1996).

Minds structure certain communicable aspects of the ideas produced, and these communicable aspects generally trigger or elicit ideas in other minds through inference (to relatively rich structures generated from often low-fidelity input) and not by high-fidelity replication or imitation. Communication of religious beliefs bears this out. For example, in one set of classroom experiments, we asked students to write down the meanings of three of the Ten Commandments: (1) Thou Shall Not Bow Down Before False Idols; (2) Remember the Sabbath; (3) Honor They Father and They Mother. Despite the students' own expectations of consensus, interpretations of the commandments showed wide ranges of variation, with little evidence of consensus. A student project by Amol Amladi aimed to show that members of the same church have some normative content of that could serve for memetic selection. Twenty-three members of a Bible class at a local Pentecostal Church, including the church pastor, were asked to define the three Commandments above, as well as "Thou shalt not kill," "The Golden Rule," "Lamb of God," and "Why did Jesus die?" Only the last two elicit some degree of consensus. It is an open question whether cultural consensus would be obtained for other congregations, despite claims by Hogan and others that "all moralities have approximately the same content (e.g., the Ten Commandments)" (cf. Schlesinger 1999).

In another student project, Sara Konrath compared interpretations of cultural sayings (e.g., "Let a thousand flowers bloom") among 26 control subjects and 32 autistic subjects from Michigan. The autistic subjects were significantly more likely to closely paraphrase and repeat content from the original statement (e.g., "Don't cut flowers before they bloom"). Controls were more likely to infer a wider range of cultural meanings with little replicated content (e.g., "Go with the flow," "Everyone should have equal opportunity") — a finding consistent with previous results from East Asians (who were familiar with "Let a thousand flowers bloom" as Mao's credo; Atran 2001b). Only the autistic subjects, who lack inferential capacity normally associated with Theory of Mind (ToM), came close to being "meme machines." They may be excellent replicators of literal meaning, but they are poor transmitters of cultural meaning (see the discussion of autistics failing to understand the Eucharist, in the target article).

With some exceptions, ideas do not reproduce or replicate in minds in the same way that genes replicate in DNA. They do not generally spread from mind to mind by imitation. It is biologically prepared, culturally enhanced, richly structured minds that generate and transform recurrent convergent ideas from often fragmentary and highly variable input (Norenzayan & Atran 2004).

R4. Why religion is not likely to be an adaptation

R4.1.

Landau, Greenberg, & Solomon (Landau et al.) wish to argue that belief in supernatural agents is an adaptation for terror management. They dispute the implication of our experiments that supernatural beliefs are a buffer against existential concerns, functionally distinct from worldview defense.

Response. Landau et al. are not clear whether they mean religious belief is literally an adaptation — a genetically transmitted trait that has conferred a reproductive advantage to ancestral humans, such as the visual system, sexual desire, and possibly mind reading (biological adaptation) — or the distinct claim that religion serves psychological functions (not biological adaptation). We agree with Kirkpatrick's notion of why adaptationist arguments for religion falter. Such arguments need to: (1) rule out that the phenomenon is a cultural by-product of other adaptations; (2) show that it has the telltale features of a naturally selected mechanism, such as a compelling adaptive function in ancestral environments, unitary and complex design, efficiency, precision, specificity, economy, and reliability (cf. Williams 1966).

Experiments reported in the target article showed that among predominantly Christian participants, mortality awareness, relative to control, led to (1) stronger belief in Buddha (a culturally alien deity of a world religion), (2) stronger belief in shamanic spirits (culturally alien deities of an obscure religion) and (3) contrary to Landau et al.’s assertion, these effects were moderated by participants’ religious identification in a direction contrary to that predicted by narrowly sectarian worldview-defense: those who identified more with their religion (none were Buddhists or shamanists) were more likely to believe in a culturally alien Buddha or shamanic spirits under mortality salience conditions (see Norenzayan & Hansen 2005). In the control conditions, the correlations between religious identification and belief in culturally alien supernatural agents were no different from zero. Perhaps participants were favoring a non-denominational, all encompassing “religious worldview” endorsing equally the religious beliefs of outgroups as much as those of the ingroup. This is a viable possibility that remains to be explored in more detail.

These effects did not emerge for self-avowed atheists. Although atheists under mortality salience did not show stronger supernatural belief, neither did they derogate supernatural beliefs (in defending an atheistic worldview). Atheists may have access to alternative, non-supernatural terror management mechanisms, an idea requiring further investigation. In brief, the evidence suggests that, at least among believers, religious belief and cultural identification with the ingroup converge, but are possibly distinct mechanisms (see, for example Solomon et al. 1991).

R4.2.

Sosis & Alcorta also claim religion is an adaptation that regulates social interaction and promulgates social cohesion. They think we underplay the functional and adaptive value of religion by overlooking “conditionally associated neuroendocrine responses” in ritual display.

Response. Sosis & Alcorta observe that critical nuclei and cortices in the brain, such as the amygdala and hypothala-
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mus, interact "to generate the affect, cognition, and somatic states of religious belief and practice." But these same nuclei and cortices also routinely interact to generate the affect, cognition, and somatic states of mundane beliefs and practices. They are also involved in singular experiences such as posttraumatic stress disorder. No readily identifiable sequence of neuron firings marks religion.

Sosis & Alcorta's studies of costly signaling in ritual—including neurophysiological aspects—make noteworthy contributions to commitment theories of religion. Nevertheless, their invoking of "adaptation" produces no new finding or surprising insight, and the underlying reasoning seems questionable (i.e., religion enables social cohesion; social cohesion is adaptive; therefore religion is adaptive).

We do not reject "adaptationism" as a research strategy that may potentially prod important scientific discoveries about thought and behavior. Elsewhere, we argue that it can be an insightful research heuristic for designing tests to decide between competing theories (Atran, in press). But we also find that invoking adaptation in ancestral environments (or EEA; see also Fabrega) is often unjustified, unnecessary, and rarely predicts panhuman aspects of cognition and culture. Given the "family resemblance" character of religion across individuals and cultures (see Sperber), and lack of a well-circumscribed and replicable structure or structural core, the prima facie case for religion as an adaptation seems implausible.

R4.3.

Bering & Shackelford propose that the tendency to infer agentic intent in natural events might have served an ancestrally adaptive function.

Response. We argued that supernatural agent beliefs that anchor religions are promiscuous overextensions to novel domains of the naturally selected proclivity for an oversensitive agency-detection mechanism. Ketelaar's speculations about the relation between predator images in horror movies and religion are plausible extensions of this line of reasoning. Although the adaptationist argument for agency detection is grounded in sound theoretical and empirical literature, there is no independent case for any crapted adaptive function for supernatural beliefs. Experiments that Bering & Shackelford describe tell us something important: that preschoolers refrain from cheating in the perceived presence of a supernatural agent illustrates the important causal role that supernatural agent beliefs play in maintaining the moral order from a very young age. These findings, though, are consistent with explanations that do not invoke adaptationist reasoning at the level of religious beliefs.

R4.4.

According to Knight, behavioral ecology can "account for the cognitive peculiarities of religious belief." The functional efficacy of God concepts depends upon contractual relationships that uphold the institutional authority of God—something that imaginary and fantastical beliefs could not do alone. He argues that our framework neglects religion in small-scale hunter-gather societies, and that our "mentalistic perspective" discourages empirical research on the evolutionary origins of the utilitarian functions and signaling displays that underlie religion.

Response. Knight rightly insists that the perspective of behavioral ecology is crucial to understanding religion. But he provides no more evidence (or argument) that behavioral ecology can account for the cognitive "design features" of religion that we discuss (e.g., the peculiar counterintuitive properties of supernatural agents), than that behavioral ecology can account (as many of its proponents believe it can) for the design features of human language (e.g., syntactic features). At best, it may help to show that a given feature has behavioral correlates that convey some selective advantage to that feature over competing features. Nothing in our account precludes "empirical research on fossils, artefacts, genes, and climates" as these relate to religious beliefs and practices. A previous review of available evidence (Atran 2002a) suggests that expanding hominid camp size may have been an important factor motivating the commitment to non-kin that characterizes all religions (cf. Alexander 1979), and that spatial distance and ecological range may be crucial to understanding differences in ritual forms among religions (cf. Whitehouse 2000). Nevertheless, these and other factors noted by Knight, as important as they are to any general account of religion, may have only limited value for understanding the peculiar cognitive, social, and emotional processes responsible for religious emergence and recurrence across human cultures.

Knight's points are well taken about the importance of contractual relationships in upholding deity concepts, and about hunter-gatherer societies often reversing the dominance relations that prevail in larger-scale societies (chiefdoms, states, and other "kleptocratic" societies; see Diamond 1997). These points we also make elsewhere (Atran 2002a, sect. 5.5). We do not favor consideration of large-scale over small-scale societies. Neither do we say, or imply, that belief in supernatural agency alone forestalls moral defection—it's the whole point of "The Mickey Mouse Problem" (see note 1). Elsewhere (Atran 2002a, sects. 5.6–5.8), we discuss the evolutionary rationality of extravagant displays of self-sacrifice, love, and vengeance as they relate to religion (in ancient Judea, colonial India, the Solomon Islands, contemporary Middle East, Central Asia, United States), including how kinship structures differentially constrain such displays for men and women (e.g., in Arab societies). Arational aspects of devotional values. Commitment theorists, including political scientists, acknowledge the role of religious values in coordinating groups for economic, social, and political activities, and in providing people with immunity that goes with action in large numbers (Schelling 1963).

Religious commitment, by establishing trust, can reduce "transaction costs" in group mobilization (Fukuyama 1995; Hardin 1995). But this does not explain why religious motivation, as opposed to other forms of social mobilization, is historically the most enduring, and cross-culturally the most recurrent, facilitator of trust.

All commitment theories of religion rely (implicitly or explicitly) on standard models of utility and rational choice. Roughly, rational decision making employs cost-benefit calculations regarding goals, and entails abandoning or adjusting goals if the costs of realizing them are too high. But religiously driven behavior is often motivated independently of its prospect of success. High-cost personal sacrifices to (non-kin) others in society are typically motivated by, and framed in terms of, religious values.

Post hoc explanations of religious sentiments (as in ji-
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R5. Are we functionalist and reductionist? Costly commitment to the supernatural

R5.1. Rottschaefer criticizes our “speculative cost/benefit estimate” for religion as unsupported. 
Response. We did not provide experimental evidence that religion carries sacrifice, that is, hard-to-fake costly commitment. Nevertheless, anthropological evidence for costly sacrifice is overwhelming, even if many reports are anecdotal. Summing up the anthropological literature, Raymond Firth (1963, pp. 13–16) concludes “sacrifice is giving something up at a cost... ‘Afford it or not,’ the attitude seems to be.”

There can’t be individual fitness advantages of the sort that part-for-whole sacrifice among animals may convey (Burkett 1996), given that the probability of certifiably obtaining the desired outcome, such as a rewarding afterlife or freedom from catastrophe, ranges between zero and chance. For a bear to sacrifice its paw in a bear trap by gnawing it off, a lizard to leave behind its tail for a predator; or a bee to die by stinging an intruder to save the hive, seem reasonable tradeoffs for survival. Yet, what could be the calculated gain from: Years of toil to build gigantic structures that house only dead bones (Egyptian, Mesoamerican and Cambodian pyramids)?

Giving up one’s sheep (Hebrews) or camels (Bedouin) or cows (Nuer of Sudan) or chickens (Highland Maya) or pigs (Melanesian tribes, Ancient Greeks), or buffaloes (South Indian tribes)?

Dispatching wives when husbands die (Hindus, Inca, Solomon Islanders)?

Slaying one’s own healthy and desired offspring (the first born of Phoenixiaca and Carthage, Fawnece and Iroquois maidens, Inca and Postclassic Maya boys and girls, children of South India’s tribal Lambadi, adolescents in contemporary satanic cults)?

Chopping off a finger for dead warriors or relatives (Dani of New Guinea, Crow and other American Plains Indians)?

Burning your house and all other possessions for a family member drowned, crushed by a tree, or killed by a tiger (Naga tribes of Assam)?

Knocking out one’s own teeth (Australian aboriginals)?

Making elaborate but evanescent sand designs (Navajo, northern tribes of Central Australia)?

Giving up one’s life to keep Fridays (Muslims) or Saturdays (Jews) or Sundays (Christians) holy?

Or from just stopping whatever one is doing to murmur often incomprehensible words while gesticulating several times a day?

As Bill Gates aptly surmised: “Just in terms of allocation of time resources, religion is not very efficient. There’s a lot more I could be doing on a Sunday morning” (cited in Keil 1999).

R5.2. Qirko argues, as does Martin, that costly commitment to religion is overstated. Believers often are not sacrificing, but simply (and rationally) exchanging goods or labor for desired services” (Qirko). Religious specialists typically make greater sacrifices than non-specialists, but even specialists (e.g., celibate priests) may gain more than they sacrifice (by advancing the fortunes and inclusive fitness of their genetic kin). Other forms of apparent sacrifice (e.g., martyrdom) may simply involve cultural manipulation and perversion of adaptive behaviors (e.g., creating fictive kinship among “brothers” of non-kin). Cooperation often benefits average individual interests in the long run and does not require costly commitments.

Response. As indicated in response to Rottschaefer, on balance the anthropological evidence seems to favor a net cost over benefit in sacrificial displays (see Evans-Pritchard 1940, on the limits to which the Nuer of Sudan allow rational calculations of exchange and redistribution to enter into sacrificial displays). Many examples of celibacy may fit inclusive fitness models, but not all (only children also become Hindu Sadhus, Lamist monks and even Catholic priests and nuns). Fictive kinship, like ethnic mobilization, may indeed involve manipulations of the sort that Qirko suggests. We do not believe that religious sacrifice endures only if it benefits those who make the sacrifice. The actual sacrifices of some individuals may be co-opted as sacrificial displays that enhance the prestige and power of others. For example, Atran (2003a; 2004a) describes how, like good ad-
vertisers, the charismatic leaders of martyr-sponsoring organizations turn a recruit's ordinary desires for family and religion into cravings for what they're pitching, to the benefit of the manipulating organization rather than the individual being manipulated (much as the pornography industry turns universal and innate desires for sexual mates into lust for paper or electronic images to ends that reduce personal fitness but benefit the manipulators). Finally, much of the cooperation that benefits individuals does not involve costly sacrifice in the long term; however, trust in promissory commitments to an uncertain future (of the kind that religions typically sanctify) usually do.

R5.3. Martin also chides us for reverting to functionalist arguments that we seem to criticize. The resolution of existentia-list anxieties, such as afterlife as a solution to death anxiety, seems to be largely absent from Hellenic religion (and Judaism, see Cohen, Rozin, & Keltner [Cohen et al.]). Morality also does not appear to have been a preoccupation of ancient Greek religion. Response. "Rationalist" schools of the Greece and Roman played down concern with death and afterlife. Epicurus and Lucretius argued that people shouldn't fear death—nor, therefore, invoke gods for help—because death is simply nonexistence: If people aren't worried by the fact that they didn't exist for some indeterminate time in the past, there is no reason to be worried about not existing for some indeterminate time in the future. Such views had no popular appeal. There's a lot more anxiety about losing what one has, especially one's own life or that of someone dear, than of never having something (Tversky & Kahneman 1981). The manner (Paradise and Hell, reincarnation, transmigration of souls, etc.), importance, and richness of an afterlife may vary greatly across religious traditions. But most people hope, and in all societies there is institutionalized belief, that death doesn't end existence.

In a similar vein, it would be misleading to suggest that religion in the secular United States and France was not concerned with a personal God who dealt with human existential anxieties just because Thomas Jefferson and the Founding Fathers championed a "lazy" divinity who, having set the world in motion, refrains from interfering in human affairs. Most people want personal solutions to personal problems, which Jefferson's Unitarian God and the French Revolution's deity could not provide.

Greco-Roman law and governance, unlike Hebrew or Islamic law and governance, were not dominated by religion and belief in supernatural authority (until Constantine); however, Martin's claim about the divorce between Greek religion and morality is puzzling. Greek (and Roman) religious mythology and theater offer a running commentary on the moral shortcomings of mortals and gods, and of the transcendent necessity for upholding a rigid moral order by self-punishment of transgressions (i.e., costly sacrifice), even if violations of that order are unintentional and beyond individual control (e.g., Agamemnon's sacrifice of his daughter Iphigenia in the Iliad, the self-blinding of Oedipus Rex).

Our critique of "functionalism" does not entail that religion lacks social purpose. It is rather that religion may serve many different and even contrary purposes (e.g., as Karl Marx's opiate of the masses or as Benjamin Franklin's incitement to rebellion against tyranny). Morality and existential anxiety represent broad clusters of ever-pressing human concerns that logical and factual reasoning alone cannot adequately cope with. There appears to be significant convergence and recurrence in the choice and interrelation of functional elements within and between these broad clusters across religious traditions. But there seems to be no determinate relation of cause and effect between functional categories, much less one that is evolutionary; prescribed by natural selection as an adaptation.

R5.4. Pyysiäinen also argues that we espouse an overly functionalist account of religion. Religion persists not because it is costly, but because, once it is around, it may be too costly to eliminate. He sees little clinical support for the "tentative suggestion" in Atran (2002a, p. 169) that "the more traditionally and continuously religious the person, the less likely to suffer anxiety and depression in the long run." Response. Pyysiäinen's speculation runs counter to anthropological evidence, including the substantial body of data produced by commitment theorists of religion. Secular intellectual and political movements tried to do away with religion, often at enormous costs in lives (e.g., French Revolution, Spanish Civil War, Stalinist and Maoist communism), but they failed in the long run. Evangelical Christianity is the fastest growing major religious movement in the world, followed by militant Islam. Adherence to evangelical movements typically requires a considerable material outlay (up to 30% of family holdings among Latin America's poor), whereas adherence to militant Islam often requires willingness to fight outnumbered and die in jihad. We grant that rejecting religion (like opting out of a marriage) can be sometimes more costly than upholding it because of the ensuing disturbance to one's societal relationships; however, this cannot explain how costly commitments to religion (or marriage) ever arose to begin with—or why people will die to defend Mary's virginity but not Minnie Mouse's.

According to Pyysiäinen, "many extensive literature reviews have shown that results from studies on religion and mental health are mixed and even contradictory." Yet, the citation from Atran (2002a, p. 169) concludes a literature review showing mixed and even contradictory results for conversion studies. The passage cited refers only to anxiety and depression studies among regular churchgoers and to elderly populations, and not to health and well-being generally or among converts. In the target article, we simply point out that our account does not preclude religious contributions to health and well-being.

R5.5. Glassman argues that our "severely reductionist" account of religion unjustifiably excludes the possibility that theistic beliefs—or the extent that they do not conform to mundane ontological intuitions—can have ontological significance in their own right. Response. Glassman offers no way of testing his speculation about the role of working memory; only unconstrained analogies with "neural synchrony" and how humans "are always grasping for meanings." Our empirically testable notion of counterintuitiveness does not foreclose the possibil-
ity that “religious beliefs comprise a set of heuristics for summarizing cultural accumulations of experience.” In a decade-long study of the Lowland Maya that focused, in part, on the role of spiritual values in predicting short and long-term effects of agro-forestry practices and the relative distributions of tree species over informant parcels (Atran et al. 2002), we concluded that: “spirit preferences may represent a statistical summary of sustained human-species interactions over many generations” (Atran et al. 2004, p. 414).

R6. Is the supernatural necessary to religion?

R6.1. Whitehouse objects to our claim that invoking supernatural agents create arational conditions for commitment. He does so on the grounds that ritual can lead to commitment without invoking the supernatural, while invoking the supernatural does not explain how consensus is achieved about the “truth” that the supernatural is supposed to represent.

Response. We did not contend that invocation of the supernatural causes commitment, as Whitehouse implies, or that commitment cannot occur without invoking the supernatural. Rather, we argued that, all things being equal, sincere and costly commitment to a factually contradictory supernatural world tends to foster, in others, the most enduring form of trust that the believer’s interests extend to the community and are not primarily self-centered. Max Weber (1946) put it this way:

On a long railroad journey through what was then Indian territory, the author, sitting next to a traveling salesman of “under-taker’s hardware” . . . casually mentioned the still impressively strong church-mindedness. Thereupon the salesman remarked, “Sir . . . if I saw a farmer or a businessman not belonging to any church at all, I wouldn’t trust him with fifty cents. Why pay me, if he doesn’t believe in anything?”

Unlike validation of ideologically driven commitments, which can involve logical and factual reasoning and possibly ritualization as well, supernatural beliefs can only be ritually validated. Of course, there can be ritualized commitment without the supernatural, but commitment to a supernatural world appears to be historically more robust and enduring than ideological commitment whether ritualized or not (for reasons given in the target article). Arational ideologies that invoke transcendent laws of history and human nature – such as communism, fascism, or market capitalism – also have quasi-agentic characteristics.

Whitehouse criticizes us for assuming but not explaining the ideological standardization of religious concepts. We do not assume standardization of content, and repeatedly point out that, in many instances, there is little consensus about conceptual content, whether in the “doctrinal” religions of large-scale societies or the “iconic” religions of small-scale societies. It is because stable consensus about religious content is rarely possible (given the intrinsic lack of logical and factual consistency in representations of the supernatural) that ritual coordination is required to produce a visceral, communal consensus. Ainslie’s proposal that social ritual also provides a common “model” for individuals to establish empathetic relations with supernatural agents seems right, if we consider the model to consist of variable, loosely-textured content bound by rigid, formulaic structures.

R6.2. Stingl & Collier argue against “error theory” in moral philosophy, which holds that there are no objective moral properties. For them, moral beliefs are likely grounded in ancestral primate categories like “injustifiable inequality” – categories as biologically real as “predator” or “prey.” Religious beliefs, then, may reinforce phylogenetically based moral sentiments that have been destabilized but not destroyed by reflective (i.e., metarepresentational) capacities for doubt and deception.

Response. Unlike perceptually based beliefs (e.g., “the grass is green”), moral beliefs (e.g., “adultery is bad”) lack clear physically grounded truth conditions. Humans respond to moral values as if they were objectively true in order to overcome doubt and deception regarding the imperative of moral goodness in cooperating. Unlike error theorists, we do not claim that this is a naturally selected response governed by some special psychological mechanism (moral faculty). Instead, we argue that by parasitizing an evolved capacity for metarepresentation – the very capacity that created moral doubt and deception – humans build counterintuitive worlds governed by supernaturally sanctioned moral values. Believing in these worlds resolves moral dilemmas that undermine social cooperation. Stingl & Collier accept the plausibility of this religious resolution to moral dilemmas without accepting that moral beliefs are completely arbitrary (shifting sand on the phylogenetic landscape). We are inclined to agree with Stingl & Collier that there may be some phylogenetic basis to moral judgment (see ongoing work by Marc Hauser), and that religion may sometimes reinforce more primitive and unreflective moral sentiments that could not otherwise withstand the threat of reflection and deception.

R6.3. Rottschaefer argues that we fail to address differences between major religious traditions that involve supernatural agency (e.g., personal conceptions of the supernatural in the Abrahamic faiths) from those that do not (e.g., Buddhism, Taoism), between folk and disciplined (theological) epistemic assessments of religion, and between religious and scientific use of counterintuitions.

Response. Distinct religious traditions do indeed involve different conceptions of supernatural agency (e.g., dimensions of predatory vs. protective, exaggeration or lack of human foibles, kinds and degrees of powers that transcend ordinary human abilities, etc.). No major religious traditions seem to lack personal conceptions of the divine (see experiments with Buddhists; Pyysiäinen 2003). Theological doctrine often differs from folk statements of religious belief, but the cognitive content appears to be much the same for theologians and non-theologians alike, regardless of religious tradition (as experiments among Christians and Hindus suggest; see Barrett 1998; Barrett & Keil 1996).

Scientific theories and religious beliefs differ in their use of, and development from, counterintuitions (often initially involving the very same metaphors). We did not claim that scientific analogies must be “understood in literal (com-
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R7. A scientific account of religion need not be strictly positivist or severely reductionist

Hogan suggests we agree with his positivist view of religion (and magic) as a spontaneous and rash form of causal reasoning that more reflective reasoning (favored by science) strives to overcome and replace. Response. Ever since Edward Gibbon, in the History of the Decline and Fall of the Roman Empire, attributed the fall of Rome to the Christian infusion of religious obscurantism into rational forms of Roman law and governance (Gibbon 1789/1994), many, if not most, scientifically minded philosophers, historians, and scientists have adopted a positivist view of religion similar to Hogan's (cf. Dawkins 1998; Diamond 1997; Horton 1967; Nielsen 1996; Popper 1950; Russell 1948). We don't.

A crucial difference between science and religion is that factual knowledge as such is not a principal aim of religious devotion, but plays only a supporting role. Only in the last decade has the Catholic Church reluctantly acknowledged the factual plausibility of Copernicus, Galileo, and Darwin (Geitner 1999). Earlier religious rejection of their theories stemmed from challenges posed to a cosmic order unifying the moral and material worlds. Separating out the core of the material world would be like draining the pond where a water lily grows. A long lag time was necessary to refurbish and remake the moral and material connections in such a way that would permit faith in a unified cosmology to survive.

Religion survives science as it does secular ideology not because it is older than, or more primitive than, science or secular reasoning, but because of what it affectively and collectively secures for people. Religion underpins the "organic solidarity" (Durkheim 1912/1995) that makes social life more than simply a contract among calculating individuals. It creates the arational conditions for devotion and sacrifice that enable people and societies to endure against even terrible odds.

In breaking one vicious cycle, however, religions almost invariably set in motion another. The more strongly individuals uphold group interests, the more they risk fighting the interests of other groups, as Hogan implies. The absolute moral value that religions attach to in-group interests practically guarantees that the ensuing conflict and competition between groups will be costly and interminable, and they will only be resolved in specific cases by banishment, annihilation, or assimilation of out-groups and their ideas. Nevertheless, proselytizing religions may also contain "humanist" elements – especially in early stages of expansion – that foster tolerance and openness (e.g., early Christianity and Buddhism). The dominance of "secular" ideologies stemming from the European Enlightenment have arguably lessened the compulsion for religious exclusion – not so much by dampening religious passion, as by transforming religious belonging from a mainly ascriptive to more voluntary forms of association and action.

R8. Has the essence of religion been overlooked? Dreaming, embodiment, and language

R8.1. Bulkeley suggests more work on "extraordinary dimensions of religious experience," on cultural variation in religious experience, and on dreaming as "a primal wellspring of religion." Response. We agree which each point. Elsewhere (Atran 2002a, sect. 3.1, part 3), we explore implications of dreaming in different religious traditions, and examples of extraordinary manifestations of religious experience (spirit possession, sudden conversion, revelation, trance, etc.), including comparisons with pathological expressions of the religious and mundane (epilepsy, schizophrenia, autism). In our society, relatively few individuals have emotionally arousing mystical experiences, although the overwhelming majority of individuals consider themselves religious believers. The neurophysiological bases that commit the bulk of humanity to the supernatural remain a complete mystery.

One aspect of dreaming that we do not discuss concerns the extraordinary playing out of intellectual and emotional conflicts that re-emerge in religious mythologies, part of what Joseph Campbell (1975) dubbed "the mythic image." One experiment worth pursuing might be a diary study to see if subjects report being more religious on days when they have vivid dreams.

R8.2. Cornwell, Barbey, & Simmons (Cornwell et al.) maintain that the manner in which concepts are physically embodied helps to explain ordinary and extraordinary (e.g., supernatural) concepts.

Response. The claim that ideas are "highly constrained by the physical structure of the body and environment" (Cornwell et al.) is intriguing, but difficult to evaluate. On the one hand, sensorimotor interactions with the surrounding environment undoubtedly channel conceptual understanding; for example, Rosch's "basic-level" concepts for natural objects, like "chair" or "chicken," are not only concepts that children first learn and adults most readily use; people's sensorimotor interactions with the referents of such concepts also show high covariation (Rosch et al. 1976). On the other hand, the psychological factors involved in the fact that people tend to look up when they think of birds or gods, but down when they think of worms and devils, are insufficient to distinguish, say, birds from gods or worms from devils. These "embodiments" may facilitate, but are not necessary for, conceptual understanding (e.g., people can also look down and easily think of gods). An intriguing possibility is that embodiment principles may have special relevance to the way supernatural ideas elicit emotions and associated body states. Rituals of-
ten involve “performing embodiments that help drive people’s cognitive systems into appropriate religious states” (Barsalou et al., in press): kneeling in prayer helps instill submissiveness to a religious idea, consuming the host in Mass helps convey incorporation of the Holy Spirit within. Associated motor performances may enhance memory for religious ideas, as may the highly circumscribed physical settings that “situate” cognitions within a vivid field of memorable loci. Finally, the multi-modal states that rituals elicit may be later evoked and recombined in simulations interpreted as religious visions.

**R8.3.**

*Fabrega* claims we ignore the evolution of language, culture, and “especially self-awareness,” and fail to clearly articulate the connection between modules and metarepresentation, particularly in relation to emotional factors.

**Response.** We don’t think language has any special role in generating religious ideas beyond its role in facilitating conceptual combination in mundane thinking. There is a strong, but not yet well-understood, relationship between language and Theory of Mind (ToM; e.g., in the recursion of sentences and propositional attitudes, that enables metarepresentation. From the perspective of conceptual modularity, the cognitive faculty for metarepresentation may have coevoled, or emerged as a by-product, of language or ToM (or both) to take, as input, the outputs of all other conceptual modules (Sperber 1994). We discuss the relationship of metarepresentation to self-awareness and emotion elsewhere (Atran 2002a, sect. 4.8).

**R9. Is a pan-cultural theory of religion possible? How to better understand cultural variation**

**R9.1.**

*Cohen et al.* argue that the specific cognitive contents, emotions, and social arrangements vary greatly across religious traditions. They advocate context-bound theories of religion that are grounded in specific cultural and historical circumstances.

**Response.** *Cohen et al.* are right. For example, the monotheistic religions may be unique in teaching that the world’s moral order. Religious sentiments of “awe,” fear, disgust, contempt, guilt, and the sublime — and their associations with natural forms, life stages and death — may be very different in monotheistic societies (where animals, for example, are simply to be used rather than negotiated with, or observed as objects of curiosity rather than deep insight into human character and the structure of the world). There are also profound differences between the Abrahamic religions — and even between different currents within these religions — as a result of historical and environmental contingencies. But we have elaborated our general framework precisely as a means to systematically understand human religious variation.

Both *Cohen et al.* and *Kirkpatrick* highlight cultural variability in the psychological processes motivating religious belief. We agree regarding the importance of individual and cultural variation in religion. It is important to understand, for example, why religion motivates some to become lifetime peace advocates and others to advocate terrorism or war (Atran 2003a; 2004a). One such investigation is being conducted regarding religiosity and cultural variation in levels of intolerance for religious others (Hansen & Norenzayan 2005). In two different cultural contexts (Canada and Malaysia) it is found that, controlling for ethnic background and other demographic variables, Chinese Buddhists express more social tolerance of religious outsiders than Chinese Christians. Importantly, this difference in tolerance is consistently mediated by measures of religious exclusivity (the belief that the in-group religion is the only true way of knowing the divine, anchoring the social cohesiveness of religion). These measures of exclusivity are distinct from measures of religious devotion (the strength of religious faith in a supernatural deity). The latter measures failed to explain cultural differences in tolerance.

Other experimental work is investigating the ways some Protestant religions suppress processing of emotional cues in work contexts (Sanchez-Burks 2002). But *Cohen et al.* may be unduly pessimistic about the project of outlining a unifying framework of religion. Such a project also guides empirical investigation of ways in which historical contexts shape and sustain religious particulars.

**R9.2.**

*Sperber* argues that, from a cross-cultural perspective, “religion” shows only a family resemblance character. He implies that we take overattribution of agency as a defining condition of religion because that has been the prevailing historical bias in the anthropological study of religion since Tyler.

**Response.** We accept the cautionary note that religion is not a well-circumscribed thing but a fuzzily bounded network of interrelated phenomena. We do not think that there are intelligible “laws,” “grammars,” “codes,” or fully integrated “systems” of religion.

We clearly don’t take overattribution of agency as a sufficient condition of religion (“the Mickey Mouse Problem”), but we do consider it necessary to the extent that it involves attributions of counterintuitive ontologies. We do not think that the historical standpoint is simply a conventional bias. In all societies ever described, it appears that people do believe in agents unseen who have intentionally generated the world we see. In every society, people believe that ritual – conventional, formulaic sequences of behavior – can provoke spirits to renew or alter the world for the better and make clearer its meaning, like stage directors called upon to rerun, change, or improve a play. Our chosen conduit metaphor is of an evolutionary landscape that constrains (initially randomly) interacting humans, as they “walk” through life, onto converging life paths that involve cognitions of supernatural agents who deal with emotionally eruptive existential anxieties and regulate long-term social commitments. Within this framework, an explanatory account, or theory, of religion would build from the “bottom-up” in terms of the cognitive, emotional and social microprocesses that assemble interacting individuals into religious traditions.

Our use of a working notion of “religion” is to some extent consonant with traditional anthropology is not circular reasoning. As with Darwin’s use of the commonsense notion of species, which first focused his attention, subse-
quent discoveries revealed only rough correspondence between the commonsense construct (species) and historically contingent patterns of evolution (more or less geographically isolated and interbreeding populations). Darwin continued to use a traditional circumscription of species (Wallace 1859, p. 1), while denying it any special ontological status or reality, using it only as a heuristic notion that could ground attention as diverse and often inconclusive scientific analyses advanced (Atran 1998). Likewise, our working characterization and account of "religion" may continue to help orient research, but should not be mistaken for a final point of reference and explanation. Nevertheless, we hope that this approach can eventually lead to a scientific account of systematic cognitive and behavioral processes across religions, much as there is now a scientific account of systematic organizational and behavioral processes across species.

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NOTES

1. The initial linking of cognitive and commitment theories of religion occurred subsequent to a BBS exchange between Atran (1998) and Boyer (1996). Atran, following up on earlier dis-

2. According to Islamic tradition, Abu Hurayah and Abu Sa‘eed reported that Muhammed said: “He who gets into Paradise . . . neither . . . will his clothes wear out [narrow counterfac-


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Letters "a" and "r" appearing before authors’ initials refer to target article and response respectively.


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