

- Turkheimer, E., & Gottesman, I. I. (1992). Is $h^2 = 0$ a null hypothesis any more? *Behavioral and Brain Sciences*, *14*, 410-411.
- Twain, M. (1935). *The family Mark Twain*. New York: Harper Brothers.
- Vernon, P. A., Jang, K. L., Harris, J. A., & McCarthy, J. M. (1997). Environmental predictors of personality differences: A twin and sibling study. *Journal of Personality and Social Psychology*, *72*, 177-183.
- Waldman, I. D., & Rhee, S. H. (2006). Genetic and environmental influences on psychopathy and antisocial behavior. In C. J. Patrick (Ed.), *Handbook of psychopathy* (pp. 205-228). New York: Guilford Press.
- Waller, N. G., Kojetin, B. A., Bouchard, T. J., Jr., Lykken, D. T., & Tellegen, A. (1990). Genetic and environmental influences on religious interests, attitudes, and values: A study of twins reared apart and together. *Psychological Science*, *1*, 138-142.
- Wiggins, J. S. (1966). Substantive dimensions of self-report in the MMPI item pool. *Psychological Monographs*, *80*, 42.
- Williams, G. C. (1966). *Adaptation and natural selection: A critique of some current evolutionary thought*. Princeton, NJ: Princeton University Press.
- Wilson, E. O. (1978). *On human nature*. Cambridge, MA: Harvard University Press.
- Wilson, J., & Sherkat, D. E. (1994). Returning to the fold. *Journal for the Scientific Study of Religion*, *33*, 148-161.
- Winter, T., Kaprio, J., Viken, R. J., Karvonen, S., & Rose, R. J. (1999). Individual differences in adolescent religiosity in Finland: Familial effects are modified by sex and region of residence. *Twin Research*, *2*, 108-114.
- Zahavi, A., & Zahavi, A. (1997). *The handicap principle*. New York: Oxford University Press.

CHAPTER 4

RELIGIOUS BEHAVIORS, BADGES, AND BANS: SIGNALING THEORY AND THE EVOLUTION OF RELIGION

Richard Sosis

Among the Ilahita Arapesh, boys as young as three years old are pinned down by adult males dressed as frightening boars, and their genitals are forcefully rubbed with stinging nettles. Having just watched slightly older boys attacked by these boars and suffer lacerations to their penises, these toddlers have something to look forward to in a few years. After these molestations, all the youth are tossed into a pool filled with stinging nettles. Later in childhood, their penises are abused again with bamboo razors and pig incisors, this time in a wooden structure built over a stream. Following the assault, the boys insert their penises through the floorboards to let the blood drip into the water below. Marriage brings little relief to the abuses of childhood. After their first evening together, the naked couple walk to the stream in the presence of spectators, where the wife builds a dam and the husband lacerates his own penis (see Tuzin, 1982).

The Ilahita Arapesh are not an anthropological oddity. Ritual practices throughout the world are often torturous and terrifying (Glucklich, 2001). Consider several initiation ceremonies historically performed by Native Americans: Apache boys were forced to bathe in icy water, Luiseno initiates were required to lie motionless while being bit by angry hordes of ants, and Tukuna girls had their hair plucked out. Of course, not all communities demand such sacrificial behavior of their members. Indeed, putting ashes on one's forehead, dunking an infant in water, avoiding hamburgers on Fridays, and erecting an evergreen in the living room are admittedly much more benign. Even in religious communities that place few demands on their adherents, however, ritual activities minimally require time and energy; time and energy that cannot be invested in other, more "productive" activities.

Why is there so much variance across religious communities in the costs imposed on adherents, and what are the determinants of this variance? If we are rational thinking beings, which most of us like to believe we are, why do we spend so much time, energy, and resources pursuing such activities?

To answer these questions, a theory is needed that can explain the universality of religious behavior as well as its variance within and across populations. Only a theory grounded in the process of natural selection can offer such a comprehensive explanation, but how? Religious behavior appears to *contradict* the principles of natural selection, which claims that to secure the resources necessary for reproduction and survival, organisms, including humans, are designed to maximize the rate at which they extract energy from the environment. Most religious behaviors seen entirely counterproductive to this goal, and, indeed, some religious practices, such as ritual sacrifices, are a blatant conspicuous display of wasted resources. It is one thing to share your food with a friend or someone in need, but why would anyone willingly give up part of their dinner to a fire that will burn it to ashes on an altar? The knee-jerk response to this issue is that humans engage in religious practices because they believe in the efficacy of the rituals and the tenets of the faith that give meaning to the rituals. However, this response begs the question. Why has natural selection favored a human psychology that believes in the supernatural as well as the behavioral patterns that are manifestations of these beliefs?

What follows in this chapter is a description of a signaling theory of religious behavior that aims to answer this question and a summary of some of the data that have been brought to bear on this theory. In the history of science, it is often the case that new and revolutionary ideas, while overlooked for centuries, are nearly simultaneously discovered by multiple independent scholars (for numerous examples, see Bryson, 2003). The application of signaling theory to religious behavior fits that historical pattern precisely. More or less independent literatures within economics (Berman, 2000; Carr & Landa, 1983; Lannaccone, 1992, 1994), anthropology (Cronk, 1994; Irons, 2001, 2004; Sosis, 2003, 2004; Sosis & Alcorta, 2003), cognitive science (Atran, 2002; Atran & Norenzayan, 2004), and philosophy (Bulbulia, 2004a, 2004b) have converged on what has been variously (and clumsily) called the club-goods model of religion, hard-to-fake sign of religious commitment model, commitment theory of religion, religious costs model, and the costly signaling theory of religious behavior. In this chapter, I hope to synthesize some of these emerging and diverging literatures that wrestle with understanding the evolution, endurance, and diversity of religion.

RELIGION AS COMMUNICATION

When most people consider religion and its myriad of moral strictures, bizarre rituals, puzzling myths, exotic gurus, and mysterious mystics,

"communication" is not the first thought that comes to mind. Indeed, communication evokes images of information, clarity, and pragmatic interactions, whereas religion is shrouded in mystery and grapples with unfathomable existential issues. Nonetheless, drawing on the work of ethologists and their study of animal rituals, anthropologists have long considered religion a form of communication. Granted, religions use "standard" forms of communication, such as speaking, singing, and writing, but religions most effectively and uniquely communicate through what I will informally refer to as the three B's: religious behavior (ritual), badges (the physical manifestations of some ritual behaviors, such as tattoos or religious garments), and bans (behavioral restrictions known in anthropological circles as taboos). When individuals pray to deities, they are of course attempting to "communicate" with these supernatural agents; however, for understanding the selective pressures that have shaped prayer and other religious behaviors, badges, and bans, the most relevant communicants are not the deities but rather the other congregants.

To grasp how religion is a form of communication, two critical questions need to be answered. First, what do religious behaviors, badges, and bans communicate? What message is a worshipper sending to the other worshippers? Is there also a message intended for those not in the pews? Second, why are the three B's effective at communicating whatever it is that is being communicated? If someone has something to say to another congregant, why not just say it?

Answering these questions and discerning why natural selection has universally favored religiously communicated messages requires that we approach our subject from the mind-set of an evolutionary biologist. Whether studying human language, religion, the color of peppered moths, or any potentially adaptive trait, evolutionary scholars must first determine what problem the trait solved in the organism's evolutionary history if they are to uncover the causes of its emergence. Regarding religion, if it is an adaptive strategy, it must have solved some environmental problem that all societies face. William Irons, a behavioral ecologist from Northwestern University, has suggested that this universal dilemma is how to promote cooperation. Irons argues that in human history the adaptive advantage of group living was the benefits that individuals attained through cooperating with each other in activities such as hunting, food sharing, defense, and warfare. However, as Irons notes, although everyone is better off if everybody cooperates, it is often very difficult to coordinate and achieve this cooperation. The problem is that although everyone is better off if everybody cooperates than if nobody cooperates, each person is even better off if everyone else does the cooperating while they sit at home enjoying an afternoon siesta. Throughout our evolutionary history, there were likely to have been conditions in which everyone in a group would benefit if they all worked together, possibly to kill a few bison or men in the

tribe next door, but individuals themselves could do even better by watching everyone else expending energy and putting their lives at risk. Obviously, however, if everyone pursues the latter strategy, at best there will be no bison for dinner; at worst, your tribe will be decimated by those who figured out how to cooperate. Thus, although everyone may gain if all group members invest in the cooperative goal, attaining such large-scale cooperation is often difficult to achieve without social mechanisms that prevent individuals from slacking off and free riding on the efforts of others. Irons argues that religion is such a mechanism.

In order to appreciate his argument, let's consider the shortcomings of messages communicated through our most common means of communication, language. A number of researchers have noted that trust lies at the heart of the problem of securing cooperation. If everyone knows that it is in everyone else's best interest to watch the hunt or war from the sidelines, how do groups of individuals develop the mutual trust that could ensure everyone that everybody else will participate? Of course, hunters and warriors can promise, "You have my word, I'll show up tomorrow. You can count on me." Unfortunately, unless there is trust already established between these individuals, such statements are not believable. As Shakespeare warned in *The Life of King Henry the Fifth*, "Trust none, for oaths are straws." (Of course, the statement is believable if the hunter or warrior would be severely punished if he failed to show up, in which case there is no need for him to promise anything because it is actually in his best interest to show up.) But what if a man does really intend to show up to the hunt or battle? How does he indicate to others the truth of his promises? Well, an overused truism never seemed more appropriate: actions speak louder than words. Or, to translate into our discussion, religious behaviors, badges, and bans are a more reliable means of communicating commitment than spoken promises.

HONEST HANDICAPS

Why should this be the case? Isn't human language the evolutionary apex of communication? For an explanation, I turn to the work of Israeli biologist Amotz Zahavi, who studied warblers rather than religion, yet his writings inspired Irons and others to apply his reasoning to religious phenomena. Zahavi recognized that when it is in an organism's best interest to send a dishonest signal (such as "I'm really much bigger, quicker, stronger, healthier, or more beautiful than I actually am"), the signals that are most believable are those that are costly to fake. He referred to such signals as handicaps. Handicaps are reliable because they are too costly to display or perform for those of low quality (in other words, those who are smaller, slower, weaker, sicker, and uglier than they want others to believe they are). All behaviors incur time and energy costs as well as the costs of missed opportunities

when performing one behavioral alternative over another. Costs that extend beyond these baseline costs (also known as efficacy costs) are called strategic costs. Strategic costs can take the same form as baseline costs of production (e.g., time and energy) but also often include the risk of consequences if a false signal is discovered.

Zahavi argued that selection has favored handicaps in a variety of species (see Zahavi & Zahavi, 1997); however, this has been more difficult to confirm than is generally appreciated. As the British evolutionary biologist John Maynard Smith and David Harper (2005) explain, for a signal to classify as a handicap, the net benefits for displaying the signal must be higher for a high-quality individual than a low-quality individual. This could mean that the costs are higher for low-quality individuals, that the benefits are higher for high-quality individuals, or both. Critically, to classify as a handicap, it must be possible to send a false signal, in other words, for a low-quality signaler to send a signal suggesting high quality. The signal must be costly to fake but not impossible to fake. The handicap principle asserts that low-quality signalers generally don't send false signals because it simply does not pay; the net costs are too high.

Given the rigorous standards of evidence needed, few handicaps have been convincingly demonstrated. One of the better-worked-out examples, however, is musth in African elephants. Musth is a state of heightened aggressiveness and sexual arousal that occurs in adult male elephants for several weeks to several months per year, depending on the elephant's age. Testosterone levels are frighteningly increased by a factor of 50, accompanied by vocalizations, threatening poses, and dribbling urine. As in most species, size determines who wins a fight, and as most organisms recognize this, including elephants, most agonistic encounters end with the smaller individual retreating without any combat ever occurring. However, Joyce Poole, who has studied African elephants for more than two decades, observed that smaller males occasionally escalate a fight with larger males, and it is almost always the case that the smaller are in musth while the larger are not. Interestingly, the smaller who are in musth generally win these conflicts. So why don't smaller males continually remain in musth so that they can at least win conflicts when larger males are not in musth? As Poole (1989) suggests, musth is physically costly for males, including increased metabolic rate from high testosterone levels and loss of liquid through urination. Smaller males likely pay higher costs since musth inhibits growth, preventing smaller males from growing into successful larger males. In other words, it doesn't pay for smaller males to be in musth unless larger males are not in musth, which is typically what happens. Unfortunately for the smaller males, the larger males time their musth for when females are in estrus. Musth is thus a handicap: a costly trait that reliably signals aggressiveness and willingness to escalate agonistic encounters.

INGENUOUS INDICES

When there are gains from deception, handicaps are not the only signals that are honest. As mentioned previously handicaps must be costly to fake, but some signals are actually impossible to fake and are consequently quite reliable. These are referred to as indexical signals. More generally, an index is a signal that refers to what it denotes by being truly affected by it. Rashers, rain clouds, and weather vanes are common examples of indexical signs that indicate measles, rain, and wind direction, respectively (Rappaport, 1999). As a further example, let's return to the animal kingdom and consider some rather strange behavior by Thompson gazelles. When these gazelles spot a predator, they often stot, which means they jump up and down. This behavior is extraordinary and has understandably puzzled biologists for years; why should a gazelle waste precious energy leaping up and down, energy that will be necessary if she is pursued by a predator? And why would a gazelle make herself *more* visible to a predator? It turns out that stotting gazelles are probably advertising to predators their ability to escape. They are effectively saying, "Don't bother chasing me. Look how strong my legs are, you won't be able to catch me." The only reason that a predator believes the gazelle is because the signal is reliable, precisely because it is indexical. Only gazelles that are actually quick enough to escape can jump to a certain height, displaying their leg strength. Gazelles that are not strong enough to jump high are simply not able to imitate the signal; it is impossible to fake, and thus stotting serves as an honest signal of a gazelle's speed.

SIGNALS OF SOLIDARITY

So what do elephants, gazelles, and the pious have in common? They all send reliable signals under conditions in which deceit can reap rewards. Whereas musth signals a willingness to escalate an agonistic encounter and stotting signals speed, religious behaviors, badges, and bans signal commitment to a particular group. Consider a religious population I work with in Israel, Ultra-Orthodox Jews, who prefer to be known as *Haredim* ["God] fearing or trembling ones). One of the most notable features of the Jerusalem summer landscape is how overdressed the Haredim are for the season. Women sport long-sleeve shirts, head coverings or wigs (and occasionally both), and heavy skirts that scrape the ground. In their thick beards, long black coats, and black pants, Haredi men spend their days fervently swaying and sweating as they sing praises to God in the desert sun. Many of them wear *strimels*, thick fur hats that were undoubtedly helpful in surviving the long and cold eastern European winters where their ancestors had lived but probably should have been left at the border when they immigrated to the Holy Land. By donning several layers of clothing and standing out in the midday desert sun, these

men are signaling to others, "Hey! Look, I'm a Haredi Jew. If you are also a member of this group, you can trust me because why else would I be dressed like this? Only a lunatic would spend their afternoon doing this *unless* they believed in the teachings of Ultra-Orthodox Judaism and were fully committed to its ideals and goals." Thus, the "quality" that these men are signaling is their level of commitment to a specific religious group.

Adherence to a set of religious beliefs entails a host of ritual obligations and expected behavioral patterns. Although there may be physical or mental health benefits associated with some ritual practices, the significant time, energy, and financial costs involved in imitating such behavior serve as effective deterrents for anyone who does not believe in the teachings of a particular religion. There is no incentive for nonbelievers to join or remain in a religious group because the costs of maintaining membership (such as praying three times a day, eating only kosher food, donating a certain part of your income to charity, growing *peyos*, and so on) are too high. Hence, those who engage in the suite of behaviors, badges, and bans required by a religious group can be trusted to sincerely believe in the doctrines of the group, which often includes behaving altruistically to other group members. As a result of increased levels of trust and commitment among group members, religious groups are able to overcome free-rider problems that typically plague communal pursuits and limit overconsumption and exploitation of the mutual benefits they generally offer their adherents. And these mutual benefits can be quite significant. For example, during my fieldwork among Haredi communities, I repeatedly observed invitations for meals, lodging, and rides by residents to unknown Haredi travelers. On several occasions, I witnessed cars being loaned to complete strangers, and interviews revealed a surprising number of interest-free loans offered and accepted between people who had previously not known each other. Costly ritual behaviors, badges, and bans serve to protect these benefits—and similar benefits offered by religious communities throughout the world—from free-riding nonbelievers.

It is important to note that there is nothing inherent in these religious behaviors, badges, and bans that tie them to a particular group. They are symbolic signals; in other words, the relationship between the signal and its referent is completely arbitrary, similar to language. While there are historical factors that likely explain why religious Jews wear head coverings or why Sikh men do not cut their hair or beards, there is not anything intrinsically sacred in these badges that make them connected to these populations. Only because the community collectively identifies with these badges (similar to the way we agree that what I am typing on is a "computer" rather than a "dog," "cat," "zat," or infinite other possibilities) do they serve as signals of commitment to each respective group. Under different historical conditions, different badges would have emerged and effectively served as signals of group commitment. This is not to deny the importance of environmental

factors in shaping successful signals. For instance, the Haredi dress code is certainly more challenging to endure in the desert climate than in eastern Europe, making it a particularly effective commitment signal in modern Israel, which may explain why the Haredim are so reluctant to abandon their uncomfortable attire. Nonetheless, whether they don black frocks or orange robes to signal group identity is a result of historical factors and has nothing to do with any intrinsic holiness bestowed to these garments.

STABLE SIGNALS

Understanding the ecological problem that a trait such as religious behavior evolved to overcome provides the biologist with the reason *why* a trait evolved. In our case, I have argued that the primary ecological problem driving the emergence of religious behaviors, badges, and bans was the consistent challenges of collective action that our ancestors faced. However, equally important in any adaptationist analysis is understanding *how* the trait evolved. Why is the trait maintained within the observed population, and how did it achieve stability? Anthropologists Rebecca Bliege Bird and Eric Alden Smith (2005) outline four necessary conditions for the evolutionary stability of a costly signal in a population. Let's address them one by one and return to our African elephants to illustrate. First, Bliege Bird and Smith note that there must be within-group variance in some unobservable attribute. As far as we know, no elephant can observe the inner physiology of another elephant; thus, testosterone production, which varies across males, meets this first condition. Second, group members should benefit from reliable information about this variance. Indeed, it is quite beneficial to know which elephants are hormonal since there may be reproductive opportunities for those that take advantage of males not in musth, whereas picking a fight with one that is in musth can have devastating consequences. Third, signalers must be able to achieve benefits at the expense of those receiving the signal. In other words, there needs to be the potential for deceit, such as smaller elephants gaining reproductive benefits by pretending to be in musth when in fact they are not. Fourth, the cost or benefit to the signaler of sending the signal should be correlated with the signaler's quality of the attribute. As discussed previously, it is costlier for smaller males to produce all that testosterone than it is for larger males because of both the physical hardships of musth and the forgone future opportunity to become a larger male.

Presumably, you are reading this with greater interest in mystics than musth, so let's apply these conditions to religious behaviors, badges, and bans. First, the intensity of religious beliefs varies within communities, and this variance is unobservable. Many people attend church, roughly 40 percent of Americans per week, but worshippers of course do not share the same level of belief in their churches' tenets, and their dedication to their churches

also varies. Second, individuals benefit from accurate information about how beliefs and commitment vary across members. Intensity of beliefs related to one's commitment to the group and its goals; committed members are more likely to be cooperative and trustworthy and thus preferred social interactants. When choosing friends or simply facing situations where you must rely on another, such as watching your kids for an hour or taking in your mail while you are away, it is important to know who can be trusted and who cannot. Third, religious groups offer various benefits for in-group members that are mutually provided and are at risk of exploitation by those not committed to group goals. Most notably, religious groups tend to offer mutual insurance benefits. For instance, a teacher in my Connecticut suburban neighborhood severely broke his leg while playing basketball on vacation, and his insurance did not cover such an out-of-state calamity. Fortunately for him, the members of his Orthodox synagogue contributed generously to his recovery. Fourth, the cost or benefit of religious performance is weighed against opportunity costs that are expected to be higher for nonbelievers than for believers. This last condition will take a little more space to explain. For sake of simplicity, imagine a population divided between believers and skeptics. Believers will have genuinely forsaken many worldly behaviors, while skeptics have not. In the case of my Haredi study population, for example, they shun the secular media entirely, including secular newspapers, radio, movies, television, and the Internet (although exceptions are made for the latter). Since they avoid these pursuits, their opportunity costs, that is, the costs associated with missed opportunities while performing a behavior or displaying a badge, are much lower for believers than for those who have not relinquished such activities. Men in these communities are expected to dedicate their days to praying and studying religious texts. Since alternative activities are severely restricted, the cost of spending long hours in religious devotions is less for them as believers, in terms of viable missed opportunities, than for skeptics who still have all those secular activities at their disposal.

BEHAVIORS, BADGES, AND BANS

Thus far, I have treated the obligations that religious groups demand of their members, namely, the three B's, as a suite of requirements. There is some justification for this, as most religious groups do not allow their members to pick and choose which obligations they want to fulfill and which they wish to ignore. You can wear the Haredi garb, but if you like to dine on pork chops, you won't be counted among the community. Nevertheless, it will be useful to point out some of the distinguishing characteristics of the three B's.

Let's start with bans. The astute reader is likely wondering how a taboo, such as avoiding the consumption of pig products, can be a signal. Ritual behaviors and badges can be observed by others in the community, but how

can one observe something that is not done? In contrast to ritual performances and symbolic markers, bans can be "observed" only when they are at risk of being violated. The Jew who refrains from eating in a social setting because the food is not kosher is signaling his identity and commitment to the Jewish community. Sometimes linguistic messages, such as "I don't eat nonkosher food," are required to signal adherence to a ban. Generally however, other badges and rituals imply the adherence to a ban. Generally, donning a Catholic priest's frock implies celibacy, and attending services at a Mormon temple implies abstinence from coffee and tobacco. Since bans can not be directly displayed, they are effective as signals only when they are in jeopardy of being transgressed, such as the Mormon accompanying a friend to Starbucks or the Muslim whose employer requires him to attend a business lunch during the fasting month of Ramadan.

While bans do not constitute "complete" signals, they are especially proficient at increasing group solidarity and commitment. We can thank economists for this insight. Economists refer to what we have been calling bans or taboos as *prohibitions*. They explain that prohibitions are efficient gatekeepers, eliminating those not dedicated to a group, because they effectively tax secular items. By decreasing that certain activities or goods are off limits for adherents, it becomes more costly to pursue those activities or acquire those goods because offenders will suffer the costs of punishment. This tax on secular activities and goods consequently encourages religious activity, making it "cheaper" and thus more attractive to those who accept a religious community's prohibitory decrees. By raising the price of secular activities, the opportunity costs for religious activities are lowered. For example, as mentioned previously, Haredim are forbidden to watch television or subscribe to secular newspapers. The pursuit of these pastimes is costly because harsh communal punishments will be enacted if a transgression is discovered. Concomitantly, permitted religious activities, such as prayer and textual study, become less costly and more desirable because of fewer competing alternatives of how Haredim can spend their time.

Distinguishing between prohibitions (or bans and taboos) and ritual behaviors and badges is useful since it underscores the separate processes that ultimately result in increased intragroup solidarity and commitment. For many religious behaviors and badges, though, both social processes seem to be at work. For instance, we can confidently categorize the distinct turbans and beard styles of Sikhs as badges that signal group commitments. However, these badges also prevent them from participating in activities where Sikhs are unwelcome, which in the United States following 9/11 was apparently quite a few, as Sikhs found themselves the misplaced targets of anti-Muslim bigotry. These badges essentially put a tax on events that, whether implicitly or explicitly, sought to restrict Sikh participation. If to pursue an activity Sikhs must hide their identity badges, adherents face the risk of punishment

if the community discovers their covert transgression. Consequently, in addition to their role as signals, these badges also impact solidarity through a process similar to how bans serve as gatekeepers, namely, by making forbidden activities costly. Rituals can operate similarly, as any American Muslim who has tried to inconspicuously fulfill their five-times-daily religious devotions will attest. The relative impact of these separate processes, namely, signaling and taxing alternative activities, on group solidarity for any behavior or badge that engages both mechanisms is unclear and will likely vary across practices and cultures, thus requiring empirical examination on a case-by-case basis.

HARD-TO-FAKE HANDICAPS OR IMPOSSIBLE-TO-FAKE INDICES?

To take stock of how far we've gotten, it appears that religious behaviors, badges, and bans meet the conditions for the evolutionary stability of a costly signal, as outlined by Bliege Bird and Smith. So, depending on your preference, the three B's are hard to fake, costly to fake or, in Zahavi's terms, can be classified as a handicap. But are some religious behaviors, badges, and bans also impossible to fake? Could they be defined as indexical signals, such as the *stotting* of gazelles?

Certain badges, such as tattoos and ritual scars, are permanent (barring the wonders of modern surgery) and are thus quite difficult to fake. It is conceivable that charlatans can be illegitimately tattooed while avoiding the initiation rites that typically result in such badges; however, the collective memory of the community will make such a ploy dubious. Roy Rappaport, the eminent cultural ecologist and anthropologist of religion, claimed that all rituals, badges, and bans are indexical signals. While the logic of his argument applies to all the B's, let's focus on ritual, as Rappaport himself does. He argued that while ritual behaviors appear to be shrouded in mystery, they are deliberate, and their message to other adherents is clear: participation in a ritual performance indexically signals acceptance of (and not necessarily belief in) the moral values encoded in the ritual. He maintains that regardless of whether or not individuals believe in the moral values encoded in a ritual performance, by participating they are signaling that they accept the moral code of the community and can be held accountable if these rules are compromised.

Rappaport stresses the distinction between belief and acceptance, a distinction that is certainly important in order to assess a signal's message. Are ritual performers signaling their religious beliefs and group commitments, or are they signaling their acceptance of a moral code that is implied by the performance of a ritual? It is likely both, but it is only acceptance that is indexical and thus nearly impossible to fake. In a classic example drawn from

his own fieldwork among the Marring of New Guinea, Rappaport describes how to dance at a *kaiho* ceremony is to unambiguously commit oneself to assist the community one is dancing with during the inevitable next round of warfare. To dance at a *kaiho* is an indexical signal of one's pledge to fight. The formality of the dance ensures that it will not be mistaken for some other behavior, and the ritual has been observed by all community members, thus making one's participation impossible to deny.

To take a more familiar ritual, consider a wedding. During a wedding ceremony, the bride and groom send a public signal that they accept the moral values, as defined by the community, incumbent on the institution of marriage. This signal is indexical; by performing the ritual, the performers can't help but indicate their acceptance of the moral code. Nonetheless, despite their acceptance, the newlyweds may not believe in the moral code's virtues. Note that the moral code itself varies widely by community; a Haredi wedding, for example, endorses different values than, say, a mainline Protestant wedding.

To summarize, performing a ritual indexically signals acceptance of the moral values implicit in the ritual but also signals belief in the doctrines that support and provide meaning for the ritual. Acceptance is nearly impossible to fake; the community observed the wedding or the *kaiho* dance, and thus one's performance cannot be denied. An individual is therefore held accountable for the moral values implied in a marital union (such as sexual and financial fidelity) and a *kaiho* (fight in the next round of warfare). Nonetheless, the performance of these rites also signals that the actor believes in these morals (that infidelity is wrong and that the group he is militarily supporting is right), but these beliefs are failable. A husband may leave the wedding canopy and commit adultery, and a Marring may not show up to fulfill his pledge of support during warfare. Thus, although performing a ritual does signal belief, it is not an indexical signal of belief but rather a hard-to-fake signal or handicap that faces the potential of deception.

THE FOURTH B: BELIEF

Any reader who has persevered to this point in the chapter is likely pondering, "Signaling theory does indeed appear to explain some puzzling features of religion, but religion is so much more than shaving your head and becoming vegan; this theory surely cannot explain *all* of religion." And, indeed, your thoughts (if I am clairvoyant) would be correct. I am skeptical that any lone theory can explain all the extraordinarily diverse beliefs and behaviors that fall under the umbrella we call religion; nonetheless, signaling theory does provide many valuable insights into the selective pressures that have shaped religious practices in our evolutionary history. While the theory has not explored various features of religion, such as myths and mystical

states of consciousness, there are three universal characteristics of religion that I have yet to discuss that play an important role in making the three B's effective signals: beliefs in supernatural agents, internalizing these beliefs, and the emotional significance of these beliefs. These features of religion are addressed in other chapters, so here I limit my discussion to their relevance in understanding religious practices as signals of group commitment.

Many scholars, past and present, define religion as "belief in the supernatural." Indeed, belief in the supernatural—specifically, supernatural agents such as ghosts, demons, angels, spirits, and gods—is one of the most robust features of religion. How are these ubiquitous unobservable beings related to the signaling function of religious practices? For impatient readers, the quick answer is that they are proximate mechanisms, but I need to explain what I mean by this term. Evolutionary biologists distinguish between ultimate and proximate causes of behavior. Ultimate explanations refer to evolutionary explanations that either provide the historical trajectory of a trait or offer a functional explanation for its existence. In contrast, proximate explanations address the cognitive and physiological underpinnings of a behavior. An ultimate explanation for why a smaller elephant may combat a larger one is his increase in access to fertile females; extraordinary testosterone levels provide a proximate explanation for this same behavior. Ultimate and proximate accounts are not competing but rather offer complementary explanations for understanding behavioral patterns. Our discussion thus far has concerned ultimate explanations, focusing on the gains individuals can achieve through costly religious practices, namely, the ability to overcome problems of collective action. From the view of signaling theory, supernatural beliefs are proximate mechanisms that facilitate the efficient functioning of religious signals. But how?

There is an abundance of experimental and experiential evidence that suggests that humans have a tough time paying immediate costs to achieve long-term gains. Most of us would prefer receiving \$5 immediately than paying \$5 to receive \$25 in a month despite the fact that every economist on the planet will tell you that this is utterly irrational. No bank could offer such a generous interest rate. Many people, of course, put money into retirement funds or pay the costly tuitions for a college education with the aim of increased future salaries. However, when humans pay short-term costs to achieve long-term gains, their decisions are typically strategic, and their information concerning the probability of ultimately achieving the long-term gains is high. Religious communities generally do not offer such clear instruction manuals, and the functional effects of religious practices are hidden or ignored. I have yet to hear the preacher who exclaims, "Pray five times daily, and you'll reap all the mutual insurance benefits we offer!" On the contrary, when trying to motivate religious practice, clergy typically rely on exhortations that promise supernatural rewards or punishments. There is a good reason for this.

Supernatural rewards and punishments can change the payoffs that individuals perceive when performing religious practices (see Bulbulia 2004a, 2004b; Johnson and Kruger 2004; Sosis 2003). When eternal damnation lies in the balance, fasting during daylight hours for a month doesn't sound so bad, and some of course have been convinced to take their own lives for the promise of 70 virgins. But we still haven't solved our dilemma of how to encourage individuals to pay short-term costs to achieve long-term gains; indeed, introducing otherworldly payoffs seems to have exacerbated the problem. Even if supernatural rewards and punishments alter the perceived payoffs so that individuals expect gains or losses depending on their actions, the payoffs are still in the future. In fact, they are even further in the future, awaiting the performer's arrival in the afterlife. Moreover, since these rewards and punishments cannot be proven or even indirectly demonstrated, why would anyone include them in their calculations when determining whether to pursue a religious practice? To understand how supernatural payoffs are effective at encouraging religious practices, we turn to our second noted feature of religion, internalizing supernatural beliefs.

Consider a Sunday churchgoer. Following our earlier argument, by attending church one indexically signals the acceptance of the moral strictures that are the foundation of the church's theology. Attendance signals participation in the community, and thus one is accountable for transgressing the community's moral code. Church attendance also signals belief, let's say, in God, but we argued that this signal is fakable. Not all church attendees necessarily believe in God, and even those who do vary in their confidence about their beliefs. However, signaling theory suggests that while such signals are fakable, they are certainly useful indicators of belief and more reliable than uttered statements of belief. The reliability of church attendance as an indicator of belief, of course, increases with intensity and costs, such as more frequent attendance, higher financial contributions, or more tedious sermons. Nonetheless, it is possible to regularly attend church for ulterior motives rather than communion with God. In fact, psychologists have distinguished between those who attend church to worship and connect with their Creator (known as intrinsically motivated) and those who attend for reasons other than the religious experience (known as extrinsically motivated). For instance, some individuals ignore the majority of their religious obligations but are encouraged to attend church by family members (extrinsic motivation). If not motivated by belief, they presumably accede to these familial requests because they find the benefits of domestic stability to outweigh the costs of attending church.

Despite the potential for deception, in other words, regularly attending church as an atheist, generally, repeated ritual performance will foster and enhance belief. Since ritual performance is unambiguously associated with overt group values, psychological processes, including the popularized

phenomenon known as cognitive dissonance, will cause nonbelievers to either modify their belief or discontinue the ritual actions. Unless there are strong extrinsic motivations, at some introspective moment the attendee will ask, "If I don't believe in any of this, what I am doing here every week?" Two options then remain: start believing or stop attending. What is remarkable is how often the former is chosen. Ritual participation can foster and internalize belief.

The success of cults in attracting new members, for example, is testament to the ability of religious practices to transform attitudes. Although the proselytization methods employed by cults are diverse, joining a cult is typically not a process of "brainwashing," at least as it is popularly conceived (Robbins & Anthony, 1982). Some cults, such as the Unification Church, attract members not by introducing them to the wisdom of their teachings; potential members are simply drawn into the group by participating in activities such as workshops, group singing, sport competitions, and distributing flowers at airports. The majority of recruits drop out, but for those who endure, it is only after several months of such ritualized activity that they are even introduced to the teachings of the Reverend Sun Myung Moon (Galanter, 1999; Pesternak, 1988). When these new members encounter dissonance (Why am I in this airport holding flowers?), teachings that several months before would have found unreceptive ears are now willingly accepted. Nonetheless, it is important to emphasize that ritual is most effective at transforming beliefs when initial views and attitudes are either ambiguous or not too divergent from those implied in the ritual performance. Research on proselytizing religions suggests that missionaries are most successful at converting those who already share many of their beliefs. For example, Mormon proselytization efforts have been most effective where Christianity has already gained wide acceptance (Stark, 1987).

Religious practices generally possess four characteristics that enable them to promote and internalize supernatural beliefs. First, religious behaviors, badges, and bans are physically manifested displays or actions. Physical participation, which provides performers with concrete evidence of their personal involvement, contributes to psychological uneasiness if the performer does not share the values encoded in the religious action. Second, religious practices are typically performed or displayed publicly. Since they are widely observed, there are additional social pressures to reconcile any contradictions between belief and behavior; pressures that would be absent if the practices were only privately performed. Third, religious behaviors, badges, and bans are formal. Their lack of ambiguity makes them effective modes of communication. Religious practices, while rarely understood, are even less frequently mistaken for anything other than religious practices. Fourth, religious practices are often repetitive, cyclical, or even continuous. Although some rituals, such as weddings and rites of passage, occur only once, countless

religions require daily, weekly, monthly, seasonal, yearly and/or multiyearly rituals. And, of course, many bans and badges, such as pig avoidance and circumcision, are in force from cradle to grave. The repetition of formal, publicly observed religious actions demands greater reconciliation with any conflicting beliefs.

The third feature of religion that I promised to briefly discuss, religious emotions, further serves to internalize religious beliefs. Religion is an emotional affair. Indeed, staid religious practices soon become the data of historians rather than the routines and principles by which living populations organize their lives. Religious practices are supported and sustained by the emotions they evoke. Moreover, supernatural religious beliefs, which cannot be established logically, are verified by believers "emotionally." Religious practices, rituals in particular, often increase arousal in the limbic system and generate what is typically referred to as a "religious experience." Rappaport (1971) notes, "The truth of such an experience seems to the communicant to be sufficiently demonstrated by its mere occurrence, and since a sacred proposition or its symbol (e.g., the cross) is taken to be intrinsic to the experience, the sacred proposition partakes of this often powerful and compelling sense of truth" (p. 31). Eugene d'Aquili and Andrew Newberg (1999), pioneers in the neurobiology of religion, argue that not only are religious experiences perceived as true, they "appear to be 'more real' than baseline reality and are vividly described as such by experiencers after they return to baseline reality. . . . So real do these experiences appear when recalled in baseline reality that they have the ability to alter the way the experiencers live their lives" (p. 192). In addition, since emotions are generated from limbic structures that are out of conscious control, they are difficult to "fake" (Ekman, Levenson, & Friesen, 1983; Levenson, 2003) and can consequently serve as reliable signals of trustworthiness and commitment (Alcorta & Sosis, 2005; Bulbulia, 2004b).

So it appears that through psychological and physiological processes, as well as inherent structural characteristics such as formality and repetitiveness, religious practices are effective at internalizing the supernatural beliefs with which they are associated. Why is it important that beliefs are internalized? Internalizing religious beliefs make the perceived payoffs for religious performance, in which supernatural punishments or rewards ensure that the religious performance is profitable, the real payoffs. The distinguished University of Chicago sociologist James Coleman (1990) observes that norm internalization is efficient when there are a range of actions that are sought to be controlled by a community. This aptly characterizes religious communities, which generally seek members who behave prosocially toward coreligionists under diverse conditions; in other words, they wish to encourage cooperation and trust between members regardless of the situation that arises. Furthermore, Coleman argues that external policing to encourage norm compliance becomes less efficient when members must be monitored

continuously, especially if they are dispersed. Under these conditions, societies are more likely to rely on internalization strategies. Since the intragroup trust and cooperation promoted within religious communities is not limited in time (such as just during work hours) and place (such as just in a house of worship) but is a continuous obligation, it is impossible to monitor members' commitment to this ethic all the time. Consequently, internalizing this ethic is important.

What is particularly interesting about this whole system is that religious communities do not rely exclusively on these internalization strategies (Sosis, 2005). All religious communities impose punishments, either institutionally or through informal means like cutting off social interactions. Formal punishments include fines, executions, and excommunication, among many others. Thus, religious communities rely on both supernatural and material punishment systems to ensure conformity with community norms. Likewise, these communities do not fully depend on the goodwill they cultivate through their moral teachings; systems that monitor behavior are completely intact. However, there is little emphasis on observing members' daily routines, which are too costly to continuously monitor anyway. Efficiently and ingeniously, the monitoring costs are shifted from observing daily life to observing adherence to religious obligations, which, because of their formality, conspicuousness, repetitiveness, and public performance, are much less costly to scrutinize. The system works because religious practices are worthwhile since they are reliable signals of community commitment.

PRIVATE PRACTICE

Our discussion on monitoring religious practices raises an important question: Why do groups require that their members engage in private rituals, badges, and bans even though they are rarely witnessed and compliance cannot be enforced? Two reasons seem to be germane, the first for the individual, the second for the group.

First, engaging in private practices appears to be an extremely effective method of convincing *oneself* that one believes in the doctrine that gives meaning to the rituals. And the best way to convince others of your group commitment is to convince yourself first. If individuals engage in private religious practices, they cannot rationalize such actions as coercion by group members. Because of the opportunity to defect on private obligations without risk of detection, engagement in such practices is the sole responsibility of the individual. However, some privately performed rituals, such as prayer recitation or textual study, can be evaluated in the public sphere by assessing knowledge, and thus it is difficult to fake their private performance. Moreover, many rituals, including prayer and textual study, are practiced both publicly and privately. In a number of contemporary religions, for instance, prayers

before meals are expected regardless of whether or not anyone else is at the table. The failure to say grace when alone may result in an increased likelihood of forgetting to say it in a public setting. Nevertheless, individuals are more apt to question their own commitment if they are failing to perform ritual duties that they believe others in the community are practicing; even if the rituals are never performed in public. The performance of private religious practices reinforces group commitment by convincing their performers that they are committed to the group.

The group-level benefits of private obligations further account for their prevalence. Somewhat paradoxically, by requiring adherents to perform private practices, it drives up the price of performing public practices for free-riding skeptics, thus enhancing the reliability of public practices as signals of group commitment. To understand the logic behind this surprising twist, let's start with a little more obvious assumption: believers perceive net gains from religious activity (which is why they engage in it), whereas skeptics perceive net costs from religious activity (which is why they refrain). The critical point is that within these internal calculations, which are, of course, unconscious, believers must include the costs of private practices while skeptics do not; there is no incentive for a skeptic to fake piety when nobody is watching. Since believers pay the costs of private practice while skeptics do not and believers perceive net benefits from following the full suite of religious obligations while skeptics do not, believers must either perceive public practices to be much less costly than skeptics do, or they must perceive much greater benefits from these practices than skeptics do. Therefore, private obligations force the perceived net gains of public obligations to be significantly higher for believers than skeptics (which is, of course, usually achieved through supernatural rewards), and consequently private obligations ensure that those performing public religious practices are those who are genuinely committed to the group (Sosis, 2003). Groups that successfully maintain commitment probably encourage a mix of public and private practices, although it is not yet clear how the optimal mix is determined. It is clear, however, that the costs of private practices cannot be too high because the net benefits of performance must outweigh the costs.

COMMUNES, COMBAT, AND COSTLY SIGNALS

While the costly signaling theory of religion offers numerous predictions, few of them have been directly evaluated, although there appears to be abundant circumstantial evidence that is supportive of the theory. One prediction of the theory, for instance, is that groups that impose greater membership demands will elicit higher levels of devotion and commitment from their members. (There are limits, though, to the costs that can be functionally imposed; demands that exceed members' commitment levels can result in

the collapse of the community, as the ephemeral existence of many strict sects and cults attests.) Groups that maintain more committed members are also likely to be able to offer more to their members because they will find it easier to attain their collective goals than groups whose members are less committed. This may explain a paradox in the American religious marketplace: churches that require the most of their adherents are growing the most rapidly. Indeed, while liberal mainline Protestant denominations such as Episcopalians, Methodists, and Presbyterians have been steadily losing members, groups that require much more of their members, such as Islam, the Church of Jesus Christ of Latter Day Saints (Mormons), and Seventh Day Adventists, who, among other things, abstain from alcohol, caffeine, and meat, respectively, have been growing at exceptional rates. Economist Lawrence Iannaccone has also noted that religious groups that require more of their members not only are growing at a faster rate than less demanding groups but also have the most committed members. He found a strong positive correlation between the distinctiveness of a religious group (in other words, how much their life style differed from mainstream America) and attendance rates at services (Iannaccone, 1994). Sociologists Roger Finke and Rodney Stark (1992) have argued that when the Second Vatican Council in 1962 repealed many of the Catholic Church's prohibitions and reduced the level of strictness in the Church, it initiated a decline in church attendance among American Catholics as well as reduced seminary enrollments. Indeed, in the late 1950s, almost 75 percent of American Catholics were attending mass weekly. Since the Vatican's actions in the early 1960s, there has been a continuous steady decline to the current attendance rate of about 45 percent.

The costly signaling theory of religion also predicts that levels of commitment should be a function of how important cooperative interactions are within a community. Under conditions where cooperation is critical for survival, religious signals should flourish. Consistent with this expectation, economist Daniel Chen (2005) has shown that among Indonesian Muslims, investments in religiosity reflect economic conditions. During economic crises, religiosity increases, presumably because when times are hard, greater displays of commitment are necessary to counter the higher incentives to defect in social exchanges and the increased relative costs one faces if exploited. When the fiscal crisis passes, lower levels of religious practice are restored.

The costly signaling theory of religion additionally assumes that increased commitment among the faithful will translate into successful cooperation. Groups that require the most of their members are expected to achieve the highest levels of cooperation, whereas groups that demand less of their members will find it more difficult to achieve collective goals. In historical work I pursued with psychologist Eric Bressler (Sosis & Bressler, 2003), we found

that among nineteenth-century communes, the definitive place to study human cooperation, religious communes did indeed demand more of their members than their secular counterparts, such as celibacy, relinquishing all material possessions, and vegetarianism. Whereas religious communes that demanded more of their members survived longer, this was not true for secular communes; there was no relationship between the requirements imposed and commune longevity. We were surprised by this latter result since secular groups such as militias and fraternities appear to successfully employ costly rites to maintain cooperation. While both religious and secular practices can promote cooperation, religious practices may ironically generate greater belief and commitment because they sanctify unverifiable ideologies. Because of their reliance on supernatural elements, religious ideologies are generally beyond the possibility of examination; indeed, contemporary religions struggle when they extend beyond this border into convictions that can be evaluated, such as the claim that we reside on a 6,000-year-old flat planet orbited by the sun. In contrast, secular ideologies are subject to the vicissitudes of examination and are thus less stable than religious ideologies. Successful secular groups often incorporate unverifiable elements into their ideologies, such as "brotherhood" and "liberty," both of which are commonly trumpeted in fraternities and militias. The ability of religious practices to evoke emotional experiences that can be associated with enduring supernatural concepts and symbols differentiates them from secular rituals, badges, and bans and may explain why they achieve greater long-term commitment and cooperation, as was evidenced in our sample of nineteenth-century communes.

Further research has extended these historical results to modern communes in Israel known as kibbutzim. For most of their 100-year existence, kibbutzniks (i.e., kibbutz members) have lived according to the dictum, "From each according to his abilities, to each according to his needs." While 16 kibbutzim are religious, the majority of kibbutzim are secular and often ideologically antireligious. Similar to their historical predecessors in the United States, religious kibbutzim on average have been economically more successful than secular kibbutzim. Currently, the kibbutzim are undergoing significant change, largely in the direction of increased privatization and reduced communalism. This is a consequence of a massive economic failure that saw the kibbutzim collectively fall over \$4 billion in debt. When news of their extraordinary debt surfaced in the late 1980s, what went largely unnoticed in the academic and media reports about the inevitable collapse of the kibbutz movement was that the religious kibbutzim had achieved economic stability. In the words of the Religious Kibbutz Movement Federation, "The economic position of the religious kibbutzim is sound, and they remain uninvolved in the economic crisis" that has affected so many of the kibbutzim. In fact, they have on average economically outperformed the secular kibbutzim in every

decade of their existence (Fishman & Goldshmidt, 1990). The economic success of the religious kibbutzim is especially remarkable given that many of the religious practices performed on the religious kibbutzim inhibit economic productivity. For example, Jewish law does not permit Jews to milk cows on the Jewish Sabbath. Although rabbinic rulings have permitted these religious kibbutzniks to milk their cows to prevent the cows from suffering, in the early years of the religious kibbutzim none of this milk was used commercially. There are also significant constraints imposed by Jewish law on agricultural productivity. Fruits are not allowed to be eaten during the first several years of the life of a tree, agricultural fields must lie fallow every seven years, and the corners of fields can never be harvested but must be left for society's poor. Although these constraints appear detrimental to the productivity of the religious kibbutzim, costly signaling theory suggests that they may actually be their key to economic success.

I decided to study this further with economist Bradley Ruffe from Israel's Ben Gurion University. We conducted experiments on secular and religious kibbutzim aimed at measuring cooperative behavior in order to determine if there were differences across kibbutzim in members' levels of cooperation with other members of their own kibbutz (Ruffe & Sosis, 2005; Sosis & Ruffe, 2003, 2004). Controlling for effects such as the age of the kibbutz, level of privatization, size of the kibbutz, and numerous other variables, we found that religious kibbutzniks exhibit much higher levels of intragroup cooperation than secular kibbutzniks. Furthermore, when the data were examined more closely, an interesting pattern emerged. Religious males were significantly more cooperative than religious females. Among secular kibbutzniks, we found no sex difference at all. This result is understandable if we appreciate the types of rituals and demands imposed on religious Jews. Although there are a variety of requirements that are equally imposed on males and females, such as keeping kosher and not working on the Sabbath, male ritual requirements are largely publicly oriented, whereas female requirements are generally pursued privately or in the home. Indeed, the three major requirements imposed on women—the laws of family purity (e.g., attending a *mikveh*, or ritual bath), separating a portion of dough when baking bread, and lighting Shabbat candles—are done privately. They are not rituals that signal commitment to a wider group; they appear to signal commitment within the family. Males, on the other hand, engage in highly visible ritual requirements, most notably public prayer, which occurs three times daily. Among male religious kibbutz members, we found synagogue attendance to be positively correlated with our measures of cooperative behavior. There was no similar correlation among females, which is not surprising; attending services is not a requirement for women and thus does not serve as a signal of commitment to the group. Thus, the costly signaling theory of religion is able to offer a unique explanation for our results.

While these studies focused on how communities overcome the free-rider dilemmas surrounding cooperative resource acquisition and consumption, throughout our evolutionary history individuals have faced an array of other collective action problems, most notably warfare and defense, which likely pose the greatest free-rider problems in human communities. As Steven Pinker (1997), the celebrated linguist and evolutionary psychologist remarks, "A war party faces the problem of altruism par excellence. Every member has an incentive to cheat by keeping himself out of harm's way and exposing others to greater risk" (p. 626). The ethnographic literature on warfare is replete with examples of men who defect en route to an attack or raid (e.g., Chagnon, 1997). Each individual that defects on a warring party places the remaining members at greater risk of injury or death. Thus, when warfare is frequent within a society, reliable signals of intragroup commitment, such as religious practices, should be highly favored by selective mechanisms.

To evaluate whether costly behaviors and badges were associated with warfare frequency or, alternatively, associated with cooperative resource production and consumption, I conducted a cross-cultural study with University of Connecticut colleagues Howard Kress and James Boster (Sosis, Kress, & Boster, 2005). Using ethnographic sources, we collected data from 60 geographically dispersed societies on the costs of religious practices, intensity of cooperative food production and consumption, warfare frequency, and a host of other control variables. As expected, we found that warfare frequency was the strongest predictor of the costliness of a society's male rites. Moreover, we demonstrated that the types of religious practices that have been favored as commitment signals depend on the nature of warfare prevalent within a society. In societies in which internal warfare (fought within a cultural group-ing) is common, communities continually fission and fuse; thus, an enemy one day may be an ally the next. Because of the mobility of individuals across kin groups and consequent shifting of alliances, individuals within communities that engage in frequent internal warfare should not be willing to submit to rituals that leave permanent badges, such as tattoos or scars, which can signal group identity. Indeed, we found a negative correlation between frequency of internal warfare and permanent badges, and in societies where internal warfare was prevalent, there was a greater reliance on nonpermanent rituals and badges, such as ingesting toxic substances and body painting. On the other hand, warfare fought against other cultural groups, referred to as external warfare, poses alternative problems. Groups engaged in external warfare are concerned about uniting unrelated males and fielding as large a combat unit as possible. When imbalances of power occur within a region, smaller groups are at risk of their members defecting to larger and more powerful groups. For these communities, permanent badges would serve to minimize the ability of men to abscond to another group. And, indeed, our results showed a positive correlation between external warfare and permanent badges, such as

scars, tattoos, and subincisions. Overall, our result offers strong support for the thesis that costly male rites emerge to signal commitment and promote solidarity among males who must organize for warfare.

REMAINING MYSTERIES AND CEREMONIAL CONCLUSIONS

While signaling theory has thus far offered some compelling insights into understanding the evolution and diversity of religious practices, numerous questions remain. Among the most significant of these is why signals remain so costly in tight-knit populations where interactions are regularly repeated. Under conditions where individuals interact repeatedly, theorists have shown that reputation and punishment mechanisms can maintain the reliability of signals while driving down their costs (Lachmann, Szamado, & Bergstrom, 2001; Silk, Kaldor, & Boyd, 2000). In religious communities that remain isolated from mainstream populations, such as the Haredim, reputations are vital for cooperative interactions, and punishments are efficiently and successfully implemented. Nonetheless, despite effective reputation and punishment mechanisms in sects, cults, and other closed religious groups, it is in these communities that the costliest religious signaling tends to occur. This may suggest that the signals are less important for communicating group commitments to fellow community members but rather serve to indicate their commitments to coreligionists who reside in disparate communities and thus interact infrequently (Sosis, 2005). In addition, they may function as signals to non-group members. Religious displays can often stigmatize individuals limiting outside opportunities, as noted previously, but they can also confer benefits when outsiders view religious practices as signs of cooperativeness and trustworthiness. For example, Frank (1988) observes that affluent New York City families place advertisements in the newspapers of Salt Lake City for Mormon governesses for their children. Apparently, "persons raised in the Mormon tradition are trustworthy to a degree that the average New Yorker is not" (p. 111).

To conclude, let's return to our initial questions: What do religious behaviors, badges, and bans communicate, and why are they effective signals? The three B's primarily communicate group commitments, but in addition they indexically signal acceptance of the community's moral codes. They are effective signals because their costliness ensures their reliability. Adherents are able to endure their costliness because repeated performance of religious activities can foster belief in the theologies, which provide enduring meaning for the practices by arousing emotions and generating dissonance. Various universal characteristics of religious behaviors, badges, and bans, such as their formality and repetitiveness and that they are physically and publicly performed, also facilitate internalizing supernatural beliefs. Internalizing

beliefs increases the perceived net benefits that adherents encounter when fulfilling religious obligations, including cooperative relations with coreligionists.

We have just begun to evaluate the merit of signaling theory as a lens through which we can discern the selective pressures that have favored religious practices in the human lineage. The value of the theory, however, is not limited to its evolutionary insights. Much more pressing than evolutionary reconstruction is explaining current patterns of religious practice, including new age, fundamentalist, as well as secular trends. It is hoped that further work on the costly signaling theory of religion will provide us with insights about how these trends vary across societies and the ways in which communities use religious behaviors, badges, and bans to promote trust, commitment, and cooperation.

REFERENCES

- Alcoorta, C., & Sosis, R. (2005). Ritual, emotion, and sacred symbols: The evolution of religion as an adaptive complex. *Human Nature, 16*, 323–359.
- Atran, S. (2002). *In Gods we trust: The evolutionary landscape of religion*. Oxford, England: Oxford University Press.
- Atran, S., & Norenzayan, A. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences, 27*, 713–770.
- Berman, E. (2000). Sect, subsidy and sacrifice: An economist's view of Ultra-Orthodox Jews. *Quarterly Journal of Economics, 115*, 905–953.
- Bliege Bird, R., & Smith, E. (2005). Signaling theory, strategic interaction, and symbolic capital. *Current Anthropology, 46*, 221–248.
- Bryson, B. (2003). *A short history of nearly everything*. New York: Broadway Books.
- Bulbulia, J. (2004a). Area review: The cognitive and evolutionary psychology of religion. *Biology and Philosophy, 18*, 655–686.
- Bulbulia, J. (2004b). Religious costs as adaptations that signal altruistic intention. *Evolution and Cognition, 10*, 19–38.
- Carr, J., & Landa, J. (1983). The economics of symbols, clan names and religion. *Journal of Legal Studies, 13*, 135–156.
- Chagnon, N. (1997). *Yanomama*. Fort Worth, TX: Harcourt Brace College Publishers.
- Chen, D. (2005). Club goods and group identity: Evidence from Islamic resurgence during the Indonesian financial crisis. Unpublished manuscript.
- Coleman, J. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.
- Cronk, L. (1994). Evolutionary theories of morality and the manipulative use of signals. *Zygon: Journal of Religion and Science, 29*, 32–58.
- d'Aquili, E., & Newberg, A. (1999). *The mystical mind*. Minneapolis, MN: Fortress Press.
- Ekman, P., Levenson, R., & Friesen, W. (1983). Autonomic nervous system activity distinguishes among emotions. *Science, 22*, 1208–1210.
- Finke, R., & Stank, R. (1992). *The churching of America, 1776–1990: Winners and losers in our religious economy*. New Brunswick, NJ: Rutgers University Press.
- Fishman, A., & Goldschmidt, Y. (1990). The orthodox kibbutzim and economic success. *Journal for the Scientific Study of Religion, 29*, 505–511.
- Frank, R. (1988). *Passions within reason: The strategic role of the emotions*. New York: Norton.
- Galanter, M. (1999). *Cults: Faith, healing, and coercion*. New York: Oxford University Press.
- Gluecklich, A. (2001). *Sacred pain*. New York: Oxford University Press.
- Iannaccone, L. (1992). Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. *Journal of Political Economy, 100*, 271–291.
- Iannaccone, L. (1994). Why strict churches are strong. *American Journal of Sociology, 99*, 1180–1211.
- Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 292–309). New York: Russell Sage Foundation.
- Irons, W. (2004). An evolutionary critique of the created co-creator concept. *Zygon: Journal of Religion and Science, 39*, 773–790.
- Johnson, D., & Krugler, O. (2004). The good of wrath: Supernatural punishment and the evolution of cooperation. *Political Theory, 32*(2), 159–176.
- Leachmann, M., Szamadó, S., & Bergstrom, C. (2001). Costs and conflict in animal signals and human language. *Proceedings of the National Academy of Sciences of the United States of America, 98*, 13189–13194.
- Levenson, R. (2005). Blood, sweat and fears: The autonomic architecture of emotion. In P. Ekman, J. J. Campos, R. J. Davidson, & F. B. M. de Waal (Eds.), *Emotions inside out* (pp. 348–366). New York: New York Academy of Sciences.
- Maynard Smith, J., & Harper, D. (2003). *Animal signals*. Oxford, England: Oxford University Press.
- Pesternak, V. (1988). Recruitment and commitment. *Society, 25*, 48–51.
- Pinker, S. (1997). *How the mind works*. New York: Norton.
- Poole, J. (1989). Announcing intent: The aggressive state of mouth in African elephants. *Animal Behaviour, 37*, 140–152.
- Rappaport, R. (1971). The sacred in human evolution. *Annual Review of Ecology and Systematics, 2*, 23–44.
- Rappaport, R. (1999). *Ritual and religion in the making of humanity*. Cambridge, England: Cambridge University Press.
- Robbins, T., & Anthony, D. (1982). Religious movements and the brainwashing issue. In K. Levi (Ed.), *Violence and religious commitment* (pp. 133–138). University Park: Pennsylvania State University Press.
- Ruffe, B., & Sosis, R. (2005). Does it pay to pray? Evaluating the economic return to religious ritual. Unpublished manuscript.
- Silk, J., Kaldor, E., & Boyd, R. (2000). Cheap talk when interests conflict. *Animal Behaviour, 59*, 423–432.
- Sosis, R. (2003). Why aren't we all Hutterites? Costly signaling theory and religion. *Human Nature, 14*, 91–127.
- Sosis, R. (2004). The adaptive value of religious ritual. *American Scientist, 92*, 166–172.

- Sosis, R. (2005). Does religion promote trust? The role of signaling, reputation, and punishment. *Interdisciplinary Journal of Research on Religion*, 1, 1–30.
- Sosis, R., & Alcoorta, C. (2003). Signaling, solidarity and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, 12, 264–274.
- Sosis, R., & Bressler, E. (2003). Cooperation and commune longevity: A test of the costly signaling theory of religion. *Cross-Cultural Research*, 37, 211–239.
- Sosis, R., Kress, H., & Boster, J. (2005). Scars for war: Evaluating alternative explanations for cross-cultural variance in ritual costs. Unpublished manuscript.
- Sosis, R., & Ruffe, B. (2003). Religious ritual and cooperation: Testing for a relationship on Israeli religious and secular kibbutzim. *Current Anthropology*, 44, 713–722.
- Sosis, R., & Ruffe, B. (2004). Ideology, religion, and the evolution of cooperation: Field tests on Israeli kibbutzim. *Research in Economic Anthropology*, 23, 89–117.
- Stark, R. (1987). How new religions succeed. In D. Bromley & P. Hammond (Eds.), *The future of new religious movements* (pp. 11–29). Macon, GA: Mercer University Press.
- Tuzin, D. (1982). Ritual violence among the Ilahita Arapesh. In G. H. Herdt (Ed.), *Rituals of manhood: Male initiation in Papua New Guinea* (pp. 321–336). Berkeley: University of California Press.
- Zahavi, A., & Zahavi, A. (1997). *The handicap principle: A missing piece of Darwin's puzzle*. New York: Oxford University Press.

NATURE'S MEDICINE: RELIGIOSITY AS AN ADAPTATION FOR HEALTH AND COOPERATION

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CHAPTER 5

INTRODUCTION

Many people express religious commitments, and these commitments strongly influence how they lead their lives. In this chapter, I discuss two hypotheses about the biological functions that strongly motivating religious commitments may serve. The first hypothesis is the healing placebo hypothesis, that religiosity evolved as a mechanism for self-healing—if you will, as nature's medicine. The second hypothesis is the costly signaling hypothesis, that religiosity evolved as a hard-to-fake signaling system to motivate trust, solidarity, and cooperation among nonkin in the ancestral world. I hope to show that by integrating these two hypotheses, we can gain a new understanding to the psychological design that equips us for religious thought and behavior.

"Religion" and its cognates are contested terms, but in science we can operationally define our meanings in ways that depart somewhat from ordinary language (Chomsky, 2000). By "religiosity," I am interested in motivating commitments to supernatural beings, powers, and places as well as dispositions to form these beliefs. Departing from common usage somewhat, I will call all such supernatural objects "gods." Lots of us believe in supernatural realities—gods—and why this is so presents one of the most fascinating and underexamined questions in the naturalistic study of our species. Yet it is far from obvious how selection could have tolerated dispositions to beliefs and practices relative to supernatural worlds for selection is intolerant of excess.