Israel Journal of Ecology & Evolution
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tiee20

The extended religious phenotype and the adaptive coupling of ritual and belief
Benjamin G. Purzycki\textsuperscript{a} & Richard Sosis\textsuperscript{b}
\textsuperscript{a} Centre for Human Evolution, Cognition, and Culture, University of British Columbia, 1871 West Mall Vancouver, British Columbia V6T 1Z2, Canada
\textsuperscript{b} Department of Anthropology, University of Connecticut, 354 Mansfield Road, Storrs, Connecticut 06269-2176, USA
Published online: 07 Oct 2013.

To link to this article: http://dx.doi.org/10.1080/15659801.2013.825433

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the “Content”) contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at http://www.tandfonline.com/page/terms-and-conditions
In this paper, we consider the idea that religion is a transsomatic adaptation. At the genic level, the religious system constitutes an extended phenotype that has been fashioned by natural selection to overcome socioecological challenges inherent in human sociality, primarily problems of cooperation and coordination. At the collective level, the religious system constitutes a cognitive niche. We begin our discussion focusing on the former and concentrate our attention on the “sacred coupling” of supernatural agency and ritual behavior. We detail the complex connections between genes, cognitive faculties, and their expression in religious contexts, followed by a discussion of how religious ritual functions to maintain relative social order. We conclude with a discussion about the relevance of niche construction theory for understanding the adaptive nature of religious systems.

Keywords: cognition; extended phenotype; niche construction; religion; ritual

Notes on contributors
Benjamin Purzycki is currently a post-doctoral research fellow at the University of British Columbia’s Centre for Human Evolution, Cognition, and Culture. He is a sociocultural anthropologist who conducts fieldwork in the Tyva Republic. He investigates the evolution of religious systems with a particular emphasis on how people represent gods’ minds.

Richard Sosis is Professor of Anthropology and Director of the Evolution, Cognition, and Culture Program at the University of Connecticut. His work has focused on the evolution of cooperation and the adaptive significance of religious behavior, with particular interest in the relationship between ritual and intra-group cooperation. To explore these issues, he has conducted fieldwork with remote cooperative fishers in the Federated States of Micronesia and with various communities throughout Israel. He is co-founder and co-editor of the journal Religion, Brain & Behavior, which publishes research on the biological study of religion.

Introduction
In the Extended Phenotype (1982), Dawkins asks us to consider the case of a beaver in relation to its environment. He persuasively makes the case for the idea that “its environment” is more a part of the beaver than we might typically think:

By building a dam across the stream the beaver creates a large shoreline which is available for safe and easy foraging without the beaver having to make long and difficult journeys overland. If this interpretation is right, the lake may be regarded as a huge extended phenotype, extending the foraging range of the beaver in a way which is somewhat analogous to the web of a spider. As in the case of the spider web, nobody has done a genetic study of beaver dams, but we really do not need to in order to convince ourselves of the rightness of regarding the dam, and the lake, as part of the phenotypic expression of beaver genes.

It is enough that we accept that beaver dams must have evolved by Darwinian natural selection: this can only have come about if dams have varied under the control of genes (p. 200).

Compare this to Leslie White’s (1952) famous definition of culture as “an extrasomatic mechanism employed by a particular animal species in order to make its life secure and continuous” (p. 8), or consider Binford’s (1962) revision of White’s definition of culture as humans’ “extrasomatic means of adaptation... to its total environment both physical and social” (p. 218).

At the level of the individual, religion – something often considered prototypically cultural – may be understood as an extended phenotype in Dawkins’ sense and therefore an “extrasomatic” adaptation. While lakes and dams are made of water and wood respectively, the religious phenotype is made of concepts, propositions, rules, narratives, artifacts, and behaviors. The faculties that give rise to the features of religion are ultimately linked to individuals’ genes for their behavioral outputs. However, religious consist of more than behavioral outputs; sharedness is a central feature of the adaptive religious system (Purzycki & Sosis, 2010). That is, the constituent components of religious systems exist within individuals, extend between and affect individuals, and reach beyond human communities through generations (Purzycki & Sosis, 2009). As such, at the level of religious groups, religion may be understood as transsomatically adaptive insofar as it requires shared models and effects in order to function optimally for individuals. Here, we isolate the basic components of religion at the level of the individual and situate the religious phenotype within its social and cognitive niche.

*Corresponding author. Email: bgpurzycki@alumni.ubc.ca
Like the extended phenotypic effects of the “mound-building genes” of the termite, “It is incidental that… the proximal theatre of within-body gene effects happens to be distributed among the cells of a large number of… bodies” (Dawkins 1982, p. 201). Likewise, religion is a transsomatic adaptation insofar as what people typically call “religion” is the aggregate phenotypic shadow cast by shared genetic factors that co-occur across human bodies. Like any other “animal artefacts” such as a beaver’s dam or spider web, a considerable amount of religion can be “regarded as a phenotypic tool by which that gene could potentially lever itself into the next generation” (Dawkins 1982, p. 199). In the present piece, we discuss how advances in the evolutionary and cognitive sciences have improved our understanding of the features that constitute religious systems, and we illustrate how religion has been an essential – but neither exclusively internal nor external – feature of the human experience that has been fashioned by natural selection.

Several questions that arise from these perspectives warrant serious consideration. Like the beaver’s lake, can we consider human manifestations of culture such as tools, jewelry, and residences as extended phenotypes of human genes (see Dawkins 2004)? Does selection favor such extrasomatic features in humans? How would selection actually shape such extrasomatic features? In other words, what types of selective forces might design such features? Is it cultural selection or genic selection, or some combination of both? In Dawkins’ terms, there need not be genes exclusively for lake-construction, just as there need not be genes exclusively for projectile or necklace production. Rather, such phenotypes are “product[s] of the interaction of many genes whose influence impinges from both inside and outside the organism” (1982, p. 239).

The evolutionary study of religion is advancing at a rapid pace (Bulbulia et al. 2008; Feierman 2009; Voland & Schiefenhövel 2009) and the evidence for the heritability of traits typically associated with religiosity is mounting (see Bouchard & McGue 2003; Bouchard 2004; Koenig & Bouchard 2006). Researchers generally do not emphasize the genetic underpinnings of religious expression but rather explore the proximate foundations of religious experience and employ evolutionary models to explain variation in religions. Considerable debate exists, especially concerning whether religion is an adaptation or merely a by-product of other evolved capacities (see Bulbulia et al. 2008; Sosis 2009; Pyysiäinen & Hauser 2010; Purzycki et al. in press). There is also the question of whether religion is inherently maladaptive. Dawkins (2006, pp. 200–208), for instance, likens religious adherents to a moth that engages in “self-immolation behavior” by flying into a candle flame; the moth’s perceptual algorithms inform it to do so as these mechanisms serve moths for navigational purposes. Because such an apparatus evolved in moths, false positives under new conditions may entail an individual’s demise (or at least nightly devotional practices toward porch lights). The analogy, however, suffers from a gross oversimplification of what religions are insofar as they are not merely beliefs that lead people to do things. Moreover, like the other accounts we describe below, it ignores the remarkably consistent logic of religious systems’ constituent parts (i.e. its design features), and the benefits that people can often reap through participation (i.e. its fitness effects). Additionally, it ignores the fact that around the world, the features of religious systems often converge under similar conditions.2 We do not deny that religion can lead to disastrous effects for individual fitness (e.g. suicide cults), but such cases are not representative of religious systems around the world.

Here, we offer a different approach to understanding religion that takes account of these patterns and features of religious systems: We view religion as an adaptation that exists within, between, and beyond individuals that increases the chances of genetic survival. In this view, religions’ essential components are supernatural agent concepts, rituals, and their coupling. We discuss this coupling first by detailing the evolved machinery behind mentally representing other minds and how this translates to the perception of supernatural agents. We then address the nature of religious ritual and how it forges the social bonds necessary to minimize the deleterious effects of isolation from social groups. This is followed by a discussion of the convergence of religious belief and ritual. We then build upon this foundation by using contemporary insights from biology and systems theory to further develop the idea that religion is a transsomatic adaptation.

The machinery behind supernatural agency

Let us first consider supernatural agent beliefs. It is typically held that the same cognitive processes that allow us to make sense of other people’s minds are the same processes that allow us to conceive of and interpret the thoughts and behaviors of supernatural agents. Normally functioning people readily and rapidly attribute agency to a wide variety of entities in our world, even when those entities do not have minds (e.g. “my car doesn’t want to start”). This ability to mentally represent others’ mental states is made possible by a complex suite of evolved mechanisms generally considered to be part of the “theory of mind” complex (ToM) (Premack & Woodruff 1978; Baron-Cohen 1995). Agency detection, attribution, and related forms of anthropomorphism are often considered to be the hallmark of religiosity. Indeed, central to all religious traditions are the mental representation of and the commitment to gods, spirits, and other supernatural agentive forces. These patterns, therefore, are likely to be a part of our evolved pan-human cognitive architecture (Barrett & Keil 1996; Barrett 2004). Most people are wanton agent-detectors and religious concepts hinge on this ability (Guthrie 1980, 1995). Barrett (2012) argues that we have a “hypersensitive agency detection device” (HADD), a cognitive mechanism designed to attribute mental states. HADD is “hypersensitive” as it attributes agency even to agentless events and things such as rustling bushes, moving dots on a computer screen, surprising events, gods, and spirits.
While the relationship between mentalizing and religion still requires further investigation, it undoubtedly has become clearer in recent years. First, mentalizing faculties are variable; people with autism spectrum disorder are often diagnosed with deficits in theory of mind, a form of “mindblindness” (Baron-Cohen 1995; Moran et al. 2011; Vivanti et al. 2011). Notably, mentalizing activates specific regions in the brain (see Gallagher & Frith 2003). Among these, the superior temporal sulci in particular has been directly associated with autism spectrum disorder (Zilbovicius 2006). While the question of the precise genetic foundations of autism spectrum disorder remains unanswered, there is considerable evidence that it is partly heritable (El-Fishawy & State 2010). Remarkably, deficits in mentalizing predict reduced religiosity (Norenzayan et al. 2012). Moreover, variation in other aspects of religiosity correlates with variation in neuroanatomy as well, beyond religious upbringing (Kapogiannis et al. 2009). Here, then, we see clear glimpses of the otherwise blurry connections between genetic variation, cognitive faculties, and how they are expressed in social environments. In sum, theory of mind systems constitute the biological foundations of mentalizing and variation in ability of mentalizing predicts variation in religiosity. However, it is not simply mentalizing that is at work in supernatural agency detection. Rather, gods’ minds have content.

Religious discourse often converges around what gods know and care about (Boyer 2001, p. 144). Some researchers have argued that humans commit to supernatural agents because these agents have access to important otherwise unknown social information (Boyer 2001, 2002; Atran 2002; Barrett 2008; Purzycki et al. 2012; Purzycki 2013). Their access to “socially strategic knowledge” makes them particularly salient, and a growing evolutionary literature demonstrates that concepts of supernatural punishment actually minimize antisocial behavior and often promote prosocial behavior (Bering & Johnson 2005; Johnson 2005; Shariff & Norenzayan 2007; Norenzayan and Shariff 2008; Schloss & Murray 2011). So, while representing minds appears to be a central process of religious cognition, the contents of those minds – what gods know and care about – are cross-culturally variable (Purzycki 2011, 2013; Purzycki & Sosis 2011). In other words, what exactly counts as “socially strategic” varies across contexts, just as what counts as “moral” varies from group to group (Shweder et al. 1987, 1997) and from time to time. However, catch-all notions such as these do not explain the limited diversity we find in what gods care about around the world, nor do they answer the question of whether or not a unified cognitive apparatus underlies religious and moral cognition.

It appears that despite the estimated 42000 religions around the world, supernatural agents primarily care about only a handful of domains – interpersonal social behavior, ritual behavior, nonmoral taboos and etiquette, and resource maintenance – all of which have direct implications for interpersonal behavior. All populations have conceptions of these, but we do not know if these domains are rooted in the same evolved apparatus. In other words, are these domains unified somehow by some underlying “moral” or “social strategy” system? Presumably, tightly connected to each of these is a generic psychological sense of “right and wrong.” However, as mentioned before, even if it were the case that a moral system undergirds all of these domains, it remains to be explained why some gods, for instance, care about ritual whereas others care more about morality (see Purzycki 2010, 2013; Purzycki & Sosis 2010 for further discussion). As understanding the nature of ritual is prerequisite for addressing the question, we now turn to this feature of the extended religious phenotype.

**Ritual behavior and the forging of human bonds**

From an outsider’s perspective, religious behavior often appears to be curiously taxing for individuals and remarkably wasteful. The pageantry, time and resource expenditures, body-mutilations (e.g. circumcision, subincision, scarification, piercing, etc.), activism, organization, and so forth all demand considerable investment on the parts of those who engage in them. While traditions vary in terms of their emphasis on religious belief and practice, we often say someone is “really religious” when they devote a lot of resources (time, thought, money, etc.) to the tradition. Individual variation in religious commitment can be measured in terms of such investments. Some evolutionary approaches to religious ritual consider individuals’ religious investments as signals to other people (Sosis & Alcorta 2003; Bulbulia & Sosis 2011). So, while religious rites may appear to be a squandering of resources, the trade-off for paying the costs of these investments can be prolonged cooperative behavior.

The animal kingdom is rife with communicative signals (Hauser 1996; Searcy & Nowicki 2005), defined as the “behavioral, physiological, or morphological characteristics fashioned or maintained by natural selection because they convey information to other organisms” (Otte 1974, p. 385). Obviously, all one needs to do to appreciate the cacophony of animal communication is take a step outside and listen; mating and warning calls, the colors and songs of birds, and so forth are all streams of ongoing communication between animals. One inherent challenge in communication is how effective and reliable information actually is, and this challenge becomes particularly acute when an individual’s reproductive fitness is at stake. The “Handicap Principle” set out by Zahavi and Zahavi (1997) explains that selection favors organisms when they pay high costs to produce signals that reliably indicate their own quality. For example, the peacock’s tail requires a significant energy investment to produce, and it certainly increases the risk of predation. However, the tail serves as a reliable indicator to peahens of the male’s quality; males of lower quality are unable to pay the costs to produce an extravagant tail. Note the dynamic nature of this process; not only do genes, regulatory systems, and ontogenetic factors influence the growth of the tail, but the ability to equate variation in tail quality with variation in mate quality has been forged by natural selection just as much as the tail has.

In terms of religious beliefs, Cronk (2005, p. 608) suggests that even a “willingness to suspend reason and to...
embrace beliefs that appear ridiculous to nonbelievers is itself a hard-to-fake sign of commitment to the religion and a defining feature of the boundary dividing believers from nonbelievers.” Consider the social repercussions of “appearing ridiculous to nonbelievers” by engaging in unusual behaviors or simply rejecting a behavior that is common practice. Just like the somatic displays of other animals, the costs of religious rituals vary within and across individuals. Costly signaling theory, which has been remarkably useful for anthropologists to account for a vast array of behaviors (see Cronk 1994; Bird & Smith, 2005 for reviews), anticipates a positive correlation between the cost of a ritual and the stakes or risk involved in cooperative ventures. Human groups are difficult to maintain and human bonds are potentially tenuous, but religious rituals maintain costs that convey important social information that may help to mitigate these challenges. Rituals can do this in at least three important ways.

First, paying religious costs conveys commitment to the group to which one belongs. This overcomes problems of cooperation insofar as receivers are able to determine that high-cost rituals would not be engaged in if one were-n’t committed to the group. By indicating one’s commitment to the group, costly religious rituals serve as an effective signal that one is a worthwhile partner for prolonged cooperative interaction (see Dawkins & Krebs 1979; Axelrod 1984; Iannaccone 1992, 1995). Second, as such, religious rituals also communicate to outsiders who might be considering participation. Specifically, costly requirements serve as a gatekeeper preventing potential defectors from joining the group. Third, collective rituals convey messages to out-group members who can gauge the level of solidarity between individuals in the observed group (Sosis 2005; Bulbulia 2012).

The evidence supporting the costly signaling theory of religious ritual has considerable breadth from an array of cross-cultural studies of traditions both past and present (for an archaeological example, see Kantner & Vaughn 2012). For example, in economic game experiments, Israeli religious kibbutz members contributed more to the common pool than secular kibbutz members (Sosis & Ruffle 2003, 2004; Ruffle & Sosis 2007), and Afro-Brazilians who were more engaged with their religious communities were more generous than those who were less engaged (Soler 2012). Also, religious communes with costlier obligations outline those with fewer requirements (Sosis & Bressler 2003).

One indication of the bonds forged by religious ritual is perceived trustworthiness (Sosis 2005). Religiosity has been found to predict trustworthiness in a number of studies from diverse populations (Tan & Vogel 2008; Purzycki & Arakchaa 2013; Ruffle & Sosis n.d.). These studies show that this sense of trust extends beyond religious contexts; religiosity predicts trustworthiness in individuals’ economic transactions, reliability in returning lost objects, and even the likelihood of allowing anonymous ritual participants to babysit one’s children (Purzycki & Arakchaa 2013). This approach to the communicative aspects of ritual participation addresses how costly rituals facilitate and maintain cooperation, which can increase individual fitness. If this view is correct, then when others’ reliability is acutely unclear or perceptions of risk are especially heightened, rituals should be manifest. In a cross-cultural study Sosis et al. (2007) found that higher rates of warfare were correlated with costlier ritual obligations. In contexts such as war, where the challenges of organization and mobilization are especially acute, the costs and benefits of defecting are particularly high because one’s life and the lives of one’s kin are at stake. In such conditions costlier rites may serve to strengthen social bonds and minimize the likelihood of defection. Likewise, many pastoralists (Sierksma 1963; Purzycki 2012, pp. 341–360), hunters-gatherers, and fishers (Watanabe 1972; Jordan 2003, p. 146) engage in ritual costs at other groups’ territorial borders in order to honor local spirits and signal prosocial intentions. This indicates that trust-enhancing costs are located precisely where resident groups would desire outsiders’ subservience to the rest of the local norms.

The religious phenotype: the sacred coupling

At its core, the religious phenotype is the coupling of ritual behavior and supernatural agency attribution. Rituals without supernatural agents are otherwise superstitions, forms of secular etiquette, and patterned, repetitive behaviors designed to serve some proximate end. Supernatural agency detection without ritual might be mythical, explanatory, or merely our general tendency to promiscuously find minds in the world at work. Of course, however, features of religion are largely shared and institutionalized; humans share meanings, motivations, and the justifications for behaviors. Also, there is interindividual variation in the mental models, roles, and costs involved in ritual, as well as the models of gods to whom such rites are devoted. Moreover, while there is considerable variation between populations, the coupling of ritual and supernatural agent beliefs is virtually constant all over the world. Stripped of the noise, religious groups are aggregate, global properties of these local phenotypic couplings expressing themselves with relatively similar – but not identical – content. Increased bonds offer increased benefits for individuals, which outweigh the costs of participation.

The cognitive structures that produce religious concepts, such as HADD and ToM, provide the foundation for religious beliefs and behaviors. But the underlying cognitive structures of religion comprise only the seeds that provide the potential for the religious system itself. To be sustained across the life course and across generations, religious beliefs require learning and reinforcement, and religious behaviors require practice. Religious expression requires cultural inputs and cultivation, not just cognitive potential. Whether one believes in Zeus, Vishnu, or Allah will depend on the cultural environment in which one was raised. But exposure to these supernatural agent concepts is not enough to generate commitment to them. So, what does? Adherents throughout the world believe in their gods and not other people’s, regardless of exposure, because adherents perform rituals for their particular
deities (Alcorta & Sosis 2005). In other words, while humans possess the cognitive machinery to believe in gods, the particular gods that humans commit to require cultivation and maintenance. Belief in this regard is not automatic but rather achieved through ritual behaviors, such as supplications to a particular god, ritual presentations of myth, ascetic practices, and healing ceremonies, all of which instill an experience of what religious persons would call the “sacred.” Herein lies the essence of the dynamic nature of the “adaptive religious system.” In other words, ritual behaviors and religious beliefs exist in a feedback loop in which behaviors affect beliefs and beliefs affect behaviors.

In terms of cultivating religious experience, religious ritual is universally used to identify the sacred, and in so doing separate it from the profane (Durkheim, 1915/2001). But, as noted by Rappaport (1999), ritual does not merely identify that which is sacred – it creates the sacred. For instance, holy water is not simply water that has been discovered to be holy, or water that has been rationally demonstrated to have special qualities; rather, it is water that has been transformed through ritual. This is because the sanctifying ritual of holy water collectively alters the participants’ cognitive schema of water itself, rendering them with a template for differentiating holy water from profane water. Most importantly, from a behavioral perspective the emotional significance of sacred and profane water is quite distinct: not only is it inappropriate to treat holy water as one treats profane water; it is emotionally repugnant to do so. The central point can thus be summarized. While religious adherents differentiate sacred and profane things, their cognitive discrimination would be empty without having an emotional reaction to the sacred (Alcorta & Sosis 2005). For it is the emotional significance of the sacred that underlies “faith,” and it is ritual participation that invests the sacred with emotional meaning.

To recapitulate, the two central features of religion are supernatural agency detection and ritual behavior. The former is made possible by the evolved systems devoted to mental state attribution and detection whereas the latter is the behavioral expression of the acceptance of local mores (Rappaport 1999; Purzycki & Sosis 2009). While we frequently engage in both ritual performance and agency detection in our secular lives, religion emerges in their dynamic coupling. This coupling is a human universal (Brown 1991, p. 139), but there is significant cross-cultural variation in content. Some people devote rituals to ancestor spirits while others commit themselves to gods or omnipresent forces. Moreover, there is variation in the materials, relative costs, types of costs, timing, and placement of rituals. We now examine ways in which we can explain this variation.

Extended phenotypes, niche construction, and the evolving religious system

Of course, religious systems are much more than beliefs, rituals, and the cognitive underpinnings that make them possible. Religions also consist of external objects, spaces, and places; using internal representational systems, people navigate the external religious environments that were established by previous generations. And again, those religious environments exhibit diversity around the world. This is the crux of the debate concerning extended phenotypes and niche construction theory (see Dawkins 2004; Jablonka 2004; Laland 2004; Turner 2004; Hunter 2009). Dawkins (2004, p. 377) notes that “the success or failure of buildings does not affect the frequency of architects’ genes in the gene pool. Extended phenotypes are worthy of the name only if they are candidate adaptations for the benefit of alleles responsible for variations in them.” Keeping this in mind, we must not confuse individual expressions of the religious phenotype (i.e. the sacred coupling) with the social environments in which they are a part (i.e. religions). Religions are the aggregate expression of the religious phenotype. Variation across religions lies primarily in the content of those aggregate phenotypes (e.g. currency of cost, timing of rituals, type of supernatural agent, etc.). What, then, explains this variation? Anthropologists have long known that socioecological factors affect patterns of religious expression and new studies reassessing this relationship strongly suggest that religious content shows predictable variation in order to overcome problems posed by specific environmental challenges. We now turn to this research.

Current evolutionary approaches to religion tend to focus on the evolution of psychological mechanisms and explain how we retain religious concepts and behavioral scripts for ritual protocol. They also suggest the importance of researching receiver psychology, and how variation in religious signals and concepts affect behavior. However, religious phenotypes operate within contexts of a multitude of other religious phenotypes (i.e. religious communities and institutions), and by way of shared expectations, behavioral protocols, and the parameters of acceptable behavior, individuals must navigate such contexts (e.g. rules, regulations, expectations, institutions, etc.). How can we account for the persistence of these contexts and their features?

Let us revisit Dawkins’ (1982) notion of the extended phenotype. Extended phenotypic behaviors can take the form of a variety of things such as beaver lakes, spider webs, caddis fly houses, and a bowerbird’s cache of blue objects (see Turner 2000 for more examples). One of the obvious distinctions here between the extended phenotype of, say, blue bits of glass in a bower and religious concepts is that the content of the latter is transmitted through language; specific religious information is transmitted between bodies through direct communication. Bower decorations are the content of the extended phenotypic expression of genes working “at a distance.” In the case of religion, the machinery required to be a religious species is genetically transmitted, whereas the specific informational floursishes – interestingly, Bering (2011, p. 37) calls this “cross-cultural plumage” – which become attached to these faculties (e.g. ancestor spirits, zoomorphic gods, etc.) are transmitted across minds. The same is true for ritual; people convey the same things across cultures using different materials in their offerings.
So, the essential components of religion are rooted in biological systems, while socioecological context determines when and how these faculties are expressed. A bowler’s blue bits of glass and other objects differ from the religious phenotype’s ancestor spirits, gods, myths, and so forth because the socioecological contexts of bowers are not maintained by the social transmission of information. Even though there is some evidence that bowbird males can learn elements of displays from other males, including calls from birds of other species (and even a dog’s bark; Loffredo & Borgia 1986; Diamond 1987; Borgia 1995a, 1995b), bowbirders are not born into their bowers or explicitly taught that bowers are the correct or optimal form of mate attraction, and they are certainly not scolded or ostracized when they fail to make bowers altogether (they just don’t attract mates as successfully). Religions, on the other hand, are a part of the environment into which individuals are born and the content of religion is socially transmitted. Once religious phenotypes become part of the social landscape that individuals navigate, they may introduce novel selection pressures that would otherwise not be there. As such, the extended phenotypic expressions of one’s social environment and the shared content of these phenotypes constitute a social niche. In other words, religions ontogenetically fashion the content, form, timing, and costs of individuals’ phenotypic expressions of the sacred coupling.

Laland et al. (2000, pp. 132–133) define niche construction as “the activities, choices, and metabolic processes of organisms, through which they define, choose, modify, and partly create their own niches.” Odling-Smee (1996, p. 196) details a number of “[o]rganisms [that] change selection pressures by choosing or perturbing their local habitats, or by constructing artefacts.” An anthill, for instance, is a perfect example of a colony of organisms that alters their natural environment, thus introducing new selection pressures. Ants are genetically predisposed to alter their environments and presumably have modules which prevent them from building colonies with unsuitable materials. As such, by crafting a niche, organisms introduce new selection pressures just as much as they may overcome previously endured ones.

Geertz (1973, p. 44) notes that “man is precisely the animal most desperately dependent upon such extragenetic, outside-the-skin control mechanisms, such cultural programs, for ordering his behavior.” As we have seen above, and as others have illustrated quite beautifully (Pinker 2002; Ridley 2004), there is no clear point at which genes stop and culture begins. Moreover, such “cultural programs” are very much “inside the skin” of people. Humans are masters of niche construction – or what Dawkins (2004) calls “niche changing” – as we create landscapes, institutions, and communities that change how individuals interact with the environment. However, we also create social realities in the form of interpenetrating institutions which, as already discussed, create particular avenues that we navigate. A “cognitive niche” is the “dramatic increase in the use of contingent information for the regulation of improvised behavior that is successfully tailored to local conditions” (Tooby & DeVore, 1987; Cosmides & Tooby 2000, p. 53). Our social environments operate as natural environments insofar as individuals must ontogenetically acclimate to them and behave in such ways that do not violate the boundaries by which our institutions delimit. These environmental pressures, in turn, regulate how the religious phenotype is expressed.

Scholars have begun to recognize the value of approaching religion as an environmental niche (Sorensen 2004). Bulbulia (2008, p. 21), for example, argues that religion is a system of organized behavior and knowledge, together with whatever artifacts and other symbolic structures (musical scores, texts, religious architecture) that is supported, retained, improved, and transmitted at least in part because we possess cognitive capacities to believe and morally commit to supernatural realities and purposes.

Additionally, however, religions are moral communities in the sense that there are encoded expectations and forms of appropriate and inappropriate conduct. Moreover, people navigate this social niche by engaging in rituals which, as discussed above, communicate sharedness and commitment: “it is the religious niche that affords those habitats whose information properties are capable of enduring the slings and arrows of cooperation’s inevitable frustrations, which favour inefficient but safe patterns of transaction” (Bulbulia & Sosis 2011, p. 376; see also Kydd 2008). Natural selection favors genes that make social organisms engage in stable and reliable cooperative endeavors. Such endeavors have inherent problems that rituals function to minimize. In this way, religion is a “phenotypic tool by which... gene[s] could potentially lever [themselves] into the next generation” (Dawkins 1982, p. 199) and the “cognitive niche” aspect of religious groups introduces additional pressures that motivate conformity to social mores. This niche provides the content to which the religious phenotypes of incoming generations must conform, the parameters of what constitutes appropriate costs, and when those costs are appropriately paid.

Conclusion

What, then, of the formation of religious niches’ content? Viewing religions as niches into which people are born and which they become part of is a helpful view, but it does not necessarily address how the specific content of particular niches emerges in the first place. Humans located in different geographic regions face different adaptive challenges. One persistent problem for all humans, however, is our reliance on others to maintain the cooperative relationships that have undoubtedly served our species for millennia. Who are reliable partners? How can we negotiate access to limited resources?

Different modes of subsistence have locally specific problems of cooperation and coordination. In a number of studies, state-level social organization predicts the presence of moralistic high gods (Swanson 1960; Wallace 1966; Stark 2001; Johnson 2005; Sanderson 2008; Lahti...
beavers in the area, whether they created it or whether they just found it and exploited it (1982, p. 234).

Note that in this case, freeriding may in turn overrun such a system to the point where genes for the big-lake phenotype become outcompeted. As we discuss below, religious ritual functions to prevent such exploitation by imposing costs upon participants as a means to keep freeriding at bay.

However, if it is the case that under particular external conditions, religious systems provide advantages for individual agents when their constituent parts, both internal and external to the individual, converge in a particular way, then the question of whether or not natural selection also "operates" at an emergent level is an important one. So, while genes are the foundational replicators of the evolutionary process, it may be that emergent properties of human social systems – when their components “lock into place” – may provide benefits for individuals which would otherwise be unattainable. But the benefits are only reaped when this convergence of units consists of a particular logic and that logic must exist within a compatible socioecological context. In other words, selection may favor the expression of specific kinds of religious systems, a possibility that lies beyond the scope of strictly cognitive approaches to religion (see Malley 1995, 1997; Sørensen 2004; Purzycki et al. in press).

2. Dawkins’ hostility toward religion is well-known, but his characterization of religion as a maladaptive by-product is notably odd in light of his other work. Of course, he knows the distinctions between “adaptive”, “good”, and “accurate.” He also understands how flimsy “byproduct” arguments can be:

A geneticist colleague has argued that there are virtually no behaviour-genetic traits, because all those so far discovered have turned about to be ‘byproducts’ of more fundamental morphological or physiological effects. But what on earth does he think any genetic trait is, morphological, physiological or behavioural, if not a ‘byproduct’ of something more fundamental? If we think the matter through we find that all genetic effects are ‘byproducts’ except protein molecules (1982, p. 197).

Presumably, Dawkins’ primary concerns are with religions in contemporary state-level societies rather than smaller, traditional societies. As such, it is perfectly conceivable that under contemporary conditions, religion may be maladaptive, but research suggests that religious people in state societies are doing remarkably well on the reproductive front (Fredja & Westoff 2008; Blume 2009, 2010; Kaufmann 2010).

3. This number was taken from http://www.adherents.com/ on 22 April 2013.


