

Understanding Religion from Cultural and Biological Perspectives

Stefanie B. Northover and Adam B. Cohen

We present a synthesized cultural and biological explanation of the origin of religious beliefs and behaviors. Any phenomenon is the effect of multiple causes (Mayr, 1961), but we will pay special attention to cultural and biological causes. Specifically, we will propose that religious beliefs first appeared as byproducts of evolved cognitive adaptations, that these byproducts may be adaptive or functional, and that cultural learning largely determines the details of one's religious beliefs and behaviors and partly determines the degree of one's religiosity. In all we discuss religion as a product of a complex interplay of culture and biology.

First, we note that it is not easy to discuss what features religions do and do not have in common, or even what a religion is. As Cohen (2009) noted, religion is a fuzzy set, comprised of religious traditions with very different features. Nonetheless, all religions involve moral codes, rituals, community, and beliefs about supernatural agents (Atran & Norenzayan, 2004; Saroglou, 2011). While these commonalities are important, some liberties must be taken in considering certain features to be common across religions (for example, considering both Buddha and the Jewish God to be supernatural agents), while also acknowledging the unique cultural instantiations of religions.

Where Religions Come From

There is no way of knowing exactly when religion emerged, but certain behaviors among non-human primates, such as chimpanzee accumulative stone throwing, share features with human rituals (Kühl et al., 2016).

Precursors of religious beliefs and behaviors might, therefore, have emerged in our pre-human ancestors. Humans are equipped with evolved psychological mechanisms for solving problems of survival and reproduction that recurred over evolutionary history. Many religious representations have been explained as byproducts of these adaptive cognitive systems. Religious concepts may flow naturally from intuitive mental systems such as teleology (Kelemen, 2004), person permanence (Bering, 2011), dualism (Bloom, 2005), agency detection, anthropomorphism, and theory of mind. We will focus on the last three.

Supernatural Agents

Supernatural agents play a large role in religion (Atran & Norenzayan, 2004; Barrett, 2000; Boyer, 2003; Guthrie, 1993). An agent is an animal, person, or other being that reacts to others and can move of its own accord (Barrett, 2004; Boyer, 2001, 2003). Belief in supernatural agents, including gods, spirits, ancestors, ghosts, demons, angels, and jinn, is culturally universal (Pyysiäinen, 2009; Whitehouse, 2004).

Humans possess a cognitive mechanism for detecting agency. This ability to recognize agents goes beyond mere object recognition, as demonstrated by New, Cosmides, and Tooby (2007). Participants were shown images of scenes, such as an African savannah or a desk, and then, a moment later, shown the images again with an object, person, or animal missing. Participants more quickly and accurately detected changes in people and animals (i.e., agents) than in inanimate objects. For example, participants did a better job of spotting a distant gray elephant on a fairly gray background than they did of spotting a red van on a green background, even though the image of the van was larger than that of the elephant.

We can be reasonably certain that agency detection has always been adaptive. Throughout human evolutionary history, people and animals have afforded opportunities and imposed costs (New et al., 2007). Agency detection allows adaptive responding, for example avoiding or defending against threatening agents (such as predatory animals and human enemies) and approaching beneficial agents (such as food animals and caretakers).

Our agency detection mechanism is highly sensitive, frequently over-inferring the presence of agents (Atran & Norenzayan, 2004; Barrett, 2000; Guthrie, 1993). Agency detection may be triggered by non-agentic stimuli such as rustling grass or simple geometric shapes moving on a screen (Bloom & Veres, 1999; Heider & Simmel, 1944). The threshold may be set low because failing to notice a dangerous agent can be deadly.

Many have hypothesized that belief in supernatural agents is a byproduct of our adaptation for detecting agents (Atran & Norenzayan, 2004; Barrett, 2000). Empirical evidence is somewhat lacking, however. Tests of this hypothesis have revealed no correlation between religious belief and illusory agent detection (van Elk, 2013) and no effect of supernatural agent primes on agency detection (van Elk, Rutjens, van der Pligt, & van Harreveld, 2016).

Anthropomorphism

Supernatural agents are often conceptualized as humanlike (Boyer, 2001). Anthropomorphism, the interpretation of non-human beings or traits as humanlike (Guthrie, 1980), is found in every culture (Brown, 1991; Guthrie, 1996) and can be understood as an adaptation for group living. Humans are highly social animals who depend on each other for survival (by providing each other with mating opportunities, protection, resources, and so on) but also impose costs on each other. Therefore, humans possess evolved cognitive mechanisms for perceiving other humans, mechanisms that allow the recognition of other humans, human behavior, and the consequences of human behavior (Guthrie, 1993). These mechanisms may err on the side of perceiving ambiguous stimuli as human or caused by humans. For instance, people often see humanlike faces in clouds, smoke, and geological features, or hear voices in the wind (Atran & Norenzayan, 2004; Schick & Vaughn, 2005).

Theologies often contain ideas about superhuman supernatural agents; however, people often think of supernatural agents in simpler and intuitive – humanlike – ways (Barrett, 2000; Barrett & Keil, 1996; Boyer, 2001; Gervais, 2013b). In one classic study, participants heard or read stories about God and then answered questions about or paraphrased the content of the stories. Participants who endorsed a theologically correct description of God (as omnipotent, omniscient, omnipresent, etc.) on a separate questionnaire nonetheless frequently projected human limitations on God when recalling the stories, even though the stories left God’s abilities open to interpretation. For example, the following line comes from a story about a boy who gets his leg stuck between two rocks in a river and prays to God to save him from drowning: “Though God was answering another prayer in another part of the world when the boy started praying, before long God responded by pushing one of the rocks so the boy could get his leg out” (Barret & Keil, 1996, p. 224). Participants often indicated that God answered the prayer in another part of the world before answering the

boy's prayer – doing one task after another, as a human would – rather than answering two prayers at the same time. Hindus in India responded similarly (Barrett, 1998). This study is often cited as an example of a cognitive constraint on religious concepts. This interpretation has received criticism, however. Westh (2014) argued that participants anthropomorphized God at least in part because the language of the stories strongly implied an anthropomorphic version of God. Westh (2014) also suggested that the universality of religious anthropomorphic concepts is due to the universality of story-telling.

Further evidence for a link between anthropomorphism and religion comes from a study in which religious believers perceived more faces in images of scenery than skeptics did (Riecki, Lindeman, Aleneff, Halme, & Nuortimo, 2013). On the other hand, Norenzayan, Hansen, and Cady (2008) found no relationship between participants' belief in religious supernatural agents and their tendency to anthropomorphize a tree and a volcano.

Theory of Mind

Supernatural beings are often endowed with humanlike minds; in fact, Boyer (2001) claims that the mind is the only humanlike trait supernatural agents are always believed to possess. Perceiving the minds of others is referred to as mentalizing, and someone with the ability to mentalize possesses a theory of mind. Individuals with a theory of mind understand that other people have thoughts, desires, intentions, memories, and knowledge, and that these may differ from their own (Premack & Woodruff, 1978).

Theory of mind is critical for a species as socially sophisticated as humans; it allows individuals to interpret and predict the behavior of others, to accurately determine what other people know (or what they *think* they know, as their representations may be incorrect), and to read between the lines (for example, sometimes "I'll call you" means "Get lost"). Humans often err on the side of mind over-perception. Both adults and children have attributed mental states to stimuli as varied as robots, action figures, blobs, and animated shapes on screens (Abell, Happé, & Frith, 2000; Csibra, Gergely, Bíró, Koós, & Brockbank, 1999; Gergely, Nádasdy, Csibra, & Bíró, 1995; Morewedge, Preston, & Wegner, 2007).

Some support for the idea that belief in supernatural agents is a byproduct of theory of mind comes from a comparison of men and women. On average, women are more religious than men, and they also perform better on theory of mind tasks than men do (Baron-Cohen, Knickmeyer, & Belmonte, 2005; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001;

Stiller & Dunbar, 2007). This gender difference is apparently driven to some extent by women's greater mentalizing abilities (Norenzayan, Gervais, & Trzesniewski, 2012; Rosenkranz & Charlton, 2013). Furthermore, individuals diagnosed with autism, a developmental disorder characterized by a deficit in mentalizing abilities, tend to report less belief in God than neurotypical individuals, and the relationship between autism and belief is mediated by mentalizing (Norenzayan, Gervais and Trzesniewski, 2012). Finally, functional magnetic resonance imaging (fMRI) studies have found that the brain regions associated with theory of mind activate when religious participants pray to or think about God (Kapogiannis et al., 2009; Schjoedt, Stødkilde-Jørgensen, Geertz, & Roepstorff, 2009).

Evidence and Conclusions

We have described three cognitive biases: agency detection, anthropomorphism, and theory of mind. All of these are intuitive mental systems, and there is evidence that religious belief is related to intuitive thinking generally. Participants who favor intuitive thinking or have been put into an intuitive state of mind report stronger belief in God than participants who favor analytical thinking or have been put into an analytical state of mind (Gervais & Norenzayan, 2012; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Shenhav, Rand, & Greene, 2012).

According to one point of view, religious representations are byproducts of evolved cognitive mechanisms for adaptively detecting and understanding animals and people. This may help to explain the ubiquity of religion across cultures. Furthermore, it seems that anthropomorphism, mentalizing abilities, and intuitive thinking can explain some of the variance in religious belief. In our view there is less empirical support for agency detection as underpinning religion. Some researchers have argued that intuitive cognitive biases are not a cause of religious beliefs, but account for which features of religious beliefs are easy to mentally represent (Gervais & Najle, 2015). From this perspective, anthropomorphism, for example, does not cause belief in supernatural agents, but explains why supernatural agents tend to be anthropomorphic.

From Byproducts to Adaptive Religion

Some scholars have promoted the view that religion can be adaptive. Rather than seeing religion as either a byproduct or an adaptation, we think it is possible that religious beliefs and behaviors began as byproducts, and

some of these then provided useful functions. Thus, some religious beliefs and behaviors may be *exaptations* – useful features not developed by natural selection for their current function (Gould & Vrba, 1982).

Researchers have long noted a connection between religion and cooperation, and religion may be an adaptation (or exaptation) to promote intragroup cooperation (e.g., Irons, 2001; Wilson, 2002; Xygalatas et al., 2013). Evolutionary theories of kin selection, reciprocal altruism, and indirect reciprocity are inadequate to explain the high level of cooperation demonstrated by humans, particularly in the context of interactions between genetically unrelated people, because individuals are tempted to free-ride on the efforts of others (Dawkins, 1976). Here we discuss two theories of how religious behaviors and beliefs have served to promote intragroup cooperation: supernatural punishment and commitment signaling.

Supernatural Punishment

One prominent theory is that people cooperate because they fear punishment from supernatural agents or impersonal cosmic forces (e.g., karma) for violating norms and moral codes (Bering & Johnson, 2005; D. Johnson, 2015; D. Johnson & Krüger, 2004; Norenzayan, 2013). Misfortunes, such as illness, death, or scarcity, are frequently interpreted as punishment from supernatural agents (Bering, 2011; Boehm, 2008; Froese & Bader, 2010; Hartberg, Cox, & Villamayor-Tomas, 2014; Hartland, 1924; Murdock, 1980; Swanson, 1960). Furthermore, many cultures believe that supernatural punishment extends to the transgressor's family and friends (Aten et al., 2008; Bering & Johnson, 2005; Hartberg et al., 2014) and to the afterlife. World Values Survey data collected from 2010 to 2014 revealed that about 60% of people worldwide believe in Hell (D. Johnson, 2016, p. 63).

Fear of supernatural punishment is possibly a multilevel adaptation. First, individuals who are caught cheating others suffer negative consequences such as loss of reputation and punishment from group members. With the emergence of language came greater risk of discovery, as those who bore witness to transgressive behavior could spread the word. Individuals who feared supernatural punishment were probably less likely to violate cooperative norms and, therefore, less likely to get *caught* violating cooperative norms. Fear of supernatural punishment profited individual believers by sparing them from the costs (e.g., punishment, revenge) group members imposed on those caught breaking rules. Second, within a group, widespread fear of supernatural punishment for cheating and other antisocial behaviors that erode trust may increase intragroup cooperation

(D. Johnson & Krüger, 2004) and reduce the amount of costly sanctioning that must be carried out (D. Johnson, 2016). Thus, fear of supernatural punishment might have conferred fitness benefits on individuals as well as groups (D. Johnson, 2015, 2016; D. Johnson & Bering, 2006; D. Johnson & Krüger, 2004).

Evidence for Supernatural Punishment

Two experiments found that belief in the presence of supernatural agents deterred cheating among children (Piazza, Bering, & Ingram, 2011) and adults (Bering, McLeod, & Shackelford, 2005). It is unclear, however, whether the participants anticipated punishment from the supernatural agents (an invisible princess in the former and a ghost in the latter). People do intuitively attribute morally relevant knowledge to God, however. Participants in a study conducted by Purzycki and colleagues (2012) responded more quickly to questions about God's knowledge of moral transgressions (e.g., "Does God know that Adam cheats on his taxes?") than to those about morally irrelevant information ("Does God know how many pickles Stefanie has in her refrigerator?") even though people explicitly claim that God's omniscience means he knows absolutely everything. The results were the same when God was replaced with a fictional omniscient agent, as long as the agent punished moral transgressions. Furthermore, in Burkina Faso, entrepreneurs had a greater tendency to play an economic game fairly when they were first reminded of supernatural punishment (Hadnes & Schumacher, 2012).

As its name implies, the supernatural punishment hypothesis focuses on punishment rather than reward. Research suggests that punishment is more conducive than reward to cooperation (Gürerk, Irlenbusch, & Rockenbach, 2006; D. Johnson, 2016). An investigation of 67 societies revealed a negative correlation between crime rate and belief in Hell, but a *positive* correlation between crime rate and belief in Heaven (Shariff & Rhemtulla, 2012). In a lab study, participants who reported that God was vengeful and punishing cheated less on a task than participants who reported that God was forgiving and compassionate (Shariff & Norenzayan, 2011). Finally, in a series of economic games, participants more frequently believed that people, rather than computers or chance, caused negative outcomes, but not positive outcomes. That is, unfavorable events were more likely to be seen as caused by agents than favorable events were (Morewedge, 2009).

The studies discussed so far put forth substantial, though not completely unambiguous, evidence that belief in supernatural punishment

reduces antisocial behavior. Two experimental studies suggest that fear of supernatural punishment can also increase prosocial behavior (Hadnes & Schumacher, 2012; Yilmaz & Bahçekapili, 2016). Furthermore, supernatural punishment is frequently involved in the cooperative management of shared natural resources such as water, forests, and fisheries (Hartberg et al., 2014; Snarey, 1996). Currently, there is indirect evidence to support the hypothesis that belief in supernatural punishment increases intragroup cooperation.

It should be noted that belief in supernatural punishment is not a perfect mechanism for good. Belief in supernatural punishment increases compliance with group norms but these norms may not be good for every individual, and may even be considered morally repugnant by other groups. For example, various misfortunes have been explained as divine punishment for homosexuality (Tashman, 2011), feminism (Goodstein, 2001), weaving on the wrong day of the week (Boehm, 2008), and failure to practice the “correct” religion (*USA Today*, 2012; Tashman, 2016; Wood, 2010). Belief in supernatural punishment is associated with aggression (K. Johnson, Li, Cohen, & Okun, 2013), victim blaming (Strömwall, Alfredsson, & Landström, 2013), and justification of inequality (Cotterill, Sidanius, Bhardwaj, & Kumar, 2014). All that said, societal coordination and cooperation often depend on people being able to send and receive signals of their intentions and trustworthiness. For that reason, we next discuss theories about religious signals of cooperative intent.

Costly Signals

Animals sometimes display phenotypic traits or behaviors that are difficult to understand from an evolutionary perspective, because they are costly. Perhaps the best-known example is the extravagant train of a peacock. Peacock trains are metabolically costly and should hinder escape from danger. Springboks and gazelles provide another example (Sosis & Alcorta, 2003). These animals may vigorously jump into the air, or *stot*, when predators are nearby, drawing the attention of predators and expending precious energy moments before they may have to run for their lives. According to costly signaling theory, costly physiological traits and behaviors are designed to signal some underlying, unobservable trait (Sosis, 2003). An extravagant train may be a reliable signal of a peacock’s genetic quality and health. This costly signal may attract mates or scare off rivals and predators. For a gazelle, stotting may be a reliable signal of swiftness. A stotting gazelle may benefit by signaling to predators that she is not worth chasing, as she will probably escape. The costliness of these signals is what makes them

reliable; only healthy, fit individuals can bear the cost of stotting or growing an extravagant train.

Strange as it may seem, such ideas have been applied to religion. Previously, we discussed the difficulty of achieving cooperation within groups. Individuals often stand to gain the most by free-riding on the cooperative efforts of others (Sosis, 2003). Costly signaling is perhaps a method of solving the problem of free-riding. Group members wish to discriminate between those who will cooperate and those who will attempt to free-ride; individuals who are committed to the group's values signal that commitment with costly religious behaviors (Sosis, 2003). Religious behaviors may cost time (e.g., time spent praying and attending services) and resources (e.g., tithing, sacrificing animals). The true cost of religious behaviors may be the same for those who are committed to the values of a group and those who are not. However, those who are committed to religious values perceive fewer costs and greater benefits than those who are not committed, because they believe religious ideas about supernatural rewards (e.g., Heaven) for religious behaviors and punishments (e.g., Hell) for breaking religious rules (Bulbulia, 2004; Sosis, 2003). Therefore, individuals who are not committed to the values of the group are less likely to participate in costly religious behaviors and can thus be identified and avoided. Costly signaling theory proposes that the tendency to display costly signals is an evolved adaptation; costly signalers gain the trust and acceptance of group members and therefore benefit from group membership (Bulbulia, 2004; Irons, 2001; Wilson, 2002). Moreover, because costly signaling promotes cooperation within groups, it may be adaptive at the group level.

Hard-to-Fake Signals and CREDs

Some researchers argue that signals of commitment do not have to be costly. Emotions elicited by religious situations may reliably signal group commitment because they are hard to fake (Bulbulia, 2008; Schloss, 2008). Religious emotional behavior includes speaking in tongues, crying, laughing, singing, fainting, trembling, going into a trance, and spontaneous bleeding (Schloss, 2008). An individual expressing hard-to-fake religious emotion is probably committed to his or her religion.

Another signaling theory is that of credibility-enhancing displays, or CREDs (Henrich, 2009). This theory proposes that humans have an evolved cognitive mechanism for evaluating the degree of others' commitments to the values, beliefs, and ideologies they say they are committed to. Talk is cheap, so cultural learners seek credibility-enhancing displays – reliable signals of sincerity and commitment. A model's religious

behaviors, which may or may not be costly, are displays that enhance the credibility of the model's claims of commitment to the shared values and beliefs of the religious in-group.

Evidence for Signals

In an analysis of nineteenth-century American communes, Sosis (2000) found that religious communes lasted longer than secular communes. Assuming that commune longevity is a reliable index of cooperation, this suggests religious beliefs promote intragroup cooperation. On average, religious communes imposed more than twice as many costly requirements on their members as secular communes (Sosis & Bressler, 2003). Furthermore, among religious communes, there was a positive correlation between the number of costly constraints and commune longevity. Experimental studies have also found a relationship between costly signaling and in-group cooperation. In one such study, members of Israeli kibbutzim played an economic game with other members of their kibbutz (Sosis & Ruffle, 2003, 2004). When several factors were controlled for, such as the degree to which participants predicted their game partners would cooperate, men who attended synagogue daily (i.e., costly signalers) were more cooperative than other participants.

A similar study was conducted by Orbell, Goldman, Mulford, and Dawes (1992), who compared cooperation among residents of Logan, Utah with cooperation among residents of Eugene-Springfield, Oregon. Church attendance was positively correlated with cooperation, but only for Mormons in Logan, where over 75% of the population are members of the Church of Latter-Day Saints. These data suggest that church attendance increases cooperation among in-group members, but perhaps not cooperation generally (i.e., parochially but not universally).

Finally, Christian undergraduates rated costly signaling religious individuals as more trustworthy than their non-signaling counterparts, even when the costly signals were performed by people from a different religion (Hall, Cohen, Meyer, Varley, & Brewer, 2015). If we make the reasonable assumption that trust facilitates cooperation (Acedo-Carmona & Gomila, 2014), these results are consistent with the hypothesis that costly signaling fosters cooperation.

Evidence and Conclusions

It is important to note that traits that were adaptive in the past are not always adaptive today. Religious beliefs and behaviors might have been adaptive to our ancestors long ago without necessarily providing adaptive

value now. Even if religion is or ever was adaptive, it did not necessarily emerge or evolve because of its functional nature (Gould & Lewontin, 1979). Religion most likely emerged as a byproduct of evolved cognitive adaptations for navigating an environment teeming with agents. Still, we do think that religious beliefs and behaviors can increase intragroup cooperation today. However, there are secular routes to cooperation as well. Some of the most cooperative, trusting, and peaceful countries in the world are also the least religious (Norenzayan, 2013; Zuckerman, 2008). Less than one-third of Danes and Swedes believe in God (Gervais, 2013a), yet Denmark and Sweden have some of the lowest rates of violent crime and corruption in the world, and have strong economies and high-quality educational systems (Zuckerman, 2008). Perhaps these nations have developed intragroup cooperation in part because of highly trusted secular institutions such as police force and courts of law (Norenzayan, 2013). Consistently with this, secular law-enforcement primes seemingly increase prosocial behavior to a similar extent as religious primes do (Shariff & Norenzayan, 2007).

We have discussed how religious beliefs and behaviors may foster intragroup cooperation. The other side of the coin is that religiosity can promote intergroup conflict. A strong religious identity can be associated with racism (Hall, Matz, & Wood, 2010); religious service attendance is related to support for religious martyrdom attacks (e.g., suicide bombing) and hostility toward out-group members (Ginges, Hansen, & Norenzayan, 2009); and greater religious infusion predicts prejudice, discrimination, and violence between groups (Neuberg et al., 2014).

Culture

Humans are not just biological beings. We dually inherit a biological endowment (shaped by biological evolution) and a cultural endowment (shaped by cultural evolution; Richerson & Boyd, 2005). Although there is evidence of some features of culture in a few non-human animals (Whiten et al., 1999), human cultures are exceptionally rich and diverse. Cultural learning mechanisms apparently evolved to allow humans to obtain ideas, beliefs, values, preferences, and practices from other humans (Henrich, 2009; Mesoudi, 2016). Such cultural learning is particularly adaptive when it allows people to obtain knowledge or skills they are incapable of obtaining on their own (Mesoudi, 2016). Cultural learning allows for learned improvements to pass on to future generations, resulting in substantial improvement in tools and information over generations (Richerson & Boyd, 2005).

Cultural learning is partly responsible for the existence of religious beliefs. A study of more than 50 cultures spread around the world (Gervais & Najle, 2015) found that whether someone was raised to be religious had a large impact on their likelihood of believing in a god (or gods). Above and beyond the effect of religious upbringing, the likelihood that someone believed in gods was strongly influenced by the frequency of religious attendance by other people in the society. Cultural learning is also largely responsible for the details of religious beliefs (e.g., what supernatural agents people from a specific cultural group believe in) and practices (e.g., what rituals they perform). Indeed, because of cultural learning, it seems religious beliefs and practices may outlive the original ecological features that gave rise to them. For example, many Ultra-Orthodox Jewish men, whose ancestors dealt with long, cold winters in eastern Europe, wear thick fur hats today in the hot Jerusalem desert (Sosis, 2006).

Cultural evolution deals with how cultures change over time. As in any evolutionary process, some cultural beliefs and practices spread while others disappear. One process by which this may happen is intergroup competition. When groups compete for resources, more competitive groups replace less competitive groups. The members of the defeated group may be killed, but they may also disperse or be assimilated into the winning group. Beliefs and practices may also spread through emulation of members of successful groups (Henrich & Gil-White, 2001; Richerson & Boyd, 2005). It has been proposed that beliefs and practices that foster intragroup cooperation, such as fear of supernatural punishment and commitment signaling, have spread and multiplied via these mechanisms (Henrich, 2004; Richerson & Boyd, 2005). Beliefs and behaviors may also propagate because the group that sustains them increases in number. Two methods by which a religious group may grow are the production and indoctrination of children, and proselytism. Despite sharing a common religious origin, Jews, members of a religion that does not proselytize, make up about 0.2% of the world population, whereas Christians and Muslims, members of proselytizing religions, make up 31% and 23% of the population, respectively (Pew Research Center, 2015).

Conclusions and Future Directions

Previously, we described religion as the result of the interplay of culture and biology. At the risk of oversimplifying, one might think of biology as forming the framework of religion and culture as filling in the details. Religious beliefs and behaviors vary from one culture to another, but that variation

is constrained by biology. For example, individuals from different religious traditions share a belief in supernatural agents, and this belief is likely a byproduct of biological mental systems for adaptively navigating a social world. The specific characteristics of supernatural agents vary from one religious tradition to another, however, and individuals learn about these characteristics from their culture. In addition to the details of religion, cultural learning affects the degree and even the likelihood of religiosity.

Not only is religion a product of biology and culture, but biology and culture are in turn products of religion. Religious traditions may affect biology, for instance by promoting a high-fertility lifestyle (McQuillan, 2004; Weeden, Cohen, & Kenrick, 2008; Westoff & Jones, 1979; Zhang, 2008) or, alternatively, a low-fertility lifestyle (Coşgel, 2000; Hoodfar & Assadpour, 2000; Skirbekk et al., 2015). The relationship between religion and health provides another example: although we can't be certain of a cause-and-effect relationship, people who are high in religious involvement live longer than people who are low in religious involvement (McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000).

Protestant individualism in the United States provides an example of religious influence on culture. Protestant Christianity views each individual as having a direct relationship with God. Thus, religion is more individualistic for Protestants than it is for Catholics and Jews, and it has been hypothesized that Protestant individualism is at least partially responsible for the individualistic nature of American culture (Cohen & Hill, 2007). Veiling practices in Turkey provide another instance of a religious influence on culture. In the last few decades, it has become increasingly popular for Turkish women to cover their hair and most of their bodies in a way that is encouraged by certain traditions within Islam. This growing trend has resulted in a veiling fashion industry (Sandikci & Ger, 2010).

If religion is so robustly a byproduct of universal psychological modules, and religion might help promote cooperation, why are some societies and people more religious than others? And why does religion take so many different forms? The capacity for different behaviors, including religious repertoires of behaviors, could all be in our genes, and facultatively elicited by different environments (Cosmides & Tooby, 1992; Kenrick et al., 2002). Therefore, religions may depend to some extent on selection pressures in the environment. For example, in places with a lot of disease, religions might be concerned with purity and contagion, with what you eat, and with whom you are allowed to have sex (K. Johnson, Li, & Cohen, 2015; K. Johnson, White, Boyd, & Cohen, 2011). All of these religious strictures could help to contain the spread of disease. In environments with unpredictable or inconsistent resources, cultures may evolve harsher, more

punishing concepts of gods, as such gods would punish people for taking more than their fair share of resources (Snarey, 1996). While surely not all of religion's complexities can be explained by features of the ecology, the effect of ecological variables on religious features is a promising area for future research, one which has received very little attention to date. The study of religion would also benefit from more empirical testing of the theories described in this chapter.

We have discussed how religious beliefs may be byproducts of evolved psychological mechanisms for detecting and understanding animals and people, how religious commitment signaling and fear of supernatural punishment may be functional, and how these processes are further shaped by cultural factors. Culture and biology interact to produce the multifaceted phenomenon we think of as religion.

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