BEHAVIORAL AND BRAIN SCIENCES (2016), Page 1 of 65
doi:10.1017/S0140525X14001356, e0

The cultural evolution of prosocial religions

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Abstract: We develop a cultural evolutionary theory of the origins of prosocial religions and apply it to resolve two puzzles in human psychology and cultural history: (1) the rise of large-scale cooperation among strangers and, simultaneously, (2) the spread of prosocial religions in the last 10–12 millennia. We argue that these two developments were importantly linked and mutually energizing. We explain how a package of culturally evolved religious beliefs and practices characterized by increasingly potent, moralizing, supernatural agents, credible displays of faith, and other psychologically active elements conducive to social solidarity promoted high fertility rates and large-scale cooperation with co-religionists, often contributing to success in intergroup competition and conflict. In turn, prosocial religious beliefs and practices spread and aggregated as these successful groups expanded, or were copied by less successful groups. This synthesis is grounded in the idea that although religious beliefs and practices originally arose as nonadaptive by-products of innate cognitive functions, particular cultural variants were then selected for their prosocial effects in a long-term, cultural evolutionary process. This framework (1) reconciles key aspects of the adaptationist and by-product approaches to the origins of religion, (2) explains a variety of empirical observations that have not received adequate attention, and (3) generates novel predictions. Converging lines of evidence drawn from diverse disciplines provide empirical support while at the same time encouraging new research directions and opening up new questions for exploration and debate.

Keywords: belief; cooperation; culture; evolution; prosociality; religion; ritual

 0140-525X/16

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1. Introduction: Two related puzzles

The vast majority of humans today live in large-scale, anonymous societies. This is a remarkable and puzzling fact because, prior to roughly 12,000 years ago,[1] most people lived in relatively small-scale tribal societies (Johnson & Earle 2000), which themselves had emerged from even smaller-scale primate troops (Chapais 2008). This dramatic scaling up appears to be linked to changes that occurred after the stabilization of global climates at the beginning of the Holocene, when food production began to gradually replace hunting and foraging, and the scale of human societies started to expand (Richerson et al. 2001). Even the earliest cities and towns in the Middle East, not to mention today's vast metropolises with tens of millions of people, contrast sharply with the networks of foraging bands that have characterized most of the human lineage's evolutionary history (Hill et al. 2011).

The rise of stable, large, cooperative societies is one of the great puzzles of human history, because the free-rider problem intensifies as groups expand. Proto-moral sentiments that are rooted in kin selection and reciprocal altruism have ancient evolutionary origins in the primate lineage (de Waal 2008), and disapproval of antisocial behavior emerges even in preverbal babies (Bloom 2013; Hamlin et al. 2007). However, neither kin selection nor reciprocal altruism (including partner-choice mechanisms) can explain the rise of large, cooperative, anonymous societies (Chudek & Henrich 2011; Chudek et al. 2013). Genealogical relatedness decreases geometrically with increasing group size, and strategies based on direct or indirect reciprocity fail in expanding groups (Boyd & Richerson 1988) or as reputational information becomes increasingly noisy or unavailable (Panchanathan & Boyd 2003). Without additional mechanisms to galvanize cooperation, groups

collapse, fission, or feud, as has been shown repeatedly in small-scale societies (Forge 1972; Tuzin 2001). Our first puzzle, then, is how some groups, made up of individuals equipped with varying temperaments and motivations, which evolved and calibrated for life in relatively small-scale ancestral societies, were able to dramatically expand their size and scale of cooperation while sustaining mutually beneficial exchange. How was this feat possible on a time scale of thousands of years, a rate too slow to be driven by demographic growth processes and too fast for substantial genetic evolution?[2]

Consider our second puzzle. Over the same time period, prosocial religions emerged and spread worldwide, to the point that the overwhelming majority of believers today are the cultural descendants of a very few such religions. These religions elicit deep devotions and extravagant rituals, often directed at Big Gods: powerful, morally concerned deities who are believed to monitor human behavior. These gods are believed to deliver rewards and punishments according to how well people meet the particular, often local, behavioral standards, including engaging in costly actions that benefit others. Whereas there is little dispute that foraging societies possess beliefs in supernatural agents, these spirits and deities are quite different from those of world religions, with only limited powers and circumscribed concerns about human morality. It appears that interrelated religious elements that sustain faith in Big Gods have spread globally along with the expansion of complex, large-scale human societies. This has occurred despite their rarity in small-scale societies or during most of our species' evolutionary history (Norenzayan 2013; Swanson 1960).

Connecting these two puzzles, we argue that cultural evolution, driven by the escalating intergroup competition particularly associated with settled societies, promoted the selection and assembly of suites of religious beliefs and practices that characterize modern prosocial religions. Prosocial religions have contributed to large-scale cooperation, but they are only one among several likely causes. Religious elements are not a necessary condition for cooperation or moral behavior of any scale (Bloom 2012; Norenzayan 2014). There are several other cultural evolutionary paths to large-scale cooperation, including institutions, norms, and practices unrelated to prosocial religions. These include political decision making (e.g., inherited leadership positions), social organization (e.g., segmentary lineage systems), property rights, division of labor (e.g., castes), and exchange and markets. The causal effects of religious elements can interact with all of these domains and institutions, and this causality can run in both directions, in a feedback loop between prosocial religions and an expanded cooperative sphere.

This cultural evolutionary process selects for any psychological traits, norms, or practices that (1) reduce competition among individuals and families within social groups; (2) sustain or increase group solidarity; and (3) facilitate differential success in competition and conflict between social groups by increasing cooperation in warfare, defense, demographic expansion, or economic ventures. This success can then lead to the differential spread of particular religious elements, as more successful groups are copied by less successful groups, experience physical or cultural immigration, expand demographically through higher rates of reproduction, or expand through conquest and assimilation. It was this cultural evolutionary process that increasingly intertwined the "supernatural" with the "moral" and the "prosocial." For this reason, we refer to these culturally selected and now dominant clusters of elements as *prosocial religions.*[3]

We have been developing the converging lines of this argument over several years in several places (e.g., Atran & Henrich 2010; Henrich 2009; Norenzayan 2013; Norenzayan & Shariff 2008; Slingerland et al. 2013). Here, we synthesize and update this prior work and further develop several empirical, theoretical, and conceptual aspects of it. Empirically, we discuss the historical and ethnographic evidence at greater depth and lay out the findings from a new meta-analysis of religious priming studies that specify underlying psychological processes and boundary conditions. Theoretically, we discuss in greater detail one key part of the process that we hypothesize gave rise to prosocial religions: cultural group selection. We also integrate sacred values into our framework, review alternative scenarios linking some religious elements with large-scale societies, and tackle counterarguments. Overall, we bring together evidence from available historical and ethnographic observation with experimental studies that address several interrelated topics, including signaling, ritual, religious priming, cognitive foundations of religion, behavioral economics, cooperation, and cultural learning.

This account paves the way for a cognitive–evolutionary synthesis, consolidating several key insights. These include (1) how innate cognitive mechanisms gave rise, as a by-product, to supernatural mental representations (Atran & Norenzayan 2004; Barrett 2000; Boyer 2001; Lawson & McCauley 1990; McCauley 2011); (2) how natural selection shaped cognitive abilities for cultural learning, making humans a culture-dependent species with divergent cultural evolutionary trajectories (Richerson & Boyd 2005); and (3) how intergroup competition shaped cultural evolution, giving rise to cultural group selection and gene–culture coevolution (Chudek & Henrich 2011; Henrich 2004). We hypothesize that by building on these foundations, cultural evolution has harnessed a variety of proximate psychological mechanisms to shape and consolidate human beliefs, actions, and commitments that converge in increasingly prosocial religions. The result is an account that recognizes, synthesizes, and extends earlier and contemporary insights about the social functions of religious elements (Durkheim 1915; Haidt 2012; Rappaport 1999; Sosis & Alcorta 2003; Wilson 2003).

We begin with the idea that religious elements arose as a nonadaptive evolutionary by-product of ordinary cognitive functions (Atran & Norenzayan 2004; Barrett 2004; Bloom 2004; Boyer 1994). However, we move beyond cognitive by-product approaches by tackling historical trajectories and cross-cultural trends in religious beliefs and behaviors, particularly dominant elements of modern religions that are hard to explain in the absence of cultural evolutionary processes and selective cultural transmission. We argue that although religious representations are rooted in innate aspects of cognition, only some of the possible cultural variants then spread at the expense of other variants because of their effects on success in intergroup competition.

Drawing on contributions from adaptationist approaches to religion (Bering 2006; 2011; Bulbulia 2008; Cronk 1994; Johnson & Bering 2006; Johnson 2009; Sosis & Alcorta 2003; Sosis & Bulbulia 2011), we take seriously the

important role that religious elements appear to play in shaping the lives of individuals and societies, and we recognize that there are crucial linkages among rituals, belief in supernatural monitors, and cooperation that these approaches have illuminated across diverse environmental and cultural contexts. Our contribution builds on evolved psychological mechanisms, but it also explores in great detail the cultural learning dynamics and the historical processes that shape religions and rituals in both adaptive and maladaptive ways. We therefore argue that our framework reconciles key aspects and insights from the adaptationist and by-product approaches. It also tackles a range of empirical observations, including some that have not been adequately addressed, and generates novel predictions ripe for investigation. As such, we present this synthesis as an invitation for a conversation and debate about core issues in the evolutionary study of religion.

2. Theoretical foundations

Our synthesis rests on four conceptual foundations: (1) the reliable development of cognitive mechanisms that constrain and influence the transmission of religious beliefs; (2) evolved social instincts that drive concerns about third-party monitoring, which in turn facilitate belief in and response to supernatural monitoring; (3) cultural learning mechanisms that guide the spread of specific religious contents and behaviors; and (4) intergroup competition that influences the cultural evolution of religious beliefs and practices.

2.1. Reliably developing cognitive biases for religion

The cognitive science of religion has begun to show that religious beliefs are rooted in a suite of core cognitive faculties that reliably develop in individuals across populations and historical periods (Atran & Norenzayan 2004; Barrett 2004; Bloom 2012; Boyer 2001; Guthrie 1993; Kirkpatrick 1999; Lawson & McCauley 1990). As such, "religions" are best seen as constrained amalgams of beliefs and behaviors that are rooted in core cognitive tendencies. Examples of particular interest here are (1) mentalizing (Bering 2011; Frith & Frith 2003; Waytz et al. 2010), (2) teleological thinking (Kelemen 2004), and (3) mind–body dualism (Bloom 2007; Chudek et al. 2015). Consistent with these hypotheses, individual differences in these tendencies partly explain the degree to which people believe in God, in paranormal events, and in life's meaning and purpose (Willard & Norenzayan 2013).

These cognitive tendencies can be harnessed by cultural evolution (they provide potential raw material) in constructing particular elements of religions or other aspects of culture. However, cultural evolution need not harness all or any of these cognitive tendencies. Our argument is that some of them have been drafted by cultural evolution in more recent millennia to underpin particular supernatural beliefs, such as an afterlife contingent on proper behavior in this life, because those beliefs promoted success in intergroup competition, although none of those cognitive processes are solely or uniquely involved in religion.

Most relevant to prosocial religions is the evolved capacity for mentalizing (Epley & Waytz 2010; Frith & Frith 2003), which makes possible the cultural recruitment of supernatural agent beliefs (Gervais 2013). Mentalizing, also known as "theory of mind," allows people to detect and infer the existence and content of other minds. It also supplies the cognitive basis for the pervasive belief in disembodied supernatural agents such as gods and spirits. Believers treat gods as beings who possess humanlike goals, beliefs, and desires (Barrett & Keil 1996; Bering 2011; Bloom & Weisberg 2007; Epley et al. 2007; Guthrie 1993). This mentalizing capacity enables them to believe they interact with gods, who are thought to respond to existential anxieties, such as anxieties about death and randomness (Atran & Norenzayan 2004), and engage in social monitoring (Norenzayan & Shariff 2008). Consistent with the by-product argument that religious thinking recruits ordinary capacities for mind perception, thinking about or praying to God activates brain regions associated with theory of mind (Kapogiannis et al. 2009; Schjoedt et al. 2009); and reduced mentalizing tendencies or abilities, as found in the autistic spectrum, predicts reduced belief in God (Norenzayan et al. 2012). Conversely, schizotypal tendencies that include promiscuous anthropomorphizing are associated with "hyper-religiosity" (Crespi & Badcock 2008; Willard & Norenzayan 2015).

2.2. Social instincts and third-party monitoring

Humans likely evolved in a social world governed by community-wide norms or shared standards in which the community conducted surveillance for norm violations and sanctioning (Chudek & Henrich 2011; Chudek et al. 2013). This reputational aspect of our norm psychology means that humans are sensitive to cues of social monitoring (Bering & Johnson 2005), attend keenly to social expectations and public observation (Fehr & Fischbacher 2003), and anticipate a world governed by social rules with sanctions for norm violations (Chudek & Henrich 2011; Fehr et al. 2002). Relevant empirical work indicates that sometimes exposure to even subtle cues, such as drawings of eyes, can increase compliance to norms related to fairness and not stealing (Haley & Fessler 2005; Rigdon et al. 2009; Zhong et al. 2010; but see Fehr & Schneider 2010), even in naturalistic settings (Bateson et al. 2006). If the presence of human watchers encourages norm compliance, then it is not surprising that the suggestion of morally concerned supernatural watchers – with greater surveillance capacities and powers to punish – might expand norm compliance beyond that associated with mere human watchers and earthly sanctions (e.g., Bering 2011). We argue that intergroup competition (discussed subsequently) exploits this feature of human social psychology, among others, to preferentially select belief systems with interventionist supernatural agents concerned about certain kinds of behaviors.

2.3. Cultural learning and the origins of faith

Humans are a cultural species (Boyd et al. 2011b). More than in any other species, human cultural learning generates vast bodies of know-how and complex practices that adaptively accumulate over generations (Tomasello 2001). To have adaptive benefits, cultural learning involves placing faith in the products of this process and often overriding our innate intuitions or individual experiences (Beck 1992; Henrich 2015). Children and adults from diverse societies accurately imitate adults' seemingly unnecessary behaviors (they

"over-imitate"), even when they are capable of disregarding them (Lyons et al. 2007; Nielsen & Tomaselli 2010). This willingness to rely on faith in cultural traditions – over personal experience or intuition – has profound implications for explaining key features of religions (Atran & Henrich 2010).

Much theoretical and empirical work suggests that, when deciding to place faith in cultural information over other sources, learners rely on a variety of cues that include the following:

1. *Content-based mechanisms*, which lead to the selective retention and transmission of some mental representations over others because of differences in their content (Boyer 2001; Sperber 1996). For example, emotionally evocative and socially relevant ideas are more memorable and, therefore, culturally contagious (Heath et al. 2001; Stubbersfield et al. 2015; see also Broesch et al. 2014).
2. *Context-based mechanisms* (or model-based cultural learning biases), which arise from evolved psychological mechanisms that encourage learners to attend to and learn from particular individuals (cultural models) based on cues such as skill, success, prestige, self-similarity (Henrich & Gil-White 2001), and trait frequency (Perreault et al. 2012; Rendell et al. 2011).
3. *Credibility-enhancing displays (CREDs)*, or learners' sensitivity to cues that a cultural model is genuinely committed to his or her stated or advertised beliefs. If models engage in behaviors that would be unlikely if they privately held opposing beliefs, learners are more likely to trust the sincerity of the models and, as a result, adopt their beliefs[4] (Henrich 2009; see also Harris 2012; Sperber et al. 2010).

All three classes of learning mechanisms are crucial to understanding how religious beliefs and practices are transmitted and stabilized, why certain rituals and devotions can substantially influence cultural transmission, and why some elements of religions are recurrent and others culturally variable (Gervais et al. 2011b). To date, content-based mechanisms have been the main focus and the source of much progress in the cognitive science of religion. This includes work on minimally counterintuitive concepts (Boyer & Ramble 2001; but see Purzycki & Willard, in press), folk notions of mind–body dualism (Bloom 2004), and hyperactive agency detection (Barrett 2004). We argue, however, that context-based cultural learning and CREDs are equally important if we wish to construct a comprehensive account of the differential spread of religious beliefs and behaviors. For example, because people are biased to preferentially acquire religious beliefs and practices from the plurality and from prestigious models in their communities, identical or similar god concepts can be the object of deep commitment in one historical period but then a fictional character in another (Gervais & Henrich 2010; Gervais et al. 2011b). Also, CREDs help us explain why religious ideas backed up by credible displays of commitment (such as fasts, sexual abstinence, and painful rituals) are more persuasive and more likely to spread. In turn, we see why such extravagant displays are commonly found in prosocial religions and tied to deepening commitment to supernatural agents. Moreover, core intuitions about supernatural beings and ritual-behavior complexes, once in place, coexist with other ordinary intuitions and causal schemata in everyday life (Legare et al. 2012).

2.4. The cultural group selection of prosocial religions

We propose that prosocial religions are shaped by *cultural group selection*, a class of cultural evolutionary processes that considers the impact of intergroup competition on cultural evolutionary outcomes. These processes have been studied extensively and have a long intellectual history (Boyd & Richerson 1990; Darwin 1871; Hayek 1988; Khaldun 1958). Intergroup competition has potentially been shaping cultural evolution over much of our species' evolutionary history, altering the genetic selection pressures molding the foundations of our sociality (Henrich 2015; Richerson & Boyd 1999). However, as the origins of agriculture made large, settled, populations economically possible across diverse regions during the last 12 millennia, a regime of intensive intergroup competition ensued that increased the size and complexity of human societies (Alexander 1987; Bowles 2008; Carneiro 1970; Currie & Mace 2009; Otterbein 1970; Turchin 2003; Turchin et al. 2013).

A class of evolutionary models has revealed broad conditions under which cultural group selection can influence the trajectory of cultural evolution. Intergroup competition can operate through violent conflict, but also through differential migration into more successful groups, biased copying of practices and beliefs among groups, and differential extinction rates without any actual conflict (Richerson et al., in press). These models show that the conditions under which intergroup competition substantially influences cultural evolution are much broader than for genetic evolution (Boyd et al. 2003; 2011a; Guzman et al. 2007; Henrich & Boyd 2001; Smaldino 2014). This is in part because cultural evolution can sustain behavioral variation among groups, which drives the evolutionary process to a degree that genetic evolution does not (Bell et al. 2009; Henrich 2012; Richerson et al., in press).

Empirically, there are several converging lines of evidence supporting the importance of intergroup competition, including data from laboratory studies (Gurerk et al. 2006; Saaksvuori et al. 2011), archaeology (Flannery & Marcus 2000; Spencer & Redmond 2001), history (Turchin 2003; Turchin et al. 2013), and ethnographic or ethnohistorical studies (Atran 2002; Boyd 2001; Currie & Mace 2009; Kelly 1985; Soltis et al. 1995; Wiessner & Tumu 1998). See Richerson et al. (in press) for a recent review, and Henrich (2015) for the importance of intergroup competition among hunter–gatherers.

Although these studies provide evidence of the competitive process in action, experimental evidence reveals that larger and more economically successful groups have stronger prosocial norms: a pattern consistent with cultural group selection models. For example, in a global sample of roughly a dozen diverse populations, individuals from larger ethnolinguistic groups and larger communities were more willing to incur a cost to punish unfair offers in experimental games (Henrich et al. 2010a; 2014), a result that held after controlling for a range of economic and demographic variables (see also Marlowe et al. 2008). Even among Hadza foragers, larger camps are more often prosocial in economic games (Marlowe 2004). Similarly, in a detailed study in Tanzania, Paciotti and Hadley (2003) compared the economic game playing of two ethnolinguistic groups living side by side, the Pimbwe and the Sukuma. The institutionally more complex Sukuma had been rapidly expanding their territory over

several generations, and they played much more prosocially in the Ultimatum Game than did the Pimbwe. Cross-nationally, experimental work also reveals a negative correlation between gross domestic product (GDP) per capita and both people's motivations to punish cooperators in a public goods game (stifling cooperation) and their willingness to cheat to favor themselves or their local "in" group (Hermann et al. 2008; Hruschka et al. 2014).

Broadly speaking, therefore, cultural group selection favors complexes of culturally transmitted traits – beliefs, values, practices, rituals, and devotions – that (1) reduce competition and variation within social groups (sustaining or increasing social cohesion) and (2) enhance success in competition with other social groups, by increasing factors such as group size, cooperative intensity, fertility, economic output, and bravery in warfare. Thus, any cultural traits – connected to the supernatural or not – that directly or indirectly promoted *parochial prosociality* in expanded groups (Bowles 2006; Choi & Bowles 2007) could be favored. The issue at hand is whether the crucible of intensive cultural group selection that emerged with the origins of agriculture shaped the beliefs, commitments, institutions, and practices associated with religions in predictable ways over the last 12 millennia.[5]

2.5. The theoretical synthesis

We build on these four foundations to construct a synthetic view of modern world religions. We begin from the premise that religious beliefs and behaviors originated as evolutionary by-products of ordinary cognitive tendencies, built on reliably developing panhuman cognitive templates. Some subset of these cultural variants happened to have incidental effects on within-group prosociality by increasing cooperation, solidarity, and group size. Such variants may have spread first, allowing groups to expand and economically succeed, or they may have spread in the wake of a group's successful expansion, subsequently adding sustainability to a group's cultural success. Competition among cultural groups, operating over millennia, gradually aggregated these elements into cultural packages ("religions") that were *increasingly* likely to include the following:

1. Belief in, and commitment to, powerful, all-knowing, and morally concerned supernatural agents who are believed to monitor social interactions and to reward and sanction behaviors in ways that contribute to the cultural success of the group, including practices that effectively transmit the faith. Rhetorically, we call these "Big Gods," but we alert readers that we are referring to a multidimensional continuum of supernatural agents in which Big Gods occupy a particular corner of the space. By outsourcing some monitoring and punishing duties to these supernatural agents, prosocial religions reduce monitoring costs and facilitate collective action, which allows groups to sustain in-group cooperation and harmony while expanding in size.
2. Ritual and devotional practices that effectively elevate prosocial sentiments, galvanize solidarity, and transmit and signal deep faith. These practices exploit human psychology in a host of different ways, including synchrony to build in-group solidarity, CREDs and signals (e.g., sacrifices, painful initiations, celibacy, fasting), and other cultural learning biases (conformity, prestige, and age) to more effectively transmit commitment to others.
3. Additional beliefs and practices that exploit aspects of psychology to galvanize group cohesion and increase success. These include fictive kinship for coreligionists; in-group ("ethnic") markers to spark tribal psychology, exclude the less committed, and mark religious boundaries; pronatalist norms that increase fertility rates; practices that increase self-control and the suppression of self-interest; and seeing a divine origin in certain beliefs and practices, transforming them into "sacred" values that are nonnegotiable.

2.6. Hypotheses

Here we list some specific hypotheses that follow from the present theoretical framework.

1. Big Gods spread because they contributed to the expansion of cooperative groups. Historically, they coevolved gradually with larger and increasingly more complex societies. In turn, larger and more complex societies might have been more likely to transmit and sustain belief in such gods, creating autocatalytic processes that energized each other. One consequence of this process is that group size and long-term stability should positively correlate with the prevalence of Big Gods.
2. All things being equal, commitment to Big Gods should produce more norm compliance in difficult-to-monitor situations, relative to belief in supernatural agents that are unable or unwilling to omnisciently monitor and punish.
3. Religious behavior that signals genuine devotion to the same or similar gods would be expected to induce greater cooperation and trust among religious members. Conversely, a lack of any devotion to any moralizing deities (i.e., atheism or amoral supernatural agents) should trigger distrust.
4. These cultural packages include rituals and devotions that exploit costly and extravagant displays to deepen commitment to Big Gods, as well as other solidarity and self-control-building cultural technologies (e.g., synchrony, repetition) and cultural learning biases (e.g., prestige) that more effectively transmit the belief system.
5. Cultural groups with this particular constellation of beliefs, norms, and behaviors (i.e., prosocial religious groups) should enjoy a relative cultural survival advantage, especially when intergroup competition over resources and adherents is fierce.

In the sections that follow, we confront these hypotheses with the available empirical data.

To address these hypotheses, we first draw on a combination of ethnographic, historical, and archaeological data to show exactly how different modern prosocial religions are from the religions of small-scale societies, and likely from those of our Paleolithic ancestors. This difference is important, because much theorizing by psychologists about the origins of religion often presumes that modern gods are culturally typical gods rather than being the products of a particular cultural evolutionary trajectory. Second, we examine the relationship between commitment to modern world religions and prosocial behavior by reviewing correlational data from surveys and behavioral studies, as well as experimental findings from religious priming studies to address causality. Third, we examine religion's

role in building intragroup trust, as well as commitment mechanisms that galvanize social solidarity and transmit faith. Fourth, we evaluate evidence for the cultural group selection of prosocial religions. Finally, we situate this framework within existing evolutionary perspectives, address counter-explanations and alternative cultural evolutionary scenarios, discuss secularization, and conclude with outstanding questions and future directions.

3. Big Gods and ritual forms emerge and support large-scale societies

The anthropological record indicates that, in moving from the smallest scale human societies to the largest and most complex societies, the following empirical patterns emerge: (1) beliefs in Big Gods change from being relatively rare to being increasingly common, as these supernatural agents gain more power, knowledge, and concern about morality; (2) morality and supernatural beliefs move from being mostly disconnected to being increasingly intertwined; (3) rituals become increasingly organized, repetitious, and regular; (4) supernatural punishments are increasingly focused on violations of group beneficial norms (e.g., prohibiting theft from coreligionists, including those who are strangers, or demanding faith-deepening sacrifices); and (5) the potency of supernatural punishment and reward increases for key social norms (e.g., salvation, karma, hell, and heaven). These patterns are supported by both ethnographic and historical evidence.

3.1. Anthropological evidence

Quantitative and qualitative reviews of the anthropological record suggest that the gods of small-scale societies, especially those found in the foraging societies often associated with life in the Paleolithic, are typically cognitively constrained and have limited or no concern with human affairs or moral transgressions (Boehm 2008; Boyer 2001; Swanson 1960; Wright 2009). For example, among the much studied hunter-gatherers of the Kalahari region, Marshall (1962) wrote, "Man's wrong-doing against man is not left to Gao!na's [the relevant god's] punishment nor is it considered to be his concern. Man corrects or avenges such wrong-doings himself in his social context"[6] (p. 245). Although some of these gods are pleased with rituals or sacrifices offered to them, they play a small or no part in the elaborate cooperative lives of foraging societies, and they rarely concern themselves with norm violations, including how community members treat each other or strangers. However, as the size and complexity of societies increase, more powerful, interventionist, and moralizing gods begin to appear. Quantitative analyses of the available anthropological databases, including the Standard Cross Cultural Sample (SCCS), which provides data for 167 societies, selected to reduce historical relationships, and the Ethnographic Atlas (724 societies), show positive correlations between the prevalence of Big Gods and societal size, complexity, population density, and external threats (Roes 1995; Roes & Raymond 2003; 2009). These quantitative data also show that powerful moralizing gods appear in <10% of the smallest-scale human societies but become widespread in large-scale societies (see Fig. 1). This empirical finding dates back to Swanson (1960), and

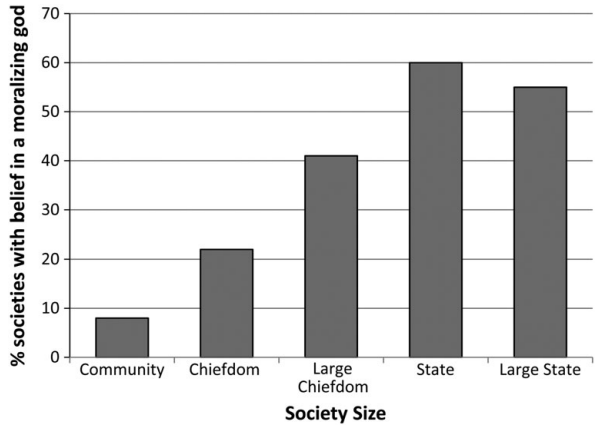

Figure 1. Increasing prevalence of Big Gods as a function of social group size in the Standard Cross Cultural Sample (reprinted from *Evolution and Human Behavior*, Roes, F. L. & Raymond, M., Vol. 24, issue 2, Belief in moralizing gods, pp. 126–35, copyright 2003, with permission from Elsevier.).

Fig. 1 - B/W online

despite critiques (Underhill 1975) and the statistical control of potential confounding variables (e.g., missionary activity, population density, economic inequality, geographic regions), the basic finding still holds.

Other researchers have arrived at similar conclusions. Stark (2001), for example, found that only 23.9% of 427 preindustrial societies in the Ethnographic Atlas (Murdock 1981) possess a god that was active in human affairs and was specifically supportive of human morality. Johnson's (2005) analysis supports earlier results, and it also reveals correlations linking the presence of powerful moralizing gods to variables related to exchange, policing, and cooperation in larger, more complex societies (see also Sanderson & Roberts 2008). Such gods are also more prevalent in societies with water scarcity, another key threat to group survival (Snarey 1996). In a different analysis, Peoples and Marlowe (2012) found several statistically independent predictors of Big Gods: (1) society size, (2) agricultural mode of subsistence, and (3) animal husbandry. Botero et al. (2014) arrived at similar conclusions. Using high-resolution bioclimactic data, and after controlling for the potential nonindependence among societies, they found that, in addition to the previously examined predictors, societies with greater exposure to ecological duress are more likely to have a cultural belief in powerful moralizing gods. More stratified societies are also more likely to support such Big Gods, but this effect sometimes drops out in the presence of mode of subsistence and community size. Nevertheless, it has been hypothesized that one way that prosocial religions maintain social cohesion in expanding groups is by legitimizing authority, inequality, and hierarchical relations (e.g., Peoples & Marlowe 2012; Turchin 2011). In the absence of much intergroup competition, those factors can lead to exploitation by the elite. However, under intergroup competition, cultural evolution may favor such legitimizing beliefs to both sustain solidarity and reinforce command and control during crises. Overall, far from being a reliably developing product of evolved human cognition, the modern popularity of Big Gods is a historical and anthropological puzzle (Tylor 1871), and one that requires explanation.

We emphasize that, although these analyses typically impose a dichotomy on the ethnographic data, our theoretical approach treats them as a continuum, and it focuses on how intergroup competition influences the selection of cultural elements. For example, although most chiefdoms in Oceania do not possess what would be coded as a "moralizing high god," there are ethnographic reasons to suspect that elements of mana and tapu, and supernatural punishment, may have been influenced by intergroup competition. These elements may have helped stabilize political leadership and may have kept people adhering to increasingly costly social norms. Archaeological and historical evidence, for example, indicates that the spread of divine kingship, spurred by interisland competition, was crucial for the emergence of a state in Hawaii (Kirch 2010). In the Fijian chiefdoms that we study ethnographically and experimentally, the strength of villagers' beliefs in punishing ancestor gods increases in-group biases in economic games (McNamara et al. 2016).

Organized rituals also follow a parallel pattern across societies. In an analysis using the Human Relations Area Files, Atkinson and Whitehouse (2011) found that "doctrinal" rituals – the high-frequency, low-arousal rituals commonly found in modern world religions (Whitehouse 2004) – are associated with greater belief in Big Gods, reliance on agriculture, and societal complexity. We argue that, among other important roles, doctrinal rituals galvanize faith and deepen commitments to large, anonymous communities governed by these powerful gods.

3.2. Archaeological and historical evidence

These comparative anthropological insights converge with archaeological and historical evidence, suggesting that both Big Gods and routinized rituals and related practices coevolved with large, complex human societies, along with increasing reliance on food production.

3.2.1. Archaeological evidence. Although supernatural beliefs are hard to infer archaeologically, and such evidence should, therefore, be interpreted with caution, the material record in Mesoamerica indicates that rituals became more formal, elaborate, and costly as societies developed from foraging bands into chiefdoms and states (Marcus & Flannery 2004). In Mexico before 4000 BP, for example, foraging societies relied on informal, unscheduled rituals just as modern foragers do (Lee 1979). With the establishment of multivillage chiefdoms (4000–3000 BP), rituals expanded and distinct religious specialists emerged. After state formation in Mexico (2500 BP), key rituals were performed by a class of full-time priests using religious calendars and occupying temples built at immense costs. The same is also true of the earliest state-level societies of Mesopotamia after 5500 BP and India after 4500 BP. We find similar patterns in predynastic Egypt (6000–5000 BP) and China (4500–3500 BP), as well as in other North American chiefdoms. In China, for example, the beginning of the Bronze Age (ca. 1500 BCE) is accompanied by a radical elaboration in tomb architecture and burial practices of elites, indicating the emergence of highly centralized and stratified polities bound together by costly public religious ceremonies (Thote 2009). Similar evidence for this can be found in Çatalhöyük, a 9500 BP Neolithic site in southern Anatolia (see Whitehouse & Hodder 2010).

3.2.2. Historical evidence. Once the written record begins, establishing links among large-scale cooperation, ritual elaboration, Big Gods, and morality becomes more tractable. To date, most of the historical work related to this topic focuses on the Abrahamic faiths. Wright (2009) provides a summary of textual evidence that reveals the gradual evolution of the Abrahamic god from a rather limited, whimsical, tribal war god – a subordinate in the Canaanite Pantheon – to the unitary, supreme, moralizing deity of two of the world's largest religious communities. We see the same dynamics at work in other major literate societies.

For example, although China has sometimes been portrayed as lacking moralizing gods, or even religion at all (Ames & Rosemont 2009; Granet 1934), scholars in recent years have begun systematically correcting that misconception (Clark & Winslett 2011; Slingerland 2013). Although there are important ongoing debates about the importance of supernatural surveillance relative to other mechanisms (e.g., Sarkissian 2015), in the earliest Chinese societies for which written records exist, the worshipped pantheon includes both the actual ancestors of the royal line and a variety of nature gods and cultural heroes, all under the dominion of a supreme deity, the "Lord on High" (*shangdi*) or Heaven (*tian*). This Lord on High/Heaven was a Big God in our sense, wielding supreme power over the natural world, intervening at will in the affairs of humans, and intensely concerned with prosocial values. The ability of the royal family to rule was a direct result of its possessing the "Mandate" (lit. "order" or "charge") of Heaven, the possession of which was – at least by 1000 BCE or thereabouts – seen as being linked to moral behavior and proper observance of costly sacrificial and other ritual duties.

Surveillance by morally concerned supernatural agents also appears as a prominent theme in early China. Even from the sparse records from the Shang Dynasty, it is apparent that the uniquely broad power of the Lord on High to command a variety of events in the world led the Shang kings to feel a particular urgency about placating Him with proper ritual offerings. When the Zhou polity began to fragment into a variety of independent, and often conflicting, states (770–256 BCE), supernatural surveillance and the threat of supernatural sanctions remained at the heart of interstate diplomacy and internal political and legal relations (Poo 2009). Finally, the written record reveals an increasingly clear connection in early China between morality and religious commitments. The outlines of moral behavior had been dictated by Heaven and encoded in a set of social norms, and a failure to adhere to these norms – either in outward behavior or in one's inner life – was to invite supernatural punishment (Eno 2009).

Similarly, although the highly organized Greek city states and Imperial Rome are sometimes portrayed as possessing only amoral and fickle deities (e.g., see Baumard & Boyer 2013), modern scholarship is increasingly rejecting this picture as the result of later Christian apologists' desire to distance the new Christian religion from "paganism." The gods of the Greek city-states received costly sacrifices, were the subject of elaborate rituals, and played an active

role in enforcing oaths and supporting public morality (Mikalson 2010, pp. 150–68). Although Roman religion did not have sacred scriptures or an explicit moral code that was considered to be the word of the gods, the deities of imperial Rome were seen by the populace as the guardians of what was right and virtuous (Rives 2007, pp. 50–52, 105–31), and the gods were central enough to the public sphere that even the spatial layouts of Roman cities were created around temples dedicated to the major gods (Rives 2007, pp. 110–11).

One of the challenges of large-scale societies involves the trust necessary for many forms of exchange and credit, particularly long-distance trade (Greif 2006). Not surprisingly, several Roman gods played a pivotal role in regulating marketplaces and in overseeing economic transactions. Cults dedicated to Mercury and Hercules in second- and first-century-BCE Delos – an important maritime trade center – emphasized public oaths certified by supernatural surveillance and divine punishment to overcome cooperation dilemmas in long-distance trade relations (Rauh 1993). In earlier periods, Greek, Roman, Sumerian, and Egyptian gods were also deeply involved in regulating the economic and public spheres. In surveying the Mediterranean region, Silver, for example, wrote, "The economic role of the gods found important expression in their function as protectors of honest business practices. Some deities openly combated opportunism (self-interest pursued with guile) and lowered transaction costs by actively inculcating and enforcing professional standards" (Silver 1995, p. 5). The gods also concerned themselves with public morality more broadly. In ancient Egypt, "The two components of the general concept of religion, and at the same time the central functions of kingship, are (1) ethics and the dispensing of justice (the creation of solidarity and abundance in the social sphere through dispensing justice, care, and provisions) and (2) religion in the narrower sense, pacifying the gods and maintaining adequate contact with them, as well as provisioning the dead" (Assmann 2001, p. 5).

The so-called karmic religions (Hinduism, Buddhism, Jainism) also reflect historical convergences between religion and public morality, although the precise psychological mechanisms are not as well understood as for the Abrahamic religions. Obeyesekere (2002) observes that the notion of rebirth is present in many small-scale societies – but disconnected from morality. Gradually, rebirth connects with the idea of ethical causation across lifetimes, and begins to influence the cooperative sphere. In a seminal field study with modern Hindu samples, participation and observation of extreme Hindu rituals such as the Kavadi, practiced among devotees of the Tamil war god Murugan, increased prosocial behavior (Xygalatas et al. 2013). A Hindu religious environment was also shown to induce greater prosocial behavior in a common resource pool game (Xygalatas 2013). Karmic religions are, therefore, also compatible with the prosocial religious elements in the present framework, although cultural evolution may be harnessing a somewhat different psychology, a question that is ripe for experimental research.

3.2.3. The "Axial Age." The "Axial Age" refers to the period between 800 and 200 BCE that marked the birth of "genuine" public morality, individuality, and interior spirituality (Jaspers 1953). Since Jaspers, a common view of the historical record has been that there is a vast cultural chasm between pre–Axial Age amoral religions – demanding mere external ritual observance from their adherents –and Axial Age moral religions, a view some in the cognitive science of religion (e.g., Baumard & Boyer 2013) have echoed. This interpretation is historically questionable on several fronts. To begin with, it fails to recognize the gradual nature of cultural evolution: Chiefdoms and early states predating the Axial Age by thousands of years had anthropomorphized deities that intervened in social relations, although their moral scope and powers to punish and reward were substantially narrower and more tribal than those of later, Axial gods. This is also true in contemporary Fijian chiefdom societies, as we noted in section 3.1. More plausibly, then, there has been a coevolution of two gradual historical processes: the broadening of the gods' powers and their moral concern, and an expansion of the cooperative sphere.

Moreover, the sheer length of this supposedly crucial historical period should itself raise suspicions about its usefulness as an explanatory category. The transition to prosocial religions emerges at very different time periods in various parts of the globe. Islam, for example, is a classic example of what we are calling a prosocial religion, both in terms of its doctrinal and ritualistic features and its apparent role in forging the disparate, warring tribes in the Arabian Peninsula into a unified, world historical force. Islam did not get its start until the sixth century CE, a full 800 years after the close of the "Axial Age."

Finally, there is ample historical evidence that elements of "pre–Axial Age" religions were supportive of public morality. In ancient Egyptian religion, for example, moral behavior was seen as part of *Maat*, the supernaturally grounded "right order" of the world. One of the Coffin Texts of the Middle Kingdom, "Apology of the Creator God," written between 2181 and 2055 BCE, includes a passage where said Creator God takes credit for having created morality – and laments that people seem disinclined to follow his moral mandates.[7] Similarly, Hammurabi's code, a Babylonian text from around 1772 BCE, is a well-preserved document of a divinely inspired moral system, capitalizing on fear of Marduk, patron god of Babylon, and the powers of Shamash, god of justice: "When (my god) Marduk had given me the mission to keep my people in order and make my country take the right road, I installed in this country justice and fairness in order to bring well-being to my people" (Bottéro 2001, pp. 168; for more on moralizing Mesopotamian gods, see Bellah 2011, pp. 221–24).

There are important open questions that require deeper analysis, regarding both the ethnographic and historical records. In moving this debate forward, it is important to recognize two crucial points that flow from a cultural evolutionary analysis. One is that our hypotheses are probabilistic, which allows for multiple causal pathways, including the possibility that in some societies prosocial religions played a minor or no role, or that their role emerged late in the process. Two, the historical trajectories of Big Gods, let alone the suite of elements we call *prosocial religions,* are not an all-or-nothing phenomenon. There is room for transitional gods that are knowledgeable about certain domains but not others and morally concerned in some respects but not others. As we noted, chiefdoms, in both the ethnographic and the historical records, appear to fit this intermediate pattern, and they are implicated in the expansion of the social scale. Their gods are more powerful and

moralizing than those of foragers, although not as full-fledged as the Big Gods of states and empires (Bellah 2011).

Overall, these ethnographic, historical, and archaeological patterns are consistent with the idea that the religious elements we have highlighted have spread over human history and have replaced many alternatives. We could have found no pattern, or the opposite pattern; for example, most hunter–gatherers might have had big, moralizing gods. Therefore, in this sense, an empirical test was passed, at least provisionally. However, none of this evidence establishes causality, or that any of our key religious elements can cause people to behave prosocially. At least some of these historical and ethnographic data are also consistent with the alternative hypothesis that bigger and more prosocial societies simply projected bigger and more prosocial gods in their own image, or that bigger gods hitched a ride along with other institutional forms. In the final section, we return to the issue and explore the merits of alternative scenarios, but, next, we turn to the issue of the direction of causality postulated in this theory and explore whether adherence to the religious elements discussed previously directly increased prosociality.

4. Religion and prosocial behavior: Psychological evidence

If certain religious elements can promote prosociality, then we should be able to study these effects using a variety of tools from the cognitive and social sciences. We review here both correlational and experimental evidence in light of the abovementioned hypotheses.

4.1. Correlating religious involvement and prosocial behavior

Several lines of evidence now link participation in world religions with prosociality. A large sociological survey literature shows that religious engagement is related to greater reports of charitable giving and voluntarism (e.g., Brooks 2006; Putnam & Campbell 2010). However, these findings are mostly confined to the American context and are based on self-reports, limiting generalizability, and inferences to actual behavior.

To avoid the problems of self-report, several studies now show a linkage between prosocial religions and the predicted forms of prosociality using economic games. In an investigation spanning 15 societies from around the globe, including populations of foragers, pastoralists, and horticulturalists, Henrich et al. (2010a; 2010b) found an association between world religion (Christianity or Islam) and prosocial behavior in two well-known economic games, the Dictator and Ultimatum Games. Unlike other studies, this one specifically validated the idea that participation in religions with Big Gods, CREDs, and related practices elicits more prosocial behavior in anonymous contexts than does participation in local or traditional religions, controlling for a host of economic and demographic variables. Interestingly, results of this and follow-up studies suggest that commitment to Big Gods is most likely to matter when the situation contains no credible threat of "earthly punishment" in the form of third-party monitoring (Laurin et al. 2012b). Those effects of participation in a world religion disappear when a secular third-party punisher is introduced.

Other behavioral studies have also found reliable associations between various indicators of religiosity and prosociality, albeit under limited conditions. A study employing a common-pool resource game, which allowed researchers to compare levels of cooperation between secular and religious kibbutzim in Israel, showed higher cooperation in the religious kibbutzim than in the secular ones; the effect was driven by highly religious men who engaged in daily and communal prayer and took the least amount of money from the common pool (Sosis & Ruffle 2003). Soler (2012) found similar cooperative effects of religious participation among members of an Afro-Brazilian religious group: Controlling for various sociodemographic variables, individuals who displayed higher levels of religious commitment behaved more generously in a public goods game and also reported more instances of provided and received cooperation within their religious community (for a similar finding in a Muslim sample in India, see Ahmed 2009).

Although these studies are provocative, it should be noted that similar studies conducted with Western, educated, industrialized, rich, and democratic (WEIRD) samples (Henrich et al. 2010b) have found that individual differences in religious commitment typically fail to predict prosocial behavior (e.g., Batson et al. 1993; Randolph-Seng & Nielsen 2007; Shariff & Norenzayan 2007). This inconsistency may arise from several factors, but one important consideration is that among groups with high trust levels toward secular institutions (the police, courts, governments) – such as the WEIRD students of so many studies – the effect of these institutions crowds out the influence of religion. In this sense, the strong secular mechanisms that have emerged recently in some societies can replace the functions of prosocial religions, an issue to which we return. Or, undergraduates may not have solidified their religious commitments. Either way, psychologists' narrow focus on WEIRD undergraduates may have caused them to miss these important moderating contexts.

In summary, behavioral studies have found associations between religious commitment and prosocial tendencies (for reviews, see Norenzayan & Shariff 2008; Norenzayan et al. 2013), especially when secular institutions are weak, reputational concerns are heightened, and the targets of prosociality are in-group members (coreligionists). However, causal inference in these studies is limited by their reliance on correlational designs. If religious devotion is predictive of prosocial behavior in some contexts, then we cannot conclusively rule out the idea that having a prosocial disposition causes one to be religious – or that a third variable, such as dispositional empathy or guilt-proneness, causes both prosocial and religious tendencies. To address this issue, we consult a growing experimental literature that induces religious thinking and subsequently measures prosocial behavior.

4.2. Religious priming increases fairness, cooperation, and costly punishment while decreasing cheating

If religious beliefs have a causal effect on prosocial tendencies, then experimentally induced religious thoughts should increase prosocial behavior. Findings support this prediction. Religious reminders reduce cheating, curb selfish behavior, increase fairness toward strangers, and promote cooperation in anonymous settings for samples drawn from societies shaped by prosocial religions, primarily Abrahamic

ones (for a recent review, see Norenzayan et al. 2013). Figure 2 shows the results of a recent meta-analysis (25 studies, 4,825 participants) from this literature (Shariff et al., in press), which shows that, overall, religious priming reliably increases prosocial behavior. The effect remains robust (though somewhat reduced) after estimating and adjusting for the prevalence of studies with null findings that are less likely to appear in the published literature.

Crucially, analyses looking at religious priming effects on a broad range of psychological outcomes (93 studies and 11,653 participants) showed that these effects are moderated by prior religious belief. That is, religious priming effects are reliable for strong believers, but they vanish for nonbelievers (Shariff et al., in press). This suggests either that nonbelievers are not responsive to religious reminders, or that there is large variability among nonbelievers with regard to their responsiveness to religious primes. This is important, because it indicates that exogenous religious primes interact with endogenous religious beliefs. Religious priming is shaped by cultural conditioning, and it is not merely the result of low-level associations (in addition, it could be interpreted to mean that religious primes are most effective when they are self-relevant, as is often the case in the priming literature, e.g., Wheeler et al. 2007).

The experimental and correlational literatures also reveal several important points about the psychological mechanisms involved.

1. Supernatural punishment and supernatural benevolence have divergent effects on prosocial behavior. In laboratory experiments, greater belief that God is punishing is more strongly associated with reductions in moral transgressions such as cheating, whereas greater belief that God is benevolent, if anything, has the opposite effect, increasing cheating (Shariff & Norenzayan 2011). Similarly, at the national level, greater belief in hell relative to heaven is predictive of lower national crime rates such as burglary, holding constant a wide range of socioeconomic factors and the dominant religious denomination (Shariff & Rhemtulla 2012).

2. Gods are believed to monitor norm violations. Reaction time analyses suggest that believers intuit that God has knowledge about norm-violating behaviors more than they believe that God has knowledge about other behaviors (Purzycki et al. 2012).

3. Religious priming increases believers' perceptions of being under social surveillance (Gervais & Norenzayan 2012a).

4. Belief in a punishing god is associated with *less* punishing behavior toward free-riders, because participants believe that they can offload punishing duties to God (Laurin et al. 2012b). Here, people are doing the opposite of what they think God is doing.

Together, these findings suggest a role linking beliefs in morally concerned, punitive, supernatural monitors to increases in prosocial behavior. These findings contradict the idea that already prosocial individuals spontaneously imagine conceptions of prosocial deities, or with explanations that suggest that religious priming brings to mind cultural stereotypes linking religion with benevolence, which in turn encourage benevolent behaviors such as generosity (Norenzayan et al. 2013). Finally, our framework predicts cultural variability in religious priming; these effects should diminish in cultural contexts, typically in smaller-scale groups, where religious elements and norm compliance are largely disconnected, and the gods have limited omniscience and are morally indifferent. This hypothesis remains open to investigation.

4.3. Prosocial religions encourage self-control

Participation in prosocial religions cultivates a variety of self-regulatory mechanisms, including self-control, goal

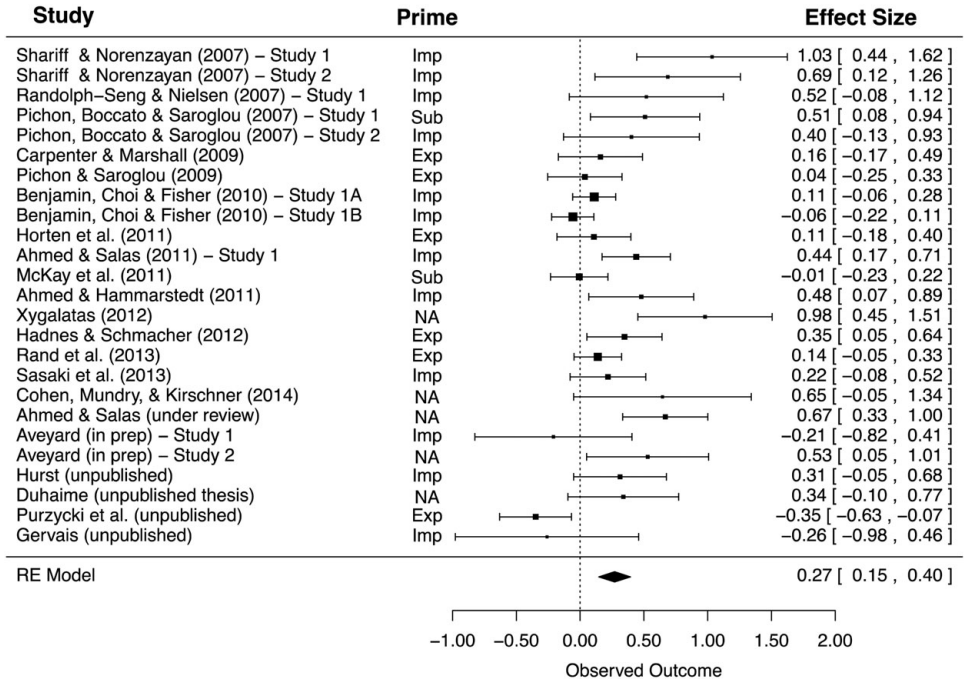

Fig. 2 - B/W online

Figure 2. A meta-analysis of religious priming studies shows that religious reminders increase prosocial behavior, with an average effect size of Hedges' $g = 0.27$, 95% CI: 0.15 to 0.40 (from Shariff et al. in press, with permission from Sage). Error bars are 95% CI of effect sizes.[8]

pursuit, and self-monitoring: all processes that may also partly explain religion's capacity to suppress selfishness in the interest of the group and promote longevity and health (McCullough & Willoughby 2009). Although most of the supporting evidence is correlational (e.g., Carter et al. 2012), recent experimental studies suggest a causal direction. In a series of experiments (Rounding et al. 2012; see also Laurin et al. 2012a), religious primes were found to increase an individual's willingness to endure unpleasant experiences (e.g., drinking juice mixed with vinegar) and delay gratification (e.g., by agreeing to wait for a week to receive $6 instead of being paid $5 immediately). In addition, religious reminders increased persistence on a difficult task when self-control resources were depleted (Rounding et al. 2012). Other experimental findings (e.g., Inzlicht & Tullett 2010) corroborate these observations, showing that implicit religious reminders enhance the exercising of self-control processes, by, for example, suppressing neurophysiological responses to cognitive error. Self-control is closely related to prosociality, because cooperating or complying with various norms often requires forgoing immediate returns in exchange for some future benefits, group benefits, or afterlife rewards.

Many ritual and devotional practices may have culturally evolved in part by increasing self-control (see below) and performance. For example, Legare and Souza (2012; 2014) have explored how the elements found in widespread rituals, including repetitions, multiple-step complexity, and supernatural connections, tap aspects of our intuitive causal cognition to increase their perceived efficacy. Believing one is equipped with efficacious rituals may foster self-regulation, persistence, and discipline by increasing individuals' confidence in their own success. Ritually enhanced self-efficacy improves performance (Damisch et al. 2010).

5. Galvanizing group solidarity

Belief-ritual complexes take shape as cultural evolution increasingly exploits a variety of psychological mechanisms to ratchet up internal harmony, cooperation, and social cohesion. In this way, prosocial religions bind anonymous individuals into moral communities (Graham & Haidt 2010; Haidt & Kesebir 2010), without prosocial religious elements being necessary for moral capacities or vice versa (Norenzayan 2014). Although many important open questions remain, here we focus on several that appear critical and that have received some attention.

5.1. Transmitting commitment: Why extravagant displays deepen faith and promote solidarity

The extravagance of some religious rituals has long puzzled evolutionary scientists. These performances demand sacrifices of time, effort, and resources. They include rites of terror, various restrictions on behavior (sex, poverty vows), painful initiations (tattooing, walking on hot stones), diet (fasts and food taboos), and lifestyle restrictions (strict marriage rules, dress codes). Why are extravagant displays of faith commonly found in prosocial religions?

The answer to this question could be found in the way that cultural learning biases operate. Belief can be easily faked, which would allow cultural models to manipulate learners by propagating "beliefs" that they did not sincerely hold. One evolutionary solution to this dilemma is for cultural learners to be biased toward acquiring beliefs that are backed up by deeds that would not be performed if the model's beliefs were not genuine (as well as related strategies for "epistemic vigilance," see Sperber et al. 2010). Although limited, existing experimental work on cultural learning indicates that CREDs play an important role in the transmission of belief or commitment in multiple domains where cultural influence matters, not just in religious contexts (for review see Henrich 2009; for more recent evidence, see Lanman 2012; Willard et al. 2015). In prosocial religions, CREDs are of particular importance, given that faith spreads by cultural influence, and that religious hypocrites can undermine group cohesion. The idea here is that cultural evolution exploited the evolved inclination to attend to CREDs as a mechanism to deepen religious faith and commitment, and thereby promote cooperation.

Religious displays of self-sacrifice are often seen in influential religious leaders, who then transmit these beliefs to their followers. For example, when male priests of the Phrygian goddess Cybele performed ritualized public self-castrations, they sparked cultural epidemics of Cybele religious revival in the early Roman Empire that often competed with the spread of Christianity (Burkert 1982). Similarly, early Christian saints, by their willing martyrdom, became potent models that encouraged the cultural spread of Christian beliefs (Stark 1996). When religious leaders' actions credibly communicate their underlying belief and commitments, their actions in turn energize witnesses and help their beliefs to spread in a group, after which commitment deepens. If, on the other hand, they are not willing to make a significant demonstration of their commitment, then observers – even children – withhold their own commitment to those beliefs. Supporting this idea, Lanman (2012) reports that in Scandinavia children are less likely to adopt the beliefs of their religious parents if those parents do not display religious CREDs. Conversely, both children and adults, exposed to both religious propositions (implicit or explicit) and CREDs, acquire a deeper commitment or belief in them than they would otherwise.

Once people believe, they are more likely to perform similar displays themselves, which offers another explanation of why extravagant behaviors are culturally infectious in prosocial religious groups. Moreover, CREDs often come in the form of altruistic giving to other in-group members, further ratcheting up the level of in-group cooperation in prosocial religious groups. For example, Xygalatas et al. (2013) investigated the prosocial effects of participation in, and witnessing of, the Kavadi, an extreme set of devotional rituals for Murugan, the Tamil god of war, among Hindus in Mauritius. The act of witnessing this intense, pain-inducing set of rituals increased anonymous donations to the temple as much as participating did. Donation sizes correlated with perceptions of the pain involved. This suggests that extreme ritual worship such as this one is likely to be a CRED-like phenomenon in addition to any signaling functions that it carries.

Although reliance on CREDs evolved for adaptive reasons originally unrelated to religion, their exploitation by prosocial religions helps explain why (1) religious participants, and especially religious leaders, must engage in sacrifices (e.g., vows of poverty and chastity make leaders more effective transmitters of faith and commitment); (2)

martyrdom emerges prominently in religious narratives and actions; and (3) Big Gods are believed to demand extravagant sacrifices and worship, thereby causing CREDs, which in turn deepen faith in these Big Gods.

Finally, cultural evolution may have shaped the rituals of prosocial religions for the effective transmission of standardized religious beliefs and doctrines across large populations. Following Whitehouse's formulation (2004), we propose that cultural evolution may have increasingly favored the "doctrinal mode" of ritual, in which some subset of rituals becomes high frequency, low arousal, highly repetitious, and obligatory. The idea is that these types of repetitious rituals may cue norm psychology and increase the transmission fidelity of certain religious ideas (Herrmann et al. 2013; Kenward et al. 2010), thereby helping to maintain religious uniformity in large populations, not only among those individuals attending the ritual (more on this subsequently), but also across a larger imagined community of coreligionists.

5.2. Synchrony and fictive kinship

Prosocial religions often harness collective rituals that are characterized by shared, synchronous arousal, a phenomenon Durkheim (1915) termed *collective effervescence*. Historians have suggested that this synchronous arousal was the key to understanding the military innovation of close-order drill, which increased unit solidarity (McNeill 1982; 1995). Recent empirical work shows that the experience of synchrony increases feelings of affiliation (Hove & Risen 2009; also see Paladino et al. 2010; Valdesolo et al. 2010) and facilitates feelings of fusion with the group, which may in turn encourage acts of sacrifice for the group (Swann et al. 2009). One study found that joint music-making promotes prosocial behavior even among 4-year-olds (Kirschner & Tomasello 2010). Experimental work has also shown that participation in synchronous song and dance results in greater trust, greater feelings of "being on the same team," and more cooperation in economic games (Wiltermuth & Heath 2009). Even witnessing fire-walking puts the heart-rate rhythms of friends and relatives in sync with those of the walkers (Konvalinka et al. 2011). As noted earlier, synchronous rituals may also affect self-regulation: Rowing synchronously with team members leads to higher levels of pain tolerance (Cohen et al. 2010), which should improve team performance.

Many have observed that the prosocial religious groups that often unite people across ethnic, linguistic, and geographic boundaries evoke kinship in referring to each other (Atran & Henrich 2010; Nesse 1999). Christians often describe themselves as belonging to a "brotherhood," a common term that often applies today to the global fraternity (*ikhwan*) of Islam (Atran & Norenzayan 2004). In fifth-century BCE China, Confucius famously observed that anyone in the world sharing his moral and religious commitments should be viewed as a "brother" (*Analects* 12.5; Slingerland 2003, p. 127), and throughout Chinese imperial history the emperor was known as the "Son of Heaven" and viewed as the both the mother and father of the populace.

There is little experimental work exploring the psychology behind fictive kinship and its relation to religious solidarity. We suggest two possible hypotheses. One is that kinship psychology partly contributes to the deep trust and commitment that is characteristic of global religious communities. Alternatively, it could be that the use of kinship metaphors helps establish the social norms for how one is supposed to treat coreligionists, which allows participants to readily learn proper behavior and to judge and sanction norm violators (Chudek & Henrich 2011). Either way, we hypothesize that cultural evolution exploits this feature in innate social psychology, rather than it being an automatic misfiring of psychology evolved for survival in ancestral environments.

5.3. Signaling religious commitment and expanding the social circle while marking group boundaries and fueling intergroup conflict

Through ritual practices and devotions, cultural evolutionary processes often exploit signaling to differentiate those with high levels of religious commitment from those without (Bulbulia 2004; Sosis & Alcorta 2003). Empirically, sociological analyses are consistent with the idea that groups that impose behavioral restrictions or taboos have members that are more committed (Iannaccone 1994). Controlling for relevant sociodemographic variables, "strict" Protestant and Jewish denominations (Jehovah's Witnesses, Orthodox) show higher levels of church and synagogue attendance, respectively, and make larger monetary contributions to their religious communities (despite *lower* average income levels) than do less strict ones (Methodists, Reform). Work by Ginges et al. (2009) affirms that there is a link between ritual participation and parochial altruism; that is, commitment to a combination of in-group cooperation and out-group aggression. Both extensive survey data and experimental findings from Palestinians and Jewish Israelis in the West Bank and Gaza show that religious participation (as measured by attendance) predicts more support for suicide attacks against out-groups, independent of religious devotion (as measured by prayer) and a wide range of other factors. These findings by themselves do not conclusively demonstrate that measures of strictness or sacrifice predict community survival and growth (an issue that we explore later). They do, however, demonstrate that group commitment is associated with the ritual participation commonly found in prosocial religions.

One of the pillars on which we build our argument is the hypothesis that human minds are reliably equipped with a set of social instincts related to kinship, reciprocity, status, and reputation. In addition, these social instincts are bundled together with tribal instincts for life in groups based on a social identity cued by shared customs, taboos, languages, and practices (Henrich & Henrich 2007; Richerson & Boyd 1999). Our hypotheses suggest that cultural evolution harnessed these social, and particularly tribal, instincts to stretch and expand the social sphere of people to include all coreligionists, even when they lived well beyond the sphere of ethnic identity, reputation, or repeat interaction. Prosocial religions accomplish this in myriad ways, including norms that mark group boundaries, and sacralize inequality and vertical relationships within expanding groups, beliefs that describe a group-based primordial essence, or rituals that instill the relevant essence in new initiates. Common boundary markers that spark tribal psychology include distinctive dress, ornamentation, tattooing, bodily mutilation, and food taboos. These behaviors can act as boundary markers, signals of commitment, and CREDs that transmit commitment to learners.

One critical boundary marking in prosocial religions that is of particular interest is distrust of atheists (Gervais & Norenzayan 2013; Gervais et al. 2011a). For atheists, belief is a personal matter on a metaphysical issue. For believers, lack of commitment to supernatural surveillance is a public threat to cooperation and social trust (Gervais et al. 2011a; Norenzayan 2013). Although several factors are implicated in this prejudice, converging evidence shows that one key driver of religious distrust of atheists is the intuition that people behave better if they are under supernatural surveillance (Gervais & Norenzayan 2013). These boundary-setting processes highlight the parochial aspect of religiously motivated prosocial behavior. They also illustrate that the solidarity-building potential of prosocial religions has a dark side. This potential can reify political and economic inequality within cooperative but hierarchically organized groups (Peoples & Marlowe 2012; Turchin 2011), often contributing to exploitation by those who hold power; and it can turn toxic for people who are seen to fall outside of the imagined moral boundaries (such as perceived religious outgroups). Thus, in the present framework, intragroup cooperation can readily feed into intergroup antagonism, especially when social groups are already in a state of real or imagined conflict. This is a topic of great interest in our age, for understanding the conditions under which prosocial religions become accessories to intergroup intolerance, conflict, and violence (see for example, Atran & Ginges 2012; Haidt 2012; Neuberg et al. 2014; Norenzayan 2013).

5.4. Metaphysical grounding and sacred values

Our approach suggests that cultural evolution anchors certain kinds of norms or beliefs – those favoring success in intergroup competition – to a kind of metaphysical bedrock (Durkheim 1915; Rappaport 1999), such as the desires of a widely accepted and omnipotent deity. Some scholars have argued that distinctively moral norms have a necessary connection to metaphysical beliefs (e.g., Taylor 1989). This suggests that key features of norms such as authority independence, universal applicability, and emotional salience become more widespread in large-scale societies influenced by Big Gods and in their secular successors but are likely to be less important or unknown in small-scale societies (Huebner et al. 2010). It is also apparent that such moral norms, or "sacred values," are distinctive in being uniquely resistant to cost–benefit trade-offs (Atran 2010a; Ginges et al. 2007; Haidt 2012).

We hypothesize that metaphysically grounded, group-beneficial norms that carry powerful affective force and punitive sentiments play an important role in insulating within-group cooperation from potential defection (see also Atran 2010a). Moreover, in larger-scale cooperative societies, especially those involving social classes and multiple ethnic groups, subgroups or coalitions will have incentives to push social norms in directions that favor their subgroup, sometimes at the expense of the overall group. If norms are grounded metaphysically, however, self-interested individuals or subgroups pushing to alter norms face a substantial obstacle.

The spread of normative monogamy may provide an illustrative case of self-interest being curtailed by metaphysically rooted norms. The anthropological record indicates that approximately 85% of societies have permitted men to take more than one wife (polygynous marriage), and both empirical and evolutionary considerations suggest that large absolute differences in wealth should favor more polygynous marriages. However, monogamous marriage spread across Europe, and more recently around the globe, even as absolute wealth differences expanded. Much evidence now suggests that cultural evolution has favored the norms and institutions of modern monogamous marriage because of their group-beneficial effects. In suppressing intrasexual competition and reducing the size of the pool of unmarried men, normative monogamy reduces crime rates, including rape and murder (Henrich et al. 2012). Historically, Christianity overcame the obstacle presented by elite male interests (kings and nobles) by making monogamy sacred and divinely ordained, and thereby making polygamy not just counternormative but heretical. Similarly, Islam, although not enforcing strict monogamy, adopted practices that nevertheless inhibited polygyny, again backed by sacred authority (Henrich et al. 2012). A king or chief may be motivated to change secular laws to suit his immediate needs, but challenging divinely ordained sacred commands is another matter.

In summary, and to emphasize a key point, none of the psychological mechanisms harnessed by cultural evolution in the above described account are unique to religion or to prosocial religions. Extravagant displays can be found in a variety of domains in which social influence is important, such as in marketing, education, and warfare. Synchrony is widely used, especially in military drill. Fictive kinship is the central organizing principle of the kinship systems that characterize small-scale societies. Many sacred values, such as the notion of the existence of fundamental human rights, are found in secular societies, even among atheists (Atran 2010a; Taylor 1989; Haidt 2012). What makes prosocial religions interesting and distinctive is the way that cultural evolution has packaged and interwoven a converging set of mechanisms with commitments to Big Gods and other supernatural beliefs.

6. The cultural group selection of religious groups

We now turn to the final argument: Cultural evolution, driven by intergroup competition (including warfare), over historical time favored those amalgams of beliefs, norms, and rituals (belief–ritual complexes) that most effectively increased internal solidarity, elevated in-group cooperation in expanding groups, and promoted success in outcompeting or absorbing rival groups. Because fully documented and quantified cases of long-term historical processes are currently hard to find, we proceed by sketching two converging lines of evidence. First, we highlight ethnographic and historical evidence of cultural group selection in action, in which certain belief–ritual packages spread as a result of the differential survival or success of groups. These cases do not conclusively demonstrate all of the relevant causal interconnections, but they do establish a prima facie case that certain rituals and beliefs spread via intergroup competition. Second, to illuminate the causal processes that link the adoption of certain religious beliefs to group success, we examine demographic and economic evidence suggesting that prosocial religions favor faster reproduction and greater economic success.

6.1. Ethnographic and historical cases

Historical and ethnographic evidence from a variety of sources indicates that particular belief–ritual combinations do spread by cultural group selection. As noted, even before the emergence of large-scale societies, intergroup competition would have favored solidarity-inducing rituals (Henrich 2015). This process can be seen in an ethnohistorical study of the evolution of various belief–ritual complexes in the highlands of New Guinea. Central to the emergence of these ritually galvanized ideological systems, which the authors describe as promoting "identity, welfare, and unity" within larger and larger groups over time, is the cultural transmission of these belief–ritual complexes, or elements of them, both within and across linguistic boundaries (Wiessner & Tumu 1998, pp. 195–96).

Elsewhere in New Guinea, Tuzin has examined the historical co-emergence of a strong group ideology, an intricate form of social organization, a complex ritual system, and a high degree of cooperation and solidarity. In a region where villages often break down when they grow to more than 300 or so people, this study of the Ilahita Arapesh reveals how an interlocking segmented moiety system, galvanized by the rehearsal of a secret ritual system called the *Tambara*, permitted 1,500 people to live together with high levels of cooperation and solidarity, and thereby survive in a very competitive regional environment that has long included both military and economic threats (Tuzin 1976; 2001). The basic elements of the belief–ritual complex, which the Ilahita Arapesh elaborated and improved upon, were first imitated from a highly successful and aggressively expanding group called the Abelam in the 1870s or thereabouts. Their acquisition and modification of the Abelam system probably permitted Ilahita's inhabitants to resist being driven out, and it has since permitted both military and economic success.

This contextually rich ethnohistorical study fits with recent cross-cultural analyses of small-scale preindustrial societies showing that greater participation in intergroup warfare (but not within-group violence or intensity of mating competition) predicts more extreme rites for males (Sosis et al. 2007). Whether these rites are commitment signals or CREDS (or both), the findings suggest that increases in intergroup competition favor rituals and devotions that more effectively galvanize commitment, solidarity, and cooperation. Groups with these practices increase their odds of surviving, expanding, and being imitated by other groups.

Cultural group selection also operates when individuals preferentially adopt or "convert" to certain cultural packages, based on the success of those groups (Boyd & Richerson 2009). In her study of the spread of Islam into Africa, Ensminger (1997) discussed how Islamic CREDs – abstaining from alcohol, avoiding pre- and extramarital sex, not consuming blood or pork, and fasting – transmitted greater trust and shared rules of exchange and the use of credit institutions among converted Muslims. This facilitated more trade and greater economic success. The Orma (Kenyan agro-pastoralists), and presumably other African groups, began adopting the religious beliefs along with the associated institutions and rituals. Ensminger (1997) suggests that these Islamic groups not only attracted followers faster than other groups, but also succeeded at times in imposing Islam on conquered groups: another form of cultural group selection that influences the distribution of religious representations.

Finally, at least one quantitative investigation has directly tested the prediction that religious cultural groups, particularly those incorporating extravagant displays, enjoy an advantage in group stability over time over cultural groups that do not (Sosis 2000; Sosis & Alcorta 2003). Sosis compared the group longevity of nineteenth century American religious and secular communes. Facing various internal and external threats to group stability, communes that were unable to solve collective action problems were unlikely to survive and prosper. For every year considered over a 120-year span, religious communes were found to outlast secular ones by an average factor of four (Fig. 3). Moreover, religious communes were less likely than secular ones to dissolve in any given year as a result of internal conflict or economic hardship. A subsequent analysis of 83 of these religious and secular communes (Sosis & Bressler 2003) found that religious communes imposed more than twice as many restrictions (including food taboos and fasts, and constraints on material possessions, marriage, sex, and communication with the outside world), and the number of restrictions predicted religious commune longevity (R^2=0.38), even after controlling for population size, income, and founding year. It is important to note that these are differences in the longevity of the cultural groups (not the individuals within the groups) over a historical time spanning only a few generations.

6.2. Prosocial religions influence reproductive and economic success

Cultural group selection can work through a variety of mechanisms. Here, we highlight evidence indicating that the beliefs and practices of prosocial religions generate greater reproductive and economic success. Greater reproduction means a faster rate of production of culture-bearing coreligionists, because children, all else being equal, tend to acquire the religious beliefs of their families and communities. All else being equal, economic productivity also matters because of the obvious advantages it

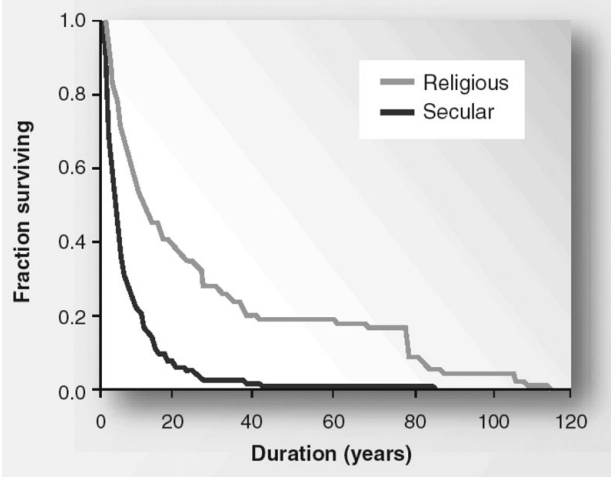

Figure 3. Religious communes outlast secular ones over time (from Sosis, R., Cross-Cultural Research (vol. 34), pp. 70–87, copyright © 2000. Reprinted by permission of SAGE Publications.).

Fig. 3 - B/W online

offers in intergroup competition, and because economically less-successful groups often copy more-successful ones.

Prosocial religions are often pro-natalist in orientation: They tend to favor higher fertility rates (Blume 2009; Kaufmann 2010; Norris & Inglehart 2004). This association is both strong and robust across diverse populations. For example, individual-level data from 82 countries reveals a linear relationship between the frequency of religious worship and number of children, with those who worship more than once a week averaging 2.5 children compared with 1.7 (below replacement) for those who never worship. Blume (2009) has examined the Swiss census of 2000 and found that, even after controlling for education and income, Christians, Hindus, Muslims, and Jews all outbred the religiously unaffiliated. A study comparing the fertility rates of Orthodox or atheist European Jews found that the atheists had the lowest birthrate, averaging approximately 1.5 children per woman, whereas the religious Jews averaged nearly 3, with the Haredim in Israel averaging 6–8 children per woman (Kaufmann 2010).

At the group level, societies that are more religious have higher population replacement levels than secular societies, even when countries are matched on national income and education levels (Norris & Inglehart 2004). Time series analyses indicate that, as religiosity declines in a society over time (as has occurred in Europe in the second half of the twentieth century), so do fertility rates. According to Blume (2009), it is hard to find overwhelmingly secular societies today that are reproducing above replacement levels, despite strong government incentives in welfare state countries such as France and Germany. Religious positions on women's rights, contraception, sexual orientation, and abortion can be seen in this same light. What are called "family values" in the United States can be best understood as a set of values conducive to producing larger families.

Of course, not all religions encourage reproductive success; consider the celibate Shakers. However, in the argument we have outlined, those religious groups with beliefs and practices that promote rapid population growth would be, all else being equal, expected to outcompete their rivals (whether religious or secular) and take a larger share of the religious market. Exactly how prosocial religions have these effects is an open question. Nevertheless, we think that cultural evolutionary processes play a major role in this reproductive advantage, just as they do in their effects on cooperation. Fertility rates of second-generation immigrants to the United States can be predicted from the average fertility rates of the home countries of their parents, indicating just how powerful a grip culture can have on reproduction (Fernandez & Fogli 2009). The rapid declines in fertility – often in just a few generations – following secularization also suggest that these effects are likely to be, in an important sense, culturally transmitted.

Elements of prosocial religions can also influence the economic performance of groups, which facilitates their cultural success. For example, using panel data from 81 countries, McCleary and Barro (2006) showed that countries with stronger beliefs in a consequential afterlife (e.g., heaven and hell), experience faster economic growth rates, controlling for life expectancy, education, the rule of law, fertility rate, and ratio of investment to GDP. Belief in hell, in particular, is found to be a strong predictor of commitment to teaching thrift to children. However, consistent with the secularization trend, greater GDP per capita in turn leads to a subsequent decline in religious beliefs. These effects on economic growth are based on both longitudinal evidence and on extensive statistical controls (Barro & McCleary 2003). With appropriate caveats, then, these analyses encourage the hypothesis that religious beliefs have effects on economic outcomes. Other correlational analyses show that belief in a personal god and in the afterlife, as well as ritual participation, independently predict harsher judgment of key moral transgressions, including cheating on taxes, accepting a bribe, adultery, and lying (Atkinson & Bourrat 2011).

7. Implications, counterarguments, and concluding remarks

7.1. Synthesizing existing views on the evolution of religion

Despite recent progress, the evolutionary study of religion is in its infancy, and important gaps remain in our knowledge and much work needs to be done to reach a more complete understanding. The theoretical framework presented here synthesizes key elements of the two most influential evolutionary approaches to religion to date: the *by-product* and *adaptationist* approaches. We note that both approaches have their merits and have generated rich theorizing and empirical literatures that have moved the field forward. Our framework builds directly on the by-product perspective that religious representations are made possible and facilitated by reliably developing features of human cognition that were not naturally selected for the production of the religious beliefs or behaviors that they now underpin. However, by embedding these ideas within a framework that considers more fully both genetic and cultural inheritance, we can account for a number of key phenomena not explicitly addressed by the cognitive by-product account.

Two examples illustrate this point. First, although the by-product account helps explain how people come to mentally represent supernatural agents, it is silent about one of the most critical features of (some) religions, that of deep *faith or commitment* to particular gods. This is captured by the "Zeus Problem" (Gervais & Henrich 2010), which asks how people in one place and time can acquire belief in, and commitment to, a particular religious representation, whereas people in another place or time do not, even when exposed to identical representation.[9] We argue that understanding the origin of faith requires explaining not only the cognitive mechanisms that allow people to mentally represent, remember, and transmit religious ideas, but, equally crucially, how people passionately and selectively commit to only a subset of all intuitively conceivable deities. We hypothesize that cultural learning biases, such as CREDs (Henrich 2009), are a crucial part of the explanation. In this view, if cultural learning cues are altered, significant shifts occur in the particular deities people believe in without altering their content. Second, most by-product approaches have not explicitly dealt with the body of empirical evidence showing that some religious elements spread by having prosocial effects.[10] In contrast, we offer an argument compatible with central aspects of the cognitive by-product view, but one that goes further and explains why

some, but not most, "thinkable" cultural variants have powerful downstream social effects.

The current framework also accounts for a set of important phenomena that two distinct adaptationist theories of religion address: costly signaling approaches and the supernatural punishment hypothesis. Both perspectives accommodate the idea that the cognitions underlying religious beliefs and behaviors may have been evolutionary by-products, but both highlight their adaptive role (Bering 2006; Sosis 2009). The costly signaling approach, grounded in behavioral ecology, argues that extravagant religious displays are naturally selected for life in cooperative groups, allowing individuals to reliably signal their degree of cooperation or their group commitment to solve the free-rider problem (Bulbulia 2004; 2008; Irons 2001; Sosis & Alcorta 2003). This approach is compatible with cultural variability and cultural evolutionary logic, and recent work in this perspective has begun to integrate costly signaling accounts with models that take into account intergroup competition and cultural evolutionary changes (e.g., Sosis & Bulbulia 2011; Wildman & Sosis 2011). We have built a foundation that further promotes such synthesis by incorporating insights from this approach in two ways. First, by emphasizing CREDs as well as signaling, we account for both the cultural contagion generated by these extravagant displays and what they communicate to others about the actor's commitments. Second, by embedding signaling approaches within a cultural evolutionary framework (Henrich 2009), we can explain why people might acquire religious beliefs with varying degrees of commitment, as well as why individuals are more susceptible to acquiring religious beliefs that are backed up by credible displays. Our view also positions specific signals within a cultural evolutionary process that assembles practices and beliefs to exploit signaling logic over historical time.[11]

Another adaptationist account that has garnered interest is the supernatural punishment hypothesis (SPH) (e.g., Bering 2006; 2011; Johnson 2009), which argues that a fear of a moralizing god is a naturally selected genetic adaptation targeting moral self-constraint or error management. Although our framework and the SPH share many similarities, and draw from some of the same body of evidence, they also differ in interesting ways. Whereas we argue that fear of moralizing gods and other supernatural punishment beliefs were culturally selected in individuals and groups, the SPH argues that they are a *genetic adaptation* favored by within-group genetic selection, whose function is to restrain individuals from defection because of the social punishment they personally risk if caught (Johnson 2009; Johnson & Bering 2006; Schloss & Murray 2011). The cultural evolutionary framework and the supernatural punishment hypothesis in principle can be compatible, and we encourage debate on this possibility. However, our interpretation of the current ethnographic evidence raises two key challenges for this hypothesis. One is that the available evidence shows that in small-scale societies, and especially among foragers, gods have limited omniscience and little or no moral concern. Two, gods become more moralizing and interventionist as societies scale up and anonymity invades relationships, where the likelihood of escaping social sanctions for defection is greater, not smaller (for further discussion and critique, see Norenzayan 2013; Shariff et al. 2010). The framework we present here preserves the important insights and evidence from this hypothesis but also accommodates what would otherwise be empirical anomalies.

Our framework also circumvents what we argue are unproductive definitional debates about "religion." Within religious studies, there is no widely accepted definition of what constitutes religion, or even if the term itself usefully picks out a coherent category of beliefs or behaviors (Saler 2009; Stausberg 2010). In our view, the concept of religion merely provides a pithy rhetorical prop to cue readers to the kinds of interrelated phenomena that require explanation. The religious package is a statistical pattern governed by specific hypotheses, rather than a predefined concept with necessary or sufficient features. There is, therefore, no expectation of a single overarching definition of religion or clear semantic boundaries, because the package of traits that gets labeled "religion," although containing recurrent elements, culturally mutates in a predictable fashion, taking different shapes in different groups and at different historical times (Norenzayan 2013; for a similar but distinct account, see Taves 2009).

7.2. Counterarguments and alternative cultural evolutionary scenarios

Now that we have situated a cultural evolutionary framework in the broader debates about the evolution of religion, we evaluate the merits of alternative scenarios and counterarguments in light of the evidence. One obvious possibility we return to is reverse causation: the idea that prosocial religions are a consequence, rather than a cause, of social complexity and large-scale cooperation. To sharpen this alternative account, we consider two versions of the question. The broad version is that the causality is bidirectional: Prosocial religions are both a cause and a reflection of large-scale cooperation. In other words, they are best characterized as a mutually galvanizing feedback-loop. This is of course compatible with the hypothesis that prosocial religious elements contributed to the expansion of the cooperative sphere. The narrower version is that prosocial religions may be causally inert and only a by-product of large-scale cooperation (e.g., see Baumard & Boyer 2013).

We argue that this by-product-only account is difficult to reconcile with the breadth of the evidence for at least three reasons. First, we note that the religious priming data, supported by a meta-analysis, contradicts this alternative claim. Second, in the 15-culture experimental study conducted by Henrich et al. (2010a; 2010b), in which adherence to world religions (relative to local religions) predicted more prosocial behavior in economic games, this effect remained even after controlling for community size (as well as other variables implicated in religion and prosociality). If both prosocial religions and prosocial tendencies were merely a consequence of societal scale, statistically controlling for community size, market integration, income, education, and wealth would eliminate the association between world religion and prosocial behavior. The data did not support that. Third, the cross-cultural ethnographic patterns we discussed earlier pose a different kind of challenge to this account. There are multiple, statistically independent predictors of the prevalence of Big Gods (e.g., Botero et al. 2014; Peoples & Marlowe 2012). The by-product-only hypothesis would have to offer piecewise and special case explanations; that is, different accounts would have to be conjured up for why people who live in

large, anonymous societies, practicing animal husbandry, engaged in agriculture, and exposed to ecological duress such as water scarcity, imagine Big Gods more than do people in other societies that lack these conditions. The causal hypothesis, in contrast, is backed up by experimental evidence, and it also offers a unified explanation for these cross-cultural patterns, as each of these socioecological conditions poses serious collective action problems to which prosocial religions with Big Gods contribute solutions (e.g., Botero et al. 2014; Peoples & Marlowe 2012).

Another cultural evolutionary scenario is that prosocial religions proliferated only after other mechanisms produced a set of conditions in which prosocial religions increasingly became a target of cultural evolutionary pressures. That is, prosocial religions may not have played an original role in enabling the rise of large-scale cooperative societies, but rather, they may have been a consequence. Once prosocial religions took shape, they then contributed to maintaining and expanding large-scale cooperation.[12] Because the framework we have outlined does not specify a fixed temporal sequence, this scenario is a viable alternative given the available ethnographic, historical, and experimental evidence. We suspect that history will show some cases in which religious elements spread first, and then societies expanded, and other cases in which the societies expanded, and then the religious elements spread and in turn sustained and broadened the expansion. These alternative historical scenarios are ripe for research.

7.3. From religious belief to disbelief

The widespread occurrence of at least some forms of atheism[13] presents an interesting challenge for any evolutionary explanation of religion. Religion, by some evolutionary accounts, is either a suite of adaptive strategies built into evolved psychology, or it is a direct projection from reliably developing, species-specific, cognitive capacities onto the world. We take up this challenge in the framework presented here and offer an account of secularization. By combining insights from the by-product approach with cultural evolution, we suggest that psychologically real atheism is possible, even if some cognitive biases – *all else being equal* – push people toward religious belief. Our framework suggests that religious belief – as a joint product of cognitive biases, core existential motivations concerning mortality as well as control and meaning, and cultural learning strategies – may produce distinct psychological pathways that jointly or in isolation lead to disbelief (Norenzayan & Gervais 2013).

Therefore, rather than seeing "atheism" as a single phenomenon, our model treats it as a blanket term for several pathways to disbelief, including (1) *mindblind atheism* associated with deficits in mentalizing; (2) *InCREDulous atheism*, caused by the lack of witnessing extravagant displays of religious commitment; (3) *apatheism* or indifference to religion induced by the absence of existential threats or material hardship; and (4) *analytic atheism*, in which analytic cognitive processes override or block the cognitive intuitions that anchor religious beliefs.[14]

Finally, because this framework tackles both recurrent features of prosocial religions, and historical and cultural changes over time, it gives center stage to questions about the conditions that give rise to secularization. We argue that, whereas multiple pathways likely stabilized large cooperative social groups, religiously driven prosociality was one powerful force. In most of humanity's past, and for many societies even today, the secular mechanisms and institutions that sustain prosociality, were – and often remain – rare or unreliable. Our analysis accommodates the fact that religiosity systematically varies depending on the social conditions that exist in particular populations at particular times. Religious prosociality was once one of the most effective ways to foster exchange among strangers or organize them for cooperative endeavors. However, the recent spread of secular institutions since the industrial revolutions – including democratic political institutions, policing authorities, and effective contract-enforcing mechanisms – has ushered in widespread large-scale prosociality without gods.

Our framework, therefore, provides an account of how secular societies climbed the ladder of prosocial religion and then kicked it away. Prosocial religions may have buttressed a cultural bridge between the small-scale human societies that dominated much of our evolutionary history and the complex secular societies of the modern world. However, with the emergence of strong secular institutions that promote public trust and existential security (Norris & Inglehart 2004), the selective forces that spread and sustained these belief–ritual packages began to ebb. This may have led first to a downgrading of concepts such as hell and God's wrath, which would have weakened the forces sustaining prosocial religions, and then gradually to the loss of religious faith itself. Conversely, prosocial religions continue to thrive where existential threats, such as natural disasters, material insecurity, and inefficient rule of law, remain rampant (e.g., Bentzen 2013; Norris & Inglehart 2004; Sibley & Bulbulia 2012).

It appears that God and government are both culturally and psychologically interchangeable. Experimentally induced reminders of secular moral authority had as much effect on generous behavior in an economic game as reminders of God (Shariff & Norenzayan 2007). The effect of participation in a world religion on punishing of selfish behavior disappears when a third-party punisher is introduced into the game (Henrich et al. 2010a), also suggesting some psychological interchangeability between supernatural and secular sources of monitoring and punishment. Cross-national surveys show that greater trust in government stability and control undermines religion (Norris & Inglehart 2004) and reduces distrust of atheists among believers (Gervais & Norenzayan 2012b; Norenzayan & Gervais 2015). Moreover, experimental manipulations or naturally occurring events (e.g., electoral instability) that lower faith in one of these external control systems (God or the government) lead to subsequent increases in faith in the other (Kay et al. 2008). There are signs that some societies with strong institutions and stable life conditions have passed a threshold, no longer leaning on prosocial religious elements to sustain large-scale prosociality. Some of the most cooperative and trusting societies, such as those in Scandinavia, are also the least religious (Zuckerman 2008).

7.4. Conclusion

It is far from clear whether secularization will outpace prosocial religions. Worldwide evidence shows that societies,

as they experience the emergence of strong secular institutions that reduce existential insecurity and ensure the rule of law, become more secular (Norris & Inglehart 2004). However, prosocial religions continue to convey a reproductive advantage (Blume 2009; Norris & Inglehart 2004), which means that religious societies are still growing faster than secular ones, countervailing the great inroads made by secularization. As a result, the majority of the world's population remains religious (Norris & Inglehart 2004), and the vast majority of adherents belong to the prosocial religions. This tension between demographics and economics – along with the corresponding interplays and rivalries among various competing prosocial religions, and the tension between religiosity and secularity – remains a defining feature of modernity (Taylor 2007) and one that will continue to shape the world in the coming century.

ACKNOWLEDGMENTS

The writing of this article was supported by the Cultural Evolution of Religion Research Consortium (CERC) at the University of British Columbia, funded by a generous partnership grant, "The Evolution of Religion and Morality" [895–2011–1009], from the Social Sciences and Humanities Research Council of Canada. AN thanks the James McKeen Cattell Fund for a Sabbatical Fellowship. JH thanks the Canadian Institute for Advanced Research. Colin Xu provided technical assistance.

NOTES

1. We consider 12,000 years a convenient starting point for when the first human groups in the Middle East began to scale up (cf. Diamond 1997a). However, this process unfolded at different times in different regions, and there were fluctuations in the size and social complexity of human groups even in the Pleistocene.

2. Richerson et al. (2001) show why demographic growth cannot account for this expansion. Note that some evolutionary researchers do not see this as a puzzle, arguing that our "hunter–gatherer psychology" (e.g., kin and reciprocity psychology) in the absence of any cultural evolution simply "misfires" to create a ready path to large-scale cooperation (Burnham & Johnson 2005; Dawkins 2006). The limitations of this argument have been discussed elsewhere (Chudek et al. 2013).

3. We label these evolutionarily modern religious groups "prosocial" to emphasize the fact that they encourage prosocial behavior among their adherents. It should be noted that we see this prosociality as a form of *parochial altruism* (e.g., Bowles 2006); that is, preferentially applied toward in-group members, and when real or perceived intergroup threat is present, coupled with hostility toward out-groups. Moreover, we do not claim that these elements are unique to religious groups. We see no natural partition between "religious" and "cultural" representations; rather, what is distinctive and impactful is the convergence of these elements and their cultural evolution in historical time. Finally, we emphasize that our explanatory focus is on "natural religion": the lived folk religious beliefs and behaviors among ordinary believers, not the theological doctrines or texts found in some groups (McCauley 2011).

4. In this category we include aspects of epistemic vigilance (Sperber et al. 2010). Also, we include here cultural transmission of belief or commitment based on hard-to-fake emotional or physiological cues, such as involuntary crying and shaking. Other scholars have considered such behaviors in the context of signaling models (Bulbulia 2008; Frank 1988; Schloss 2007; Slingerland 2014).

5. In discussing the varying cultural survival rates of religious ideas, traditions, and groups, we take care not to conflate cultural success with moral superiority: a version of the well-known is-ought fallacy (i.e., what is, is good).

6. Also see Marlowe (2010) for similar observations of Hadza foragers, and for recent quantitative evidence among Tyvan pastoralists in Siberia, see Purzycki (2011) and Purzycki (2013).

7. Schneider, personal communication. Coffin Text spell 1130; see discussion in Enmarch (2008), and compare with Assmann (2001) and Lazaridis (2008).

8. After this target article was accepted for publication, we became aware of a preregistered study (Gomes & McCullough, in press) that found no effect of religious reminders on dictator game offers. (For a commentary on this study, see Shariff & Norenzayan, in press). When we re-analyzed the above meta-analysis, focusing on prosocial behaviors with this null finding included (n = 5,475), the mean effect size was g = 0.25, p<0.0001, 95% CI = (0.13, 0.37). A subset of 11 of these studies that distinguished effect sizes based on prior religious belief revealed once again a reliable effect for believers (g = 0.38, p = .002) but not for nonbelievers (g = 0.12, p = .31).

9. The related Mickey Mouse Problem asks why people do not worship the minimally counterintuitive agents in cartoons, myths, and folk tales (Atran & Norenzayan 2004; cf. Barrett 2008).

10. Baumard and Boyer (2013) propose to explain prosocial religions as cultural reflections of evolved moral intuitions, such as proportionality and fairness, and argue against the idea that some religions spread by having prosocial effects. However, as we explain in section 7.2, it is unclear to us how this "by-product only" account explains the full range of observations: historical, cross-cultural, and experimental.

11. We note that formal models of signaling typically produce many different stable equilibria, only some of which are signaling equilibria and even fewer of which involve any prosocial behavior. Cultural group selection provides a mechanism by which these more group-beneficial signaling equilibria can spread, and at the same time permits us to account for the immense diversity of signaling systems across human societies and their change over historical time (Henrich 2009). Once individuals come to differ in their degrees of commitment to a religious doctrine, signals of various kinds can allow them to assort (honestly) according to their degree of commitment. We think cultural evolution has harnessed both CREDs and signaling mechanisms.

12. We thank an anonymous reviewer for this suggestion.

13. For worldwide prevalence of atheists, see Zuckerman (2007).

14. For a review, see Norenzayan and Gervais (2013) and Norenzayan (2013). See also similar arguments concerning different forms of disbelief and the importance of cultural and linguistic environment to religious disbelief (Banerjee & Bloom 2013; Bulbulia 2012; Geertz & Markusson 2010; Lanman 2012; McCauley 2011).

Open Peer Commentary

Moralizing religions: Prosocial or a privilege of wealth?

doi:10.1017/S0140525X15000321, e0

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Abstract: Today's major religions are moralizing religions that encourage material sacrifice for spiritual rewards. A key issue is whether moralizing religions gradually evolved over several millennia to enable cooperation

among genetic strangers in the spiraling competition between increasingly large groups occupying Eurasia's middle latitudes, or whether they emerged only with the onset of the Axial Age, about 2,500 years ago, as societal wealth increased to allow privileging long-term goals over immediate needs.

Norenzayan et al. suggest that moral deities emerged to forestall free-riding and foster long-term planning and long-range social and economic exchange among anonymous strangers well before the Axial Age, making the emergence of large-scale societies possible (Roes 1995). Nevertheless, the power of moralizing deities to punish and reward, as well as the scope of selflessness and compassion, expanded greatly with the spread of universalizing religions along the long-range trading routes of middle Eurasia, which came to be known (post-Axially) as the "Silk Road," linking the Atlantic to the Pacific via large-scale empires that became contiguous (Greco-Roman, Seleucid-Parthian, Bactrian-Kushan, Chinese) (Atran 2010a).

Yet, according to Baumard et al. (2015), increased wealth made religious morality possible rather than the other way around. Baumard and colleagues selected eight regions of antiquity, from Mesopotamia to Mesoamerica, and looked at the several variables in each region over time, concentrating on energy capture per capita and moral notions of "personal transcendence." They argue that critical moral developments in Greece (Stoicism, Skepticism), North India (Buddhism, Jainism) and North China (Confucianism, Taoism) all sprouted like Athena from the head of Zeus within a narrow 200-year time span in the Axial Age (500–300 BC) once energy capture per capita reached a critical threshold.

Apart from the very tentative historical estimates of energy capture, key developments in some of these traditions predate the Axial Age by hundreds of years. For example, Stoicism shares several important elements with metaphysical concepts of the Akkadian Empire (ca. 2334–2154 BC), such as *logos*-related notions of divine reason, command, and order (Lawson 2001). Zoroastrianism, one of the first monotheistic religions (excluded from Baumard et al.'s analysis), first emerged in the Achaemenid era of the sixth century BC; however, it has strong roots in Indo-Iranian culture of the Heroic Age (beginning 1500 BC; Foltz 2004). The *Epic of Gilgamesh* (2200–1700 BC) introduces several moral parables later taken up by Hellenic, Assyrian, and Judaic religions concerning: the corrupting influence of power and the drive for lasting glory, the meaning of friendship, the humbling inevitability of death, and, above all, the realization that no individual, however powerful, can transcend the obligations and limits imposed by society and the cosmos (Abusch 2001).

Although Baumard et al. treat all of the regions in their analysis as if they were statistically independent, that cannot be justified historically: For example, the Achaemenid Empire encompassed parts of five of the eight presumed "independent cultural regions": Greece, Anatolia, Mesopotamia, Egypt, and South Asia. In fact, rulers promulgated Axial religions to foster the integration and unification of large-scale multiethnic empires, involving myriad smaller states, cultures, and religious traditions. As Cyrus the Great put it: "If God requires reverence, so does the human race, and you must treat all people with benevolence" (Hedrick 2006, p. 294). Without a common moral framework and foundation for long-range social and material exchanges between strangers with often antagonistic prior cultural traditions, it is difficult to see how a single social and economic order could develop in the first place (Atran & Henrich 2010).

Morality creates trust, which allows credit for long-term trade, investment, and the production of wealth. In Babylonia, Hammurabi's moral code preceded by nearly 500 years the first recorded loans on the security of mortgages and advanced deposits (1300 BC), and by nearly 1,000 years the emergence of coined money (800–600 BC), whose trustworthiness resides in the state rather than the reputations of individuals (Graeber 2012). To be sure, as Norenzayan et al. allow, the scope of moral concern likely increased with the scale of cooperation during the Axial Age involving, for the first time, people from potentially any ethnicity who elected to join, or were pressed into, one of the universalizing religions.

The Axial religions surveyed by Baumard et al. (2015) are marked by doctrines of denial of immediate worldly pleasures for lasting spiritual goals, made possible by increased wealth and freedom from everyday want. And this asceticism is equated with "personal transcendence" and morality. But why are religions that treat relationships between people and nature as duty bound not "moral," as many pre-Axial religions were, with their costly rituals teaching the moral order of societies-in-their-environments (Rappaport 1999)? Indeed, anthropological and psychological studies of modern hunter-gatherers and nonliterate societies indicate that personal preferences differ markedly from beliefs in supposed spiritual preferences (Taylor 2008), with the latter likely representing the accumulated wisdom of generations for long-term social and economic planning (Atran & Medin 2008).

Finally, although a society may fall back below the tipping point of caloric threshold for asceticism, as Baumard et al. (2015) have determined it, and need not suffer absolute loss of asceticism because it had previously passed that point, it is nevertheless puzzling for their account why it is that the poorest people and societies (Norris & Inglehart 2011), as well as those on the front lines of war (Beit-Hallahmi 1997) are by and large the most concerned with moralizing religion in today's world – given that these are the people and societies most pressed to satisfy immediate needs.

In sum, historical, anthropological, and psychological studies support a central claim of Norenzayan et al. – namely, that the universalizing and spreading of moralizing religions, represented by Big Gods, helped critically to manage problems of trust and control for ever-increasing social interdependence, and need for long-term economic planning among strangers. Evidence points to moralizing deities well before the Axial Age; however, their scope of concern increased with – indeed likely made possible – large-scale cooperation in the Axial Age and thereafter.

The prosocial benefits of seeing purpose in life events: A case of cultural selection in action?

doi:10.1017/S0140525X15000333, e0

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Abstract: Norenzayan et al. propose that religious beliefs with incidental prosocial effects propagated via a long-term process of cultural evolution. Applying their model, I explore a possible candidate target of cultural selection: the teleological view – often culturally elaborated as a belief in karma or fate – that life events occur to punish or reward individuals' moral behavior.

Norenzayan et al. argue that a suite of beliefs and practices characteristic of modern prosocial religions stabilized and proliferated via a process of cultural evolution that facilitated the rise of large-scale cooperative societies. This approach usefully advances the scientific study of religion beyond traditional by-product versus adaptationist debates that have dominated the field in recent decades – but it also meaningfully draws on insights from both camps.

Here, I apply Norenzayan et al.'s cultural evolutionary framework to the study of a particular common feature of religious belief systems – the notion that significant life events are nonrandomly designed and that they happen for some deeper intended reason (e.g., to send a sign or to teach a lesson). In doing so, I highlight the utility of Norenzayan et al.'s cultural evolutionary thesis for generating predictions about the content of culturally successful religious beliefs.

Accumulating evidence suggests that a broad bias to infer purpose and design in significant life events is cross-culturally

pervasive (Bering 2011; Heywood & Bering 2014; Norenzayan & Lee 2010; Stephens et al. 2013; Willard & Norenzayan 2013; Young & Morris 2004; Young et al. 2011) and early emerging (Banerjee & Bloom 2015). The belief that life events have deeper purposes is often closely tied to religious belief in designer gods who oversee and orchestrate human life. However, recent research suggests that seeing purpose in life events need not depend on a belief in supernatural monitors, as even many atheists hold this view (Banerjee & Bloom 2014; Heywood & Bering 2014).

Instead, a teleological view of life events appears to be rooted in certain more general social-cognitive propensities that naturally bias people to overextend mentalistic inferences about purpose and design from the human domain to nonhuman domains (Banerjee & Bloom 2014; Heywood & Bering 2014; Willard & Norenzayan 2013). Consistent with this, individuals with Asperger's syndrome who have mentalizing deficits are less likely to infer deeper purpose in their own life events (Heywood & Bering 2014), whereas individuals prone to hypermentalizing – those who are highly paranoid or deeply empathetic – are most likely to perceive signs and messages embedded in human life (Banerjee & Bloom 2014). Thus, a teleological view of life events possesses the hallmark characteristics of a cognitive by-product of innate mental systems that has subsequently been co-opted and elaborated in religious reasoning.

A central feature of Norenzayan et al.'s account of the spread of prosocial religions is that certain cultural variants of the by-products of ordinary cognition – specifically, those with incidental prosocial effects – enjoy a cultural transmission advantage because they promote in-group harmony and sustainability and confer a strategic advantage in intergroup competition. Applying this framework, we may ask, could a teleological view of life events be favored by cultural selection?

Some available evidence suggests that certain teleological beliefs may be. For one thing, beliefs about purpose and design in life events commonly center on issues concerning the regulation of human morality. Take, for example, young children's intuitive belief in immanent justice – the view that life events can serve as vehicles of reward or punishment for our past moral behavior (Fein & Stein 1977; Jose 1990; Piaget 1932/1965). Or consider adults' common "belief in a just world" – the notion that the world is fundamentally fair and that people generally get what they deserve (Lerner 1980). These sorts of teleological intuitions – often culturally elaborated as a belief in karma or fate – sometimes derive from a belief in moralizing and just gods who reward the good and punish the bad. But in other cases, moral justice underlying human life is simply presumed to be interwoven into the very fabric of the cosmos itself (Banerjee & Bloom 2014; Young & Morris 2004; Young et al. 2011).

Previously, Bering and colleagues (Bering 2006; 2011; Johnson & Bering 2006) proposed that these sorts of morally valenced teleological beliefs motivate group beneficial prosocial behavior and inhibit selfish behavior and that they have therefore been favored by natural selection because of their reputation-enhancing fitness benefits. However, Norenzayan et al.'s thesis offers an alternative to this adaptationist perspective. Specifically, their theory suggests that certain teleological beliefs about life events that promote core group beneficial social norms (e.g., a karmic belief that doing good for others begets good for oneself) may instead gain steam through a cultural evolutionary process that selects for their prosocial effects. On this account, all else being equal, teleological beliefs that serve to regulate interpersonal morality and encourage social norm adherence ought to be culturally propagated more successfully than morally neutral teleological views that propose deeper purpose behind events, but without implications for individuals' social behavior.

Note that an adaptationist account of teleological beliefs about life events makes nearly the identical prediction as Norenzayan et al.'s cultural selection thesis, though it proposes a different underlying mechanism (genetic selection). Herein lies one pragmatic challenge of applying Norenzayan et al.'s cultural selection theory to study of religious belief and practice; namely, their model does not uniquely predict the selective transmission of prosocial religious beliefs. Admittedly, finding evidence that can discriminate between adaptationist and cultural selection views is not, in theory, an insurmountable challenge. For example, Norenzayan et al. point out that the relative absence of moralizing Big Gods in small-scale societies implies that a belief in such gods is not sufficiently universal to be a likely candidate for a species-wide genetic adaptation (see also Norenzayan 2013); instead, this belief may spread via cultural selection. However, in the case of broader morality-regulating teleological views of life events that do not hinge on representations of moralizing gods, and which may be more cross-culturally universal, the picture is much less clear. Distinguishing between adaptationist and cultural selection accounts may be more difficult as a result. Despite this challenge, Norenzayan et al.'s new framework is likely to encourage a useful refinement of techniques for evidentially assessing hypotheses in the cognitive study of religion.

ACKNOWLEDGMENTS

The writing of this commentary was supported in part by a National Science Foundation Graduate Fellowship and a grant from the John F. Templeton Foundation. The opinions expressed in this publication are those of the author and do not necessarily reflect the views of the John Templeton Foundation. I thank Paul Bloom for helpful comments on an earlier draft.

Prosociality and religion: History and experimentation

doi:10.1017/S0140525X15000345, e0

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Abstract: Norenzayan et al. are praised for choosing to deal with significant questions in the understanding of religion. They are then criticized for refusing to define religion and for relying on problematic theoretical concepts. The authors discuss Abrahamic religions as the best-known prosocial religions, but the evidence shows that the case does not fit their conceptual framework. Finally, an extension of the authors' ideas about the meaning of priming effects is proposed.

Norenzayan et al. should be praised for their ambitious attempt to tackle some Big Questions. The connection between religious beliefs and social structures is certainly a Very Big Question. Behind the debate about the adaptive value of religion there hides an often pragmatist question of how religious beliefs could lead to prosocial acts.

The authors insist on avoiding a definition of religion. This is puzzling. How and why do you study religion if you are not sure what it is? (Beit-Hallahmi 2015) Although stating that defining religion is impossible, they actually deal with a well-circumscribed set of concrete phenomena, and refer to "supernatural agents," "supernatural punishment," and so forth scores of times, so they obviously have a clear notion of the phenomena they wish to explore.

Setting their conceptual framework, Norenzayan et al. choose to glide over serious theoretical disagreements. Reading their article, one would never guess that the concepts of group selection and social instincts, which they rely on, are not universally accepted. Bracketing this issue, there are some other difficulties.

It is clear that cooperation (as well as competition) characterized human interactions long before the appearance of so-called prosocial religions. Humans have always negotiated (with varying degrees of success) interactions with peers and superiors. Neighbours and kin will act as enforcers without divine authority,

and most humans will handle that productively. Beyond face-to-face interactions, humans had commitments to family, clan, and tribe before young religions were created over the last 12 millennia. As societies grew, loyalties expanded. The authors note the use of fictive kinship terms in large groups, which supports the notion of loyalties expanding symbolically and practically as groups get larger. Religion sometimes inspires cooperation among genetically unrelated individuals by invoking a new identity that is above that of family or clan, but secular nationalism has been doing the same thing, using other fictions.

The evidence presented in the article moves back and forth between ancient times and the latest in priming experiments. There is nothing wrong with that, as long as all pieces of the puzzle are handled with critical caution.

The authors provide insightful evidence about religion and political systems in Mesoamerica, China, India, Mesopotamia, Greece, and Rome. As to the evolution of Abrahamic religions, they offer one source: "Wright (2009) provides a summary of textual evidence that reveals the gradual evolution of the Abrahamic god from a rather limited, whimsical, tribal war god – a subordinate in the Canaanite Pantheon – to the unitary, supreme, moralizing deity of two of the world's largest religious communities. We see the same dynamics at work in other major literate societies" (sect. 3.2.2, para. 1). Wright is a journalist, not a scholar, who writes charmingly and promotes recycled mythology. One of the main heroes of his narrative is named Josiah, and the problem is that there is no evidence that he, just like other Biblical heroes, ever existed. The search for the historical Jesus, Paul, or Muhammad has not been any more successful than the search for the historical Krishna, Osiris, or Zeus (Berg & Rollens 2008; White 1896/1993). Nevertheless, mythology should be of major interest to students of religion in its own right, as a reflection of universal (and local) human experiences and fantasies (Beit-Hallahmi 2010).

Bringing up Abrahamic religions goes right to the heart of the theoretical question of the relation between religion and political structures. The examples of religion and political systems in Mesoamerica, China, India, and so forth, provided by the authors, are totally different from the cases of Abrahamic religions. Christianity, for example, was founded by a small group of committed believers and scribes who produced authoritative scriptures. It was not formed in the womb of a state or empire. Both the Hebrew Bible and the New Testament were canonized under imperial Rome around 200 CE, but in this case the empire was the hated enemy. In the case of Islam, it might be claimed that the religion created an empire, but the actual founders probably had little political power. As suggested above, we need to admit that we know very little about the early days of the Abrahamic religions, or most religions. We are on a surer footing when looking at younger religions, such as Mormonism, Baha'ism, or Anthroposophy, where real historical documents are available.

In relation to "Karmic religions," the authors state that the "precise psychological mechanisms are not as well understood as for the Abrahamic religions" (sect. 3.2.2, para. 6). Nowhere do we get an explanation for this claim. What psychological mechanisms are well understood for Abrahamic religions? Should we seek explanations which apply to specific religions? Is this a goal of evolutionary–cognitive theories?

The authors' comprehensive literature survey has missed some critiques of evidence used to buttress their theoretical approach. Claims about the higher survival rates of religious communes (Sosis 2000; Sosis & Alcorta 2003; Sosis & Bressler 2003) ignore Bader et al. (2006), who, after examining 454 modern American communes, challenged the generalization and stated that religiosity had no effect on survival. Similarly, they present findings on trust through ritual participation (Ruffle & Sosis 2006; Sosis & Ruffle 2003) but neglect to mention Hoffmann (2013), who pointed out that the effects were less than robust.

The interpretation of religious priming effects, presented here, could be broadened. The impact of religious concepts was found to be identical to that of secular law-enforcement concepts ("jury" or "police"). Moreover, Ma-Kellams and Blascovich (2013) found that using "science" terms, such as *laboratory*, *hypothesis*, or *theory* had the same effect, because "science" is apparently imagined by many people as a positive authority. Harrell (2012) found that reward-related primes, whether religious (heaven) or secular (appreciation) also elicited generosity. It is possible that priming with religious, or secular, authority images or with reward symbols will induce benevolence, cooperation, or submission in humans and that this wide effect is not limited to WEIRD populations but has deep evolutionary roots.

Memes and the evolution of religion: We need memetics, too

doi:10.1017/S0140525X15000357, e0

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Abstract: In their analysis, Norenzayan et al. completely ignore memetics, which, unlike other theories, treats memes as replicators and looks to memetic as well as genetic advantage. Now that memes are evolving ever faster, genetic advantage is less relevant. So when religious and secular values are at odds, we need a memetic analysis to understand what is going on.

Norenzayan et al. claim to assess "alternative cultural evolutionary scenarios," (sect. 2.6, para. 3) but although they consider by-product and adaptationist theories, they do not mention memetics. They never use the word *meme*, preferring instead *religious elements*, *mental representations*, *cultural variants*, and *culturally contagious ideas*. They argue that religious elements (I would call them memes) originally arose as nonadaptive by-products, but then only some of them spread "because of their effects on success in intergroup competition" (sect. 1, para. 8). Would memetics have anything different to say about this process? I believe it would.

The difference between memetics and other theories of cultural evolution is that for memetics cultural elements (memes) are replicators. That is, they are information that is copied with variation and selection and therefore, like genes, have replicator power. When memes compete for survival, they do so not primarily for the benefit of the genes of their carriers but for their own benefit (Dawkins 1976; Dennett 2006). The authors do not make it clear whether theirs is really a memetic analysis without using that name, or whether they rely entirely on genetic advantage and reject the idea of a cultural replicator.

Much of their analysis fits well within a memetic framework. They provide excellent examples and supportive evidence of why certain memes thrive at the expense of others, and they hypothesise that cultural evolution exploits such innate features as kinship metaphors. They argue for a framework that considers both genetic and cultural inheritance but still does not make it clear whether cultural inheritance ultimately comes back to genetic advantage.

This makes a real difference when it comes to the effects of cultural group selection. They argue convincingly that the beliefs and practices of prosocial religions generate greater reproductive and economic success, and economic success aids intergroup competition. So successful groups are likely to thrive, expand, and be imitated by less successful groups. And here is the difference. When one group imitates another's practices with no movement of people (and their genes), the effects might still be understood entirely in terms of genetic advantage if the imitated memes provided a genetic advantage to imitators in the new group. But what if they do not?

This is the case with the final example Norenzayan et al. consider: the spread of atheism and secular values. As they point out, secular memes such as universal suffrage, sexual equality, and human rights

spread even though they reduce the fertility of those who hold them. Atheism "presents an interesting challenge for any evolutionary explanation of religion" (sect. 7.3, para 1). Indeed it does, and I suggest it is a challenge that memetics is better able to meet.

As the authors point out, religious societies are growing faster than secular ones, but, although they frame this as the tension between demographics and economics, memetics would frame it as the tension between memes and genes – two replicators running at different speeds. This is especially relevant in a world in which memetic evolution is rapidly accelerating and human biology is not.

In such a world, why should atheism spread when we are still endowed with so many innate predispositions to believe in Big Gods and when atheism reduces fertility? If genetic advantage is the final arbiter, this question seems hard to answer. If memetic advantage is also considered, it does not. When thinking about "pathways to disbelief" (sect. 7.3, para. 2), and "questions about the conditions that give rise to secularization" (sect. 7.3, para. 3), memetics can set genetic advantage aside and ask about the cultural niches available to new secular memes, the memetic adaptations they possess, and the selective pressures on them.

Population size and opportunities for spreading competing memes will have large effects on the size of the memepool and the strength of selection pressure within it. Relevant factors include not only the more traditional ones, such as universal education for both sexes, education that is free from religious oppression and that values rationality, freedom of speech, and the independence of the media, but also technology that encourages widespread access to and rapid dissemination of new memes.

This technology is now evolving so fast that we hardly need consider the impact on fertility when trying to understand the fate of the prosocial religions in this climate. For example, traditional Islamic values clash very clearly with secular ones. At the extreme, if there is a battle between secular institutions and sharia law, it will not be decided by the genetic advantage of religious groups because the process would be too slow. It will be decided by memetic competition.

At present we do not have a thriving science of memetics, but I suggest that we need one to understand what is happening here. For example, Islam relies heavily on meme tricks that are prevalent in the prosocial religions; threats, promises, the beauty trick (linking religious memes with awe-inspiring music and art), the altruism trick (persuading believers that they are good by virtue of being believers, supporting other believers, or spreading the faith), and admonitions to have faith not doubt (Blackmore 1999; Dawkins 1993) and, of course, not to laugh. We need to know how to weaken the effects of these meme tricks or replace them with secular equivalents that would support altruistic societies without the need for religious dogma. The memetic success of such memes as the Flying Spaghetti Monster or the Danish and Charlie Hebdo cartoons are perhaps examples to give us clues.

The authors conclude that "the evolutionary study of religion is in its infancy, and important gaps remain in our knowledge" (sect. 7.1, para. 1). I agree. They have made a valuable contribution to our understanding of how prosocial religions evolved in the first place, but I believe that memetics is needed to explain the evolution of religion in our fast-moving modern world.

Projecting WEIRD features on ancient religions

doi:10.1017/S0140525X15000369, e0

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Abstract: The proposed narrative relies on an anachronistic projection of current religions onto prehistorical and historical cultures that were not concerned with prosocial morality or with public statement of belief. Prosocial morality appeared in wealthier post-Axial environments. Public demonstrations of belief are possible and advantageous when religious diversity starts interacting with coalitional recruitment dynamics in large-scale societies, a typical feature of modern, so-called WEIRD societies.

We share Norenzayan et al.'s ambition to understand religious representations in terms of evolved human dispositions. But a central part of their argument is based on misunderstandings of the historical record.

In describing societies with Big Gods, the target article perpetuates a common but misleading confusion between the religions of large-scale archaic societies – for example, Egypt, Mesopotamia, Mesoamerica – and Axial Age religions with moralizing and spiritual doctrines that appeared only in a small subset of these societies. In the former societies, gods were described as seeking obedience and sacrifices, as enforcing political norms and authority, but not as interested in people's prosocial behaviors (Bellah 2011). The latter feature is characteristic of various movements that appeared roughly at the same time in a small subset of large-scale archaic societies, in the Ganges Valley, China, and in the Eastern Mediterranean (Baumard & Boyer 2013). The appearance of moralistic, ascetic movements with highly similar features may be related to a much higher level of wealth in these regions at the time (Baumard et al. 2015). Axial Age doctrines were then adopted by political elites and spread through conquest and coercion to the rest of the world (Bellah 2011).

This difference between fierce archaic gods and Axial Age moralizing doctrines means that we just cannot use features of the latter and project them, anachronistically, onto the former. That unfortunately may be the case in the scenario proposed in the target article. So, for example, the experimental evidence we have for religious primes triggering prosocial restraint (Gervais & Norenzayan 2012a) comes from people familiar with Axial Age, moralizing gods. There is no historical evidence that people in religions with Big Gods, outside Axial Age movements and their offshoots, were more prosocial, cooperative, and so forth, than before or elsewhere.

The proposed historical scenario also projects features of very recent religious developments onto human history and prehistory, often against the documented record. For example, the authors claim that an important part of religious behaviors in large societies stems from the need for people to demonstrate belief in gods and commitment to the group and the doctrine. But the evidence mentioned is vague and confusing. The authors write of belief and commitment signals such as "sacrifices, painful initiations, celibacy, fasting [… that] more effectively transmit commitment to others" (sect. 2.5, para. 1) and mention large temples or monasteries, as well as martyrdom. But the list mixes elements from very different types of societies and unduly attributes the features of some to the others. For example, animal sacrifice is not costly (the animals are consumed and the owners gain reputation), so it does not belong in the list; painful initiations are often nonreligious, generally do not express any beliefs at all (Barth 1975; 1987; Bloch 1974), and are motivated by the dynamics of coalitional recruitment (Cimino 2011); celibacy, fasting, and martyrdom do not appear in archaic large-scale societies, but typically in Axial Age religious movements (Bellah 2012), so they cannot be relevant to pre-Axial developments; temples or massive offerings to the gods do not show that the populace was committed to these religious symbols, but more prosaically that coercive authorities could rely on high taxes and large amounts of forced labor.

One explanation for this confusion may be that the very notion of commitment and credible belief displays is mostly found in the historically atypical, but (to us) very familiar circumstances of large-scale, industrial, relatively liberal social orders, what are sometimes called "WEIRD" people (Henrich et al. 2010b). That credible displays of belief are irrelevant to most forms of human religious activity is quite clear in the anthropological and historical

record. The religious activities found in bands and tribes (the social environment of human evolution) consist in propitiatory ancestor-cults, shamanistic-like healing, and various forms of magic. People perform these activities for pragmatic purposes (curing illness or ensuring good crops). There is no evidence in the record that people engaged in these activities ever engage in signaling to demonstrate to others that they do believe in ancestors or spirits. Indeed, being a believer in such contexts would be a useless signal, as that belief does not index any special prosocial inclinations. In large-scale archaic societies, a recent development in human evolution, a literate elite is closely allied to political authorities and enforces standardized ceremonies, an official doctrine, and so forth. The populace is mobilized, and often coerced, into participating in costly performances or giving away resources and labor. Participation, being mandatory, is precisely not a signal of anything beyond obedience. Indeed, the only people who sent credible belief signals in such archaic societies were people who did *not* accept the religious order, such as Jewish Messianic heretics, early Christians in Rome, iconoclasts in Byzantium, and so forth – that is, people who made it clear that they could not be trusted to abide by the common norms. Finally, in some recent social orders, because of the diversity of available competing doctrines, and relatively powerless religious institutions, it can make sense for some people to signal to others their specific adherence to particular beliefs and their commitment to a religious group. This is extremely familiar to most Western people but should not be seen as the common lot of humankind.

Once we discard ethnocentric or anachronistic assumptions, the model proposed may point to useful hypotheses in the study of religious movements. Specifically, as the authors suggest, people are often extremely interested in what others believe as far as gods and spirits are concerned. But, we would add, this occurs when expressed beliefs may serve as recruitment tools and commitment signals for specific moral and political projects. Humans need coalitions, and they need commitment from other coalition members. They use information about potential threats, superhuman powers, and moral violations as a way to elicit commitment in others (Tooby & Cosmides 2010). The study of such dynamics is indeed crucial to social science, but it requires that we stop believing, against the evidence, that religion is in any way special in human cognition or is central to human evolution.

Why would anyone want to believe in Big Gods?

doi:10.1017/S0140525X15000370, e0

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Abstract: We suggest an alternative explanation for the emergence of Big Gods that places less emphasis on the role of cognitive tendencies and selection of prosocial cultural variants. Instead, we argue that the fundamental motivation to reduce uncertainty and increase long-term predictability provides a better account for the rise of Big moralizing Gods in a complex and heavily regulated social environment.

Norenzayan et al.'s account of the role of Big Gods in promoting large-scale cooperation is powerful – so powerful, in fact, that it is almost too forceful. The combination of ethnographic, historic, and experimental evidence to support their argument makes the whole intellectual enterprise look so neat that there is a certain unreality to it – we could say that it is almost too neat to be true. We will structure our comment in the following way: First, we question the accuracy of their examination of disbelief; second, we propose an alternative motivational framework to explain the transition from small to Big Gods.

The evolution of humanity's beliefs about gods is a far messier affair than the authors convey. They explain the occurrence of disbelief or atheism as a result of the emergence and spread of modern secular institutions that promoted public trust and existential security, thus replacing the role of moralizing Big Gods. This is a rather idiosyncratic and biased reading of the historical evidence. Long before the rise of modern secularity there were organized forms of disbelief, which go back to the sixth century BCE. In India, the philosophical school known as Lokayatas (meaning "the worldly ones") proposed a purely material nature of the world and rejected the existence of the soul and of karma (Frazier 2013). In South America, there are small societies without myths of creation or belief in gods, big or small (Everett 2008). And in Europe, long before the age of industrialization, schools of Epicurean philosophy have actively challenged beliefs in the supernatural and proposed solely naturalistic explanations of the origins of the world (Wilson 2008).

Lack of supernatural belief in human societies is not as exceptional as Norenzayan et al. argue. And secular institutions, for all their security and cooperative potential, cannot explain the preindustrial existence of organized forms of disbelief. We are missing a link in this evolutionary account of religion – but there is something else we are missing. The target article seems to evade the question that is begging to be answered: *Why would anyone want to believe in Big (rather than small) Gods?* We suggest that we will find the answer not in the cognitive tendencies (such as mentalizing) the authors enumerate in their article but in fundamental motivations to seek order and to avoid uncertainty.

Recent studies have confirmed long-held intuitions that belief in gods is rooted in the motivations to feel in control (Kay et al. 2009) and to alleviate fear or stress (Ano & Vasconcelles 2005). We can further unpack these motivations following Friston's (2010) account of how the organism seeks equilibrium with its environment. In order to find an optimal state, we will attempt to reduce uncertainty in the environment to maintain homeostasis, minimize disorder, and increase long-term predictability. By generating certain beliefs about the ultimate structure and meaning of the world and acting according to these beliefs, one can sustain a manageable level of experienced uncertainty. In the case of religion, the search for optimization can take an active form, such as engaging with a ritual to align with or seek benefits from the gods, or a passive form that allows you to adapt to the environment (e.g., by making attributions about the cause of events: "the gods willed this to happen" or "it is my karma").

But how is this relevant to understanding the transition from small gods to Big Gods? Living in large communities comes with many advantages but also places the individual in a somewhat paradoxical position. The structural complexity of larger communities requires the individual to relinquish control over the surroundings, with social conventions limiting personal behavioral repertoire . In other words, to enjoy the benefits of living in a more stable and less threatening environment, one renounces a greater freedom over one's actions. The emergence of these new social restrictions on behavior gives rise to different kinds of uncertainties, which directly extend into the religious realm – more complex communities create special places to access the gods (temples) and an elite of religious experts (priests), thus distancing individuals from smaller gods. In order to reduce the uncertainty in this more complex and restrictive social environment to an optimal level, one possibility is to modify internal belief systems. Big Gods, we would argue, emerged in increasingly complex societies driven by a motivation toward optimization of

long-term predictability in a more regulated and restrictive environment.

The belief in Big Gods that reward and punish behaviors increases the long-term predictability of the environment and the perception of control. Big societies make the environment predictable by allocating the excess uncertainty resulting from the lack of direct influence on all events/outcomes to an external powerful agent. By doing so collectively, they achieve homeostasis and reduce uncertainty to an optimal and psychologically manageable level. Therefore, by believing in Big Gods that reward good deeds and punish bad actions, believers create an external "placeholder" for the excessive cognitive uncertainty caused by a reduced control over the environment when living in very large and complex communities. In contrast, the less complicated social structure in smaller societies offers individuals a greater influence over the events and outcomes affecting them. This influence allows them to act on reducing uncertainty without needing very powerful, moralizing Big Gods to gain an optimal sense of control.

At the beginning of this commentary, we noted that Norenzayan et al.'s account of disbelief as the outcome of modern, secular structures was inaccurate. According to the motivational principle we have described, you do not need secular structures to explain disbelief. Big Gods do not quite disappear; more often, they are replaced by other Big ideas such as faith in human progress or in science, which, according to recent experimental evidence, allow nonreligious individuals to reduce uncertainty about their environment, find order, and alleviate feelings of stress and anxiety (Farias et al. 2013; Rutjens et al. 2013).

A developmental perspective on the cultural evolution of prosocial religious beliefs

doi:10.1017/S0140525X15000382, e0

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Abstract: Norenzayan et al. argue that prosocial religion develops through cultural evolution. Surprisingly, they give little attention to developmental accounts of prosocial religious beliefs. A consideration of the developmental literature supports some, but not all, of the authors' conclusions.

In their target article, Norenzayan et al. develop a cultural evolutionary theory of the origins of prosocial religions. The authors argue that through this cultural evolution, beliefs and behaviors that are prosocial toward one's own social group are retained across generations. Specifically, learners attend to cultural information via content-based mechanisms, context-based mechanisms, and credibility enhancing displays (CREDs).

We agree with the authors' argument that context-based mechanisms, along with content- based mechanisms, should be considered in the transmission of religious beliefs. However, although the authors argue for early transmission of such beliefs and behaviors, they cite surprisingly little developmental research to examine how beliefs develop in individuals. We argue that including a developmental approach alongside a cultural evolutionary approach is critical to understanding this phenomenon. A more thorough inspection of the developmental literature supports some aspects, but not all, of the authors' argument.

Specifically, research on children's learning from others (cf. "testimony") indicates that even at a young age, children are able to attend to individuals ("cultural models," sect. 2.3, para. 2) to understand the world in which they live. Children are sensitive to a wide variety of cues and can shift their judgments depending on the kind of information available to them. For example, preprimary school children (ages 4–6 years) are receptive to whether the informants are in consensus with one another when deciding whom to trust in learning about unfamiliar objects (Chen et al. 2013; Corriveau et al. 2009). Young children are especially attentive to testimony provided by informants belonging to the same social group, such as those who share the same ethnicity (Chen et al. 2013) or accent (Corriveau et al. 2013; Kinzler et al. 2011).

Finally, experience with a particular social group, such as a religion (e.g., attending church services, Christian schools), can also impact children's judgments (Corriveau et al. 2015; Vaden & Woolley 2011; Woolley & Cox 2007). Thus, although the cultural evolutionary approach the authors propose can explain how testimony from prosocial religions allowed for the expansion of large-scale cooperative societies, the developmental approach is necessary to explain the spread of prosocial religion across generations. Even before children can explicitly identify the degree to which they belong to a social group, they are more inclined to learn from and to socialize with members of that group (Gaither et al. 2014).

What about children's use of CREDs when acquiring prosocial religious beliefs? The authors cite Lanman (2012) as evidence that children are sensitive to the CRED of their religious parents and are less likely to commit to the same religion if their parents do not appear to be particularly religious (sect. 5.1, para. 3). However, our recent research suggests that CREDs might not play as important a role – at least not for young children (Corriveau et al. 2015). In our research, we found that 5- and 6-year-old children who have any religious experience – either at school, at home, or both – have the ability to suspend disbelief in unexpected phenomena, in contrast to their secular peers.

Children with religious experience were not only more likely to consider characters in religious stories as real, but they were also more likely to consider characters in fantastical stories as real; these results hold even when the fantastical stories were less familiar to them and when these stories explicitly referenced magic. The religious children's decisions regarding the storybook characters did not vary depending on the type (i.e., school, home) or the amount (i.e., whether children experienced religion at home and at school, or just at home or school) of religious experience they received, which suggests that this susceptibility is less dependent on the actual content (or CREDibility) of the religious testimony.

Moreover, our findings are not consistent with the authors' argument regarding the impact of cultural evolution on our social instincts related to "kinship, reciprocity, status, and reputation" (sect. 5.3, para. 2). Specifically, the authors suggest that cultural evolution co-opted these social instincts to help people of the same religion feel a strong affinity for other members in the religious group (although the authors themselves acknowledge that these social instincts are not unique to religion). In the United States, approximately half of the population consider themselves Protestant Christians (Pew Form on Religion 2008), and cues to Christianity and other religions (e.g., holidays and celebrations in school) can often be found in children's everyday lives. Despite this potential presence of religious cues, the secular group of children in our study (Corriveau et al. 2015) – those who did not attend religious school or come from religious families – did not appear readily inclined toward religiosity, even if they interacted with religious peers on a daily basis in the classroom.

The study of religion and beliefs has become increasingly prevalent in the field of developmental psychology. Recent research has shown that both children and adults readily differentiate religious ideologies from factual and preference-based beliefs (Heiphetz et al. 2013a; 2013b), although understanding of certain characteristics associated with religiosity – such as the concept of omniscience – appears to deepen as children age (Barrett et al. 2001; Lane et al. 2014). A consideration of developmental

changes in children's understanding of beliefs is necessary in understanding how prosocial religions have evolved over time.

Monotheism versus an innate bias towards mentalizing

doi:10.1017/S0140525X15000394, e0

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Abstract: Norenzayan et al.'s account for the spread of monotheistic "Big God" religions sees these religions originating as by-products of innate cognitive biases. These biases produce polytheistic rather than monotheistic systems, however, and so do not explain the origin of monotheism. Accounts where monotheism arises from polytheism (for political reasons, for example) appear better able to explain the spread of monotheism.

Norenzayan et al. argue that religious beliefs and practices originally arose as non-adaptive by-products of innate cognitive biases – in particular, a bias towards mentalizing. Religions with "Big Gods" (powerful deities that monitor behaviour) were then preferentially selected for in a process of cultural evolution, with selection occurring because a Big God facilitates a social group's success by increasing cooperation in warfare, defence, and economic ventures. Although Norenzayan et al.'s argument covers a continuum from polytheistic to monotheistic religions, the proposed selection advantages of a Big God apply most strongly to monotheistic religions with an omnipotent, all-knowing, moralising God: religions such as Christianity and Islam. Norenzayan et al.'s proposal is thus, at heart, an account for the success of monotheistic religions. For simplicity I use monotheism to refer to religions with Big Gods. I avoid Norenzayan et al.'s unfortunate choice of the term *prosocial* because of its implicit suggestion that other religions are somehow antisocial.

Norenzayan et al.'s proposal will have widespread appeal, particularly among monotheistic adherents. There are, however, serious problems. One problem concerns Norenzayan et al.'s account for the origins of religion in a bias towards mentalizing. This bias causes people to overextend the "theory of mind" and imagine that natural phenomena in some way have minds. This bias gives a natural account for the origin of religions with a range of "local" gods, each representing the overextension of mentalizing to some specific aspect of life or the natural environment. This account does not explain, and indeed is in opposition to, the origin of monotheistic religious systems. This is because, if people have an innate bias towards mentalizing, we would expect them to repeatedly create different "local gods" (in different acts of overextended mentalizing) rather than one single god. Further, such innate biases do not just "go away": if people had that bias 5,000 or 10,000 years ago, they presumably still have it today. Although Norenzayan et al.'s origin story for religion naturally explains the creation of polytheistic systems, it does not predict the creation of monotheistic "Big Gods."

How, then, can a monotheistic religion arise from polytheistic systems produced by innate biases? I consider two possible accounts for the origin of monotheism: by politics and by absorption of other religions. Importantly, these accounts can explain not only the origins of monotheism but also the spread and differential success of monotheistic religions.

In a political account for monotheism, monotheism is seen as originating as a form of propaganda for kingly states. In this account, when one state conquers a neighbouring state, the family god of the conquering king is seen to be more powerful than the god of the conquered state. As an act of propaganda, this royal god is presented as more powerful than the gods of other states and, in the end, becomes the Big God of monotheism. This process has been proposed for the origins of Judaism in the kingdoms of Judah and Israel (Smith 2001). This political account also provides a mechanism whereby monotheistic religions spread and become dominant: because it is politically advantageous for a dominant state to have a dominant god, we would expect dominant states to have Big Gods. This view sees monotheism spreading through the decisions of powerful rulers. Perhaps the most striking example of this is the Edict of Thessalonica, 380 CE, which ordered all subjects of the Roman Empire to adopt the Christian faith (Brown 2003). This edict was probably the dominant cause for the spread of Christianity in Europe, contrary to Norenzayan et al's argument: Christianity was not adopted as the state religion of the Roman Empire because Christian adherents were more economically successful, had higher rates of reproduction, or were more successful militarily; instead, the adoption of Christianity was a political decision.

Another account for the origins of monotheism sees monotheism beginning in a process that subsumes or absorbs one religious tradition within another. In polytheistic religions, foreign gods are often worshipped in parallel alongside the native polytheistic pantheon. This type of parallelism means that polytheistic religions are not taking part in a competition for adherents. Monotheistic religions, however, typically do not allow this form of parallel worship. Instead, they can subsume the gods and holy places of their polytheistic competitors. This form of subsumption was an explicit strategy of the Christian Church from around 700 CE, referred to as "interpretatio christiana": the practice of converting native pagan practices, culture, religious imagery and sites to Christian uses (Brown 2003). This process leads naturally to the extension of the power of the subsuming gods, and so it can explain both the origins and the spread of monotheism.

How do these alternatives compare with Norenzayan et al.'s account? In Norenzayan et al.'s proposal, a religion spreads when adherents of that religion are more successful than others in warfare, defence, expansion, and economic ventures. Monotheism facilitates success in this competition, and so monotheistic religions tend to spread. However, there are a number of cases of polytheistic religions whose adherents were clearly outperforming their monotheistic neighbours in these fields, but in which those polytheistic adherents rapidly converted to monotheism. One such case is the Vikings, adherents of a polytheistic religion who in the period 800–1000 CE were extremely successful in warfare, defence, expansion, and economics (founding militarily strong and economically rich kingdoms in England, Ireland, Normandy, and Russia). Despite being notably more successful than their neighbours, the Vikings also converted rapidly to Christianity in the same period, with Viking rulers converting to Christianity for political reasons, and with the pagan religion of their subjects being subsumed within the monotheistic Christian tradition (Jones 2001). This goes against Norenzayan et al.'s argument, in which the Viking's success should have caused their Christian neighbours to convert to the Viking religion, not vice versa.

Mind God's mind: History, development, and teaching[1]

doi:10.1017/S0140525X15000400, e0

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Abstract: We dispute the target article that belief in Big Gods facilitated development of large societies and suggest that the direction of causality

might be inverted. We also suggest that plain theory of mind (ToM), although necessary, is not sufficient to conceive Big Gods. Grasp of other aspects of the mind is required. However, this theory is useful for the teaching of religion.

We focus on two of the claims of the target article and advance an argument about its possible educational implications.

What is first: Big Gods or big societies? The main position of the target article that Big Gods and related prosocial religions "promoted large-scale cooperation and high fertility, often leading to success in intergroup competition" (abstract) is not well founded in history. History suggests that the direction of causality might be inverted. That is, reaching a critical mass in a population, a certain level of intragroup cohesion, and role diversification serving group efficiency were necessary for pondering of rules (moral or other) governing the functioning and preservation of the group vis-à-vis the challenges of the natural environment or other competing groups. Under this conception, Big Gods and related prosocial religions emerged from, rather than resulted in, big societies.

The history of ancient Greek religion aligns with our position rather than the position of the target article: the belief in Big Gods appeared long after people began to live in big cities. In fact, several crucial supernatural characteristics attributed to Big Gods (immortality, omnipresence, ability to oversee humans, and their role in the preservation of moral and social order) resulted from other concerns rather than the preservation of the group as such. For example, the omnipresence of Big Gods was first attributed to anthropomorphic gods and seems to have come from the need to continue paying homage and respect to ancestors abandoned in remote lands. Their moral role seems to have come from a shift from aristocratic to democratic governance with all ensuing consequences for personal responsibilities, duties, and rights. There is also some evidence for this sequence in the development of Christian (Pnevmatikos 2002) and Muslim children (Pnevmatikos & Makris 2010). Admittedly, though, once invented and widely accepted, Big Gods might then have exerted the influences suggested by the target article.

Can every mind invent a Big God? The fundamental assumption of the target article in concern to the grasp of Big Gods is limited. We concur with it that mentalizing is crucial for belief in entities whose properties are mental constructions: Minimally, a creature must have an insight that the world is representable and that there may be variations between representations of his cocreatures to extrapolate to the Big Holy Creature knowing and controlling everything. However, plain theory of mind (ToM) would make a very simple Big God, most probably an anthropomorphic god, if any. Mentalizing is much broader than ToM and develops much beyond it. It involves, in addition to the recognition of the representational nature of the human mind, recognition of the multiplicity of the origins of representations – perception, inference, learning from others, logic itself, and the recognition of its amenability to control by oneself and others (Demetriou et al. 2014). Research suggests that grasping the representational nature of the human mind is a long process (Spanoudis et al. 2015). At 4–6 years, children understand that minds represent the world, but it is only later that they discriminate the human from the god's mind by attributing different properties to each one of them (Makris & Pnevmatikos 2007; submitted). This differentiation is facilitated by mastering executive control that enables children to discriminate between similar minds (humans) from supernatural minds (Makris & Pnevmatikos, submitted). That, for example, gods know for good and ever, beyond human fallible thinking, create and recreate in the name of justice, judge but negotiate their decisions vis-à-vis motives and intentions, and distribute favors and punishments. This is the mind of the adolescent rather than the mind of the toddler. To extrapolate, we might even assume that gods' minds are reshaped by humanity to reflect the possibilities of the human mind. This, however, occurs with huge time lags, in the fashion of Gödel's incompleteness theorems: human possibilities are projected to God's a few thousand years after they are attained.

Education for religion in post-modernity. Despite our previous objections, we accept that this theory is an excellent framework for rethinking the teaching of religion. Specifically, this framework may be used to develop curricula that would enable students to understand how different aspects of social, individual, and historical change resulted into important cultural institutions, such as religion. This curriculum would have to highlight how interaction between social needs (e.g., arising from the enlargement of societies), ruling and operational needs (e.g., autocratic vs. aristocratic vs. democratic governance), personal needs (e.g., existential needs), and abilities (e.g. mentalizing, reasoning, and knowledge) resulted in different religions, and how change in these needs resulted into changes in religions and religious thinking. This curriculum seems important now more than ever because vanishing time, geographical, and national boundaries and the emergence of supranational entities, such as the European Union, requires that citizens have a better understanding of the forces binding individuals and groups together. This framework may be used to compare religion with other forms of political organizations, such as justice and lawmaking and enforcement at the national and the supranational level.

Our model suggests that at different ages children can grasp different aspects of these interactions (Demetriou et al. 2011). At the preschool level, teaching about gods may help children conceive of practices that may facilitate them to cope with their obligations to others. This would facilitate executive control, which is important to master at this age. At the primary school level, children may learn that religion is one social institution among many that relate to the functioning of the society, as it regulates individual behavior, rights, and duties. Personal responsibility to ideals for humanity, life, and civilization beyond time must come later in adolescence. At this phase, God may be understood as the Big Mind, a huge historical projection of the struggle of humanity over time to understand and cope with its raison d'être and its destiny! At any phase, children must also differentiate actual causal forces governing societies and nature from mental constructions about them, however "holy" they may be.

NOTE

1. All authors contributed equally to the preparation of this commentary.

Even "Bigger Gods" developed amongst the pastoralist followers of Moses and Mohammed: Consistent with uncertainty and disadvantage, but not prosocality

doi:10.1017/S0140525X15000412, e0

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Abstract: The gods of monotheistic religions, which began amongst pastoralists and defeated exiles, are closer to Big Gods than those associated with ancient city-based polities. The development of Big Gods is contingent upon a need to reduce uncertainty and negative feelings in combination with a relatively high level of prosociality, rather than a need to induce or assess prosociality.

Norenzayan et al. argue that the development of complex societies leads to the evolution of Big Gods ("powerful, morally concerned deities," sect. 1, para. 3) as a means of ensuring increasingly necessary prosocial behaviour. This is at variance with the history of

religious development and overemphasizes the importance of societal complexity and prosociality. In developing these arguments, it is useful to distinguish between monotheistic and polytheistic religions. Monotheistic religions are closer to the Big Gods model so should develop only in highly complex societies if the authors are right. In monotheistic religions, only one God is worshipped ("monolatry") or even exists ("monotheism"), He is placated less by ritual and more by obeying His (often moral) commands, He is morally perfect, and group membership is significantly a matter of morality and dogma acceptance. These religions make a binary divide between God and the Devil (who embodies immorality) (e.g., De Benoist 2004). Polytheistic religions are characterized by the worship of multiple gods and ancestors, gods who have human-like personalities, an emphasis on pleasing these gods through sacrifice and ritual, and ritual and ancestry being of greater importance to religious group membership than dogma and morality.

If Norenzayan et al. are right, then there should be evidence for Big Gods in all city-based societies, and their acceptance level should not fluctuate. Less-complex societies should lack Big Gods or possess less pronounced versions. The authors say that there were numerous deities under the ultimate guardianship of the *shangdi* in ancient China, and that the Chinese elite wanted to placate *shangdi*, in particular, with correct moral behaviour, as though they had a mandate from Him, and He could interfere in world affairs. However, *shangdi* operated only through lesser gods; ordinary mortals could not worship them (only the Shang dynasty, through their departed ancestors, could; Zhao 2010); and the "moral order" was maintained by ritual observance and sacrifice (Schwartz 2009). Societal membership came through ancestors and ritual, not acceptance of dogmas or worshipping the most "moral" god.

The authors also do not appreciate the historical evidence regarding the development of monotheistic religions. The pastoralist ancient Jews oscillated between monolatry (most pronounced in times of crisis, such as the escape from Egypt) and polytheism, combining the worship of their tribal god Yahweh with worship of Baal. During the Babylonian Exile, after Judah has been crushed by Babylon and Jews were captives there, monotheism developed (Coogan 2009). Mohammed was an orphan of modest status in Mecca, but Islam spread rapidly among pastoralists on the borders of cities (Lapidius 2002). The god in these religions is much more a Big God than the ultimate guardians in China or the Greek city states. These religions worship a morally perfect God exclusively, and group membership is a matter of worshipping Him and accepting His moral proclamations. He directly punishes the immoral. So, how can the Biggest Gods develop among pastoralists and be even "bigger" among enslaved Jews than those in First Temple Jerusalem?

Various sociologists and anthropologists have argued that extreme monotheism – which has much in common with the concept of fundamentalism – is associated with the socioeconomically disadvantaged and with times of change (Bruce 2002; De Benoist 2004; Dutton 2008; Weber 1993). Firstly, perceiving the greater wealth and power of others, monotheists and modern-day fundamentalists play for status by emphasizing their moral superiority. Secondly, feelings of stress and uncertainty are predictors of religious experience (Persinger 1983; Rambo 1993), which is often at the heart of the monotheistic model (James 1902) and religiousness in general (Inzlicht et al. 2009; Kay et al. 2010; Peterson 1999), and the socioeconomically disadvantaged can be expected to be higher in stress. Thirdly, negative events such as exclusion tends to increase religiousness (Rutjens et al. 2010), and the socioeconomically disadvantaged, or those on the borders of a more successful society, might be expected to experience these acutely, as might the defeated.

We cannot see how Big Gods are invented to facilitate cooperation in the city states if, in fact, the Biggest Gods are being developed by pastoralists and those in forced exile. That many and even most city states are developing diluted versions of Big Gods is also at variance with the exact hypothesis espoused in the target article.

Rather, we argue that a more realistic hypothesis is that polytheistic societies on the borders of, and often also threatened or dominated by, more developed and successful societies raised people's feelings of uncertainty. They therefore developed a rigid religious system in which there was no room for uncertainty, as all will unfold according to the plan of an all-powerful, all-knowing, and all-benevolent (to His worshippers) God. This eliminates the uncertainty associated with one or numerous gods with human characteristics. The position of the proto-monotheists may also lead to general negative feelings associated with low socioeconomic status, which may be counteracted by a God who is primarily concerned with morality, and who even regards material success as immoral. This will reduce these negative feelings and possibly embolden believers to dominate the surrounding peoples, certain that they have God's mandate. Already monotheistic societies that experience these conditions would be pushed in an even more monotheistic direction.

This model better explains the available historical evidence. In the case of the monotheistic religions, Big Gods develop as a result of a specific combination of evolved prosociality and the need for accurate proxies for prosociality, which is conceivably only marginally less important for pastoralists than for city-dwellers, and environmentally induced uncertainty and negative feelings. The tendency for negative feelings is known as neuroticism, which is both higher in populations that have produced more complex societies (Rushton 1995) and associated with religious fervour, which is close to fundamentalism (Hills et al. 2004). This pattern is consistent with our model of why pastoralist or exiled groups developed Bigger Gods than did those in the city states. A model that combines prosociality and stress/negative feelings also explains why, during certain periods of history and in certain places, emphasis on a moral God increases or decreases (see Dutton 2014).

Awe: A direct pathway from extravagant displays to prosociality

doi:10.1017/S0140525X15000424, e0

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Abstract: Whereas Norenzayan et al. describe extravagant displays as a reliable means of belief transmission, this commentary reviews three emerging hypotheses about a direct connection between the awe elicited by extravagant displays and prosocial behaviour. If some of these hypotheses are correct, extravagant displays enhanced prosociality even among nonbelievers. Methodological suggestions are made for future experimental research on the awe–prosociality pathway.

Norenzayan et al. describe extravagant displays as the primary means of religious-belief transmission in complex societies, where free-riding is otherwise difficult to detect. Beliefs in omniscient, moralising and punishing gods are described as enhancers of prosociality in such societies.

A body of literature in philosophy and experimental psychology suggests that extravagant displays and monumental architecture might elicit an "awe" emotion that had prosocial effects independent of belief in punishing gods (Bulbulia 2011; Keltner & Haidt 2003). Specific hypotheses centre around Keltner and Haidt's (2003) definition of awe as an evolved emotion that combines a perception of vastness with difficulties accommodating the stimulus into existing conceptual schemes. Although the notions of perceived vastness and accommodation difficulty are yet to be operationalised, one self-report emotion measurement instrument now recognises awe as a discrete emotion (Fredrickson 2013).

In theorising about the awe-prosociality pathway, Rudd et al. (2012) hypothesised that the accommodation difficulties characterising awe result in increased focus on the present moment. Arguably, this leads to the perception of time as more expansive, increasing the perceived time available for helping others. In line with this hypothesis, Rudd et al. found that priming with an awe-inspiring commercial resulted in greater perceived time (and greater perceived time for helping others), as compared to a happiness-inducing commercial. Notably, verification is needed that the observed effect was the result of the degree of experienced awe rather than the differing conceptual domains activated by the awe and comparison conditions. The awe-inducing commercial presented impossible scenes of waterfalls in cityscapes, whereas the happiness-inducing commercial presented more realistic scenes of a city street carnival.

Another hypothesis points to the vastness perception inherent in awe as the beginning of the awe-prosociality pathway. According to Shiota et al. (2007, see also Joye & Verpooten 2013), perceived vastness causes perceptual space to be divided into the more abstract categories of "big" and "small." The self is resultantly conceived of as a group member – a part of the "all things small" category. The results of a survey-based study by Shiota et al. indicated that, indeed, those who reported being more dispositionally prone to awe were more likely to describe themselves as members of more universal categories in a series of 20 open-ended answers to the question "Who am I?" Problematically, however, this study did not explore whether the findings reflected the influence of a personality trait on both awe-proneness and self-concept. Among the personality traits that could have given rise to the observed correlation are openness to experience (McCrae 2007), need for cognitive closure (Shiota et al. 2007; Webster & Kruglanski 1994), and sensation-seeking (Zuckerman 1994).

A third and final hypothesis, put forward by numerous authors, proposes that beliefs in moralising high gods might encourage prosociality more strongly in the presence of awe than alone (Bulbulia 2011; Joye & Verpooten 2013; Valdesolo & Graham 2014). Under this hypothesis, accommodation difficulties activate automatic agency-detection mechanisms (Barrett 2000), whereas vastness perceptions increase the likelihood of detecting *superhuman* agency in particular. If the society's superhuman agents are known to have a moralising nature, awe-inducing stimuli serve as a constant and immediate reminder of divine observation. Valdesolo and Graham (2014) accordingly found that participants who viewed an awe-inspiring video, as opposed to an amusing one, were more likely to label strings of randomly arranged 1s and 2s as having been created by a human rather than a computer. This suggestion of a heightened sense of agency in the face of awe is yet to be supplemented by evidence of a heightened sense of superhuman agency. There is also, as yet, no evidence that, in societies endorsing moralising high gods, superhuman agency perceptions act as a mediator of prosocial behaviour. Moreover, given the nature of the agency measure used by Valdesolo and Graham (2014), it is possible that awe influences pattern detection systems rather than perceived agency.

Although empirical work on the connection between awe and prosociality is clearly in its infancy, the existence of any such connection would mitigate certain trappings of belief in moralising high gods. Firstly, as an automatic emotional reaction, awe would have enhanced prosociality even amidst individual differences in degree of belief. Secondly, if the hypotheses regarding awe's effect on time perception and self-concept are right, the prosociality encouraged by expanded time perception and universal categorisation of the self would have countered a pervasive tendency towards "temporal discounting." This is the tendency to choose immediate gains (from free-riding) over the delayed, larger gains (from supernatural good will; Ariely & Zakay 2001; Myerson & Green 1995). Finally, any prosocial effects of awe would have mitigated situations where group members witnessed individuals escaping punishment for antisocial acts (Bulbulia et al. 2013).

Hence, the direct enhancement of prosocialty could have been an adaptive side-effect of belief transmission through elaborate displays and architecture. Further experimental research on awe's phenomonelogy and prosocial effects would confirm this. Our group at Masaryk University is conducting a series of experiments to further investigate the third postulated pathway from awe to prosociality. En route, we plan to operationalise "accommodation difficulty," use primes matched on conceptual domain, and examine possible dispositional determinants of awe-proneness.

Big Gods: Extended prosociality or group binding?

doi:10.1017/S0140525X15000436, e0

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Abstract: Big Gods are described as having a "prosocial" effect. However, this conflates parochialism (group cohesion) with cooperation extended to strangers or out-group members. An examination of the cited experimental studies indicates that religion is actually associated with increased within-group parochialism, rather than extended or universal prosociality, and that the same general mechanisms underlie both religious and secular effects.

Norenzayan et al. gather an array of evidence illustrating that elements of Big Gods (e.g., supernatural monitoring) increase group cohesion and cooperation. However, the hypothesis as stated, frequently conflates concepts encompassing parochial prosociality – group cohesion in the context of intergroup competition – with extended or universal prosociality involved in cooperation among strangers. It is beyond question that religiosity increases the former. However, the authors' hypothesis that religion directs morality beyond the boundaries of the shared ethnic or religious in-group, to include strangers and known or presumed out-group members, is not supported. This distinction is crucial because the authors are presenting Big Gods as not only enabling successful intergroup competition but also as enabling societies to "scale up."

As Norenzayan et al. concede, Big Gods subsume mechanisms that are not solely prosocial but rather contain multiple competing forces. In some places, the authors correctly qualify this pattern as referring to prosociality directed toward group members and occurring alongside intolerance or prejudice against out-group members. However, in other instances, the authors refer simply to prosociality, invoking concepts like empathy and cooperation as causal mechanisms. In section 4, they suggest studies of charitable giving and volunteering illustrate the prosocial effects of religious engagement. However, it is unclear whether this represents extended prosociality because of the uncontrolled status of the recipient (i.e., often the religious group itself; Galen 2012). Religious belief is less predictive of charity or volunteering outside the group (Galen et al. 2015; McKitrick et al. 2013).

This conflation of concepts is also featured in the studies in section 4.2 purportedly demonstrating that semantic priming of religion increases "cooperation with strangers." Most of the constituent studies did not specify the relationship between partners (i.e., fellow group member vs. stranger), which is necessary to distinguish parochialism from extended prosociality. For example, in McNamara et al. (2016), the beneficiary of generosity was described as an outsider from another (Fijian) island, but a coreligionist. Similarly, other studies included designs in which participants knew the group identity of their partners (Hadnes & Schumacher 2012) or included results illustrative of selective, not universal, prosociality (Pichon & Saroglou 2009). In order to label these effects as relevant to a pluralistic social context, it is necessary to demonstrate that religious priming activates

prosociality regardless of the targets' group membership (e.g., not only "coreligionists"). Any group favoritism promoted by religiosity in small societies is irrelevant to large-scale societies in which anonymous strangers cannot be presumed coreligionists. For the same reason, any "deep trust and commitment … characteristic of global religious communities" (sect. 5.2) cannot be extrapolated to pluralistic large-scale societies. Out-group-inclusive trust is not associated with religiosity (Welch et al. 2007) but can appear so because trusting "most people" connotes in-group members to those in more religious countries, but out-group members or strangers to those in less religious countries (Delhey et al. 2011). The use of terms such as "stranger" and "anonymous" (sect. 3) to refer to individuals known to be from a given island or from within the community is oxymoronic from the standpoint of distinguishing a complete stranger – possibly an out-group member – from someone who shares some group affiliation with the participant.

Another problem with the Big Gods theory, as Norenzayan et al. partly concede, is that phenomena attributed to religion are by-products of more generalized, secular mechanisms. For example, supernatural monitoring is a subset of a broader social monitoring function. Equivalent effects are elicited by priming social scrutiny or self-awareness (Gervais & Norenzayan 2012a). Other contextual primes shown to promote honesty include mirrors and bright lights, which activate intuitions such as "what would others think of me?" (Chiou & Cheng 2013; Diener & Wallbom 1976). Supernatural concepts such as "God is watching" or "avoiding the evil eye" are thus variations of social monitoring intuitions projected as stemming from external agents, rather than uniquely religious in character.

Similarly, the authors often state that prosocial effects (e.g., in sect. 4) are attributable to "religious commitment." However, naturalistic as well as experimental studies indicate that prosociality is promoted by secular factors such as general group involvement, rather than by uniquely prosocial effects of religious beliefs (Galen et al. 2015; Thomson 2015). Many of the studies in the meta-analysis found varied effects depending on the specific primed content such as "religion" versus "God" (only the latter associated with out-group prosociality; Preston & Ritter 2013). Hence, any prosocial priming effects are not the result of "religious belief" but of certain versions of religious as well as secular content exhibiting positive or reward-related semantic associations (Harrell 2012; Pichon et al. 2007).

In sum, Norenzayan et al. concede throughout their impressive body of work that religious influences are: (1) not necessary for prosociality; (2) intertwined with non-prosocial influences; (3) context dependent; and (4) reliably linked to in-group cohesion rather than extended prosociality. In numerous places, the language used to describe religious group solidarity is properly qualified as referring only to within-group benefits. But elsewhere, phrases are used such as "large-scale cooperation" and "benefitting others" without the crucial qualifier "within the group." What may seem to be a picayune terminological issue becomes more serious when extrapolated to a generalized conclusion that religious concepts have prosocial effects. In modern pluralistic societies consisting of individuals from mixed religious and ethnic backgrounds, group cohesion is not tantamount to extended prosociality, and indeed often opposes it. As stated by the authors, sacred non-negotiable beliefs exacerbate the "dark side" of intergroup intolerance by sanctifying and moralizing it (sect. 5.3, para. 3).

Therefore, group cohesion should not even warrant the term prosociality for the same reason that selective nepotism does not. It is one thing for religiosity to connote concepts such as "God is watching and wants you to be nice to fellow group members," but this is not equivalent to more abstract moral enhancement such as "treat all others the way you want to be treated" or simply "be nice to others." In many cases (e.g., interactions with a coreligionist), the resulting actions could be identical. However, if the interaction is not with a presumed group member, the two concepts will predict different forms of behavior.

Recognizing religion's dark side: Religious ritual increases antisociality and hinders self-control

doi:10.1017/S0140525X15000448, e0

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Abstract: The target article develops an account of religious prosociality that is driven by increases in self-control. We suggest this account is incomplete. Although religion might increase prosociality to the in-group, it decreases it to the much larger out-group. Rituals, for example, lead to out-group derogation. We also challenge the link between religion and improved self-control, offering evidence that religion hinders self-control.

The cultural evolution account proposed by Norenzayan et al. does a nice job of integrating multiple lines of scientific research. We mostly agree with the authors' theoretical framework. However, there are two points that have been overlooked in their model and that warrant further discussion. First, in considering the evolution of religious behaviors, specifically costly ritual displays, the authors focus on intragroup prosociality, but they have little to say about how religious ritual increases out-group hostility. Second, the link between religion, self-control, and prosocial behavior, as outlined in the article, does not account for recent neurophysiological evidence showing that religious mind-sets predict brain states associated with less (not more) self-control. We discuss these two points in relation to research from our lab and others.

Intergroup competition has helped shape the cultural evolution of religious belief and practice (e.g., Bulbulia 2004). According to the model, cultural pressures of intergroup conflict fuel prosociality among a group's adherents, galvanizing in-group ties and fostering solidarity. But how far does this prosocial behavior extend? This prosociality, the authors posit, is within the in-group, and a central feature of the authors' model is that by prosocial, they mean parochial altruism (Choi & Bowles 2007), or affiliation and prosocial behaviors toward in-group members, coupled with hostility toward out-group members. It logically follows, then, that the current account is as much about out-group hostility as it is in-group cooperation. The cultural evolution of *antisocial* religions is the other, less appealing side of the coin and one that we feel has been overlooked in the cognitive science of religion literature (e.g., Atran & Ginges 2012; Ginges et al. 2007; 2009; Neuberg et al. 2014) and, perhaps as a result, in the target article. The authors recognize that there is a dark side of prosocial religions and state that we ought to understand "the conditions under which prosocial religions become accessories to intergroup intolerance, conflict, and violence" (sect. 5.3, para. 3). Beyond this, however, there is little mention of the relationship between the prosocial and antisocial elements of religion. And although they hint at it in their model, the authors fall short in making explicit these divergent effects of in-group versus out-group, giving considerably more weight to the prosocial (i.e., in-group) element than the antisocial (i.e., out-group) one. A complete picture of religion is therefore missing.

Recent evidence from our lab shows that ritual – even mock ritual that is devoid of cultural meaning – leads to heightened out-group discrimination (Hobson 2013; Hobson et al. 2015). In a series of studies, we show that ad hoc collective ritual is capable of promoting discriminatory attitudes and behaviors toward out-group members and that this bias is amplified as the ritual behavior (the sequences involved) becomes more effortful and onerous. What is more, these socially motivated out-group biases appear to be biologically rooted in the reward systems in the human brain, where group rituals appear to tune people to the punishment of out-groups. Across these studies, we find that extravagant ritual

display, one of the hallmarks of prosocial religions, might in fact act as a signal of not only in-group allegiance but also of out-group hostility and separation. Religious rituals embolden the in-group, but by doing so maintain the sense of "us" versus "them" (e.g., Allport & Ross 1967; Hunsberger & Jackson 2005). More research is needed here to understand the full picture.

As a second point, the authors briefly outline the link between religious prosociality and self-control, taking the position that religion leads to prosociality through improvements in self-regulation. We question whether there is a direct link here between religiosity and greater self-control. For example, although widely discussed (e.g., McCullough & Willoughby 2009; Rounding et al. 2012), the evidence in favor of religion supporting self-control is thin. The association, for example, between religiousness and conscientiousness (a personality trait associated with self-control) may be driven by a person's need for orderliness rather than his or her industriousness or trait self-control (Eisenberg 1992) – a pattern of effects that has been found in conservative personalities (Hirsh et al. 2010). Moreover, numerous neuroscience studies in our lab have shown that religious primes predict brain states associated with less control (Inzlicht et al. 2009; Inzlicht & Tullett 2010; see Inzlicht et al. 2011 for a review). In a recent study (Good et al. 2015), for example, we found that reminders of God's forgiving nature diminished the amplitude of the error-related negativity, an evoked brain potential thought to reflect performance monitoring, critical for control. We further found that such reminders decreased, not increased, actual behavioral control. Importantly, we found no evidence that reminders of God's punishing nature increased performance monitoring or behavioral control (even on a religiously important task), which directly contradicts the authors' model of Big punishing Gods keeping people honest. Perhaps, then, religious prosociality (targeted at the in-group) does not come about because of simple increases in self-control, but through some other route. Recent fMRI work complements these findings, showing that certain features of religious interactions and group ritualized behaviors limit people's executive resources by narrowing the focus of attention toward emotional, low-level action units (Schjoedt et al. 2013). Religious experiences turn down (not up) the brain's self-control system, making people less self-oriented and more likely to go along with the beliefs and practices of the group.

As a final, more general point, although the cultural evolution model provides a plausible ultimate explanation of the function of religion, it does little to address proximal explanations.

A comprehensive psychological theory ought to consider how ultimate, evolutionary accounts map onto the underlying proximate mechanisms. How does the authors' ultimate account explain religious prosociality in terms of basic cognitive and affective processes? We think that much of the work in this field would benefit from using neuro- and psychophysiological tools to arrive at questions related to process. Indeed, if we are to agree with the authors' view, then a methodological approach focused on proximal mechanism is needed.

Cultural evolution and prosociality: Widening the hypothesis space

doi:10.1017/S0140525X1500045X, e0

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Abstract: Norenzayan et al. suggest that Big Gods can be replaced by Big Governments. We examine forms of social and self-monitoring and ritual practice that emerged in Classical China, heterarchical societies like those that emerged in pre-Columbian Mesoamerica, and the contemporary Zapatista movement of Chiapas, and we recommend widening the hypothesis space to include these alternative forms of social organization.

Norenzayan et al. offer a rich, syncretic account of how prosocial religions allowed societies to scale up from bands of hunter–gatherers to the large-scale, multiethnic societies we now inhabit. They argue that successful cultures foster cooperation, harmony, solidarity, and growth by: (1) outsourcing social monitoring to moralizing Big Gods; (2) developing rituals to build and signal commitment; and (3) creating practices to exploit in-group favoritism and tribal psychology. With secularization (1) erodes, and (2) and (3) can decay in turn. So how can societies leave behind Big Gods while remaining prosocial? Norenzayan et al. suggest that as Big Gods wane, Big Govs – that is, Big Governments – can serve as surrogates. But are there other possibilities?

The hierarchical thought and organization fostered by Big Gods (like those of the Abrahamic traditions) and Big Govs manage prosociality from the top down. But centralized power can be supplemented (or even replaced) by forms of mutual accountability that are sustained by more mundane forms of social monitoring and communal practice. Focusing on religious traditions that flourished in the Levant, and forming hypotheses in light of these, may downplay other ways of fostering cooperation and prosociality, which flourished in other parts of the world.

Classical China provides an interesting example. As Norenzayan et al. note, Big Gods clearly exist in the earliest historical record, and they exhibit moral concern. Yet, it is unclear what role they played in fostering prosociality and enabling widespread cooperation and trust (Sarkissian 2015). Big Govs, including centralized governance backed by state punishment, played a substantial role. And other forms of monitoring and ritual practice (1 and 2, above) developed alongside these forms of top-down governance. Commitments to social monitoring developed early in China, in part owing to the advent of labor-intensive sustenance agriculture (Nisbett 2003; Nisbett et al. 2001). Shared commitments to cooperation were crucial in this context, spurring practices of self and other monitoring, along with increased attunement to one's impact on others (Sarkissian 2010). Social and self-monitoring continue to influence prosociality in collectivist societies today (e.g., Heine et al, 2008; Sarkissian 2014), and they might lessen the need for Big Gods or Big Govs. Moreover, when it comes to ritual practice, there is a sizable and impressive literature in the classical period (not unlike the theory adopted by Norenzayan et al.) that recognizes its instrumental value in strengthening social bonds and taming personal impulse, promoting harmonious prosocial behavior without supernatural incentives (e.g., Puett 2013). Mundane monitoring and ritual theory, then, can be found alongside Big Gods and Big Govs in the classical period, and both are amenable to appropriation today.

The heterarchical power structures that developed in Mesoamerica suggest a second interesting phenomenon. The lowland Mayan economy relied on short-range, self-organized practices of exchange, but they made room for the centrally controlled exchange of ritual goods (Potter & King 2008). Similarly, the massive, multiethnic city of Teotihuacan appears to have been organized as a decentralized network of semiautonomous communities, structured around kinship but leaving room for corporate governance (Manzanilla 2012). The archeological remains at Teotihuacan reveal a distinctive lack of dynastic monuments and limited interest in emulating existing Mayan and Zapotec writing systems, which were commonly used to record dynastic information. Self-organizing practices can be resilient to fluctuations in the availability of goods and resources, and they can preserve ethnic and cultural diversity. There is no consensus regarding the nature of the gods at Teotihuacan, but costly rituals and CREDs (including bloodletting and ritual intoxication) were critical to intergroup cooperation and the maintenance of local power throughout Mesoamerica (Munson et al. 2014). And it is possible

that periodic large-scale rituals also could have solidified cooperation in Teotihuacan (Froese et al. 2014). But even if the religion of Teotihuacan included watcher-gods, the heterarchical structure of that city suggests another important factor that can facilitate large-scale cooperation. Within large cities, small communities often build cooperative institutions to manage common-pool resources. Instead of relying on centralized power, they settle on rules collectively and rely on mundane social monitoring to maintain individual commitments to self-governance, leading each individual to follow the rules they devise together (Ostrom 1990). We believe that Norenzayan et al. could enhance their theory by considering the interplay between multiple ways of fostering cooperation in such heterarchical societies. But are there social structures that can manage cooperation and accountability exclusively from the bottom?

Among the Zapatistas of Chiapas today, decisions are grounded in the consensus of community assemblies; deliberative practices are designed to foster egalitarian attitudes and provide alternatives to hierarchy and centralized power. This has led to the creation of new forms of participatory dialogue that foster autonomy and dignity, and forms of network-based organization that foster forms of cooperation that are locally salient, dynamic, and sensitive to everyone's needs and interests. The Zapatistas also rely on forms of social monitoring and punishment that are distributed, temporary, and centered around community service (though extreme cases may warrant expulsion), and there is an ongoing commitment to creating "the power to solve their own problems and to do so democratically" (Starr et al. 2011, pp. 102–3). We believe that secularization may be possible under a collective mode of self-governance such as this, so long as such practices can sustain mutual accountability and use CREDs to signal ongoing commitments to shared practices.

If alternative social structures like these are consistent with the view developed by Norenzayan et al., we should widen the hypothesis space to include these other forms of social power. They might reveal interesting ways of conceptualizing the role of ritual in secular practice, as well as forms of socially relevant "faith," grounded not in beliefs about Big Gods or Big Govs, but instead in ways of living and acting together in accordance with shared ideals and values (Carpenter 2012; Preston-Roedder 2013). And they may open up a broader understanding of how our sensitivity to CREDs can attune us to more mundane (and less Godlike) practices of social monitoring.

Authoritarian and benevolent god representations and the two sides of prosociality

doi:10.1017/S0140525X15000461, e0

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Abstract: The Big Gods model focuses on belief in an authoritarian God as a psychological mechanism that inhibits antisocial behavior and facilitates the formation of tight, cohesive groups. Recent empirical evidence suggests, however, that belief in a benevolent God is more likely to inspire helping and inclusivity. Both kinds of beliefs are necessary to explain the development of large-scale societies.

In the Big Gods model of the cultural evolution of religions, the focus is on belief in moralizing, punishing, authoritarian gods. Such beliefs solve problems that big groups face in effectively managing limited resources, controlling cheating, and helping to defend against out-groups. Norenzayan et al. are right to focus on this representation of deity, because when people feel threatened, they are more likely to represent gods as powerful and punishing (Aten et al. 2008; McCann 1999; Sales 1972). Indeed, Norenzayan et al. provide ample evidence that, in such times, people are also more likely to define exclusive group boundaries, endorse strict moral codes, and institute costly rituals in order to distinguish in-group members, thus increasing the chances of group survival in the face of harsh conditions.

However, the focus on big, authoritarian gods tells only part of the story. Religious adherents in every tradition also think of their gods, goddesses, and deities as benevolent – as a merciful God who heals, sends the rain, and blesses. Whereas authoritarian God representations in monotheistic traditions are more likely to be associated with aggression (Bushman et al. 2007), militarism (Froese & Bader 2010), and power (Johnson et al. 2015c), recent empirical evidence shows that benevolent God representations are associated with a benevolent self-identity (Johnson et al., in press), the value of benevolence (Johnson et al. 2015c), forgiveness, and helping even those outside the religious or social group (Johnson et al. 2013; 2015a; in press). Moreover, religious people often engage in prosocial acts as a result of intrinsic motivations related to their view of God as a benevolent role model rather than for the promise of eternal rewards or the fear of reprisal (Johnson et al., in press).

Although authoritarian God representations may proliferate when groups are under threat or when social coordination is a problem, we propose that representations of a benevolent God are more likely to proliferate in times of peace or relative prosperity, when psychological motives turn to self-expansion. When resources are plentiful and there are not chronic concerns with physical safety, such environments are more likely to elicit positive emotions, to induce creative thinking, and to set the stage for making friends, enjoying the company of others, and building the social network (Fredrickson 1998). The desire to expand the self by establishing positive social connections is another motive for social interaction and, we contend, one that is largely overlooked in the Big Gods model.

Perhaps the crux of the matter is that there are also two sides to the metaphorical coin of prosociality – "refraining from doing bad" versus "doing good" (also see Janoff-Bulman & Carnes 2013). Norenzayan et al. discuss religious prosociality as involving many elements, including self-control, norm-compliance, inhibition of cheating, rigid authority structures, strong political leadership, establishment of hierarchical social structures, regulation of economic transactions, honest business practices, willingness to punish unfair offers, and an in-group bias that positively correlates with group commitments. Hence, the Big Gods model is, generally speaking, a social system that supports a hierarchical, ordered, market economy legitimized and supervised by a powerful, authoritarian, mean God and his emissaries. Prosocial religion, from this Durkheimian perspective, is perhaps better labeled as *moralizing* or *social* religion. Yet, prosocial religion can also be about individuals feeling connected with and caring for others (or the "Other") as in the Jamesian and Buberian traditions. In short, prosocial religion can also be about altruism, benevolence, grace, acceptance, forgiveness, reformation, egalitarianism, ecumenism, universalism, and peace. These intrinsic and self-expansive values, too, have a place in the establishment of increasingly larger communities.

It is likely that authoritarian and benevolent God representations and their corresponding ways of being religious exist in every society, and their effects on that society are held in tension (Johnson et al., in press). Just as there are the nurturing and dominant, the self-protective and self-expansive, or the powerful and needy in every society, there are probably also the liberals and conservatives, the universalists and fundamentalists, the traditionalists and reformists. To understand the complete story of the role of religion in the growth and development of large-scale societies, an important next step will be to better understand how authoritarian and benevolent God representations might constitute a mutually beneficial or compensatory dynamic system that has facilitated human and societal flourishing through the ages.

Hell of a theory

doi:10.1017/S0140525X15000473, e0

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Abstract: The theory of group-selected Big God religions is a master narrative of cultural evolution. The evidence is a positive manifold of correlated assumptions and variables. Although provocative, the theory is overly elastic. Its critical ingredient – belief in Big Gods – is neither necessary nor sufficient to account for in-group prosociality and discipline. Four specific issues illustrate this elasticity.

Abraham, the *Übervater* of the eponymous religions, would have delighted in the article by Norenzayan et al., except for the fact that they do not confirm the existence of his god. This ontological question is of little interest to students of cultural evolution. They care about the fact that so many people do believe in Big Gods and how that affects their behavior and the welfare of their groups and societies. Norenzayan et al. have amassed (mostly correlational) data showing a positive manifold of belief in Big Gods (BG), costly group-affirming rituals, prosocial (or rather, group-serving) behavior, group wealth, and expansion. With these variables being interconnected, the challenge is to detect a pattern and to weave a story that is more plausible and more difficult to undo than its alternatives, and to do this without critical experiments.

Norenzayan et al. have made good progress with their mission. The data suggest that BG religions co-evolved with societal growth in historical time. Within the matrix of complex feedback loops among the manifold, it seems that widespread acceptance of BG and his demands has causal power. Norenzayan et al.'s account of how belief in BG shaped cultural evolution is nothing short of a master narrative for recorded history.

The construction of a master narrative is the most ambitious project social scientists can entertain. They must respond, however, to questions regarding how much exactly their account contributes above and beyond more parsimonious accounts and explain how different cultural evolution would have been were some critical variables missing. Belief in BG is not necessary to explain prosocial behavior. There are many sources of morality and prosocial behavior. Morality can spring from the passions (Hume 1751) and from reason (Kant 1788/1956). Nor is belief in BG fully sufficient to establish an egalitarian in-group morality. Although BG demands to treat all members of the group as brothers or sisters, people do not do that. Prosociality drops off sharply over social distance (Jones & Rachlin 2006). Yet, Norenzayan et al. dismiss the power of inclusive fitness to manage individuals' prosocial resources, suggesting that prosociality is evenly distributed within a group; it is not. It is true, however, that social categorization into in-groups and out-groups provides a sharp dividing line, which contains prosociality within the in-group (DiDonato et al. 2011; Tajfel 1970). Again, however, these organizing effects of social categorization do not require a belief in BG or mundane authority. It is enough to perceive members of the in-group are more similar to the self than members of the out-group (Krueger 2007). The frontier for the BG theory is to find ways to estimate and quantify how much variance it can explain beyond the contributions made by non-BG processes. In the remainder of this commentary, I raise four issues to illustrate that Norenzayan et al.'s theory is overly elastic.

First, Norenzayan et al. couch their behavioral arguments in the language of prosociality, thereby evoking associations of moral goodness. However, to cast BG beliefs as matters of obedience, submission, and conformity is equally valid, perhaps even more valid. At minimum, the theory ought to provide a more textured distinction between the beneficent effects of prosociality (e.g., mutual aid and trust) and the destructive effects of oppression and submission (e.g., persecution and punishment of dissenters).

Second, the theory is cast within the paradigm of group selection. The controversy surrounding this concept is not acknowledged. The authors did not take the opportunity to make the case for group selection by showing how it works in the context of BG-dominated groups. Instead, they take it for granted that group selection is an accepted process, much like the selection of genes or organisms. Genes succeed by replicating themselves faster than average. This is a truism. Individual organisms have to struggle in the world before they die. They succeed if they pass on their genes faster than average. Groups are the carriers of genes and memes, a distinction that Norenzayan et al. do not elaborate. Although some of the basic capacities underlying belief in BG (e.g., mentalizing) may already be available in the gene code, belief in BG itself may be a matter of memes. How are groups selected so that the memes they carry spread faster than average? Norenzayan et al. refer to several processes (e.g., war), thereby implying a heterogeneous mishmash ranging from group selection proper to group transformation to group absorption. This heterogeneity of process militates against the ability of casting group selection as a unitary construct.

Third, Norenzayan et al. focus on belief in hell as a corollary of belief in BG, while noting that belief in heaven works against social cohesion. A strong theory would explain how two interdependent beliefs with opposite behavioral implications coevolve. A strong theory would also explain how belief in hell affects individual acts of obedience or prosociality. BG's judgment to send Everyman to hell is a single decision, whereas Everyman brings a profile of lifelong behavior. What is BG's decision rule? Is a single selfish act sufficient to throw the switch to hell? BG religions vary widely in how they treat this issue. A strong theory would make predictions about the consequences of these different treatments.

Fourth, Norenzayan et al. gloss over the question of how belief in BG was introduced. A Darwinian would settle for the idea that the belief – like anything else – emerged from random variation and then stuck because it was effective (Campbell 1975). A theory of culture demands more. Arguably, the belief in BG was invented by individuals who profited from it. Norenzayan et al. acknowledge literature suggesting that BG religions are instruments of dominance (e.g., Peoples & Marlowe 2012). Because no one knows what happened in pre-historical time, the biblical narrative of Abraham's invention of BG-ism is instructive. Abraham sought to emancipate himself from his father and to establish his own group. His imposition of monotheism and forced circumcision of all males secured his leadership and established a culture of within-group obedience and prosociality. Again, however, in this narrative and later emulations, obedience seems to come first.

Let us be careful with the evidence on mentalizing, cognitive biases, and religious beliefs

doi:10.1017/S0140525X15000485, e0

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Abstract: Norenzayan et al.'s theoretical synthesis is highly plausible and commendable. However, the empirical evidence for the arguments on mentalizing, cognitive biases, and religious belief is currently not as strong as the writers suggest. Although certainly abundant and compelling, this evidence is indirect, contradictory, and weak and must be acknowledged as such. More direct studies are needed to support the theory.

Norenzayan et al. present an admirable and highly plausible theory on the development and spreading of prosocial religions. Their approach represents a significant advance in the psychological study of religion, integrating many central ideas into a unified theory and generating a host of testable hypotheses. We specifically applaud the theory for explicating how the effects of cultural factors and cognitive factors intertwine in bringing about specific types of religions.

That said, most of the theory's central arguments about the relationship between mentalizing, cognitive biases, and religion remain to be empirically tested and should be stated with less certainty than is currently the case. Although the evidence that the authors cite is abundant and compelling, it is indirect and must be acknowledged as such. Aside from the difficulty of proving evolutionary hypotheses, in order to properly test the theory, it needs to be complemented by direct evidence of a link between mentalizing, the cognitive biases, and religious beliefs.

The authors write that the "cognitive science of religion has begun to show that religious beliefs are rooted in a suite of core cognitive faculties" (sect. 2.1, para. 1), and that individual differences in mentalizing, teleological thinking, and dualism partly explain religious and other paranormal beliefs. They cite several papers and books in support of these arguments. Closer analysis of the references, however, reveals that rather than offering empirical evidence, they provide only theoretical or indirect information about the relationship under scrutiny. For example, although Barrett (2004), Kirkpatrick (1999), Lawson and McCauley (1993), Guthrie (1993), and Boyer (2001) provide conceptual backgrounds for the authors' theoretical position, they are mainly hypothetical discussions of the types of relationships that we might expect to find. As well, many of the sources present background information on the main concepts but do not directly deal with the associations between mentalizing, cognitive biases, and religious beliefs, and some do not mention religion at all (Frith & Frith 2003). Other references present evidence that is empirical but indirect. For example, Waytz et al. (2010), Norenzayan and Shariff (2008), and Bloom (2012) deal with the question of whether religion has effects on morality or on prosocial behavior; however, they do not address the cognitive mechanism through which these associations might be realized. Although we cannot criticize the citing of any of these references, the length of the reference list may give readers an incorrect impression that the relationships between mentalizing, cognitive biases, and religiosity are well established.

Further, there are several studies whose results are not in line with the argument that individual differences in mentalizing and cognitive biases partly explain belief in God and in paranormal events, but discussion of these studies is missing. For example, promiscuous teleology is not necessarily related to God beliefs (Lombrozo et al. 2007). Strong mentalizers do not experience supernatural agency more strongly (Barnes & Gibson 2013), and do not attribute their life events to God, any more often than others (Banerjee & Bloom 2014). Similarly, the evidence for the argument that reduced mentalizing abilities, as found in autistic spectrum disorders, predict reduced belief in God, and that schizotypal tendencies are associated with "hyperreligiosity," is not as clear as Norenzayan et al. suggest. Individuals with autism spectrum disorder may consider religion to be important (Schaap-Jonker et al. 2013), and schizotypy is not necessarily linked with any kind of religiosity (Diduca & Joseph 1997; Maltby et al. 2000). Linking religious beliefs with schizotypy and contrasting them with autistic traits and nonbelief is therefore an oversimplification.

The few existing papers that have thus far supported a positive relationship between mentalizing, cognitive biases, and religiosity (and that are cited) are problematic for a number of reasons. Firstly, the relationships have tended to be weak. For example, when mentalizing, autistic traits or promiscuous teleology have predicted religiosity (or vice versa), the beta coefficients have ranged from 0.07–0.18 (Kelemen et al. 2013; Norenzayan et al. 2012; Willard & Norenzayan 2013; see also Lindeman et al. 2015), implying that the ability of these predictors to explain variance in religiosity has ranged from trivial to small.

Secondly, mentalizing is a large-scale, multidimensional construct. It can refer to the capacity to understand that other people have minds different from one's own (the theory of mind proper); the capacity to understand what others feel or think; the ability to experience and share the emotions of others; the ability to interpret communicative signs, detect intentionality, and understand social outcomes; the mirror neuron system; and the ability to think about thinking (i.e., metacognition). It can pertain to attending, perceiving, recognizing, describing, interpreting, inferring, imagining, simulating, remembering, reflecting, and anticipating, making it a slippery concept, potentially extending beyond manageable bounds (Allen 2006). The available instruments do not capture this variance in mentalizing among healthy adults. In most studies on supernatural beliefs, mentalizing has been operationalized either with the Empathy Quotient (Baron-Cohen & Wheelwright 2004), or with the Eyes test (Baron Cohen et al. 2001), which according to recent studies may not tap mentalistic abilities (Valla et al. 2010). However, comprehensive and valid methods to assess mentalizing among healthy adults are not easily available. Hence, there is a pressing need for the field to develop better methods for studying how mentalizing and various biases are related to religiosity today.

In sum, we congratulate Norenzayan et al. for the much-needed theoretical synthesis, but we caution against relying too strongly on evidence that, at least for part of the theory, is currently scarce and contradictory. At present, the only thing that can be said is that there "may be" a relationship between mentalizing, certain cognitive biases, and religiosity. Evidence that would warrant using the wording "is" or even "probably is" does not yet exist.

ACKNOWLEDGMENT

This work was supported by the Research Funds of the Academy of Finland (No. 265518).

Are gods and good governments culturally and psychologically interchangeable?

doi:10.1017/S0140525X15000497, e0

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Abstract: Cognitive by-product theorists maintain that standard cognitive development facilitates the acquisition of religion. Citing secularization, Norenzayan et al. qualify that theory, proposing that gods and good governments are psychologically and culturally interchangeable. That contention, though, occasions questions about the psychological dynamics involved, about what qualifies as religiosity, and about asymmetries between gods and good governments in the face of catastrophes.

The cognitive by-product theory of humans' religious proclivities holds that standard cognitive development facilitates the acquisition of religious representations and practices (Boyer 2001). Ideas about agents possessing counterintuitive properties and forms of putative interaction with those agents will regularly arise in human populations, on the basis of susceptibilities of diverse maturationally natural cognitive processes that enjoy neither a logical nor a psychological unity (McCauley 2011).

The authors and others (e.g., Talmont-Kaminski 2013) have raised an important qualification to the cognitive naturalness thesis about religion, pointing to the steady decline of religiosity among people in secularized societies – for example, in northern

Europe. These researchers suggest that secularized societies indirectly but substantially check people's interests in religion.

Secularized societies ensure that virtually all of their citizens have their basic material needs met. (As a result, these societies have low levels of income inequality.) Citizens live in relatively safe, secure environments. When societies with adequate material resources develop governments with trustworthy institutions, legal systems, police forces, and more, which monitor human conduct in ways similar to the oversight that the gods are supposed to carry out, their citizens' interests in the gods decrease dramatically. Norenzayan et al. suggest that such developments prompt an indifference to religion that constitutes one of the prominent routes to atheism, which they dub "apatheism." (sect. 7.3, para. 1).

Norenzayan et al. concede that the welfare, security, and stability that secularized societies engender have been rare in history and remain the exception even today. They allow that religions that forge parochial altruism continue to prosper wherever humans face social or political upheaval (ISIS in Syria) or natural disasters (Ebola in Liberia) or perilous or insufficient material support (throughout most of the third world). Still, noting evidence from studies of priming in economic games, surveys around the world, and various natural experiments, they propose that "it appears that God and government are both culturally and psychologically interchangeable." (sect. 7.3, para. 5).

By-product theorists do *not* hold that everyone is naturally religious. Among the reasons for their caution is the variability concerning the maturationally natural cognitive dispositions that inform humans' appetite for religion. (The authors note, for example, "mindblind atheism" [sect. 7.3, para.2] resulting from deficits in theory of mind.) These observations about the impact of secularization on religious proclivities illuminate the profound role that material and cultural conditions can have on the tuning of humans' maturationally natural cognitive systems and on their attitudes, beliefs, and behaviors. Norenzayan et al.'s contention, however, that gods and good governments are psychologically and culturally interchangeable raises questions about the details of both the relevant psychological and cultural mechanisms.

Clarifying the means by which material and cultural conditions influence the psychological and cultural viability of ideas and practices, including religious ideas and practices, involving agents with counterintuitive properties will enrich research on the cognitive bases and the cultural evolution of religion. It is worthwhile to explore whether the processes of secularization interact with the psychological and cultural mechanisms on which prosocial religions rely and how uniform, stable, and lasting the psychological and cultural effects of secularization are. Following are a couple of matters that may merit consideration.

First, what at the psychological level enables secularization to undo religiosity across entire human societies (e.g., in the Scandinavian countries)? The authors hold the view that secularized societies produce conditions in which religious ideas are unlikely to thrive. If their satisfaction and security depends upon someone other than the gods, citizens appear less receptive to religious sales pitches. Does secularization also inevitably neutralize the forces driving the *generation* of such ideas in the first place (and, if so, how?), so that, eventually, they may not even bubble up in the relevant populations? This raises a question about the famed secularized populations of northern Europe. Have the measures researchers employed demonstrated a pervasive deflation of religiosity or have they only furnished evidence of the waning of its traditional expressions? The national churches attract few, but has secularization in these countries also squelched traffic in ideas and practices concerning ancestors and angels, ghosts and golems, fairies and leprechauns, saints and spirits, and vampires, witches, and zombies or representations of animals, plants, objects, or places possessing counterintuitive properties?

Second, for the members of secularized societies do analogues exist of soldiers' experiences in foxholes, in which allegedly no one remains an atheist? The list of contingencies capable of disrupting a society's safety and security is long and includes problems for which no government can ever be adequately prepared. The devastating earthquakes in Christchurch, New Zealand, constitute a natural test. The New Zealand Attitudes and Values Study, a longitudinal study of New Zealanders' views since 2009, showed that the half-century trend of increasing secularization and of decreasing religious affiliation among New Zealanders by roughly 1% per year was reversed among Christchurch residents and among those who reported that the earthquakes affected their lives (Bulbulia 2013; Sibley & Bulbulia 2012). The more than 3% increase in religious affiliation among this population contrasted with the continued decreasing religiosity among New Zealanders overall during this period. *Reversals* of the shrinking religiosity characteristic of secularized populations may be no more than a natural disaster away. It is, perhaps, not a coincidence that such disasters are often called "acts of God."

Prolonged disasters (e.g., climate change) may well point to a vulnerability of secularization (Diamond 2005). This seems less clear in the case of religion. In support of their interchangeability thesis, Norenzayan et al. cite experiments (Kay et al. 2008) in which "experimental manipulations … that lower faith in … (God or the government) lead to subsequent increases in faith in the other." (sect. 7.3, para. 5) That, of course, applies only in the few situations in history in which confidence in secular institutions has been a viable possibility. In the vast majority of settings where religion was, basically, the only option, catastrophe provoked quests for more or better religion. By contrast, in the face of outright catastrophe, either collective or individual, the failure of secular means to preserve tranquility seems less likely to provoke a quest for more thorough secularization.

Religion promotes a love for thy neighbour: But how big is the neighbourhood?

doi:10.1017/S0140525X15000503, e0

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Abstract: The term *prosocial* has often been taken to mean *nice* or *neighbourly*, but many acts that further in-group interests are hostile and aggressive towards out-groups. According to Norenzayan et al., religion's ability to foster social cohesion *within* religious groups has been a key factor in the human transition to complex societies. But what are the prospects for nonparochial "religious prosociality"?

…love thy neighbour as thyself…
(e.g., Leviticus 19:18)

When Joshua killed twelve thousand heathen in a day and gave thanks to the Lord afterwards by carving the ten commandments in stone, including the phrase "Thou shalt not kill," he was not being hypocritical.
— Ridley (1996, p. 192)

The work of Norenzayan et al. on the evolution and psychology of "prosocial religions" impressively integrates theory and data from multiple disciplines, including economics, anthropology, history, evolutionary biology, and social psychology. Although this is in many respects a rich and fertile approach, the fact that notions of "religious prosociality" differ across disciplines can give rise to serious conceptual confusions.

In an influential review, Norenzayan and Shariff (2008, p. 58) defined "religious prosociality" as "the hypothesis that religions facilitate costly behaviors that benefit other people." Although they

noted that such behaviours can produce victims as well as beneficiaries, their focus on nice, "neighbourly" aspects such as generosity and trust was consistent with a standard social psychological conception of "prosociality" (Batson & Powell, 2003). Subsequently, other authors (e.g., Galen, 2012; Preston et al. 2010) have reinforced this usage, contrasting religion's "prosocial" effects with its "antisocial" or "nonprosocial" effects, the latter including aggressive and prejudicial behaviours. Thus, evidence that participants passing a Christian landmark express more negative attitudes toward Christian out-groups than those passing a civic landmark (LaBouff et al. 2012) has been taken as evidence *against* the religious prosociality hypothesis (Galen 2012).

This might have less serious consequences theoretically were it not for Norenzayan et al.'s cultural evolutionary argument. According to Norenzayan et al., the advent of cultural notions that intertwine the "supernatural" with the "prosocial" has been a key factor in the human transition from small-scale, kin-based groups to complex large-scale societies. On this view, the "religious prosociality" hypothesis is not the hypothesis that religion promotes indiscriminate sharing and caring, but rather the hypothesis that religion fosters social cohesion *within* religious groups – favouring their "stability, survival, and expansion, at the expense of less successful rivals" (Norenzayan 2013, p. 30). As the current target article makes clear, Norenzayan et al. view "prosocial religions" as religious groups that encourage cooperation among their adherents, and – when intergroup threat is perceived – *hostility and aggression towards out-groups*.

From this perspective, it is no paradox that the holy books of the two most dominant "prosocial" religions, Christianity and Islam – whose adherents include the majority of the world's people (Central Intelligence Agency 2015) – contain numerous exhortations to violence against out-group members. As unpalatable as it may seem, even the barbaric treatment of out-group members by groups such as ISIS/DAESH is not necessarily "antisocial" on this conception. Indeed, aggression, murder, and even genocide can be viewed as prosocial acts insofar as they facilitate success in intergroup competition and conflict (McKay & Whitehouse 2015). By contrast, a paradigmatically antisocial act might be a cyberattack on social institutions carried out for mere personal satisfaction, rather than in the service of some group cause.

So, does the evidence indicate that religiously motivated altruism is always parochial – that is, preferentially directed toward in-group members? Interestingly, several lines of recent evidence suggest otherwise. Reddish et al. (2013) found that social synchrony, a key feature of many religious rituals, evoked cooperation with both in-group members (with whom the synchronous action was performed) *and* members of a non-performance group. Meanwhile, Everett et al. (2015) found that religious participants gave significantly more money to other players in an economic game than did atheist participants – irrespective of whether the recipients were coreligionists or atheists. In fact, only the atheists in this study discriminated between religious and atheistic recipients, transferring marginally more money to atheist recipients.

Do such findings count against Norenzayan et al.'s cultural evolutionary story? Not necessarily. In the case of the synchrony study, cooperation with out-group members may represent a spillover effect. That is, it may be that synchronous behaviours promote generalized cooperative sentiment, ordinarily applied toward co-religionists in the immediate performance vicinity but here – in the artificial context of the experiment – extended also to out-group members. As for Everett et al. (2015), one possibility is that as prosocial religions grow and prosper, the decidedly parochial mores of their initial manifestations transmute into more benign, universal forms, forms that contemporary adherents adopt (see also Clobert et al. 2015; Johnson et al. 2015b). According to Hartung (1995), whereas the biblical context of the injunction to "love thy neighbour" clearly indicates that one's neighbour is a fellow in-group member, most contemporary Jews and Christians view the law as applying to everybody – that is, *everybody* is "thy neighbour."

For Hartung (1995), attempts to present religious in-group morality as universal morality are disingenuous, defying the clear intent of the texts upon which such moralities are based. As he documents, certain religious texts (e.g., Maimonides' Codes) have been "strategically mistranslat[ed]" to obscure the parochial intent of the original variants (e.g., replacing the words "single Israelite" with "human being"). Although we understand the impulse to expose the parochial underbelly of prosocial religions, we should also be exploring ways of making the ideals of universalistic prosociality achievable (Whitehouse 2013a; 2013b). The interesting research question is whether certain elements of the universal religious repertoire (e.g., notions of hell; kinship cues) are especially geared toward motivating parochial as opposed to universal conceptions of morality. If so, do these mechanisms exhibit plasticity such that, for example, religiously motivated "prosociality" is more parochial in the presence of out-group threat and more universalist in conditions of "existential security"? We hope that future research will elucidate the prospects for harnessing the various cognitive and cultural mechanisms that Norenzayan et al. discuss in the service of implementing a more universally applicable conceptualisation of "prosociality," in which the "neighbourhood" of "love thy neighbour" expands without limit.

ACKNOWLEDGMENTS

This work was supported by an ESRC Large Grant (REF RES-060-25-0085) entitled "Ritual, Community, and Conflict."

Self-control, cultural animals, and Big Gods

doi:10.1017/S0140525X15000515, e0

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Abstract: As Norenzayan et al. cogently argue, religions that proliferated most successfully did so because they facilitated prosociality and cooperation in large-scale, anonymous groups. One important way that religion promotes cooperation may be through improving self-control. In this comment, we cover some potential obstacles to implementing self-control and how religion can overcome them.

The profound insights put forward by Norenzayan et al. about the societal impact of prosocial religion mesh well with the theoretical framework that has informed much of our own work. In particular, Baumeister (2005) reviewed extensive psychological research on human processes and dispositions, leading to the speculative conclusion that the distinctively human traits are largely adaptations designed to facilitate culture. In this brief comment, we focus on one of these traits – namely, the advanced, flexible, and relatively powerful form of self-control seen among humans.

The great social leap forward seen among humankind, as compared with other primates, is the extensive involvement in social interactions and relationships with non-kin, so that they could have mutually beneficial interactions with distant acquaintances and even strangers. These have extended beyond one-to-one interactions to include participation in much larger social networks and systems, such as marketplaces, governments, and armies.

Whereas cooperation with close relatives may come naturally, on the basis of shared genes, cooperating with non-kin and strangers is more difficult. Moral rules point the way toward making these interactions possible. Economic marketplaces, for example, can provide benefits to all who participate, but they only work if people maintain some respect for honest disclosure, fair trade, property rights, and the like. Widening the circle of trust, so that people can treat non-kin fairly, is always an incomplete transition (Fukuyama 2011). Even in modern societies,

people tend to trust and cooperate with kin more than strangers, especially during times of societal instability.

Self-control enables people to override impulses and obey abstract rules. The point of our comment is that prosocial religions may have contributed to cultural progress partly by improving self-control. Evidence linking religiosity to self-control was reviewed by McCullough and Willoughby (2009), though their work was motivated by seeking to explain the link between religion and longevity, not morality. Moreover, many findings were correlational, rendering ambiguous what caused what. The link between self-control and moral behavior has clear support (e.g., Baumeister & Exline 1999), such as reflected in experimental evidence that people perform immoral actions more when their self-control is impaired than when fully functioning (Mead et al. 2009).

Self-control can fail for several reasons, reflecting its structural and motivational bases (Baumeister & Heatherton 1996). Specifically, it can fail because of unclear standards, insufficient monitoring, depletion of regulatory resources, and a heightened emphasis on immediate desires rather than long-term enlightened self-interest. We suggest that religion can help reduce each of those pitfalls.

Successful self-control is facilitated by having clear and consistent standards. One may also assume that successful cooperation is facilitated when individuals endorse the same standards. As Norenzayan et al. note, all-encompassing prosocial gods helped this process by advocating single sets of moral rules that all people were expected to obey. Indeed, Jaynes (1976) proposed that conflicting demands from multiple gods were a factor leading to a preference for monotheism and a heightened sense of conscious moral responsibility. Even today, religiosity is linked to relatively low levels of goal conflict (Emmons et al. 1998).

Monitoring (keeping track of relevant behaviors) is also vital for effective self-regulation. Here again, religion helped. Whereas the early multiple gods were often preoccupied with their own adventures, the large prosocial gods came to be understood as constantly watching people, particularly for virtuous and immoral actions. Being watched makes one self-conscious, and so belief in a watchful god likely made people aware of themselves. Secret actions thus ceased to be secret, rendering morality a ubiquitous concern. Self-awareness inherently seems to involve comparison of self to standards (Duval & Wicklund 1972), and so the process of moral self-evaluation was likely increased by belief in a god with a clear and consistent set of moral rules.

Self-regulation can also fail because the capacity for altering one's responses is temporarily diminished. Ego depletion is a state of diminished willpower. Although causal evidence is lacking, it seems plausible that religion could help in two ways. First, ego depletion typically reflects efforts to conserve a partly depleted resource, and people can self-regulate despite depletion when sufficiently motivated (e.g., Muraven & Slessareva 2003). An omnipresent, judgmental god could well help supply such motivation. Second, regular exercise of self-control appears to strengthen one's capacity for self-control (e.g., Baumeister et al. 2006). As suggested by McCullough and Willoughby (2009) and others, regular participation in church practices, from rituals to prayer to meditation, may serve as self-control exercises that would strengthen the capacity. Desmond et al. (2013) found that frequency of prayer and religious attendance correlated positively with adolescents' self-control, even after controlling for relevant demographic variables. That could indicate the strengthening benefit of religious activity, though other explanations could be proposed.

Last, self-regulation fails when aversive emotional states prompt people to seek immediate pleasure and benefit rather than do what is best in the long run (e.g., Tice et al. 2001). Again, religion can help in multiple ways. Invoking eternity is likely helpful in maintaining a long-term focus, as is the assurance of intense future punishments for current lapses. Religion may function similarly to these tactics by promoting a long-range time perspective (e.g., consequences in an afterlife) and increasing the salience of long-term goals (Baumeister et al. 2010). Highly intrinsically religious Turkish Muslims, to take one example, have more future-oriented thinking than do less religious Muslims (Öner-Özkan 2007). Religion also helps mitigate current suffering by helping individuals place it in long-range contexts, thereby possibly reducing the need to seek solace through illicit pleasures (Baumeister 1991).

The advent of large-scale, morally prescriptive gods was a major step in the evolution of large societies, as Norenzayan et al. argue. We propose that the beneficial effects of religion on self-control and, through that mechanism, on morality, were one vital part of this process.

Moralizing gods revisited

doi:10.1017/S0140525X15000527, e0

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Abstract: Six ideas explaining the existence of moralizing gods are mentioned, and I discuss the words *prosocial* and *antisocial*.

The variable "High Gods" of the Ethnographic Atlas and the Standard Cross Cultural Sample allows gods to be coded as either moralizing or not moralizing. In other words, gods do or do not give instructions on how to behave. This is a clear and straightforward dichotomy, yet the decision how to code a particular religion can be problematic. It is interesting to read how Norenzayan et al. (sects. 3.2–3.2.3) challenge some ideas in this regard. Here I mention six hypotheses about moralizing gods, and I try to explain why I feel uncomfortable with terms like *prosocial* and *antisocial*.

Hypotheses or theories about a belief in moralizing gods can be grouped in descriptions of ecological or social conditions. An example of the first is Snarey's (1996) claim that a belief in moralizing gods is more often found in societies where water is scarce. Other examples are Botero et al. (2014), who found this belief to be more prevalent among societies that inhabit harsh environments, whereas Baumard et al. (2015) argue that increased affluence explains the emergence of moralizing religions.

An example of a hypothesis describing social conditions is Marxist theory, which argues that moralizing gods are used, if not created, by the rich to manipulate the poor. In another theory, moralizing gods function to keep competing members of society together, so one society can more effectively compete with other societies. Roes and Raymond (2003) found support for both of these hypotheses. Finally, there is the idea (Roes 2014) that paternity confidence is more important in patrilocal societies, and moralizing gods function to sequester women. Notice that in the last three hypotheses, moralizing gods are associated with competition between human groups – namely, between (a) socioeconomic classes, (b) different societies, and (c) the sexes.

The words *prosocial* (as used in the title of the target article) and *antisocial* sound like moral qualifications, which is one reason I would refrain from using them as scientific terms. Who wants to be known as an antisocial individual? However, a prosocial person is not, as the word suggests, someone who is indiscriminately nice to everybody else. He or she is nice in relation to *a certain group*. A mafia member is considered prosocial by his colleagues if he abides by the "omertà" code of silence, whereas the rest of the larger society considers him antisocial. So someone can be pro- and antisocial at the same time, depending on the perspective taken. This might be confusing, and I believe George Peter Murdock was right in designing the variable "High Gods" the way he did, because even a god cannot be both moralizing and not moralizing

at the same time. Two of the target article authors mention in another publication (Shariff & Norenzayan 2011, p. 85) the term *counternormative behavior*. I prefer this term to *antisocial behaviour*, because it is more neutral and also poses the question about which norms are being violated. I imagine a similar alternative for the word *prosocial* can be found.

ACKNOWLEDGMENT

Once again, I thank Hamilton McMillan for his comments.

Divorcing the puzzles: When group identities foster in-group cooperation

doi:10.1017/S0140525X15000539, e0

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Abstract: We argue that general social psychological mechanisms (e.g., common group identity) can account for prosocial behavior and cooperative norms without the need for punishing Big Gods. Moreover, prosocial religions often do not prevent conflict within their religious groups. Hence, we doubt whether Big Gods and prosocial religions are more effective than alternative identities in enhancing high-level cooperation.

We appreciate Norenzayan et al.'s nice collection of theory and evidence for processes fostering human cooperation in large-scale groups. However, we are not convinced by the proposed connection between large-scale cooperation and prosocial gods for several reasons. First, the proposed group-functional aspects of prosocial religions or gods seem not to prevent conflicts within such religious groups. Second, general group processes foster prosocial tendencies within groups independent of religion. Third, the proposed surveillance and punishment mechanisms also seem to work without gods. Finally, gods as enhancers of prosocial tendencies would have to be more effective in enhancing prosocial tendencies than alternatives in order to spread via cultural evolution.

In contrast to enhancing prosocial tendencies, a shared common religion does not prevent conflicts between groups defined by language, ethnicity, or nation. Other group identities (e.g., nation, kingdoms, ethnic groups) are sometimes more important for collective action than religious identities. For example, in World War I, Christians and Muslims allied (Germany and the Ottoman Empire) to fight other Christians and Muslims (e.g., French, British, Egypt). Here, an allegiance to the same Big God does not prevent war, and allegiances to different Big Gods are no obstacle for alliances. Moreover, European history is full of wars in which Christians fought against other Christians. Besides being unable to prevent conflicts derived by other identities, prosocial religions even instigate conflicts within the same faith. For example, religious ideas promote conflict between Shiites and Sunnis about who the real Muslim is, and Protestants and Catholics fought hundreds of years about who the right Christian is. Juergensmeyer (2008) even suggests that there is an inevitable conflict between orthodox groups and more secular groups within all religions. Hence, prosocial religions do not produce happily united cooperative groups. They fail to prevent conflicts within, and sometimes they even instigate conflicts. The prosocial aspect of Big God religions thus seems too weak to establish and maintain high levels of cooperation within religious groups.

Second, as Norenzayan et al. suggest, Big Gods may serve as templates of identification within a group, but there are many other effective templates. Groups can substitute shared ideologies (e.g., communism), nonomnipotent leaders (e.g., dictators), general ideas (e.g., human rights), a shared feature (e.g., skin color), or even experimentally created categories that an individual identifies with (Tajfel & Turner 1979) for Big Gods. Experimental data in social psychology demonstrates that the psychological processes Norenzayan et al. propose effectively attach to any group identity. For example, arbitrary and ad hoc created groups in psychological laboratories trigger the formation of common norms (Sherif 1965), favorable treatment of fellow in-group members over out-group members (Tajfel et al. 1971), expectation about reciprocal behavior among in-group members (Yamagishi & Kiyonari 2000), and positive interdependence between group members (Platow et al. 2012). Hence, all salient group memberships can promote cooperation between its members, and in-group identification ensures that cooperation is maintained. This is true for small face-to-face groups, as well as for broad categories defining a group (Brown & Brewer 1998). If people are attached to their group, they display prosocial behavior toward their fellow group members. It does not matter if the group is defined by a common religion or by any other group identity.

Third, punitive Big Gods are believed to increase norm compliance by threatening to punish deviants. However, if the belief in a punishing god would be enough to stabilize cooperation, actual punishment of unfair or uncooperative individuals in and outside of the laboratory would not be necessary. Nonetheless, people engage in punishment, even if an investment of their own resources is necessary (Fehr & Gächter 2002). In addition to first-person punishment, where the victim punishes, there are other sources of social control, such as third-person punishment and institutionalized punishment (e.g., the police), that account for norm compliance. Further, surveillance does not need to be performed by a higher entity, but cooperation is enhanced by the presence of others (Dawes et al. 1977) or even by exposure to a pair of stylized eyes (Haley & Fessler 2005). In many experimental studies, the mere option of punishment increases cooperative behavior among participants (Fehr & Fischbacher 2004a). Sometimes, people even prefer groups in which deviants can be punished by fellow group members over groups in which no punishment option is available (Gürerk et al. 2006). Despite the evidence that punishment is effective in fostering group cooperation, it could increase social distance and conflict within and between social groups (Turner 2005). Forcing people to do something enhances resistance and reactance to such pressure (Brehm & Brehm 1981). Hence, punishment comes at some considerable costs of social conflict and resistance. In contrast, positive interactions (e.g., incentives, respect, etc.) also enhance the motivation to cooperate (Balliet et al. 2011). Positive interactions as a means to convince group members about what is right fosters their intrinsic motivation and thereby enhances group-serving behavior as effectively as punishment and coercion (Turner 2005). Although Big Gods may also play a role in these more positive ways to enhance prosocial tendencies, they are not necessarily more effective than other rewarding structures. Hence, there is no need for a Big God or other punishing instances if people conform to what they think is right and not because they want to avoid punishment.

In summary, prosocial religions constituting common group identities seem to be connected to large-scale cooperation through more general social psychological processes. However, in our understanding, alternative identities are just as good and often even better in fulfilling the purpose outlined by Norenzayan et al. For a proper argument in favor of the relation between the two developments, one would have to demonstrate that prosocial religions are *more* successful in promoting cooperation than other identities. Otherwise, we suggest substituting prosocial religion with any important identity and leaving the spread of Big Gods as a still unresolved puzzle.

Coerced coordination, not cooperation

doi:10.1017/S0140525X15000540, e0

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Abstract: Norenzayan et al. propose that Big God (BG) religions are large-group cooperative enterprises that promote internal harmony and higher fertility, resulting in "mutually beneficial exchanges" for those involved. We examine the possible distributions of costs and benefits within BG religions and propose that they are, instead, successful coordinating mechanisms that rely on intragroup competition and exploitation between the classes and sexes.

Norenzayan et al. review the available evidence and successfully synthesize many of the debates of the by-product and adaptationist camps on the evolution of religion. Although they acknowledge that Big God (BG) religions are one of many factors that foster large-scale cooperation, one of their central claims is that these religions promote internal harmony and higher fertility, thereby reducing competition within social groups. However, the evidence presented makes a compelling case that modern and ancient BG religions result in intragroup exploitation and conflict rather than "mutually beneficial exchange." We discuss the implications of the terms "prosociality" and "cooperation" with regard to intragroup conflict in large-scale societies, and particularly in relation to intersexual competition.

Within-group exploitation and receiver psychology. In the target article, the ideas of prosociality and large-scale cooperation are used interchangeably and exemplified by behaviors such as participation in warfare, religiously motivated suicide attacks, and construction of monumental architecture (note that historically these have been exclusively male undertakings, a point that we shall return to later on). Although these activities require the coordination of numerous individuals to reach a common goal, they do not necessarily represent "mutually beneficial exchanges" or a symmetrical distribution of costs. Such coordinating efforts often have been achieved through coercion and exploitation: In antiquity, officers drawn from the aristocracy survived to write accounts of well-known battles, whereas armies of conscripts drawn from less privileged backgrounds died by the thousands (Gabriel 2006). During the Crusades, the Papacy lured warriors into battle with the promise of salvation and pardon from supernatural punishment (Cohn 2011). Contemporary suicide attackers are enlisted and groomed by manipulative charismatic leaders (Atran 2003), and the construction of monumental architecture in ancient Egypt was made possible by compulsory labor recruited from the poor peasant class (David 1997).

Hence, much of the available evidence allows BG religions to be interpreted as opportunistic manipulations of receiver psychology by royalty, priestly elites, and other dominant groups, which sometimes are able to harness the collective efforts of large groups (see Soler et al. 2014). In the animal world, a growing literature explores how individuals take advantage of conspecifics by exploiting preexisting perceptual and sensory preferences (e.g., Arnqvist 2006; Guilford and Dawkins 1991). In the case of religion, such biases include cooperation through costly-to-fake signaling (Irons 2001; Soler 2012; Sosis 2003) or the social bonding experienced through synchronous, dysphoric, or euphoric rituals (Bastian et al. 2014; Fischer et al. 2013). Altough these arose in the context of small-scale societies where parochial altruism was a crucial adaptation, BG religions allow elites to exploit these biases to extract resources from lower-ranking group members. Although long-term exploitation will lead to either the extinction of the exploited class of individuals or the evolution of a defensive response (Ryan & Rand 1993), BG religions are a relatively new phenomenon. It may be that the cultural evolution of secular institutions that elbow out religiosity is such a response. Other possibilities are schisms, millenarian movements, and political revolutions: The Protestant Reformation, for example, was in large part a reaction to a BG religion in which elites received asymmetrical benefits by commercializing salvation and exploiting believers (Luther 1517/1915).

Fertility and intersexual competition. Norenzayan et al. point out that BG religions provide additional group benefits in the form of higher fertility (via a pronatalist orientation) and monogamous marriage. In the first case, the evidence does not permit such a conclusion; the studies cited compare fertility rates between BG religions and secular populations. The relevant contrast is between BG and non-BG religions, and we have no data to suggest, everything else being equal, that the former are more pronatalist or have higher fertility rates than the latter. With regard to the spread of monogamous marriage, it may be that such norms reduce conflict because they effectively obliterate choice for females and nonprestigious males. Across societies, data suggest that wealth increases male reproductive success (not female) and the effect is particularly strong in polygynous societies (Nettle & Pollet 2008). Moreover, a salient aspect of contemporary BG religions (i.e., Abrahamic and karmic religions) is their overwhelmingly patriarchal nature. Not only are the religious elites of these traditions predominantly male, but many of their moral dictates are also specifically aimed at constraining women's autonomy and restricting female sexuality through taboos (Guterman et al. 2007). In contrast, rates of paternal uncertainty around the world suggest that (1) there are contexts where females do choose to disperse their reproduction across males, and (2) that explicitly religious populations that follow a BG tradition seem particularly well able to reduce this possibility (see Anderson 2006).

Public morality statements by modern and historical BG religions are not uniformly aimed at fostering general cooperation or benefitting all group members on average. Relevant analytical concepts that can shed light on the implications of BG religions on fertility and intersexual competition include: differences in mate choice, ease of divorce, and punishment incurred for extra-pair copulations (which is often more severe for females). For example, in the Code of Hammurabi (mentioned in the target article) we find that although a woman who leaves her husband "shall be cast into the water," a man who wishes to do the same must only financially compensate her to end the marriage. If a phenomenon associated with BG religions is increased group fertility and fitness, we suspect that such a distribution is highly skewed between the sexes (and across social classes). This is not to say that non-BG religions are dominated by gender equality norms – they may well not be – but this is a question that needs to be considered. The internal processes of BG religions appears to be focused, as mentioned earlier, on those activities that have historically been the exclusive province of males. Any results from those examples will necessarily leave out the role of half of the population. A closer examination of dynamics of intersexual competition needs to be part of any explanation of BG religion.

Credibility, credulity, and redistribution

doi:10.1017/S0140525X15000552, e0

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Abstract: After raising some doubts for cultural group selection as an explanation of prosocial religiosity, we propose an alternative that views it as a "greenbeard effect." We combine the dynamic constraints on the

evolution of greenbeard effects with Iannaccone's (1994) account of strict sects. Our model shows that certain social conditions may foster credulity and prosociality.

Several reasons cast doubt on cultural group selection (CGS) as the key to prosocial religiosity. First, CGS is committed to a high degree of cultural homogeneity. However, not only can different populations share the same religion, but within one and the same population, several religions may coexist; when one group dominates another, several distinct possibilities may occur (homogenization, syncretism, sect explosion, etc.). Second, strong CGS (where behaviors are detrimental for the individual but beneficial for the group) seems to take place in the timescale of centuries (Soltis et al. 1995).

Other options can be considered: the explanatory role of coercion (Diamond 1997) or the stabilizing role of preexisting maladaptive biases (André & Morin 2011). Here, we focus on a traditional contender to group-selectionist hypotheses: "greenbeard effects." "Greenbeards" in evolutionary dynamics are arbitrary traits transmitted in conjunction with other traits that induce some form of preferential treatment to those carrying those same arbitrary traits (Gardner & West 2010). In the human cultural arena, this mechanism has been applied to social selection (Baumard 2010; Nesse 2009) and to partner choice (Noë & Hammerstein 1994). Similarly, it also readily suggests an account of why individuals who share the same religious beliefs – regardless of the content of those beliefs – have a preference to coordinate or cooperate with each other (Viciana 2014).

No doubt, appeals to putative greenbeards (in the form of ethnic markers) have been too common, and the evolutionary consistency of this mechanism has often been oversold in explanations of human prosociality. However, the basic evolutionary game-theoretical setting of this process remains relevant, if the possibility of free-riders – through the decoupling of the arbitrary trait (the "greenbeard") and the cooperative behavior itself – is properly addressed. This is especially required when cultural evolution is involved, where agents keep some degree of rational choice over many of the behaviors they adopt (Fehr & Fischbacher 2005).

When is such a form of tag-based cooperation to be expected? One possibility is when cultural traits are acquired in such a way that they reliably correlate with underlying behavioral tendencies (McElreath et al. 2003). Another possibility arises depending on outside opportunities of subgroups of agents in a population and the appearance of costly traits that reliably signal eagerness to enter into cooperative relationships (Iannaccone 1994). In what follows, we develop this second type of solution as a powerful way to explain the strategic adoption of beliefs and practices with increased prosociality.

In our model, agents choose to become part of groups that have three characteristics that are public and known: (1) an entry cost, that one could see as the cost of carrying a certain greenbeard or costly tag (i.e., a religious belief); (2) the degree of redistribution and participation in the production of public goods inside that group; and (3) the recent productivity of that group. Under this model, agents produce resources following a random sequence every "year" or cycle of the model. They share a portion of their production with the group and keep the rest for themselves. Therefore, each agent benefits from the average of resources shared by the group. Fitness is directly related to the resources obtained, but with diminishing returns (see online appendix, available at http://www.normalesup.org/~viciana/bbs_appendix.html). At each cycle, before sharing, the individuals know their productivity for this year, and they can decide either to stay in the same group or leave for a group with different past success and different sharing expectations. In this model, two kinds of groups survive in the long run: no-entry-cost groups with low levels of redistribution, and entry-cost groups with high levels of redistribution. Variability in individual opportunities may turn high costs attractive if they open the door to cooperative enterprises. As a result, the most "committed" individuals may find each other in a situation where they have little to gain from free-riding, as we see in Figure 1.

Fig. 1 - Colour online

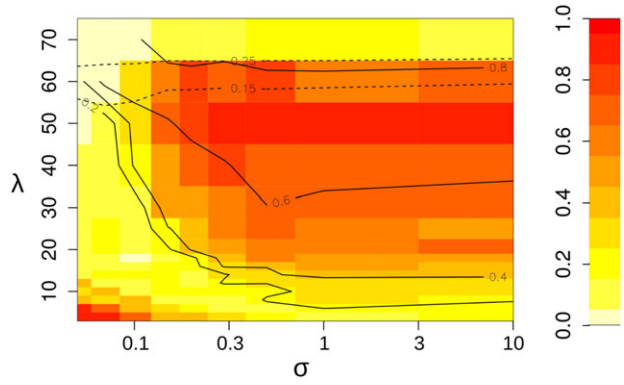

Figure 1 (Viciana et al.). Proportion of simulations in which groups with an entry cost survive (red), mean sharing in entry cost groups (solid contour lines), mean sharing in groups with no entry costs (dashed contours), as a function of σ (the larger σ, the larger the year-to-year resource variation) and λ (diminishing returns).

What does this model of the evolution of cooperation have to do with beliefs in the supernatural? Perhaps very little, except that one could say that there may be religious CREDs (Henrich 2009) that increase the credibility of the signaler insofar as there are landscapes of available opportunities (profitability of cooperative activities, lack of outside options) that may enhance the credulity of agents over certain religious forms. As an analogy of how partner choice mechanisms may operate here, think of the so-called Nigerian Internet scam (Herley 2012). This scam self-selects the perfect victims with the minimum amount of cost dedicated to partner control (maximizing the degree of credulity of those answering the e-mail). In a similar fashion, certain social circumstances and evolving religious practices can self-select the most committed coreligionists, creating an environment for distributed degrees of credulity that may promote cooperative ventures. This does not need to be a fully intentional process.

The specific answer for why particular religious forms have come to play this role may be historical as much as psychological. From what we currently know, metaphysical beliefs about religious dogma tend to be stronger and more widespread in those populations where existential insecurity is higher (Inglehart & Welzel 2005). This finding holds as much across societies as it does inside societies (Norris & Inglehart 2011). Those benefiting most from cooperation can have a strategic interest in adopting certain beliefs, under certain circumstances. From this point of view, the facilitation of cooperation through religious priming, found in experiments, may be partially mediated by the previous economic and sociological context of participants. In other words, do most religious primings induce substantial prosocial effects in the absence of previous coalitionary dynamics as the ones here described?

In summary, a shift in emphasis from group-functionalism to the specifics of coalitionary dynamics is required. Our model suggests that, in studying the prosociality of religious forms, one should pay as much attention to the design features of the credibility-enhancement devices as to the evolutionary landscapes of available opportunities that enhance the credulity of agents.

The functions of ritual in social groups

doi:10.1017/S0140525X15000564, e0

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Abstract: Ritual cognition builds upon social learning biases that may have become specialized for affiliation within social groups. The adaptive problems of group living required a means of identifying group members, ensuring commitment to the group, facilitating cooperation, and maintaining group cohesion. We discuss how ritual serves these social functions.

Norenzayan et al. make a compelling argument that cultural evolution has selected for beliefs and behaviors that increase group solidarity and reduce intragroup conflict. Over time, groups that had religious beliefs and behaviors that promoted intragroup prosociality had a competitive advantage over other groups. Prosocial religions also made it possible to increase group size through outsourcing third-party monitoring of exchanges to Big Gods.

As social networks have increased in size over human history, rituals have allowed groups to remain cohesive, while reducing the need for physical and social proximity. Rituals, which we define as socially stipulated, causally opaque group conventions (Legare & Souza 2012; 2014), are central to the cultural evolution of prosocial religions. The role of ritual in cultural evolution raises compelling questions about the process by which the elements of rituals were aggregated and honed to address the adaptive problems of group living. Here, we discuss how the social functions of ritual solve adaptive problems associated with group living. Ritual is a distinctly human predisposition – a psychologically prepared, culturally inherited, species-specific behavior. We propose that the evolution of ritual cognition builds upon selective social learning biases that may have become increasingly specialized for affiliative functions within social groups.

Engaging in rituals serves a variety of functions that solve adaptive problems associated with group living. First, rituals provide a means of identifying in-group members. Engaging in approved social etiquette and participation in group-specific ceremonies allow identification of in-group members, who are more likely to cooperate and less likely to free-ride than out-group members. Engaging in rituals also demonstrates commitment to in-group values. Rituals often include costly actions, in terms of time and energy expenditure as well as pain and sacrifice, that operate as reliable signals that convey commitment to the group. Individuals who demonstrate commitment to in-group values through ritual participation are more likely to be trusted in cooperative endeavors. Hence, rituals facilitate cooperation with social coalitions. Finally, rituals function as mechanisms of social group cohesion, which, in turn, fosters the longevity of social groups. The term *social cohesion* implies a form of attachment among group members that allows them to think and act as a group (Legare & Watson-Jones 2015).

Group cohesion over time requires mechanisms for high fidelity transmission of group beliefs, values, and practices. We propose that the social stipulation and causal opacity of rituals make them ideally suited to high fidelity cultural transmission and inhibition of individual level innovation (Legare et al. 2015). Ritual behaviors lack a potentially knowable physical causal structure linking actions to outcomes (Humphrey & Laidlaw 1994). Causal opacity may be associated with a key facet of cultural learning that Norenzayan et al. identify: A "willingness to rely on faith in cultural traditions – over personal experience or intuition" (sect. 2.3, para. 1).

Where does the motivation to attend to group consensus, prestigious individuals, and individuals displaying CREDs come from in the context of ritual? We propose that selective social learning biases are motivated by affiliative goals that are adaptive in the context of group living (Herrmann et al. 2013; Legare et al. 2015; Watson-Jones et al. 2014; Watson-Jones et al., in press).

How did ritual cognition evolve? Rituals are cultural adaptations to the problems of group living that are built upon reliably developing features of our social group cognition. Through descent with modification, the motivation to affiliate with social groups and selective social learning biases may have become increasingly interconnected because of their downstream adaptive effects on social group behavior. Evolutionary feedback between learning mechanisms and the environment may have produced our species-specific ritual behavioral phenotype. The phenotypes that emerged from group living may have been selected for by an ongoing process of cumulative cultural evolution (Henrich 2009; Liénard & Boyer 2006; Richerson & Boyd 2005).

Ritual forms may differ between large- and small-scale societies. For example, there is evidence for two basic clusters of ritual dynamics, or "modes of religiosity" – a low-frequency, high-arousal cluster linked to the formation of small cohesive communities (imagistic mode) and high frequency, low-arousal cluster associated with larger, more centralized social morphology (doctrinal mode) (Atkinson & Whitehouse 2011). Big Gods are likely only associated with the doctrinal mode of religious transmission. Big Gods and CREDs increase in importance when it becomes impractical to monitor interactions on a large scale. As ritual coevolved with the expansion of social groups, concepts surrounding moralizing high gods could then act as reinforcers of social norms through their ability to punish individual transgressions that might damage the cohesion and cooperation of the community.

The problem of coordinated and cooperative group action is one of the greatest challenges of social group living (Tooby et al. 2006). Rituals increase within group functioning by providing a means of identifying in-group members, displaying group commitment, facilitating cooperation with coalitions, and increasing social group cohesion. The social functions of ritual have allowed human groups to increase the scale of cooperation, facilitate collective action, and through incorporating concepts of supernatural punishment, promote prosociality. The selective social learning mechanisms associated with ritual cognition may have become increasingly specialized for affiliative functions within social groups. The social-stipulation and causal opacity of ritual also facilitate high fidelity cultural transmission over time.

Clarity and causality needed in claims about Big Gods

doi:10.1017/S0140525X15000576, e0

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Abstract: We welcome Norenzayan et al.'s claim that the prosocial effects of beliefs in supernatural agents extend beyond Big Gods. To date, however, supporting evidence has focused on the Abrahamic Big God, making generalisations difficult. We discuss a recent study that highlights the need for clarity about the causal path by which supernatural beliefs affect the evolution of big societies.

Norenzayan et al. provide a valuable review of ethnographic records, experimental research, and cross-cultural studies related to the cultural evolution of prosocial religions. However, clarification is needed about the causal role that different kinds of gods have played in the evolution of big societies. Previous work has focused on the role of powerful, all-knowing, moral, and punishing gods – Big Gods. Big Gods are central to the Abrahamic religions, which include Christianity and Islam – the two

most successful religions in the world today. As Norenzayan et al. note, priming, economic games, and self-reported charitable giving studies are all based on the effects of the Abrahamic religions, rather than prosocial religions generally. The Abrahamic religions have also driven the results of previous cross-cultural studies. The cross-cultural studies cited (Johnson 2005; Peoples & Marlowe 2012; Roes 1995; Roes & Raymond 2003) are based on the "high god" variable in the Ethnographic Atlas (EA). In a refined subset of these cultures, known as the Standard Cross Cultural Sample (SCCS), there are 40 moralising high gods, 32 of which (80%) belong to Christian or Islamic cultures (variable 2002) (Murdock & White 1969). The remaining eight are either part of another branch of the Abrahamic religions or are plausibly influenced by Abrahamic religions (Atkinson et al. 2014).

There are three major reasons to interpret these studies with caution. First, the moralising high gods considered in these studies have spread with Christianity and Islam, and these religions have a range of unique features that might explain their success. These features include active proselytization, the exclusivity of a single god, belief in an end time, and eternal hell for heresy – none of which are necessarily prosocial. It is therefore not clear that Big Gods have spread because they are prosocial. Second, the Abrahamic religions have spread though processes of cultural diffusion such as trade networks, conquest, and missionisation. These processes led to the transmission of a range of features, including political structures, education systems, subsistence technologies, language, and religion. Cultural diffusion violates the independence assumptions of the statistical methods used in cross-cultural studies, and the diffusion of this suite of traits means that the associations found between Big Gods and big societies do not necessarily reflect a direct causal relationship (Atkinson et al. 2014). Third, because the Abrahamic religions arose within the past 3,000 years, around 9,000 years after humans began the transition to large cooperative societies, they cannot have played a causal role in the emergence of the earliest large human societies.

Though previous research has tended to focus on the role of Big Gods, Norenzayan et al. acknowledge a continuum of supernatural agents and allow for a broad range of moralising supernatural agents. However, as it stands, only the Big Gods corner of this "multidimensional continuum" (sect. 2.5) is explored. If the theory put forward is a general theory about the evolution of prosocial religions, rather than a theory about the recent spread of the Abrahamic religions, then there needs to be more focus on the kinds of religions that were present in early human societies, including premodern societies at various scales of complexity and stratification.

In a recent study, we tested the scope of claims about the role of supernatural agents in the evolution of big societies using a sample of indigenous Austronesian cultures as they were before conversion to Christianity and Islam (Watts et al. 2015). We sought to tease apart two different kinds of supernatural punishment: first, broad supernatural punishment (BSP), which includes punishment by a wide range of supernatural agents, and second, the specific belief in punishment by a moralising high god (MHG). Our sample included 96 cultures, with social structures ranging from small, lineage-based communities such as Arosi, in which reciprocity is likely sufficient to sustain cooperation (Scott 2007), to large, politically complex societies such as Hawaii, which faced the challenge of maintaining cooperation among multiple large communities (Kirch 2010). Language-based trees of Austronesian cultures are a good proxy for the cultural history of the cultures and enable the use of phylogenetic methods (Gray et al. 2009). Phylogenetic methods address Galton's problem by controlling for cultural ancestry (Mace & Holden 2005) and are able to get at the direction of causality by inferring the order that traits tend to evolve (Pagel & Meade 2006). A broad range of supernatural agents were believed responsible for punishment in Austronesia, including the spirits of recently departed ancestors and powerful deities. However, beliefs in the kinds of Big Gods found in Abrahamic religions were scarce. Our results indicated that BSP facilitated the evolution of political complexity in Austronesia, and that MHGs arose after political complexity, though neither sustained political complexity once it had arisen. We do not take our study to be a test of the model put forward in the target article, which includes a complex array of mechanisms that drive the evolution of social complexity. Although further work is needed to establish the mechanism by which BSP facilitates social complexity, the results highlight the potential importance of small gods in the evolution of big societies.

In summary, just as Norenzayan et al. acknowledge a bias in their experimental work towards Abrahamic religions, Abrahamic religions also drive the correlations in most of the comparative studies cited as supporting a role of Big Gods. As a result, these studies cannot tease apart which elements of religion are causally important, nor whether religion is playing a role at all. Future work should (1) systematically catalogue religious variation both within and outside the Abrahamic traditions, (2) test whether and how specific features play a causal role in promoting prosociality and, (3) identify at what points in the evolution of big societies each kind of supernatural agent plays a functional role.

Explaining the success of karmic religions

doi:10.1017/S0140525X15000588, e0

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Abstract: One of the central claims of Norenzayan et al.'s article is that supernatural monitoring and intergroup competition have facilitated the rise of large-scale prosocial religions. Although the authors outline in detail how social instincts that govern supernatural monitoring are honed by cultural evolution and have given rise to Big Gods, they do not provide a clear explanation for the success of karmic religions. Therefore, to test the real scope of their model, Norenzayan et al. need to seriously engage with questions concerning the evolution of karmic prosocial religions.

Norenzayan et al. purport to explain the cultural success of prosocial religions in terms of their effects in sustaining large-scale cooperation. There is much to praise about this work – it is theoretically ambitious and it provides a general framework that combines the strengths of multiple theories in the cognitive science of religion. However, in its current form, the model seems limited in terms of explanatory scope. Although the authors outline in detail how their theory explains the success of prosocial religions with Big Gods (i.e., religions that put emphasis on monitoring, moralizing gods that punish wrongdoing and reward good deeds), they do not provide a clear explanation for the success of karmic religions (i.e., religions such as Buddhism, Hinduism, and Jainism that put emphasis on the idea that one's moral or immoral deeds determine one's future happiness or suffering – in particular, through cycles of reincarnation). In other words, in its current form, Norenzayan et al.'s model does not explain the fact that karmic religions have enjoyed a success that at least parallels the success of Abrahamic traditions. To incorporate karmic religions into their model, the authors must provide an account of the development and spread of karmic religions over time, and the cognitive tendencies that have been harnessed by these traditions. In this commentary, we discuss these two aspects in more detail.

Norenzayan et al. claim that "karmic religions are … also compatible with the prosocial religious elements in the present framework" (sect. 3.2.2, para. 6); and to support this statement, they draw upon the observation that karmic theories of rebirth are found in large-scale societies, whereas the doctrines about rebirth in small-scale societies (e.g., of West Africa and Melanesia) tend to be "amoral" (Obeyesekere 2002). This association, however, between karmic religions and large-scale societies is insufficient as evidence in support of their theory. Notably lacking from their account are details concerning the evolution of karmic religions over time and the compatibility of these historical trajectories with the current framework. Obvious questions that need to be addressed by the authors include the following: What is the evidence that the emergence and spread of karmic religions were the result of their effect in promoting in-group cooperation in the context of intergroup competition? Which elements of karmic religions promoted such cooperation? Further, the authors need to discuss why their explanation is the more parsimonious compared with other accounts that also discuss karmic traditions (e.g., Baumard & Boyer 2013; Baumard et al. 2015; Watts et al. 2015).

Assuming that the karmic component of religious traditions such as Buddhism have contributed to their success through a process of cultural group selection, we are still left with the question of whether evolved cognitive dispositions underpin intuitions about how karma operates, and if so, whether these dispositions are similar to the dispositions related to supernatural monitoring as activated by beliefs in supernatural agents. In fact, Norenzayan et al. remain virtually silent on the issue of which evolved psychological mechanisms underpin karmic traditions, stating simply that in such contexts "cultural evolution may be harnessing a somewhat different psychology" (sect. 3.2.2, para. 6). Yet, only by specifying the exact nature of this different psychology can one envisage whether their model provides a good explanation for the success of karmic religions.

There are multiple possibilities, and these possible scenarios may well apply to only some of the three mainstream karmic prosocial religions (i.e., Buddhism, Hinduism, and Jainism) or even particular traditions within them. For example, some karmic traditions (e.g., Jainism), may hone a different set of evolved cognitive biases that do not depend on supernatural agents as third-party monitors. It is possible that what is necessary is just the acceptance of a principle that behaviors that do not comply with norms are punished in the next life and, conversely, compliance is rewarded (i.e., what goes around comes around). This relationship (between deed and outcome) does not entail a supernatural agent per se. If it turns out that people do not implicate supernatural monitoring in the interim between deeds and the deliverance of reward or punishment, then the authors need to explain which evolved intuitions are driving compliance in these karmic traditions, and how. For example, it could be, as others have argued, that such intuitions arise from our evolved sense of fairness – that is, proportionality between deeds and outcomes (Baumard & Chevallier 2012).

There are other possibilities that may be more fitting with Norenzayan et al.'s model, which credits fear of supernatural punishment with inducing prosociality in religious contexts. For example, perhaps the same evolved social instincts that govern supernatural monitoring also underpin how people reason about immanent justice in some karmic traditions (e.g., Hinduism) – namely, people can assume that supernatural agents (e.g., gods, spirits, and other deities) monitor earthly behaviors and are inherent in the causal chain that links deeds and outcomes (punishment and reward) in the next life. Perhaps karma and supernatural monitoring are represented as independent forces, but what most influences people's behavior are ideas about supernatural agents: ultimately, people comply with norms that they believe the agents will monitor and punish. On these accounts, the success of these karmic traditions is likewise rooted in the same suite of core cognitive faculties, such as mentalizing about other agents' reasoning (theory of mind) and heightened awareness of cues that other people may be watching (e.g., drawings of eyes) and most important, the fear of punishment. Still, it is not clear that the beliefs in supernatural punishment in these traditions involve Big Gods or broader notions of supernatural punishment as defended by Watts et al. (2015). As the authors would acknowledge, because the aforementioned possibilities involve intuitive reasoning, they are better addressed through experimental research rather than through the study of theological representations of religions.

In sum, both historical details and experimental evidence are required to test the real scope of Norenzayan et al.'s model.

Authors' Response

Parochial prosocial religions: Historical and contemporary evidence for a cultural evolutionary process

doi:10.1017/S0140525X15000688, e0

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Abstract: In our response to the 27 commentaries, we refine the theoretical claims, clarify several misconceptions of our framework, and explore substantial disagreements. In doing so, we (1) show that our framework accommodates multiple historical scenarios; (2) debate the historical evidence, particularly about "pre-Axial" religions; (3) offer important details about cultural evolutionary theory; (4) clarify the term *prosociality;* and (4) discuss proximal mechanisms. We review many interesting extensions, amplifications, and qualifications of our approach made by the commentators.

Our target article addressed three questions. One, why is it that the cultural distribution of religious beliefs, behaviors, and traditions is non-random and patterned in particular ways across both space and time? That is, despite the vast religious diversity found in the world, why are most humans today cultural descendants of a handful of extremely successful cultural traditions, now dubbed "world religions?"[1] Two, do world religions reveal socially transmitted elements that effectively harness human psychology in ways that facilitate the scaling up of human societies (among a network of other significant causes unrelated to world religions)? Three, to account for questions 1 and 2, is there an unexplored conceptual space or a "third way" that can integrate the strongest elements of the "cognitive by-product" and

"adaptationist" programs, which have dominated the evolutionary study of religion? We therefore proposed a synthesis, grounded in modern cultural evolutionary theory, to address several old debates, explain additional phenomena related to the spread of religions, and to encourage new horizons for research.

Let us start with a quick scorecard. The 27 commentaries are wide-ranging in scope and cover diverse fields, including anthropology, history, religious studies, philosophy, cognitive science, and psychology. With regard to the first question, most commentaries, if not all, appear to recognize the relevance of this question for the behavioral sciences. This is important because the significant differences between the modern world religions studied by psychologists among mostly WEIRD people and those studied by anthropologists in small-scale societies is often overlooked. With regard to the second question, among the 27 commentaries, a plurality (11) saw merit in the theoretical framework while also offering a variety of important qualifications and extensions; nine commentators were largely critical, and another seven commentators had more ambivalent reactions. Finally, we were surprised about the absence of discussion regarding our third question, although a few commentaries did insist upon revisiting the argument that religious representations and behaviors are merely accidental by-products of human brains that generate no causal effects or feedback loops on human behavior. Overall, because many of the criticisms and critiques arose from substantial misreadings of our theory, we appreciate this opportunity to explain our perspective with greater clarity and precision, with the hope of resolving false disagreements and moving these debates into territory that is more fruitful.

This brings us to the title of our article. Books written in nineteenth-century Victorian England had lengthy, convoluted titles that nevertheless had the virtue of removing confusion about the full content of the book. In that spirit, this Victorian title distills our argument and responds to the many questions and objections raised by commentators:

> On the cultural coevolution of parochial prosocial religions and large scale cooperation, that with escalating intergroup competition, often turns hostile toward outgroups, driven by increasingly potent and diverse supernatural punishment beliefs, karma, extreme rituals in the form of CREDs and other commitment signals, fictive kinship, tribal instincts, moral emotions, self-control, and practices and traditions that suppress selfishness and promote high fertility.

We organize the rest of this response as follows. First, we sharpen the theoretical claims, addressing several misconceptions that have led to false disagreements that do not actually exist. We make these clarifications in two areas. We return to the critical features of prosocial religions that are hypothesized to facilitate large-scale cooperation among coreligionists. Then we clarify issues and objections around the term *prosociality*, exploring at greater depth our claim that this prosociality is largely, though perhaps not always, in-groupish and parochial. This sets the stage for us to explore several substantial issues raised in the commentaries, particularly about how the social solidarity in prosocial religions can feed into large-scale intergroup conflict. Second, we rebut counterarguments about the historical evidence, particularly about "pre-Axial" religions, and show that our theoretical framework is much broader than assumed and can accommodate multiple historical scenarios of the coevolution of prosocial religions and social complexity. Third, we discuss issues surrounding cultural evolution theory, including the role of cultural group selection. Fourth, we review issues raised about proximal mechanisms. Throughout our response, we highlight the many interesting qualifications, extensions, and amplifications of our approach made by several commentators.

R1. Conceptual clarifications of the theoretical framework

We would like to begin with claims that *we did not make* but that were read into, or mistakenly inferred from, our target article.

R1.1. Things that we did not say

We are *not* arguing that:

The presence of Big Gods is the only magic bullet that caused societies to scale up; there are no other elements beside "Big Gods" in the "religious packages" that contributed to the process of escalating social complexity (**Dutton & Madison**; **Krueger**; **Watts, Bulbulia, Gray, & Atkinson** [**Watts et al.**]).

Prosocial religions are a necessary condition for large-scale cooperation; therefore, without prosocial religions, large-scale cooperation is impossible (**Beit-Hallahmi**; **Demetriou, Makris, & Pnevmatikos** [**Demetriou et al.**]; **Galen; Seewald, Hechler, & Kessler** [**Seewald et al.**]).

There are only two types of gods: Big Gods and completely amoral and indifferent gods, without intermediate cases (**Boyer & Baumard**, **Brazil & Farias**, **Watts et al.;** see **Roes** for methodological clarifications).

Only monotheistic religions have Big Gods, or any kind of supernatural agents that could induce greater prosociality; polytheisms are incompatible with Big Gods (**Costello**; **Dutton & Madison**).

Big Gods always precede social complexity (**Watts et al.**).

Other than world religions, there are no other mechanisms that build social solidarity on a large scale, such as ethnic bonds, cultural norms and traditions grounded in moral emotions, and secular institutions and ideologies (**Beit-Hallahmi**, **Galen**, **Seewald et al.**).

Religion occupies a special domain in human cognition (**Boyer & Baumard**)

Prosocial religions encourage indiscriminate and universal love, or that the prosociality in world religions is desirable or morally good for everyone (**Galen**, **Krueger**, **Roes;** see **McKay & Whitehouse** for discussion).

The prosociality that world religions promote do not cause intergroup intolerance, conflict, violence, and within-group inequality, injustice, and exploitation (**Galen**; **Krueger**; **Hobson & Inzlicht**). Or that prosocial religions cannot galvanize cooperation unless they completely eliminate within-group conflict or exploitation (**Seewald et al.**, **Soler & Lenfesty**).

Assuming that these misunderstanding arose from a lack of clarity in our target article, we expand upon these points below.

R1.2. Prosocial religions are part of a much larger network of causes

Our argument is grounded in the idea that cultural evolutionary pressures selected for a broad and diverse suite of

mechanisms that facilitated large-scale cooperation. As we explain in the target article, we hypothesize that complexes of culturally transmitted traits – beliefs, values, practices, traditions that (1) sustain within-group solidarity and (2) promote success in competition with other social groups – are culturally selected to the extent that they allow groups to survive and outcompete other groups. We hypothesize that *any* cultural traits, regardless of whether they are rooted in religious cognition or not, that directly or indirectly promote in-group solidarity in increasingly expanding and competing groups, are targets of cultural selection, meaning they are more likely to persist through time and space. Therefore, we take the view that *prosocial religions are an important cause in a network of causes, but they are not a necessary, perhaps not even a sufficient cause, of large-scale cooperation* (Atran & Henrich 2010; Norenzayan 2015). The framework outlined here is therefore compatible with other causal pathways that also promote large-scale cooperation, such as third-party monitoring and punishment institutions (Fehr & Fischbacher 2004b; Henrich 2006; Henrich & Henrich 2014), the rule of law and effective policing (Hermann et al. 2008; Norenzayan & Gervais 2015; Norris & Inglehart 2004), modes of production, markets, and exchange (Henrich et al. 2010a), moral emotions harnessed and amplified by cultural traditions (Frank 1988; Henrich et al. 2012; Keltner et al. 2014), social safety nets (Hruschka et al. 2014; Norris & Inglehart 2004), ethnic solidarity (Henrich & Henrich 2007, Ch. 9), and so on. In fact, an interesting cluster of open questions are precisely how the religious elements we hypothesize interact with these other mechanisms, and when and how religious mechanisms are replaced with alternatives, as appears to have happened in some societies. As should be clear from the above citations, several of us have worked on these other mechanisms (as have many others we cited in the target article).

Although prosocial religious packages may compete with these alternative routes in particular cases (e.g., religious and secular sources of social safety nets), there is no a priori theoretical reason why these two routes are mutually incompatible. We are puzzled, therefore, why several commentators seem to think that they inevitably are. **Krueger**, for example, points out that there are sources of public morality other than prosocial religions, which of course we agree with entirely and have integrated into our framework (see sect. 1, 2.4, 7.2, and 7.3 in the target article). Similarly, **Beit-Hallahmi**, **Galen**, and **Seewald et al.** point out that secular ideas and institutions can also increase prosociality; that in priming experiments, reminders of secular notions such as "jury" and "judge" also increase prosociality. In fact, that was precisely the point of one of the earliest priming studies we conducted (Shariff & Norenzayan 2007) that these commentators refer to. As **McCauley** points out, there are important questions about the psychological dynamics involved, but this observation can be accommodated within several theoretical frameworks, including the one presented in this target article.

Given this reasoning, readers might wonder, then: Why focus on the causal role of prosocial religions rather than other factors in the scaling up of human societies? There are two important reasons. For one, recall that one of the primary goals of our analysis is to build an account of how world religions spread and stabilized; this necessarily involves a close look at the specific role of prosocial religions in this process. Two, treatments of large-scale cooperation in economics, psychology, geography, and evolutionary biology have considered a broad range of factors, but religion is rarely ever discussed. For example, *The Company of Strangers* (Seabright 2004), a delightful book that is about large-scale cooperation, considers many possible contributing causes but not the potential role of world religions. In *Guns, Germs & Steel* (Diamond 1997a), religious beliefs and practices are rarely mentioned; the rise of priesthood classes is discussed briefly as a *consequence* (not a contributing cause) of population explosions and settled agriculture, which opened the door for "kleptocracy." Conversely, many widely read books on religion tend to either fail to mention any connection with large-scale prosociality or cooperation (parochial or otherwise) or forcefully argue against such effects (Dawkins 2006; Harris 2005), though typically without engaging with the empirical literature.

R1.3. There is a multidimensional spectrum of increasingly potent supernatural punishment and interventionism, not presence versus absence of Big Gods

To our regret, our use of the term *Big Gods*, as a catchy and compact rhetorical heuristic, has done real damage to the comprehensibility of our argument, resulting in a series of crucial misconceptions. This is unfortunate, because the use of the term Big Gods in this target article is meant more as a rhetorical device or theoretical placeholder rather than as an exclusive term; moreover, one of the main goals of this target article was precisely to move beyond this term and present the theoretical framework in its entirety, elaborate and fill in important gaps, and in the process respond to emerging critiques. Hence, the title of our article did not mention Big Gods but rather referred to *the cultural evolution of prosocial religions*.

We therefore see Big Gods as the extreme end of one of the key mechanisms in our framework: the intensity of supernatural punishment and interventionism culturally prevalent in particular place and time. This conceptualization allows for (1) a spectrum of intermediate cases where gods can have some interventionist capacities and some moral concern without fully being classified "Big Gods," and still play an important causal role in the gradual escalation of large-scale cooperation and (2) other supernatural punishment beliefs, emotions, and ensuing norms that may or may not be tied to gods, let alone to only the Big Gods, and let alone to only the great monotheisms of the Abrahamic religions. These include, among other things, moralizing gods with a more circumscribed scope of interventionism, but also notions of imminent justice and karmic beliefs (see **Banerjee**; **White, Sousa, & Prochownik [White et al.]**).

This issue is of particular concern when scholars rely on ethnographic or historical data. **Roes** is quite correct in pointing out that, in databases such as the Ethnographic Atlas or Standard Cross Cultural Sample (SCCS), the variable concerning high gods is often coded as a sharply binary variable (present or absent), whereas the issue of whether or not a given supernatural being counts as a high god, or a moralizing high god, is often subject to interpretation and admits to gradations and qualifications (e.g., Purzycki 2013; Purzycki & McNamara 2016). Binary coding of this

variable may be a convenient methodological tool, but it should not influence our theorizing about the cultural distribution of these beliefs in the historical and ethnographic record. Therefore, our framework does not hinge on testing for the presence versus absence of Big Gods in the ethnographic record, as **Dutton & Madison** imply. This also addresses **Krueger**'s worry about how Big Gods originate in the first place. The important details about origin questions are invariably hard to pin down and require extensive, patient work. But in principle, it is not a mystery how belief in Big Gods come about: They arise from modifications of preexisting beliefs and practices that over historical time become targets of cultural evolutionary selection pressures. We think **Watts et al.,** in their study of Austronesian societies before European contact, present such a case (see sect. R2.2).

In our view, the best methodological response to this concern about historical data is to adopt an expert-centered approach to coding variables, and below we describe just such an effort in which our team is engaged. That is, when attempting to convert "thick," qualitative historical or ethnographic data into quantifiable data – a necessary step for large-scale quantitative analyses – the task of making this conversion should be entrusted to the historical or ethnographic experts, who are best able to weigh the multiple and subtle factors that would argue for one coding rather than another (Slingerland & Sullivan, in press). Moreover, it is important to capture the entire range of supernatural monitoring and punishment beliefs, including intermediate-sized or non-agentic supernatural enforcers of the social orders (see religiondatabase.org; Table R1).

Both **Dutton & Madison** and **Costello** focus on monotheism as the key problem in our theoretical framework. We had hoped that the use of the term "Big Gods" consistently in its plural form would have prevented this misconception. The great monotheisms are, of course, quintessential examples of prosocial religions (and raise interesting questions regarding their potential distinctiveness). Nevertheless, they are a subclass of prosocial religions, and some are arguably not true monotheisms in practice (e.g., Catholic saint worship). As we discuss in section R2.3, we fully agree with **White et al.** that polytheistic prosocial religions, particularly the karmic religions, are as much part of our explanatory framework as the monotheistic ones. Admittedly, we said more about the Abrahamic religions than the karmic religions, for the main reason that there is a dearth of behavioral science research on the latter, a gap our ethnographic team is beginning to rectify. We applaud **White et al.**'s efforts to gather actual data from practitioners of these traditions.

R1.4. Prosocial religions comprise a dynamic suite of converging traits

Building and expanding on the previous point, the intensity of supernatural punishment is a central component of the process, but certainly not the only component, that drove the coevolutionary process that is the central thrust of our argument. The Victorian title that we use above (para. 4) should leave no doubt that our framework includes an entire suite of mechanisms that likely contributed to the escalating social complexity of human societies in the last 12,000 years. **Watson-Jones & Legare** provide a cogent argument for the importance of rituals in building social solidarity. We agree there are a variety of ways by which rituals play a critical role, and research in this area promises to be important and complementary to the framework we described in the target article. One interesting question important for the functioning of prosocial religions is whether some rituals are able to galvanize solidarity beyond face-to-face groups, in imagined moral communities of strangers (e.g., Purzycki & Arakchaa 2013).

This is why we encourage doing away with fruitless semantic debates about the term "religion." Definitions in research, to the extent that they are useful, arise from the gradual maturing of particular theories and are then operationalized for testing against the body of evidence. Definitions rarely ever precede theories, and in developing definitions from theories, pretheoretical intuitions are dropped (not imposed). Hence, contra **Beit-Hallahmi**, we think the scientific study of religion can proceed by first developing good theories to explain specific phenomena and then operationalizing precise variables in ways suitable for empirical inquiry. This could be done without worrying about the exact conceptual boundaries of the broad term "religion," that is, with necessary and sufficient features. This approach also allows researchers to account for the important differences between religious traditions, as Beit-Hallahmi is calling for. As many cognitive scientists of religion before us have suggested, the only reason to use the folk term "religion" at all is for it to serve as a convenient pointer to a common set of phenomena about which we hypothesize.

R1.5. Parochial prosociality

Aside from the term "Big Gods," which caused so much misunderstanding, the other "culprit" in our target article turned out to be the term "prosociality." **Galen, Roes, Krueger**, and **Soler & Lenfesty** express various reservations regarding this term. And although our argument centers on *parochial prosociality*, **McKay & Whitehouse** ask whether there are prospects for world religions transcending it.

In the present framework, escalating intergroup competition is a potent driver of cultural evolution. This has important implications for the type of prosociality we would expect to proliferate. As an evolutionary strategy, parochial prosociality outcompetes both indiscriminate prosociality and a self-interested strategy in a wide range of conditions. As Bowles (2008) puts it, intergroup conflict is altruism's midwife. Applying this insight to prosocial religions, we think that the boundaries of the parochial altruism that this midwifery mediates stretch outward toward coreligionists, but typically not beyond (with some important and interesting exceptions, discussed at the end of this section). Religious cooperation and religious conflict are not incompatible – they are the two sides of the same coin.

It appears that several commentators were unwilling to label a set of behaviors "prosocial" unless they refer to indiscriminate prosociality toward anyone. This led to double confusion in the commentary by **Galen**, when he wrote: "Conflated terms such as 'coreligionists including strangers' and 'anonymous individual from the community' are oxymoronic from the standpoint of distinguishing a complete stranger – possibly an out-group member – from someone who shares some group affiliation with the participant" (para. 3). Of course, the question we are asking,

precisely, is how some religious communities came to be *world religions,* where coreligionists are no longer confined to a face-to-face community of regular interactants. Instead, they expanded into an imagined moral community comprising strangers – that is, people one has never met or heard of – who, moreover, often transcend ethnic, linguistic, and geographic boundaries, such as in Islam, the Mormon Church, Mahayana Buddhism, Bah'ai, and so forth. We need an explanation for why, for example, Mexican Mormons would be willing to cooperate with, or even sacrifice for, Nigerian Mormons on the other side of the globe. Yet, such expanded cooperation is nevertheless bounded, "in-groupish," and tethered to tribal instincts. With real or imagined intergroup conflict and rivalries, it often turns toxic toward those who fall outside of the moral boundaries of the group, fueling indifference, prejudice, and violence toward religious out-groups and toward nonbelievers (for reviews, see Atran & Ginges 2012; Gervais & Norenzayan 2013; Norenzayan 2013).

We speculate that another related source of miscommunication is the attribution of inherent virtue to "prosociality" or "cooperation," a move that we did not make. Prosociality and cooperation in and of themselves are neither good nor bad. The same cooperative tendencies can be directed toward building roads or feeding the homeless, or, at the other extreme, toward the organized plundering of another group or waging war. The moral valence of such acts often turns out to be in the eye of the beholder. This is also true in the case of some bacteria, which cooperate and coordinate in "quorum sensing" to mount infectious attacks on their hosts (e.g., Winans & Bassler 2008) – good for the bacteria, bad for the host organism (an insight that is now being harnessed to create second-generation antibiotics). To use a more extreme example closer to our species, consider suicide attacks. The attacker sacrifices his own life and is seen as a virtuous martyr by his own community and, simultaneously, as a violent mass murderer by the group receiving the brunt of the attack (Atran 2011).

Does this mean that religious prosociality can never transcend the boundaries of the religious ingroup, as **McKay & Whitehouse** ask? We agree it can, under some conditions that may turn out to be extremely interesting and deserving of deeper examination. One hypothesis is that some prosocial religions may encourage extended prosociality when the targets of prosociality are also potential converts, which enhances the community's cultural survival and expansion at the expense of rival groups that do not practice such extended prosociality. For example, Stark (1996) argues that one of the key reasons Christianity spread so rapidly in the early Roman Empire, aside from high fertility rates, was that Christian altruism toward pagans led to steady conversions, particularly in times of mass epidemics and accompanying population decline. Therefore, the "spillover effects" that McKay & Whitehouse's commentary explores are not confined to the lab but exist in the real world as well.

The effects of ritual participation on prosocial behavior might illustrate such spillover effects. **Hobson & Inzlicht** discuss recent data from their own work showing that rituals increase out-group hostility. This is an interesting finding, and not incompatible with the hypothesis that the prosocial effects of ritual are parochial. However, **McKay & Whitehouse** cite several papers showing that rituals, or aspects of rituals such as synchrony, increase prosociality even toward out-groups. We point out two additional studies that show that the effects of some specifically religious ritual participation may indeed extend beyond in-group boundaries. One remarkable field study by Clingingsmith et al. (2009) compared a group of Pakistani Muslims who participated in the Hajj, the annual Muslim pilgrimage to Mecca, to a matched group of participants who were on a waiting list but did not win the lottery to go to the Hajj (hence, the study's design, by utilizing random assignment, largely eliminates selection explanations). They found greater intergroup tolerance among Hajj participants toward Christians and other out-groups. In another study discussed in our target article, Xygalatas et al. (2013) found that participation in the annual Hindu Kavadi ritual increased identification with the broader Mauritian culture by Hindu Mauritians. We think this issue is far from settled, and there likely are important, unidentified mechanisms and boundary conditions that would help us answer this question not just regarding ritual but also regarding other religious elements.

R2. The historical evidence

R2.1. Prosocial religions predating or falling outside of the Abrahamic traditions

In critiquing our use of cross-cultural evidence, **Watts et al.** are correct in observing that the Ethnographic Atlas (EA) and Standard Cross Cultural Sample (SCCS) "high god" cultures are overwhelmingly either Abrahamic religions or plausibly influenced by Abrahamic religions. This is, however, precisely why we provide alternative, non-Abrahamic evidence, such as that from early Mesopotamia, Egypt, and China. Although the lack of solid written or archeological evidence complicates efforts to ascertain whether or not moralistic gods played a role in the rise of the first large-scale agricultural societies approximately 9,000 years ago, several historical trends pointed out in our target article are worth reiterating. After we lay these out, we return to discuss concerns regarding Watts et al.'s own treatment of the independence problem.

Monumental religious architecture – a key feature of prosocial religions according to our framework – appears at least coterminously with the rise of large-scale civilizations in both the Old and New Worlds, and – in the case of sites such as Çatalhöyük and particularly Göbekli Tepe – arguably precedes them. **Boyer & Baumard** maintain that "temples or massive offerings to the gods do not show that the populace was committed to these religious symbols, but more prosaically that coercive authorities could rely on high taxes and large amounts of forced labor" (para. 4). However, this raises the question: Why did archaic, socially complex societies devote a significant proportion of their wealth to apparently nonutilitarian structures? If monumental architecture were not serving the social functions we hypothesize, it is difficult to see how cultures that instead spent their wealth on increased agricultural efficiency, irrigation, defensive walls, superior weapons, or better roads, all else being equal, would not outcompete cultures that buried a significant proportion of their wealth in the ground with dead people.

Moreover, as we document in the target article, once the earliest written records appear, which help determine more precisely the content of ancient religious beliefs, we find

powerful gods concerned with public prosociality playing a central role in ancient societies as diverse as ancient China, Egypt, and Mesopotamia. We completely agree with **Watts et al.** that "future work should (1) systematically catalogue religious variation both within and outside the Abrahamic traditions" and "(3) identify at what points in the evolution of big societies each kind of supernatural agent plays a functional role" (para. 5). To this end, we have been devoting considerable resources to developing the Database of Religious History (DRH), intended to become a publicly accessible, comprehensive database of historical cultures around the globe, with an initial focus on religious variables but plans to expand as well to political, economic, technological, military, and ecological data. The DRH is only in the very early, pilot stages of data collection as we hone its usability and functionality, but even the relatively limited data we have collected to date demonstrate that, as coded by independent experts, morally concerned gods with the power to punish and reward are certainly present outside the Abrahamic traditions and before any hypothesized "Axial Age" (see Table R1).

We agree with **Watts et al.** on the challenges of dealing with the potential historical relationships between societies in the SCCS and the Ethnographic Atlas, and we welcome new methods of inquiry to complement existing analyses. Nevertheless, we caution against rushing to embrace analytical techniques imported from genetic evolution – used to reconstruct species phylogenies – to cultural evolution. Cultural evolution is in some crucial respects unlike genetic evolution (see discussion in sect. R3.1). Species, for example, are not subject to intergroup competition that creates massive and directed horizontal transmission of only some traits. Therefore, we think the first step should be to benchmark phylogenetic techniques to cultural history using known historical cases. To our knowledge, and to the knowledge of two experts on cultural phylogenies we consulted, Mark Collard and Quentin Atkinson (personal communication), that has yet to be done.

R2.2. Compatibility of the present theoretical framework with several cultural evolutionary scenarios

Huebner & Sarkissian, **Demetriou et al.**, and **Watts et al.** present versions of the claim that the wide-ranging evidence we reviewed in the target article is compatible with several possible historical-cultural pathways to large-scale cooperation. We agree. In section 3.2.3, paragraph 4, of the target article, we say that our framework "allows for multiple causal pathways, including the possibility that in some societies prosocial religions played a minor or no role, or that their role emerged late in the process." We also cautioned against the fallacy of assuming there is a single, overarching scenario that is true everywhere and at all times:

> We suspect that history will show some cases in which religious elements spread first, and then societies expanded, and other cases in which the societies expanded, and then the religious elements spread and in turn sustained and broadened the expansion. These alternative historical scenarios are ripe for research (sect. 7.2, para. 3, target article).

It might be that part of the confusion arises from a lack of familiarity with modern cultural evolutionary theory, or falsely attributing unilinear evolutionism of the early twentieth century to our framework, or both.

Huebner & Sarkissian raise some important issues about how some societies might get large-scale cooperation off the ground through nonreligious mechanisms, such as mundane monitoring by other individuals or the ritual-enhanced internalization of values. Focusing on China, Sarkissian (2015) has previously noted that Chinese religious worldviews posited a relatively impersonalized cosmic order in comparison with, for example, the Abrahamic faiths. Although Shang Di or *tian* ("Heaven") of the Shang or Western Zhou was a clearly full-blooded, anthropomorphic Big God, capable of being angered and sending down "mandates" or orders, it should be noted that this Big God did not communicate directly with humans but only indirectly through omens or signs of pleasure (e.g., battle success or good harvests) or displeasure (e.g., natural disasters, military defeats, and popular uprisings). Huebner & Sarkissian further observe that the focus of early Chinese religions tended to be upon individual self-monitoring, bolstered by social monitoring and reliance on such mechanisms as shame. In addition, from at least the time of the state of Qin in the fourth century BCE (the state that eventually went on to defeat the other "Warring States" and found the Qin Dynasty in 221 BCE), the early Chinese developed extremely elaborate and far-reaching legal and bureaucratic institutions that may, Sarkissian (2015) has argued, have provided an essentially "secular" alternative to religious-based cooperation.

We point out that the early Chinese high god *tian* continued to be the object of supernatural reverence throughout imperial Chinese history, receiving offerings and sending down rewards and punishments. In addition, the ability of individuals to self-monitor and internalize norms requires a panoply of rituals and costly displays that are at the center of our proposed cultural complex. Finally, even in the highly bureaucratic and legalistic governments of the Qin and later dynasties, it is not at all clear that supernatural agency is entirely left behind. In important state rituals and sacrificial cults, supernatural endorsement still plays a major role, and belief in the existence and power of supernatural agents remains an important component of individual belief at all levels of society. Though clearly the developmental sequences vary, the current evidence on early China is consistent with the influence of intergroup competition on "scaling up," and for the role of supernatural beliefs and rituals in that process.

In their study of Austronesian societies discussed in their commentary, **Watts et al.** (see Watts et al. 2015) found that "broad supernatural punishment," but not "high gods" per se, played a role in social complexity. This is not only compatible with our framework, but it is also supportive of it. Because there has been limited social complexity in Austronesia (relative to, in particular, Eurasia), there is no reason to expect widespread prevalence of Big Gods. As we noted, these gods represent one corner of a multidimensional spectrum, and certainly no relationship would be expected between the two variables, and none was found. In a cultural region where small-scale societies predominate, one would instead expect a gradual ramping up of moral concern and punishment of norm-violations tied to smaller gods and to other cultural beliefs and practices. And indeed that is what Watts et al. found.

R2.3. The cultural evolution of karma

The issue of impersonal supernatural order brings us to two commentaries, by **White et al.** and **Banerjee.** White et al. take us to task for not exploring in sufficient depth the role of karmic religions in human cultural history despite the fact that we do point out the importance of karmic religions and cite some recent ethnographic literature on their psychological impact. We also acknowledge that beliefs in impersonal supernatural orders might do much of the same work as anthropomorphic deities. Our research teams are currently pursuing empirical studies of karmic beliefs in several field sites.

However, we agree with **White et al.**'s caution to researchers to avoid the fallacy of attributing theological correctness (Barrett 2004) to adherents of karmic – or any other – religion. Although the official theology of some forms of Buddhism, for example, might involve a completely impersonal karmic order, once we leave the scholar's or monk's study, anthropomorphic beings often reappear with a vengeance These include not only punishing and rewarding deities, but also fearsome demons portrayed in popular religious art as the personifications of the karmic order, gripping the wheel of samsara in their teeth and talons (e.g., Lopez 2005). In fact, most Buddhist traditions as actually practiced focus on the veneration of particular deities, who are typically portrayed in anthropomorphic form, and Buddha treated as a Big God (e.g., Purzycki 2013). Some of the forms of Buddhism that are most widespread in East Asia center on personal devotion to Buddhas capable of rewarding one with rebirth in an eternal Pure Land (Payne & Tanaka 2004). As with the case of *tian* in early China – or, indeed, any religious tradition – it is probably the case that within the same tradition we can find varying degrees of personification of the cosmic order.

Banerjee (see also Banerjee & Bloom 2014; 2015) opens an important line of inquiry by suggesting that teleology, or the intuition that objects and events occur for a purpose (Kelemen 2004), is a likely cognitive foundation for karmic beliefs that then become targets of cultural evolution. **White et al.** point to theories that suggest that intuitions of fairness and immanent justice are the basis for this type of thinking (see Baumard & Chevallier 2012). We agree that these ideas of retribution and reward are prominent around the world, but much evidence shows that "fairness" is highly variable across diverse societies (e.g., Henrich et al. 2010a). The egalitarian ideal of fairness referred to in this literature has been tested in the West primarily – and in the industrialized world exclusively (see Furnham 2003).

Regardless of what the underlying cognitive processes may be, explicit karma-like beliefs seem to be widespread (see Obeyesekere 2002) – especially if we broaden our outlook to include related beliefs like witchcraft and *mana* (seen across Oceania). We echo **Banerjee**'s and **White et al.**'s emphasis on this topic. We think a good research direction for the future is to investigate how these beliefs are related to social complexity, social inequality, moral psychology, cooperation, and conflict.

R2.4. Back to "Axial" and "pre-Axial" religions

We commend **Boyer & Baumard** for raising the WEIRD challenge! Cultural and historical diversity is the very focus of the comparative approach that we have used. Our empirical evidence includes ethnographic research in small-scale societies, cross-cultural comparisons more broadly, and historical evidence from a variety of cultures both within and outside of modern WEIRD contexts. Having done this work, we diverge from Boyer & Baumard's interpretation of the historical evidence.

Boyer & Baumard dismiss the importance of the Mesopotamia, Egypt, Mesoamerica, and Early China data as instances of "a common but misleading confusion between the religions of large-scale archaic societies … and 'Axial Age' religions with moralizing and spiritual doctrines that appeared only in a small subset of these societies" (para. 2). In our opinion, the confusion actually lies in (1) a failure to recognize the continuities between these early religious traditions and the later "Axial Age" religions, (2) a lack of recognition of the actual diversity of the posited Axial Age religions, and (3) the relevance of moralistic religious traditions to our central hypothesis.

The idea of an Axial Age was developed against the background of the metaphysical view of the originator of the term, Karl Jaspers (Jaspers 1953), who saw it as the product of a maturing world Spirit (*Weltgeist*). Once this metaphysical notion is put aside, the concept has little theoretical value or empirical support. Empirically, the counterexamples for a supposedly conceptually unified "Age" are many. For example, during the Warring States period (fifth through third centuries BCE) Chinese religious systems such as Confucianism or Daoism – cited by Baumard et al. (2015) as paradigmatic Axial Age religions – in fact lacked major supposed hallmarks of the Axial Age, such as an otherworldly orientation or focus on the afterlife. Confucius, for example, famously dismissed a question about the fate of human beings after death (Slingerland 2003, p. 115). On the flip side, as described in the target article, there is also ample historical evidence that several pre-Axial Age religions were supportive of public morality. New Kingdom Egypt, which well preceded the Axial Age, had many of the characteristics of an Axial Age religion (Assmann 2003). Our particular interpretations of the historical record aside, independent historians identify various "Axial Age" qualities as being present in religious traditions from pre-Axial Age ancient Egypt, China, the non-Christian Mediterranean, and the ancient Near East (see Table 1).

Finally, we acknowledge the distinction between a concept of "spiritualized" morality in something like a Kantian sense (Kant 1785/1964) – moral behavior freely chosen and driven solely by intrinsic motivation – and moral behavior resulting from other motives. We agree with **Boyer & Baumard** that, for example, a Confucian scholar enjoined to follow the Way for its intrinsic moral superiority, in the face of social disapproval, poverty, even death, looks somewhat different from a second millennium BCE Zhou Dynasty king anxious about following moral and ritual structures lest he lose the "Mandate of Heaven," and with it his wealth and his head. However, it is unclear why Boyer & Baumard think that our hypothesis applies to the former only. Moreover, unless one is committed to the belief that this shift from prudential morality to "true" moral commitment is the result of a mysterious *Weltgeist*, the most plausible way to understand the change – as well as the one most in accord with the actual historical evidence – is as the result of a gradual process

Table R1. *Some relevant entries and variables from the Database of Religious History (DRH; http://religiondatabase.org/)*

Question	Amarna Religion	Ancient Egypt	Early Zhou Religion	Pre-Imperial Chu Religion	Late Shang	Chinese State Religion (Shang and Western Zhou)	Chinese Folk Religion	Warring States Religion	Warring States Confucian Thought	Mithraism	Religion in Attica (600 – 300 BCE)	Israelite Religion	Mesopotamia	Zoroastrianism	Lowland Maya
A supreme high god is present:	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	No
Supernatural monitoring of prosocial norm adherence in particular:		Yes				Yes	No	Yes	Yes					Yes	No
Supernatural rewards are bestowed in the afterlife:		Yes			Field Doesn't Know	Yes	Yes		Yes			Field Doesn't Know		Yes	No
[Supernatural punishment] through impersonal cause-effect principle:		No												No	
[Supernatural punishment] to enforce group norms:		Yes				Yes			Yes			Yes		Yes	Yes
[Supernatural punishment] to inhibit selfishness:		Yes				Yes			Yes					Yes	Yes
Are general social norms prescribed by the religious group:	Yes	Yes	Yes	Field Doesn't Know		Yes					Yes			Yes	Yes

Entity Name	**Author**	**Date Range**	**Region**
Amarna Religion	Thomas Schneider	1350 BCE – 1320 BCE	Amarna
Ancient Egypt	Joseph Manning	2000 BCE – 30 BCE	Upper Egypt
Early Zhou Religion	Constance Cook	1046 BCE – 771 BCE	Western Zhou (based on Li Feng)
Pre-Imperial Chu Religion	Constance Cook	790 BCE – 223 BCE	Chu (655 BCE – 585 BCE)
Late Shang	Keightley & Ashton & Slingerland	1250 BCE – 1045 BCE	Middle and Lower Yellow River Valley
Chinese State Religion (Shang and Western Zhou)	Lothar Von Falkenhausen	1750 BCE – 850 BCE	Middle and Lower Yellow River Valley
Chinese Folk Religion	Poo Mu-chou	350 BCE – 200 CE	Qin Dynasty boundaries
Warring States Religion	Armin Selbitschka	481 BCE – 206 BCE	Middle and Lower Yellow River Valley
Warring States Confucian Thought	Edward Slingerland	450 BCE – 221 BCE	Middle and Lower Yellow River Valley+Qin Dynasty boundaries
Mithraism	Roger Beck	100 CE – 400 CE	Roman Empire (Greatest Extent)
Religion in Attica (600 BCE – 300 BCE)	Roger Beck	600 BCE – 300 BCE	Attica
Israelite Religion	Shawn Flynn	1200 BCE – 515 BCE	Levant
Mesopotamia	Karen Sonik/Beate Pongratz-Leisten	3200 BCE – 612 BCE	Mesopotamia
Zoroastrianism	Michael Stausberg	1500 BCE – 500 BCE	Middle East
Lowland Maya	Chris Carleton	600 CE – 900 CE	North America

occurring at different times and in different ways around the world.

The fundamental flaw in the Axial Age hypothesis is its failure to recognize the gradual nature of cultural change. This is why it is unable to account for religions possessing "Axial" qualities that arise outside of the proposed time span, such as Western Zhou and Babylon (1,000 years before), or Islam (800 years after), or elements of the supposed Axial Age monolith appearing independently or sporadically in the historical record. **Atran** amplifies these points and provides additional evidence of pre-Axial moral religions, including evidence for their role in regulating long-distance trade. The gradual nature of this coevolutionary process that intertwines religious elements with social complexity is also illustrated by **Watts et al.**'s study in Austronesian societies.

R3. Modern cultural evolutionary theory

Our theoretical approach to religion is a synthesis that draws from several perspectives, including cultural evolution and culture–gene coevolution (Boyd & Richerson 1985; Cavalli-Sforza & Feldman 1981). In our target article, we were able to outline and explain only the gist of this much broader and detailed framework. The necessary brevity of our treatment might have led to confusion among some commentators (**Beit-Hallahmi**; **Blackmore**; **Krueger**; **Viciana, Loverdo, & Gomila** [**Viciana et al.**]). Next, we address (1) the place of memetics in our framework and (2) the importance and conceptualization of intergroup competition or cultural group selection within the broader framework of cultural evolution.

R3.1. Memetics

Blackmore's commentary focuses on memetics as an important explanatory framework in the study of religion. In our view, all of the useful insights from memetics have long been a part of the broader field of cultural evolution (Boyd & Richerson 1985; Cavalli-Sforza & Feldman 1981). To see this, realize that memetics builds on the notion of replicators (Dawkins 1976). Cultural replicators, termed *memes,* are discrete, gene-like entities that can evolve and spread to the degree that they can replicate with high fidelity and fecundity. Focus is given to the meme's eye view and on the ability of different memes to proliferate and colonize other minds (Blackmore 1999). This view can plausibly describe some limited cases of cultural evolution. However, much of cultural evolution involves (1) continuous (nondiscrete) traits transmitted with substantial errors or systematic transformations (no replication), (2) a constellation of powerful psychological "attractors" that shape traits (Sperber 1996), (3) social learning abilities that combine information gleaned from multiple other people, and (4) the influences of individual experience or trial-and-error learning (Claidiere & Sperber 2007; Henrich & Boyd 2002; Henrich et al. 2008).

Suppose, for example, that a learner observes (with error) and averages the arrow lengths of the three best hunters in his village in deciding how long to make his arrows. He might observe lengths of 15, 16, and 20 inches, and then make his arrow 17.5 inches. Where is the replication or the replicator? None of the models' arrows is 17.5 inches long, so there is actually no replication at all. Yet, a simple cultural evolutionary model, rooted empirically in what is known about human social learning (Morgan & Laland 2012; Morgan et al. 2012), can show that if many individuals are doing this (and making many errors as well as adjustments using trial-and-error learning) over generations, the average arrow length will home in on the optimal arrow length. Hence, modern cultural evolutionary theory allows us to model and study a much broader diversity of psychological processes, including those involving empirically well-established learning mechanisms and cognitive biases. Of course, within this framework, memes can be modeled and studied, and it is even possible to show when and why memes can sometimes provide a suitable approximation of otherwise more complex phenomena (Henrich & Boyd 2002).

R3.2. Cultural group selection

Another element of our cultural evolutionary framework that sowed confusion among some commentators was our reliance on cultural group selection as one important component of the explanatory framework (**Beit-Hallahmi**, **Blackmore**, **Krueger**, **Viciana et al.**). We argue that intergroup competition may have shaped cultural evolution, favoring the spread of particular sets of supernatural beliefs and ritual practices. This use of "cultural group selection" often gives rise to two misunderstandings. One inappropriately applies critiques relevant for *genetic* group selection to *cultural* group selection (Henrich 2004). The other confuses debates about the importance of intergroup competition with a rather technical debate about which mathematical and conceptual accounting system is preferable when building evolutionary models (Fletcher & Doebeli 2009; McElreath & Boyd 2007).

To the first confusion, many commentators may have been intellectually weaned on skepticism toward the relevance of group selection for genetic evolution (e.g., see **Blackmore**). One important source of this skepticism is the tendency of migration among groups to deplete the genetic variation between groups through mixing. Because variation fuels the engine of selection, as the variation among groups declines, so too will the strength of selection between groups. Meanwhile, mixing between groups sustains within-group variation, and hence the within-group components of selection often come to dominate (Hamilton 1975; Wilson & Wilson 2007).

However, with regard to cultural evolution, a quarter century of detailed theoretical work has revealed that cultural evolution is much less susceptible to these effects because of the nature of cultural learning and the speed of cultural evolution (Boyd & Richerson 1990; 2002; Guzman et al. 2007). There are actually many reasons for this crucial distinction, but one key set of reasons involves the tendency of rapid, error-prone, and biased cultural evolution to give rise to many different self-reinforcing stable equilibria (effectively, different social norms). In these equilibria, immigrants from other groups adopt local norms purely based on within-group selection pressures – so they or their children culturally learn how to behave "properly" in the new cultural environment. Unlike in genetic evolution, where genes cannot readily change, between-group differences can be sustained culturally, and thus the power of the group selection component of

the overall evolutionary process is preserved. Empirical work now confirms that, in fact, between-group cultural variation is much greater than between-group genetic variation (Bell et al. 2009; Richerson et al., in press). Hence, one must resist the temptation to simply take lessons (or preconceived notions) from genetic evolution and apply them haphazardly to cultural evolution without systematically considering the differences in the two inheritance systems (**Beit-Hallahmi**, **Blackmore**, **Krueger**, **Viciana et al.**). Of course, as with inclusive fitness formulations (Nowak et al. 2010), important and legitimate controversies persist, so we point readers to two recent target articles in this journal and their respective commentaries on cultural group selection (Richerson et al. in press; Smaldino 2014.

A lack of appreciation for the important difference between genetic and cultural evolution also leads to the common, yet confused, belief that cultural group selection models require within-group homogeneity. Though this is true of many simple models, it is not a general property. For example, many cultural evolutionary models give rise to mixed equilibria, with considerable stable within-group heterogeneity, that generate higher group-level payoffs than other equilibria (e.g., Henrich & Boyd 2008). This can happen in a situation in which different individuals culturally acquire different skills and can then combine these skills to create higher-order group-specific traits (e.g., specialization and trade). Notably, in these situations, what emerge are truly group-level traits (the mixed equilibria) that are not reducible to individual-level traits (Miller & Page 2007; Smaldino 2014). This logic can apply, for example, to rituals: Some participants may know only one part of a ritual, whereas another subgroup knows only another part of that ritual – so the group is culturally heterogeneous in terms of its ritual knowledge internally, but relatively homogenous compared with other groups that have different practices. But, working together, all of the participants can jointly produce emotionally more powerful rituals that strongly bind groups together, which can in turn produce measurable somatic fitness-effects (for further discussion, see Purzycki et al. 2014).

To the second issue, there is apparent confusion about the question of whether intergroup competition might be important in shaping cultural evolution, with an argument among theorists about which accounting systems or conceptual interpretation is the best way to handle this intergroup competition (Lehmann et al. 2007). Some argue that researchers should always narrowly restrict themselves to purely inclusive fitness approaches and interpretations, whereas others argue for the importance of a variety of approaches and take seriously the value of multilevel selection models, at least for some types of problems. That is, one can typically model intergroup competition using any of at least three different conceptual and mathematical frameworks: (1) inclusive, (2) individual, or (3) multilevel accounting. The debate here is *not* about whether intergroup competition matters; it is about how to think about intergroup competition. Relying exclusively on purely individual-level accounting or inclusive fitness accounting can make one miss the fact that intergroup competition is driving important outcomes.

The failure to recognize the centrality of intergroup competition is well illustrated by **Viciana et al.**'s commentary and simulation model. Viciana et al. develop a simulation model in which the evolution of fairness (the sharing of resources) is entirely driven by competition among groups, where groups compete for membership – that is, Viciana et al. developed a classic cultural group selection model (see Boyd & Richerson 2009) without realizing it! Here is their setup: The simulation begins with a large diversity of groups, and these groups are characterized by group-level (not individual-level) traits that prescribe entry costs and some degree of sharing (one possibility is no sharing at all). Groups then compete for membership as individuals make calculations about which groups will give them the highest payoff individually. Analyzing this setup within a multilevel selection framework immediately reveals that the *only* driving force is intergroup competition: Behaviorally (phenotypically) there is zero variation within groups in individuals' willingness to share or to pay entry costs. Instead, all of the behavioral variation in paying access costs and in sharing is between groups. Migrants into new groups must immediately adopt the traits of the group they migrate into. This means that the selective forces *within groups* are not doing anything, and all of the evolutionary change is driven by different group-level traits. Viewed from the point of view of cultural evolutionary theory, this is very similar to models in which social norms emerge as self-reinforcing stable equilibria (creating group-level traits), and then groups at different stable equilibria (with different norms) compete (Boyd & Richerson 1990; 2002; 2009; Henrich 2004). We commend Viciana et al. for developing an interesting model of how fairness norms can evolve through intergroup competition (though a bit more simulation work is needed).

Nevertheless, it is not wrong to conceptualize this model using either individual fitness accounting (averaging across groups) or inclusive fitness. But, in this case, those conceptualizations conceal the fundamental dynamics driving the evolution of fairness in **Viciana et al.**'s model – the competition to attract and retain migrants. There is certainly a sense in which thinking of this as "partner choice" is relevant, mostly in order to compare it with other more quintessential partner choice models (e.g., Hruschka & Henrich 2006). But, individuals in Viciana et al.'s models are actually not evaluating and selecting specific other individuals as potential partners – so a "partner choice" interpretation seems a bit strained. In their simulation, individuals are actually picking *groups* according to which group gives them the best payoffs, and different groups have different *institutional* traits. Eventually, groups not selected by anyone go extinct forever. If one turns off the intergroup competition in their model, fairness no longer evolves at all, ever. Hence, intergroup competition gradually selects the particular combination of access costs and sharing rules that best harness and exploit the fitness-maximizing psychology (or "receiver psychology" as in **Soler & Lenfesty**) of the simulation's agents.

Several commentaries focused solely on within-group dynamics. **Soler & Lenfesty**, for example, seem to think that if priests or elites figure out how to use religious beliefs to scale up cooperation, then intergroup competition is ruled out or rendered unnecessary. Of course, cultural group selection models include both within-group dynamics (elites are out for personal gains within their group) and between-group dynamics (more cooperative groups win wars or attract more migrants). Intergroup competition will, indeed, favor the cultural evolution of better and better cultural technologies for exploiting

"receiver psychology" and use elites and priests as command and control mechanisms. Elites may and often do operate to push things in directions that narrowly benefit themselves. However, if the elites push things too far as they highjack various cultural technologies, and if intergroup competition is intense, they will, in the long run, get crushed by surrounding groups with better institutional forms that more effectively restrained those elites, and galvanize cooperation for success in intergroup competition. Turchin (2005; 2009; 2011), in discussing and modeling these kinds of dynamic historical processes, has shown how we can observe the push and pull of both forces.

Much ethnographic work in the South Pacific illustrates how cultural beliefs actually *inhibit* the ability of elites to overly exploit receiver psychology for their own benefits. In Fiji, anyone can cultivate *mana* (a kind of supernatural power or effectiveness), but improper behavior can turn *mana* against careless practitioners. Having *mana* gives a person greater social standing and is used to explain the potency of both prosocial healing in traditional medicine and antisocial damage from sorcery. *Mana* abused for antisocial ends poses a danger of turning against the abuser, producing illness or misfortune. In the case of Fijian villages, one mitigates the danger of *mana* turning against the practitioner by carefully observing traditional village values and norms (Katz 1999). *Sau*, a similar power or potency that specifically legitimates Fijian chiefs' hereditary authority, depends on a chief's observation of his obligations to the *vanua* (land and people). If a chief fails in these duties, he may lose *sau* and can be ousted from power, thus providing feedback between leader and follower that does not merely capitalize on receiver psychology (McNamara 2014). Overall, detailed ethnographic studies do not support a simple "exploitation" or "kleptocracy" story for religion.

R4. Specifying and debating the mechanisms

R4.1. Good versus mean gods

Johnson & Cohen note that societies where order and prosperity are high may favor the spread of beliefs in benevolent supernatural agents in addition to the authoritarian gods implied in our discussion of supernatural punishment. Research has long recognized that there are psychological benefits associated with the sunnier, more benevolent side of religions. WEIRD people with more benevolent God beliefs have higher self-esteem and coping (Francis et al. 2001; Ironson et al. 2011). Correlational and experimental research indicates that belief in Heaven brings with it notable well-being benefits compared with belief in Hell (Shariff & Aknin 2014). And, along with their colleagues, Johnson & Cohen have begun to empirically show that priming a benevolent, rather than authoritarian, God encourages forgiveness of a transgressor and the willingness to aid out-groups, at least for some religious groups (Johnson et al. 2013).

Johnson & Cohen's commentary raises an important question about the societal conditions under which different balances of supernatural benevolence and punishment would emerge. In a cultural evolutionary framework such as ours, we expect that supernatural agents should tend toward punishment and authoritarianism when existential insecurity is rampant, secular institutions are weak, and real or perceived intergroup threats are high. On the other hand, when societies have reduced existential insecurity, secular alternatives to prosocial religions are firmly in place and keep the cooperative wheels turning, and intergroup competition is largely a matter of attracting converts, the balance would tilt toward supernatural benevolence. This reasoning produces specific hypotheses that can be tested against the historical and ethnographic records. For example, we would expect that over time, increases in existential security and the development of reliable rule of law in a society should be followed by a greater shift toward ideas of supernatural benevolence and less concern with supernatural punishment.

This brings us to explanations of religions as carriers of mechanisms for uncertainty reduction, favored by **Dutton & Madison** and **Brazil & Farias**. Our framework is compatible with this perspective. However, we also point out that some supernatural beliefs in many societies increase uncertainty and fear. In many cases, witchcraft beliefs promote anxieties and paranoia that others are out there, working to do one harm, often out of jealousy. What kinds of cultural evolutionary pressures explain why such belief systems are so stable, and why do they sometimes change?

Prosocial religions offer means to reduce existential uncertainties that are endemic in human life, particularly in places and times of rampant existential threats such as poverty, short life spans, and natural disasters. Some of us have done research that shows effects consistent with this claim (Atran & Norenzayan 2004; Laurin et al. 2012b; Norenzayan & Hansen 2006; Norenzayan et al. 2009). However, there are interesting and unexplored questions in this area ripe for research. Are ideas of supernatural punishment and benevolence equally good at soothing existential anxieties? How are supernatural agency and moral concern related (Purzycki 2013)? Moreover, both historically and cross-culturally, strong rule of law and existential security go hand in hand and jointly contribute to what is called *secularization* (Norris & Inglehart 2004). Yet, why are these conditions of secularization producing a different kind of existential threat – loss of meaning in life, with palpable consequences, such as elevated rates of depression and suicide in more secularized societies (Oishi & Diener 2014)?

R4.2. Gods versus Govs

McCauley raises interesting questions regarding our claim of the interchangeability of God and Gov (to borrow the catchy term by **Huebner & Sarkissian**, who raise similar questions). In past work we found that, although both religious priming and secular priming had comparable effects on prosocial behavior, religious primes more reliably influenced believers, whereas the secular primes influenced everyone (Shariff & Norenzayan 2007). We have also extended the theoretical implications of this idea to show that secular and supernatural sources of prosociality are at least partly interchangeable: Across nations, the rule of law (Norenzayan & Gervais 2015) and experimentally induced secular primes (Gervais & Norenzayan 2012) reduce believers' distrust of atheists, presumably because they undermine the folk intuition that religion is necessary for morality. Kay et al. (2009) have found similar effects of

interchangeability of God and Gov when it comes to threats to personal control (also see Laurin et al. 2012b).

Does this mean that strong governments predictably spell the end of religions? And how irreversible is this process? On the one hand, there is strong evidence of secularization in response to strong rule of law and government effectiveness, along with elevated existential security (Norris & Inglehart 2004; Solt et al. 2011). On the other hand, this process may not occur everywhere, it may be more fragile than previously thought, and it could be undone quickly. **McCauley** notes Sibley and Bulbulia's (2012) study, which found a spike of religiosity among New Zealanders directly affected by the Christchurch earthquake, in a country that is otherwise steadily secularizing (see also Bentzen 2013, for extensive evidence of greater religiosity in places prone to natural disasters). As McCauley puts it, "*Reversals* of the shrinking religiosity characteristic of secularized populations may be no more than a natural disaster away" (para. 8). As the world confronts the possibility of prolonged natural disasters tied to climate change, this finding by Sibley and Bulbulia is of especial importance. We think these are excellent questions that demand more attention.

R4.3. Emotion, motivation, cognition

Ejova proposes a number of intriguing hypotheses regarding how extravagant religious displays may act in part by producing feelings of awe, which in turn may increase prosocial tendencies. The potential role of awe, as well as the other moral emotions such as compassion, empathy, guilt, pride, anger, and shame in prosocial religions, are an unexplored area that deserves greater attention. Another important area that is ripe for research is the precise mechanisms of how and when religious beliefs and behaviors are implicated in self-control. **Hobson & Inzlicht** express skepticism at this link, but we need not choose between two claims, that either religious beliefs and practices enhance self-control, or they don't. Laurin et al. (2012a), for example, find a complex pattern, showing that thoughts of a controlling God increase temptation resistance but decrease goal pursuit. Clearly, we want to see more research to recognize and tease apart these complexities. Following up on McCullough & Willoughby's (2009) seminal review and analysis of the religion–self-control link, **Reynolds & Baumeister** provide a thoughtful blueprint and a set of fruitful hypotheses that can guide future research.

Similarly, **Lindeman & Svedholm-Häkkinen** caution readers against over-interpreting the findings regarding cognitive processes that underlie religious beliefs. We agree, insofar as any new literature that is in its infancy should be treated as suggestive and provisional. We offer two points to add to Lindeman & Svedholm-Häkkinen's analysis. One, we note that religious beliefs are complex and multidetermined. Cognitive processes are one key ingredient, but they are one of several causal pathways that also include motivational and cultural learning mechanisms (Norenzayan 2013). Therefore, we should not expect overwhelming effect sizes from cognitive variables alone on religious beliefs. Two, we note that despite the relatively small literature, a diversity of methods, including neuroimaging, individual difference analyses, and experimental approaches converge in pointing to the same cognitive mechanisms such as mentalizing, mind-body dualism, and teleological intuitions (for a review, see Willard & Norenzayan 2013).

R4.4. CREDs and developmental psychology

Several commentaries (**Boyer & Baumard**; **Corriveau & Chen**; **Huebner & Sarkissian**; **Viciana et al.**; **Watson-Jones & Legare**) attended to our discussion of Credibility Enhancing Displays (CREDs). Here we address some of the key issues.

The application of culture-gene coevolutionary thinking to cultural transmission provides a systematic research program for studying cultural learning in both children and adults. Unlike most work in psychology, the approach begins by using evolutionary theory, often rooted in formal mathematical models, to derive predictions about the *when, where,* and *from whom* of cultural learning (Boyd & Richerson 1985; Henrich & Gil-White 2001; Laland 2004; Nakahashi et al. 2012). For example, relevant to the comments by **Corriveau & Chen**, this body of theoretical work predicted many of the later empirical findings of developmental psychologists on the effects of cultural learning cues such as prestige and attention (Chudek et al. 2012), dialect (Kinzler et al. 2011), competence/success (Chudek et al. 2013), conformity (Corriveau et al. 2009), and sex (Shutts et al. 2013). This approach has allowed a vast body of work on cultural learning, from both developmental and social psychology, as well as economics, biology, and anthropology, to be systematically integrated within the same framework (Chudek et al. 2013; Hoppitt & Laland 2013; Mesoudi 2009).[2]

Two challenges with regard to CREDs were raised by the commentators: one that urged us to integrate more developmental psychology and address particular experimental findings (**Corriveau & Chen**) and a second that made sweeping (and surprising) historical claims about the lack of CREDs in non-WEIRD societies. With regard to Corriveau & Chen, it is worth noting that the original paper on CREDs (Henrich 2009) deploys much supporting laboratory data from developmental psychologists (Harris et al. 2006; Harris & Koenig 2006). As with the more recent studies that Corriveau & Chen highlight (e.g., Corriveau et al. 2015), this work shows that children are not automatically inclined to believe in things like germs and angels. Such findings run contrary to the proposals of some by-product theories that downplay cultural learning influences except for content biases (e.g., Barrett 2004). Instead, this developmental evidence suggests that children's inclinations to believe in invisible agents or entities depend heavily on the combination of the testimony they hear *and* the actions associated with that testimony.

What is striking about the studies discussed by **Corriveau & Chen** is that children exposed to religious CREDs, either through church attendance or parochial school, not only believed in characters that seemed like those from religious stories they had likely heard, but also believed in other fantastical or magical characters. We think this is interesting, but it is not evidence against CREDs. If anything, it suggests that CREDs are capable of shaping belief inferences in a broader range of

domains.[3] The CREDs hypothesis points developmental psychologists toward: (1) the cost of beliefs and actions of children's models, as well as relevance of testimony (testimony is only one element of cultural learning), and (2) the need to study children naturalistically, outside of the laboratory, in daily life.

Boyer & Baumard's comments about CREDs run contrary to much work in anthropology (Sosis et al. 2007; Whitehouse 1995), archaeology, and history (Atran & Henrich 2010). As we noted in the target article, detailed fieldwork in New Guinea (Tuzin 1976; 2001), for example, reveals the painful initiation rites are used by the Ilahita Arapesh in support of the expressed beliefs in the gods of the Tambaran, a cult they explicitly copied from the highly successful and aggressively expanding Abelam. The Ilahita Arapesh believed that by performing the rituals they could persuade the gods to bestow blessing on their community. They eventually became the largest and most successful community in the region. Similarly, in the highlands of New Guinea, decades of painstaking ethnography by Wiessner reveals how competition among groups favored the spread of complexes of supernatural beliefs, particular ideologies, and rituals that promoted solidarity (Wiessner 2002; Wiessner & Tumu 1998).

R5. Concluding remarks

Few topics are as important and as overlooked by scientific research as are religions: their origins, evolution, and impact on human lives. Pushing this frontier back requires a cooperative enterprise that integrates the efforts of historians, anthropologists, psychologists, economists, religious scholars, and many others. Combinations of experimental, neuroscientific, observational, and ethnographic tools and techniques must be deployed systematically, among diverse populations around the globe, to address key questions and theoretically derived predictions. There will be greater progress if historians and religious scholars worked together to construct large and ever-growing historical databases that permit scholars to provide quantifiable answers to central questions. The field also will benefit a great deal if researchers in the behavioral sciences moved beyond WEIRD samples to take full stock of humanity's great religious diversity (Norenzayan 2016). Achieving these goals requires old disciplines to shed old practices and prejudices as well as adopt novel approaches to research. Such changes will not be easy, but the effort will be worthwhile. This is our vision for the study of religion in the twenty-first century.

ACKNOWLEDGMENTS

Ben Purzycki provided helpful comments to an earlier version of this response to the commentaries.

NOTES

1. By "successful cultural traditions," we mean those that are likely to spread and stabilize in space and time. The differential cultural success of religions was highlighted recently by a Pew report suggesting that world religions will further increase their share of the global populations by 2050, whereas membership in categories such as "folk religions" and "unaffiliated" will see a global decline (although the latter "unaffiliated" category is growing in already secularized societies).

2. Corriveau & Chen might appreciate that cultural evolutionary researchers actually make extensive use of children as study participants, and rely heavily on developmental data to test theories (Flynn 2008; Herrmann et al. 2013; Hopper et al. 2010; Kline 2015; Kline et al. 2013; Moya et al., in press). Conversely, developmental psychologists who engage in the study of cultural evolutionary theory are poised to make unique and important contributions to this growing area of research.

3. One concern with Corriveau et al.'s (2015) study is that it lacked random assignment to religious versus secular households. As a consequence, its findings may reflect cognitive differences among individuals that can be vertically transmitted (either genetically or culturally, or both). For example, individuals vary in their tendency to mentalize, which may also influence tendencies toward dualistic and teleological thinking; all of those favor both greater religiosity and paranormal beliefs (Willard & Norenzayan 2013).

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[The letters "a" and "r" before author's initials stand for target article and response references, respectively]

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