



The Foundations of Shamanism and Witchcraft

Citation

Singh, Manvir. 2020. The Foundations of Shamanism and Witchcraft. Doctoral dissertation, Harvard University, Graduate School of Arts & Sciences.

Permanent link

<https://nrs.harvard.edu/URN-3:HUL.INSTREPOS:37365897>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

© 2020 Manvir Singh

All rights reserved.

The Foundations of Shamanism and Witchcraft

Abstract

Human societies everywhere reliably develop complex traditions with striking similarities. Here, I examine two such near-ubiquitous practices – shamanism and beliefs in mystical harm – documenting cross-cultural patterns, then developing and testing theories to explain them.

Chapter 1 is a mixed-methods ethnographic study of the Mentawai crocodile spirit *Sikaoinan*. It introduces my fieldwork among the Mentawai people of Indonesia, showcases how shamanism intersects with domains such as medicine and morality, and uses the ethnography to answer key questions about religion in small-scale societies.

Chapter 2 steps back to consider shamanism from a more comparative light. Here, I develop a cultural evolutionary theory of shamanism, proposing that as service-providers compete to provide clients with most plausible means of influencing uncertain outcomes, they assemble packages of beliefs that conform to our cognitive architecture to convince us that can control important outcomes. I evaluate this theory against the ethnographic record and lay out predictions for how shamanism should vary with shifting social conditions.

Chapter 3 returns to Mentawai to test whether aspects of this theory can explain why shamans and other religious leaders so often observe costly prohibitions.

Finally, Chapter 4 shifts from shamanism to beliefs in mystical harm. Using a new cross-cultural database, I document global patterns in beliefs about witches, sorcerers, the evil eye, and

other harmful agents. On the basis of these similarities, and using a cultural evolutionary framework, I argue that these beliefs develop from three processes: a selection for intuitive magic, a selection for plausible explanations of misfortune, and selection for demonizing myths that justify violence. Alone, these processes produce traditions as diverse as superstitions, conspiracy theories, and propaganda – but around the world, they interact to produce the image of the odious witch.

Anthropologists have offered a catalogue of functional hypotheses to explain the pervasiveness of shamanism and witchcraft beliefs, but none satisfactorily account for the forms of these traditions or their patterns of variation. My research provides evidence that these traditions do not recur because they serve essential societal functions but because of the capacity of cultural evolution to produce practices adapted to our psychological biases.

Table of contents

Acknowledgements.....	vi
Introduction. People who control power	1
Chapter 1. Small gods, rituals, and cooperation	12
Chapter 2. The cultural evolution of shamanism.....	40
Chapter 3. Why do leaders observe costly prohibitions?.....	96
Chapter 4. Magic, explanations, and evil.....	122
Supplementary materials.....	169
References.....	170

Acknowledgements

So many to thank! Madre, pops, and Bean: Your support echoes in everything I do.

Thank you to everyone who offered suggestions on sections of this dissertation: Nicolas Baumard, Rosemary Bettle, Katia Chadaideh, Ronald Hutton, Ted Kaptchuk, Martin Lang, Samuel Mehr, Graham Noblit, Benjamin Purzycki, Ted Slingerland, Dylan Tweed, Vivek Venkataraman, Michael Winkelman, Max Winkler, and all the anonymous reviewers.

Thank you to Cammie Curtin for making the map, Mia Charifson for research assistance, Tiffany Hwang for helping with the *Sikaoinan* figure, and Steve Worthington at the Harvard Institute for Quantitative Social Science for the statistical help.

Thank you to the members of the Evolutionary Psychology and Culture, Cognition, and Coevolution Labs for watching talks, reading drafts, listening to me jabber, and doing some constructive jabbering yourselves.

Thank you to all my intellectual buddies these last seven years, especially Bethany Burum, Moshe Hoffman, Samuel Mehr, Cristina Moya, Jason Nemirow, and Dylan Tweed.

Thank you to Russell Gray and Nicolas Baumard for hosting me last year. And thank you to the Naturalists for a kickass time in Paris.

Thank you to everyone who made fieldwork possible: Chris Hammons, for pointing in the right direction; Maskota Delfi, for helping me traverse jungles of all sorts; Gejeng Sakaliou, for research assistance and friendship (despite our quibbles); and Rustam (Boroiooggok) Sakaliou for being a brother.

Finally, thank you to my committee members: Richard, for helping me find my way after I turned away from primates; Graham, for helping me become (in my own liminal way) a

cultural anthropologist; Joe, for giving me the toolkit to study things I find beautiful in a way that feels important; and Luke – Luke! – for your mentorship, editorial insight, intellectual companionship, travel buddy-ness, and friendship. You sharpened my questions, taught me how to do fieldwork, introduced me to the beauty of ethnography, and read and commented on my drafts no matter how slammed your schedule. I can't imagine what this thesis would look like without your guidance.

Dedicated to the people of Madobag, Ugai, and Buttui.

Surak sabeu





People who control power

1. Public power and private power

The Western Apache divided all people (or at least, all Western Apache) into two categories: those with ‘power’ (*diytn*) and those without it (*diytn doh-wada*) (Basso 1967). Those with power came in two forms: shamans¹ and witches.

Shamans used their power in public. They identified horse thieves, predicted the approach of enemies, and cured illness. They made sand paintings. They channeled their power through energized performances accompanied by drumming. Bourke (1892, p. 585) described the manic ecstasy of these dances:

As the volume of music swelled and the cries of the on-lookers became fiercer, the dancers were encouraged to the enthusiasm of frenzy. They darted about the circle, going through motions of looking for an enemy, all the while muttering, mumbling, and singing, jumping, swaying, and whirling like the dancing Dervishes of Arabia.

¹ Both Basso (1967) and Bourke (1892) referred to these individuals as “medicine men”.

To become a shaman, a person had to demonstrate that they could control power (Bourke 1892). They began by interpreting omens and taking fasts and vigils. They dreamt important dreams. They withdrew from society, seeking out lonely wilderness. They might have paid an existing shaman to train them, but no one was barred from proclaiming themselves a shaman and offering their services.

Shamans performed incredible feats (Bourke 1892). They swallowed fire and spear heads. One was remembered to have lit a pipe by pointing his hands towards the sun. Another survived a lightning strike and then a mountain lion attack. One of the most renowned, Willie Neal, predicted the arrival of automobiles and pick-up trucks when, years before, he foresaw that “iron objects with eyes that see in the night” (Basso 1967, p. 71) would become commonplace.

If shamans were prominent, public, and prosocial, witches were private, enigmatic, and vile (Basso 1967). They caused infirmity and inexplicable sexual attraction. They cast spells on animals, which became apathetic and then died. They did not make sand paintings. They hated with an intensity rare among normal folk, partly explaining why men, being predisposed toward such bitterness, often became witches.

Witches were rumored to meet in remote places to satisfy their deranged pleasures. These ‘witch dances’ began at dusk and ended at dawn. Participants frolicked naked around a bonfire, holding exhumed corpses above their heads. When the dancing subsided, anyone who so wished had sex with a menstruating woman, typically a close maternal relative. They saved the menstrual fluid in a small basket to use in their poison magic.

Witches did not use chants or dancing to channel their power. Rather, they used evil magic. Some witches used poison magic, concocted from menstrual fluid, the powdered skin of human corpses, and, according to some of Basso’s informants, bear feces, bear urine, dried

rattlesnake skin, and bits of wood taken from trees struck by lightning. Others used projectiles, firing beads, pebbles, arrowheads, and strands of hair into their victims. The projectiles were shot at such high speeds that they became invisible.

The Western Apache feared witches. They accused each other of evil magic after bouts of illness and death. They carried charms protecting against sorcery and esteemed the shamans proficient at curing sorcery-caused illness. But they were also skeptical. “Neither the ethnographer nor his informants,” wrote Basso (1967, p. 101), “has ever observed a witch in action, watched a ‘witch dance,’ or seen any of the ritual paraphernalia witches are reported to use.” He also reported hearing statements along the lines of “I could tell you all those things I have heard about witches, but I don’t think they are true” (Basso 1967, p. 101).

Western Apache shamanism and witchcraft represent packages of peculiar practices and beliefs. Shamanism involved asceticism, ecstatic dancing, and demonstrations of power, all linked to pragmatic services such as divination and healing. Witchcraft beliefs involved beliefs that group mates attacked neighbors through mystical means and suspicions of outrageous obscenities in nighttime collectives. Apache shamanism and witchcraft reflected their particular cultural context, demonstrated, for instance, in people’s gendered view of witchcraft (men are witches because men have hatred) and the basis of shamans’ credibility (those shamans are powerful who have survived mountain lion attacks and predicted the arrival of automobiles).

Yet Western Apache shamanism and witchcraft are remarkable for how strikingly they seem to resemble analogous traditions in widely divergent contexts. In societies the world over and throughout recorded history, people have visited ecstatic practitioners to provide services like healing and divination (Eliade 1964; Lewis 2003; Peoples et al. 2016; M. Winkelman 2000). And in societies the world over and throughout recorded history, people have suspected, or at

least accused, other individuals of attacking them using occult methods (Forsyth 2016; Hutton 2004, 2017; Mair 1969; Singh 2019c). Recognizing this ubiquity, Boyer (in press) recently referred to shamanism and witchcraft beliefs as “wild traditions” or “informal religious activity”—magico-religious traditions that are widespread, that likely predated modern doctrinal religions, and that reappear when powerful organizations try to quash them. Given their reliable reemergence, Boyer concluded, these practices likely reflect psychological capacities shared among humans everywhere (see also Winkelman 2000, 2002).

Building on Boyer’s conclusion, I pursue three objectives in this dissertation. First, I document patterns in shamanism and witchcraft beliefs, drawing, whenever I can, on systematic cross-cultural data. My goal is not only to resolve debates about whether ‘shamanism’ and ‘witchcraft’ are genuine phenomena that share features across cultures (e.g., Crick 1973; Jones 2006), but also to establish an empirical foundation necessary for the explanatory project. You cannot explain why witchcraft beliefs exist unless you know what you are trying to explain.

Second, I leverage recent insights from cognitive science and cultural evolution to explain those patterns. Over the last three decades, researchers have drawn on the behavioral sciences to explain otherwise inscrutable cultural phenomena, demonstrated most relevantly in major progress in the psychological and evolutionary study of religion (e.g., Barrett 2000; Bloom 2007; Boyer 2001; Guthrie 1995; Johnson 2015; Norenzayan 2013; Norenzayan et al. 2016; Norenzayan and Shariff 2008; Wright 2009). I use a similar approach to start to understand why shamanism and witchcraft recur.

Finally, I test predictions of those explanations, both against the ethnographic record and through my own fieldwork with the Mentawai people of Indonesia.

2. The explanatory framework and an outline of the dissertation

Shamanism and witchcraft beliefs are complex. My short summary of the Western Apache ethnography gestured at this complexity, pointing out, for instance, the asceticism, curing dances, and demonstrations of power constituting shamanism. Yet this was an impoverished description of Western Apache shamanism, leaving out, among many other features, the diverse curing practices, the many types of shamans (e.g., those who control bear power, those who control snake power, those who control manzanita root power), and shamanic regalia.

This complexity is noteworthy because there are few processes capable of producing complex design. In the case of human behavior, the three most likely are (1) genetic evolution, (2) cultural evolution, and (3) intentional design (Dawkins 1986; Dennett 1995). Genetic and cultural evolution produce complex design through iterative selection, as variants that best reap some currency (e.g., inclusive fitness) are selectively retained, over time producing traits designed to maximize that currency. Intentional design, meanwhile, refers to when an agent deliberately designs an entity.

In this thesis, I explore how these three processes might interact to reliably assemble shamanism and witchcraft beliefs. Building on approaches developed by cognitive and evolutionary scholars (Boyd and Richerson 1985; Henrich 2015; Sperber 1996a; Sperber and Hirschfeld 2004), I consider how cultural evolution, accelerated by ingenious individuals, shapes cultural practices to apparently satisfy regular psychological goals. I refer to this process as *evaluative cultural selection*.

The word *evaluative* here is key. According this framework, what is important is that a person *evaluates* some cultural practice as satisfying their goal. A person will continue to visit a shaman as long as they think the shaman helps them achieve a desired, regardless of whether the shaman is actually efficacious. Similarly, a person will adopt an explanation contingent on how psychological mechanisms evaluate its plausibility, regardless of whether it actually explains an event. (Granted, in many instances, people can evaluate whether a variant truly satisfies a goal. People can tell, for instance, whether some food delivered pleasure.)

The logic of evaluative cultural selection is simple. It starts with the observation that humans are motivated to achieve certain ends, such as experiencing pleasure or harming a rival. These motivations seem to ultimately emerge from cognitive adaptations designed by natural selection (H. C. Barrett 2015). An example of a regularly occurring motivational state is revenge: Humans seem motivated to harm individuals who have attacked them, an impulse that, according to some scholars, emerges from cognitive mechanisms designed by natural selection to deter repeated aggression (McCullough et al. 2013).

Of course, the particular goals we are motivated to achieve, and the extent to which those goals have priority, vary greatly. I don't feel compelled to snap back at someone who bumps me, but someone from a different social ecology might (D. Cohen et al. 1996). Or, to take a more trivial example, I have no motivation to wash my car, given that I don't have a car. Because my aim in this dissertation is to explain cultural practices that appear across human societies, I focus on cross-culturally recurrent motivational states. But I also try to integrate variation when possible. To the extent that we can identify how contexts mediate certain motivational states, we can make predictions about how a practice should vary. For example, people will be motivated to attack out-group members more in ecologies where there is ongoing inter-group aggression.

Thus, if we argue that a cultural practice (such as private sorcery) emerges because of a motivation to harm others, we should expect that it will be directed towards out-group members in ecologies where inter-group conflict is most frequent.

Next, as humans regularly confront and pursue these psychological goals, they invent, tweak, and selectively retain practices that best satisfy them. The simplest demonstration of this process is the evolution of pleasure-inducing technologies. As we selectively retain those practices best at sparking pleasure, we over time craft technologies that are potent at evoking it, such as pornography, cheesecake, or stories (Hogan 2003; Nettle 2005; see also Singh 2019a, 2019b). In fact, ethnographers have observed individuals noting and then incorporating those elements that most effectively tickle audiences. In writing about Xhosa *ntsomi* story-performers, Scheub (1975, p. 90) reported that “an artist includes and emphasizes those elements that she delighted in during *ntsomi* performances that she witnessed, and she does not fail to recall those details that particularly delighted her audiences during her own productions.” He even connected this selective retention to the development of the *ntsomi* tradition: “Considering that this process of borrowing, influencing, innovating, and combining has been going for decades, there should be no surprise that such an involved form has developed” (Scheub 1975, p. 19).

Again, the precise design features that satisfy a goal (or that appear to) will vary. People the world over like to laugh, although they find different things funny. Yet, as with motivational states, we can use our understanding of how certain goals are satisfied (or are perceived to be satisfied) to make predictions about how the resulting practices should vary. An example I discuss at length in Chapter 4 is how humans explain misfortune. When humans are confronted with a terrible event, they seem motivated to understand what caused it (Khemlani and Johnson-Laird 2011), presumably so as to be prepared in the future (Gopnik 2000). But a person’s

environment determines which kinds of explanations they see as most plausible. When a person feels threatened and a misfortune is especially impactful, they intuitively regard explanations that blame a mistrusted individual as more acceptable (Abalakina-paap et al. 1999; Mashuri and Zaduqisti 2015; McCauley and Jacques 1979; van Prooijen and van Dijk 2014). Given that the criteria of what constitutes a compelling explanation vary with experienced mistrust and the impact of the misfortune, we should expect that the resulting explanations will, too. Simply, if people are more likely to accept paranoid explanations—those that blame an individual—when they confront an impactful rather than inconsequential misfortune, we should expect paranoid explanations to apply overwhelmingly to impactful misfortunes. And if people are more likely to accept paranoid explanations as they grow more distrustful, then we should expect paranoid explanations to be more successful in environments with higher distrust.

People’s evaluation criteria can also be influenced by other cultural beliefs. As I describe in Chapter 2, a person’s evaluation of whether a shaman successfully heals them hinges crucially on their beliefs about why they might be sick. If they believe that illness is caused when their soul wanders away, they will likely be dissatisfied with a shaman who tries to treat them with acupuncture. Again, to the extent that cultural beliefs determine which practices will be seen as effective, we can predict that as those cultural beliefs change, the resulting practice should change too. In this case, as people’s models of illness change, we should expect corresponding changes in the design of shamanism, a point we will revisit in considering shamanism’s collapse.

Evaluative cultural selection builds on existing cultural evolutionary approaches. It specifies a set of what Sperber and colleagues have called attractors (Scott-Phillips et al. 2018; Sperber 1996a; Sperber and Hirschfeld 2004), what Boyd and Richerson (1985) called *direct* biases, and what others have since called *content* biases (e.g., Henrich and McElreath 2008;

Mesoudi 2017; see also "reinforcers": Durham 1991, pp. 178-179 ; Pulliam and Dunford 1980).

Content biases are mechanisms that “cause us to more readily acquire certain beliefs, ideas or behaviors *because* some aspect of their content makes them more appealing” [emphasis in the original] (Henrich and McElreath 2008, p. 557). In the case of evaluative cultural selection, the content biases that predispose people to adopt some variant are (1) our proximate psychological goals, and (2) the criteria for satisfying those goals. Those goals can range from changing the weather to explaining misfortune. The evaluation criteria, meanwhile, can depend on cognitive mechanisms as divergent as those shaping how we evaluate causality to those determining what constitutes a plausible explanation.

That evaluative cultural selection contributes to the emergence of shamanism and witchcraft beliefs does not preclude other processes from contributing as well. Scholars provide evidence that culture can be shaped by processes such as cultural group selection (Boyd and Richerson 2010; Henrich 2004a) and self-interested rule-making and enforcement (Acemoglu et al. 2003; Singh et al. 2017), as well as variables including population size (Henrich 2004b; Muthukrishna et al. 2014) and individual uncertainty (Laland 2004; Morgan et al. 2015). In the following chapters, I will consider how these and other mechanisms might contribute to shamanism and witchcraft beliefs, especially when trying to account for cross-cultural variation.

This dissertation is comprised of four chapters, each of which is also a stand-alone academic article. The first chapter is a mixed-methods ethnographic paper on the Mentawai crocodile spirit *Sikaoinan*. This chapter introduces my fieldwork among the Mentawai and showcases how shamanism exists in a society, intersecting domains such as medicine, morality, and supernatural belief. The second chapter steps back from Mentawai to consider shamanism in a more comparative light. Here, I develop a cultural evolutionary theory of shamanism, drawing

on the principles of evaluative cultural selection just outlined. The third chapter returns to Mentawai and tests whether aspects of this theory can explain why shamans and religious leaders more generally observe costly prohibitions. Finally, the fourth chapter shifts from shamanism to beliefs in witches, sorcerers, the evil eye, and other harmful, mystical agents. I systematically document patterns in beliefs about harmful, mystical agents, and then use both cognitive science and evaluative cultural selection to explain those patterns.

3. The most difficult problem of anthropology

In 1896, the pioneer of American anthropology, Franz Boas, wrote that the profound cultural regularities observed worldwide suggest that general sociological laws guide cultural evolution (Boas 1896, p. 901):

Modern Anthropology has discovered the fact that human society has grown and developed everywhere in such a manner that its forms, its opinions and its actions have many fundamental traits in common. This momentous discovery implies that laws exist which govern the development of society, that they are applicable to our society as well as to those of past times and of distant lands[...].

Yet he doubted that these laws could be identified. “This is the most difficult problem of anthropology,” he wrote, “and we may expect that it will baffle out attempts for a long time to come” (p. 902).

More than a century later, the evolutionary social scientist E. O. Wilson (1998, p. 137) acknowledged the same intellectual puzzle. “The question remaining is how biology and culture interact,” he wrote, “and in particular, how they interact across all societies to create the

commonalities of human nature.” For him, the origin of these patterns is “the central problem of the social sciences and humanities, and simultaneously, one of the great remaining problems of the natural sciences. At present, no one has a solution.”

This dissertation starts to propose one. Ubiquitous, complex cultural practices—from shamanism to witchcraft beliefs, dance music (Mehr et al. 2018, 2019) to hero stories (Booker 2004; Singh 2019a), rites of passage (Eliade 1958; van Gennep 1961) to many forms of punitive justice (Howell 1954; Pospisil 1958; Richardson 1940)—may emerge, at least partly, because of the capacity of cultural evolution to produce practices that satisfy regular psychological goals. Humans everywhere may assemble culture to satisfy themselves.

Chapter 1

Small gods, rituals, and cooperation

The Mentawai crocodile spirit *Sikaoinan*

Abstract

Cognitive and evolutionary research has overwhelmingly focused on the powerful deities of large-scale societies, yet little work has examined the smaller gods of animist traditions. Here, in a study of the Mentawai crocodile spirit *Sikaoinan* (Siberut Island, Indonesia), we address three key questions: (1) Are smaller gods believed to enforce cooperation, especially compared to bigger gods in larger-scale societies? (2) Do beliefs in these deities encourage people to incur costs? and (3) Does ritual produce beliefs in these deities? Drawing on interview responses, data from healing ceremonies, and ethnographic observation, we show that *Sikaoinan* is believed to punish people who violate meat-sharing norms and that people ‘attacked’ by *Sikaoinan* invite shamans to conduct costly healing rituals. The public nature of these rituals, involving prestigious individuals speaking to *Sikaoinan* and apologizing for the patient’s stinginess, reinforce onlookers’ beliefs about *Sikaoinan*. The most widely-shared beliefs about *Sikaoinan* are represented in rituals while beliefs not represented vary considerably, indicating that ritual may be potent for cultural transmission. These results suggest that moralizing supernatural punishers may be more common than previously suspected and that the important trend in the cultural evolution of religion has been the expansion of deities’ scope, powers, and monitoring abilities.

This article was coauthored with Ted Kaptchuk and Joseph Henrich.

1. Three unresolved questions

Worshiped by the majority of living humans (Pew Research Center 2017), punitive supernatural agents are ubiquitous and important; they seem to promote cooperation beyond the provincial circle regulated by kinship and reciprocity (Purzycki et al. 2016; Shariff et al. 2015); and they are associated with the emergence and maintenance of political complexity around the world (Watts, Greenhill, et al. 2015). Yet despite evidence that beliefs in these gods enabled humans' unique levels of cooperation (Norenzayan 2013; Norenzayan et al. 2016), three basic questions remain unresolved:

First, do supernatural agents punish non-cooperative behavior in small-scale societies? According to a prevailing view, the answer is “no”. Tylor (1874/1920, p. 360) endorsed this position when he wrote that “savage” religion “is almost devoid of that ethical element which to the educated modern mind is the very mainspring of practical religion.” Instead, by his appraisal, people in such societies behave morally because of the pressure of “tradition and public opinion, comparatively independent of the animistic belief and rites which exist beside them.” Recent scholars, pointing for the tendency for gods to become powerful as societal complexity increases (Peoples and Marlowe 2012; Roes and Raymond 2003), have echoed these conclusions (Baumard and Boyer 2013; Boyer in press, 2018). As Wright (2009, p. 24) summarized, “Even if religion is largely about morality today, it doesn’t seem to have started out that way.”

Other researchers have challenged these conclusions (Boehm 2008; Purzycki et al. in prep; Purzycki and Sosis 2019; Watts, Greenhill, et al. 2015). Boehm (2008), for instance, coded the ethnographies of 18 forager societies and found moralistic supernatural punishment in every society examined, although spirits typically focused on only a couple behaviors, lacking the broad,

moralistic scope of the supernatural punishers of large-scale societies (White and Norenzayan 2019). Resolving whether the spirits of hunter-gatherers and horticulturalists are moralistic is crucial not only for properly characterizing the cultural evolution of prosocial religion. It also has implications for our understanding of the forces supporting human cooperation in small-scale societies, especially given humans' exceptional levels of cooperation towards non-kin (Hill et al. 2011).

The second unanswered question is: do people *believe* in supernatural punishment? Just as people *believe* that germs are dangerous and thus wash their hands before eating, do they hold mental representations of supernatural punishers that encourage them to incur costs? Experimental work suggests that, for believers in world religions, the answer is “yes”. Across diverse societies, participants who rated gods as more punitive and knowledgeable were more cooperative with distant co-religionists in economic games (Lang et al. 2019; Purzycki et al. 2016). Moreover, a meta-analysis of 25 experiments showed that whereas religious priming induced prosocial behavior among religious participants, it failed to affect non-religious participants, indicating that the effects of priming depended on participants' beliefs (Shariff et al. 2015). In lab settings, supernatural belief seems to nudge behavior.

Despite this growing evidence, many influential researchers remain skeptical (Baumard and Boyer 2013; Boyer in press, 2018). They point to evidence showing that religious beliefs affect “reflective” beliefs (those that participants report) but not “intuitive” beliefs (those that affect decision-making) (J. L. Barrett 2000). Moreover, most existing empirical evidence comes from experimental rather than naturalistic data, leaving it unclear to what extent beliefs in supernatural punishment affect real-world behavior (although see Shariff and Rhemtulla 2012; Barro and McCleary 2006; Edelman 2009). These gaps are even more pronounced given that

almost all of aforementioned studies have been conducted with participants in large-scale societies, with little research investigating whether supernatural belief affects naturalistic behavior in small-scale settings.

The final unanswered question is: what is the relationship between ritual and belief? Scientists have investigated many mechanisms by which ritual might provide group-level benefits, including enabling coordination (Chwe 2001), enhancing group identification (Clingsmith et al. 2009; Whitehouse and Lanman 2014), and maintaining political hierarchy through demonstrations of power (Watts et al. 2016). Researchers have also described how people's social contexts and cognitive architecture contribute to religious belief (Boyer 2001; Gervais and Henrich 2010; Lanman and Buhrmester 2017). But these lines of research remain disconnected. With the exception of research on children's belief (Kapitány et al. 2019; Woolley et al. 2004), very little empirical work has examined the interaction between belief and ritual (although see Barth 1975). This gap is all the more striking given that some scholars hypothesize that ritual is a critical mechanism for transmitting religious belief (Henrich 2009; Sosis 2006; Whitehouse 2002). Without ritual, some propose, the transmission of such beliefs would be impeded by cognitive adaptations for protecting against misinformation.

These questions remain unanswered partly because of a paucity of targeted data on religious practice in small-scale societies. To help fill these gaps, we here present data on a punitive small god – the Mentawai people's crocodile spirit, *Sikaoinan*. As a belief system that includes shamanism, ancestor spirits, and an animist worldview (Loeb 1929a, 1929b; Schefold 1988; Singh and Henrich 2019), Mentawai religion shares features with the traditional religions of many small-scale societies, including those of hunter-gatherers (Boyer in press; Peoples et al. 2016; Singh 2018). Synthesizing interview responses, behavioral data on healing ceremonies, and

primary ethnographic observation, we here address the three questions just outlined while presenting a rich ethnographic case study of a small god in an animist tradition.

2. Ethnographic context

The Siberut Mentawai are sago-horticulturalists who live in the river valleys of Siberut Island (Indonesia), the largest island of the Mentawai Archipelago (4,030 km²; about 150 km west of Sumatra) (Tulius 2012) (Figure 1.1). The island is covered by at least 11 major rivers, each branching into dozens of smaller waterways. Given the distance between rivers and a history of headhunting, people infrequently traveled to other rivers, driving cultural differences among people living in distinct river valleys (Schefold 2007). We refer to the set of communities who speak a common dialect and live in the same river valley as a cultural region.

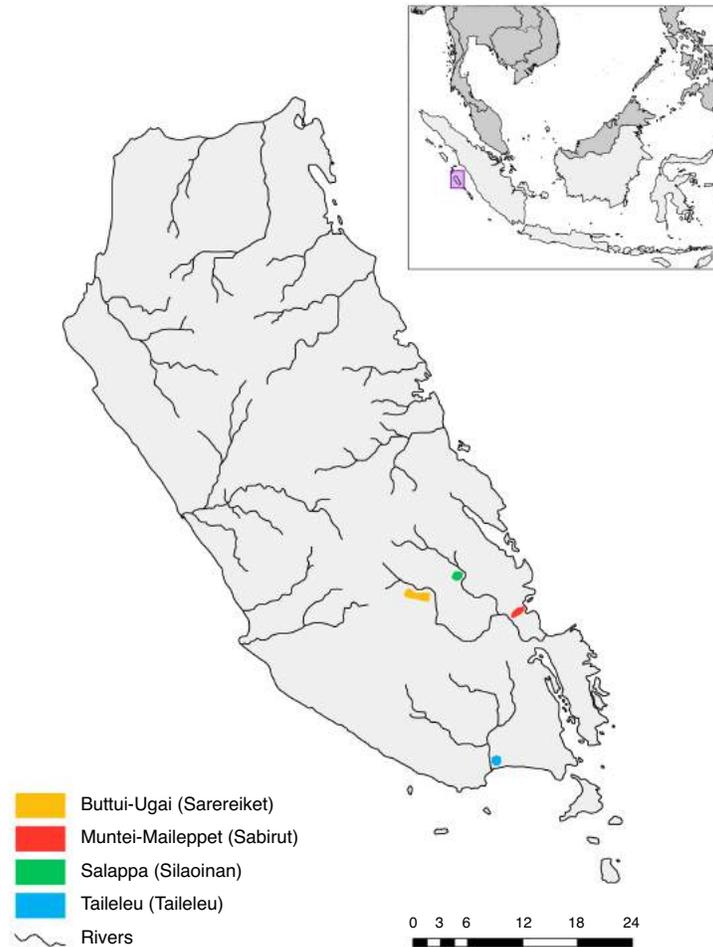


Figure 1.1. Siberut Island, the largest island of the Mentawai Archipelago (Indonesia). The different study sites are colored. The legend shows the villages studied with the cultural region in parentheses. Indonesia is light gray in the inset, while other countries are dark gray.

The Mentawai are organized into patrilineal clans (known as *uma*), traditionally residing either in longhouses (also known as *uma*) or small houses nearby (Schefold 1988; Tulus 2012). Following settlement programs by the government, most people shifted to villages (*barasi*), which host schools, mosques, churches, and clinics. Settlement villages alter residence patterns

by placing families in close proximity and positioning clans much closer than they traditionally lived. Still, many families maintain several residences, traveling between a house in the forest, where they tend to pigs and conduct ceremonies, and a house in the settlement village. Some families, typically those of shamans, spend most or all of their time in these forest residences. Families with school-age children, meanwhile, tend to remain in settlement villages.

The indigenous Mentawai religious system is known as *Arat Sabulungan*. Missionaries and government programs largely destroyed Arat Sabulungan elsewhere in the Mentawai Archipelago, yet it continues to thrive in Siberut, partly due to the resistance of local communities, awareness efforts by the anthropologist Reimar Schefold, and the protective, malarial swamp-forest covering the island. Nevertheless, tourism, the spread of Islam, development agendas, and the expansion of formal education are rapidly transforming Mentawai culture and society (Delfi 2013, 2017; Hammons 2010), making current ethnographic investigations invaluable.

The traditional healers in Mentawai are *sikerei* (shamans), a class of men set apart by their ability to see spirits (Loeb 1929b; Singh and Henrich 2019). As healers, *sikerei* are experts in herbal medicine and the special songs used for communicating with souls and spirits (Singh 2018). A man hoping to become a *sikerei* must host a series of ceremonies, find another *sikerei* to teach him songs and herbal medicines, and have his eyes magically treated. In some cultural regions, *sikerei* are marked by their continued use of the loincloth and their full-body tattoos.

Sikerei treat ailments in healing ceremonies called *pabetei*. The family hosting the ceremony sacrifices pigs or chickens, which are shared with the *sikerei* (as a kind of payment) and close kin. Healing ceremonies are like doctor's appointments: All of them share common elements, but each is also geared to target particular ailments. The intervention regarded as most

paradigmatic of the sikerei institution is *lajok simagre*, an all-night treatment during which sikerei dance and summon beneficent spirits. When some of the good spirits possess the dancing shamans, they enter trance.

3. Data collection

Our report draws on three sources of data: ethnographic interviews about Sikaoinan conducted with 96 participants across four cultural regions of southern Siberut; systematic data covering 66 healing ceremonies, most of which occurred in the Buttui-Ugai region of Siberut in 2017; and participant observation occurring over 11 months in the Buttui-Ugai region.

The Harvard University Committee on the Use of Human Subjects approved this research project. All participants provided verbal informed consent before the study. All analyses and cleaned data are available online on the OSF project website online at <https://osf.io/bjq6f/>.

3.1. *Sikaoinan interviews*

M.S. and a research assistant interviewed participants about Sikaoinan in 2017 as part of a larger cross-regional study of cultural beliefs in southern Siberut. Interviews were conducted in the Mentawai language in the villages of Buttui and Ugai (Sarereiket), Muntei and Maileppet (Sabirut), Salappa (Silaoinan), and Taileleu (Taileleu) (Figure 1.1). We aimed to interview those participants living in the same village in as few days as possible and visited different sections of each village on different days. We selected participants opportunistically and made efforts to both (1) interview participants privately and out of earshot (such as in the participant's house or a small building to which participants were invited) and (2) prevent participants who had

completed the interview from discussing it with other individuals (such as by having a research assistant sit with participants as they waited to be interviewed).

Interviews consisted of demographic variables (name, age, patrilineal clan, village of residence, village of origin, spouse's clan, religion, and years of schooling), as well as surveys on shaman taboos and Sikaoinan. With the exception of eight participants in Sarereiket, all participants were asked the seven questions about Sikaoinan in the same order: (1) number; (2) sex; (3) location; (4) reason for attack; (5) method of attack; (6) injury/illness resulting from attack; (7) objects used in ritual. Responses to these questions were recorded during the interviews and later translated, cleaned, and binned.

All analyses were conducted in R 3.4.3 (R Core Team 2015). As a part of our analysis, we calculated the agreement among respondents about a given question (represented here with a) according to the following formula:

$$a = \frac{\sum_{i=1}^s p_i n_i}{n} * \frac{n}{\sum_{i=1}^s n_i}$$

where n_i is the number of respondents who gave the i th answer, p_i is the proportion of respondents who gave the i th answer, s is the total number of types of answers, and n is the total number of respondents. The formula measures the extent to which respondents gave similar answers (term on the left), taking into account that respondents can give more than one answer (term on the right). The formula simplifies to the following:

$$a = \frac{\sum_{i=1}^s n_i^2}{n \sum_{i=1}^s n_i}$$

3.2. Healing ceremonies

M.S. and a research assistant interviewed the patients of healing ceremonies or their family members in 2017. We either interviewed patients after attending or having heard about a healing ceremony or asked people to tell us about their or a family member's most recent healing ceremony. All interviews were conducted along the Rereiket River with most occurring in Ugai and Buttui.

Interviews were conducted in the Mentawai language. Respondents were asked about the treatments in the healing ceremony, the number of pigs and chickens sacrificed, the length of the ceremony, and which shamans provided care. Participants were also asked about the illness, such as what the ailment was, its duration, whether they had hosted a healing ceremony for it before, why they believed it to have occurred, which other treatments they had pursued, and whether the ceremony had worked.

When possible, participants' responses were verified in one or more of the following ways: (1) M.S. attended the healing ceremony; (2) M.S. verified details with other community members, preferably one of the sikerei said to administer the ceremony; or (3) M.S. reinterviewed the participant or another family member. In total, 90 interviews were conducted about 77 healing ceremonies and 75 bouts of illness (some healing ceremonies targeted several bouts of illness, such as when siblings or spouses were healed, while some illness bouts were healed in several successive ceremonies). Eleven healing ceremonies were removed from analyses because no ceremony was actually conducted ($n = 1$), other observers denied that a ceremony was conducted ($n = 4$), the participant admitted to not remembering details clearly ($n = 3$), there were discrepancies when the participant was interviewed again ($n = 2$), or other parties disagreed about noteworthy details ($n = 1$).

Responses to the questions were recorded during the interviews. All analyses were conducted in R 3.4.3 (R Core Team 2015).

4. Sikaoinan

Throughout southern Siberut, people describe a water-dwelling spirit that causes illness, is appeased in shamanic healing ceremonies, and is often referred to as “aunt” (*meinan*). We refer to this spirit as *Sikaoinan* (lit. “that which is in the water”). The word, which also means “crocodile” in many Mentawai dialects, is the main term used for the spirit in several of the study regions (Schefold 1988). The spirit’s other names include *Silabbualai* (“that which hits with hair”) and *Sibeuleppe* (“that with big clothes”), although these names are more variable than *Sikaoinan* and some respondents regarded them as distinct spirits. In line with the spirit’s various names, some people described it as the soul of a crocodile or as a crocodile with long hair (see Figure 1.2 for some illustrations). Others described it as a long-haired figure or a spirit-being with big clothes who, according to some, associates with the crocodile and directs it to attack people.

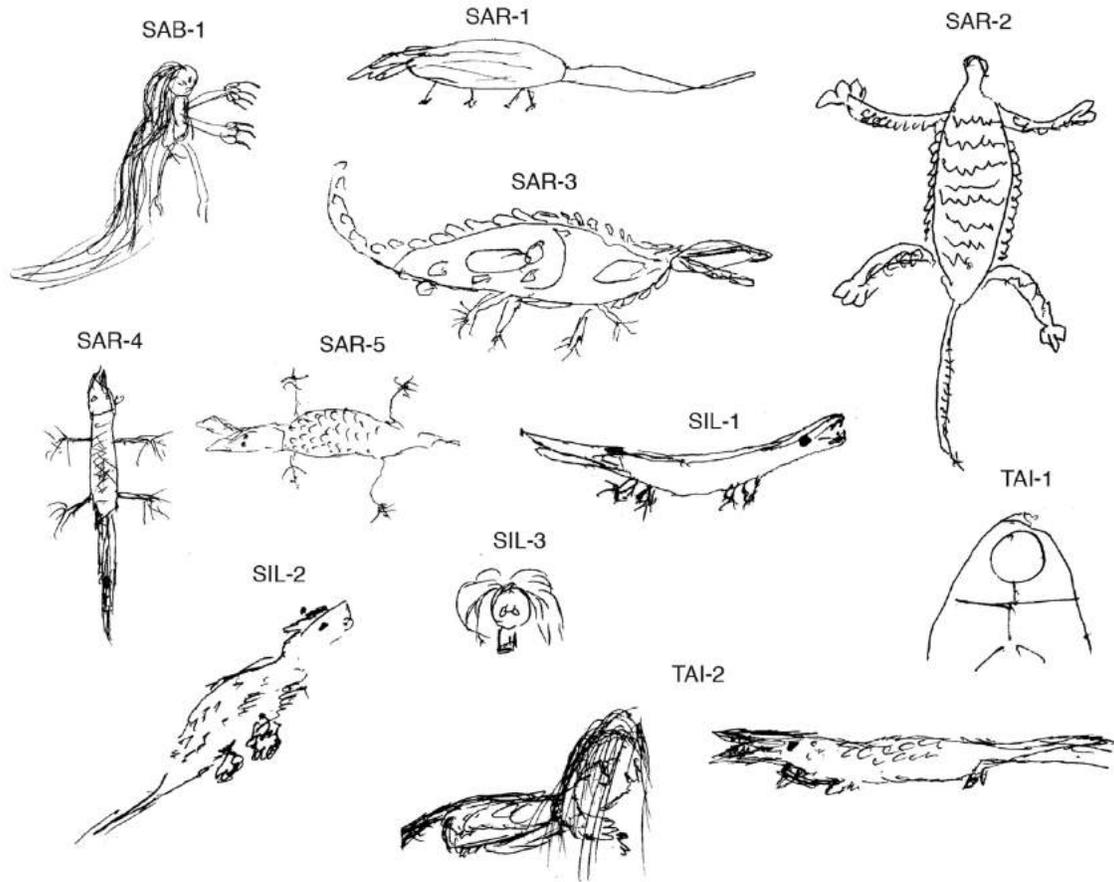


Figure 1.2. Illustrations of Sikaoinan by Mentawai people in the regions of Sabirut (SAB), Sarereiket (SAR), Silaoinan (SIL), and Taileleu (TAI). Illustration TAI-2 distinguishes between the physical body of Sikaoinan (a crocodile) and its soul (a long-haired figure with the torso and limbs of a crocodile).

4.1. Sikaoinan has moral concerns, but they are limited in scope and domain

Across four cultural regions of southern Siberut, participants near-unanimously reported that Sikaoinan attacks people who fail to share (Figure 1.3A). Moreover, participants who specified *which* items must be shared almost exclusively mentioned meat, although a tiny minority

mentioned other items including money and *kat* (edible plant food) (Figure 1.3B). We did not collect data on who food must be shared with, but food-sharing norms in Mentawai dictate that people share with social intimates, especially clanmates, affines, and neighbors who live nearby (Hammons 2010; Schefold 1982). Sikaoinan has moralistic concerns, but they are limited in domain (sharing meat) and scope (clanmates and other relatives).

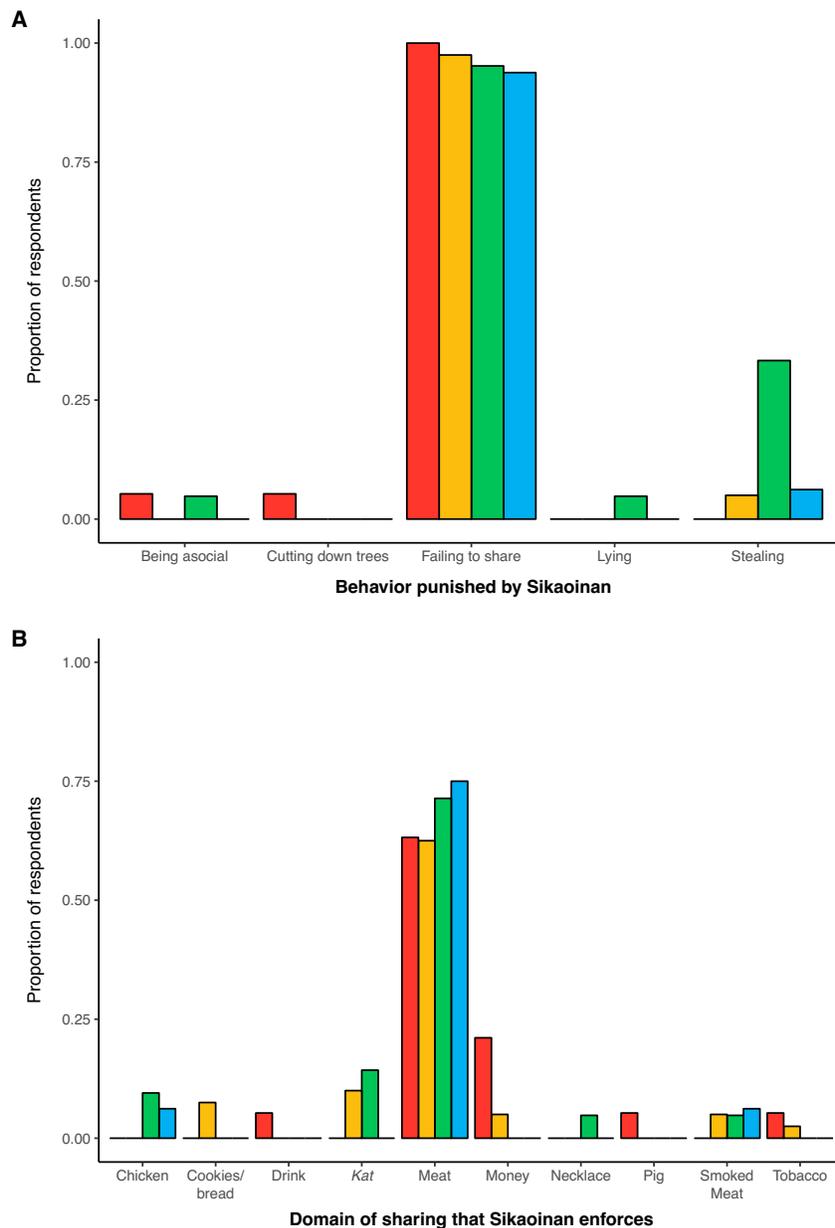


Figure 1.3. The reasons Sikaoinan attacks people, according to free responses (N = 96). Colors correspond with cultural regions: red = Sabirut; yellow = Saireireket; green = Silaoinan; blue = Taileleu. Panel A shows the proportion of respondents reporting different reasons that Sikaoinan attacks people. Panel B shows the proportion of respondents reporting different domains of sharing that Sikaoinan enforces.

Unprompted, respondents sometimes suggested that the fear of Sikaoinan causes people to share. One woman noted that the Mentawai have no need for foreign religions and moralistic prescriptions because Arat Sabulungan (indigenous Mentawai religion) already deters wrongdoing. Sorcery prevents people from stealing, she noted, and Sikaoinan ensures that they share.

An older woman also observed the instrumental effect of Sikaoinan: “That’s why we give meat to other people; that’s why we give plant-food. We give them plant-food; we give them meat. They see our food, we give it. [Otherwise, Sikaoinan] carries us to the bottom [of the river]. The body [of the crocodile] – not just a spirit. To the bottom it carries us.”

4.2. People suspect Sikaoinan after many kinds of harms

People believe that Sikaoinan watches them. When asked where it lives, most respondents said that Sikaoinan lives in water, such as the river or the small puddles that collect in broken bamboo (Figure 1.4). Several respondents reported that it drifts through the air like wind; one person compared it to the regional government – “wherever we go, it knows.” Other respondents said that it lives in people’s houses.

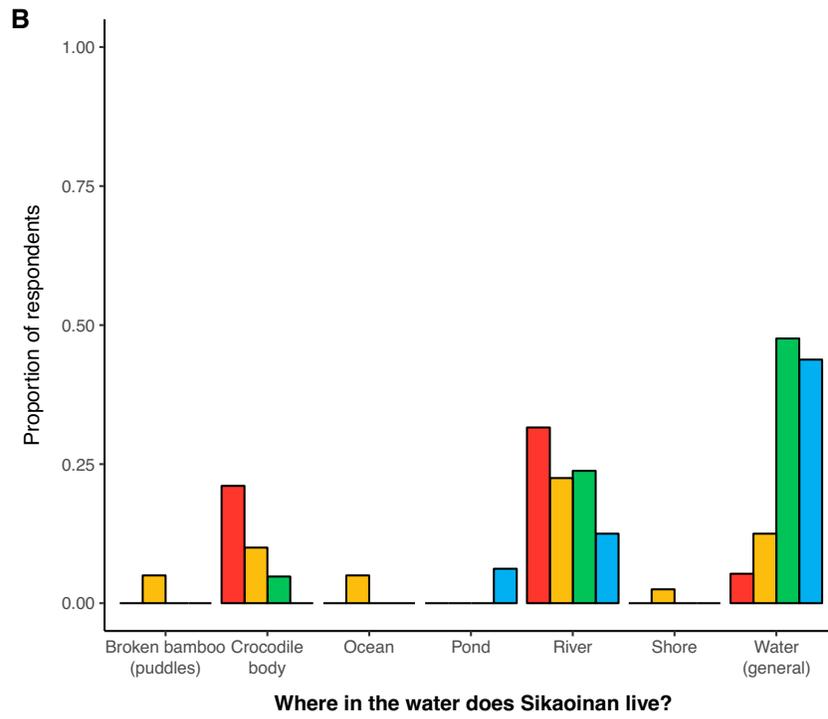
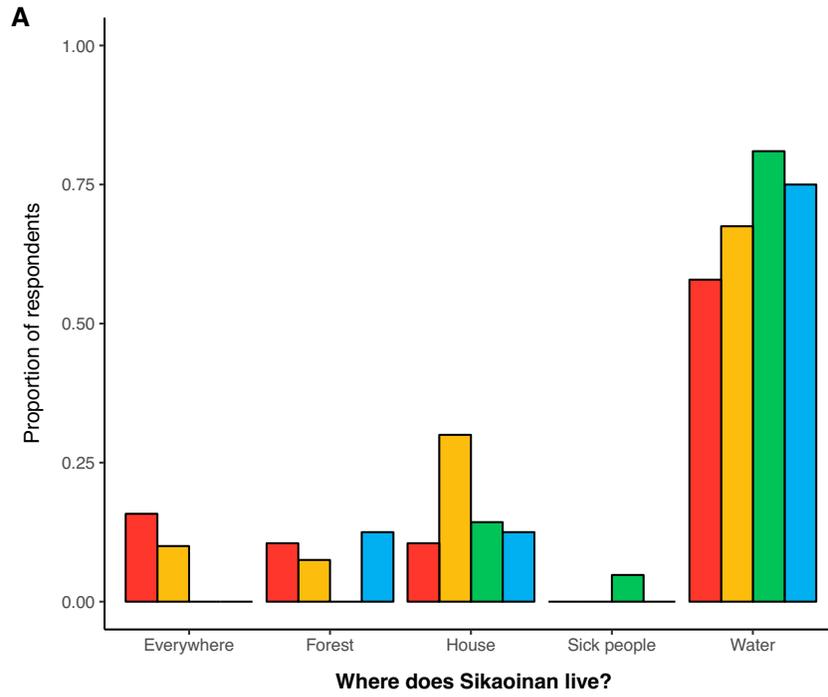


Figure 1.4. Where Sikaoinan lives, according to free responses (N=96). Colors correspond with cultural regions: red = Sabirut; yellow = Sareireket; green = Silaoinan; blue = Taileleu. Panel A shows the proportion of respondents reporting different locations where Sikaoinan lives, aggregating responses about water. Panel B shows the breakdown of different responses about water.

When Sikaoinan sees someone refusing to share, it attacks. In one version, it enters its victim's house and climbs onto a crossbeam. It radiates its illness-causing energy (bajou), scratches its victim, or weighs down on top of them, making it hard to breathe. Alternatively, it might wait for the stingy person or their family members in the river. When its target arrives, Sikaoinan attacks them as a crocodile, or it directs a crocodile to attack them, or it pulls them to the bottom and drowns them (see Supplementary Figures S1 and S2 for participants' responses about how Sikaoinan attacks and the kinds of illnesses it causes).

People sometimes connect others' misfortunes to their stinginess and Sikaoinan's retribution. In 1988, Bakels was told about a crocodile that carried off a small boy (Bakels 1994). The animal's violence was blamed on the boy's mother's stinginess. Similarly, when a boy drowned in August 2017 in a community where M.S. was conducting research, people covertly discussed possible reasons. The leading explanation that developed was that Sikaoinan attacked after the boy's parents failed to share their growing wealth.

4.3. People pay costs for shamans to remove Sikaoinan in a dramatic public ritual

When it's concluded that a patient's illness is caused by Sikaoinan, the sikerei conduct a special ceremony. The sikerei assemble in the patient's house or the patient's clan's longhouse, usually

with the patient's family. They put out objects that will attract Sikaoinan, such as fabric and a fishing net (Figure 1.5A). They publicly acknowledge that the patient or their family did not share, but they promise Sikaoinan that this was not intentional. The patient and their family members apologize, assuring Sikaoinan and any observers that they will share in the future.



Figure 1.5. Sikerei (Mentawai shamans) conduct ceremonies to remove Sikaoinan. (A) A sikerei presents items to attract Sikaoinan, including a necklace, fabric, and a luat (shaman headband) (photo taken in 2019; credit/copyright Rob Henry, Indigenous Education Foundation). (B) Sikerei prepare to release Sikaoinan into the river (photo taken in 1978; credit/copyright Reimar Schefold).

The sikerei then use special songs to lure Sikaoinan into a small basin of water. These songs are considered powerful ways of inviting Sikaoinan, and for that reason, people are forbidden from singing them outside of the Sikaoinan ceremony.

Once Sikaoinan is captured, the sikerei carry it to the river. They hold the basin steady to prevent Sikaoinan from tumbling out. They bring the lavish gifts and a small food item, such as smoked meat or piece of chicken. Finally, they release Sikaoinan into the water (Figure 1.5B).

There are three noteworthy points about this ceremony:

1. *The ceremony is costly.* The ceremony's costliness is demonstrated in two ways. First, the family hosting the ceremony must provide food for the shamans and other family members. This means preparing taro, sago, sweetened beverages, and, most importantly, meat.

The consensus is that the "price" of a Sikaoinan ceremony is 1 or 2 chickens. Examining the subset of healing ceremonies that included only the Sikaoinan ceremony (or the Sikaoinan ceremony and a treatment for the spirit-illness *kisei*, which is said to require no additional sacrifice), we found that the number of animals sacrificed varied from no chickens (when a shaman conducted the ceremony privately for his sick child) to a large female pig and 2 chickens (a large female pig is roughly equivalent in value to ten adult chickens) (see Table 1.1 for the list of ceremonies and their accompanying sacrifices). Although the family also consumes the food, (1) they must share it with more people than they would if they killed it in private, (2) they give up other opportunities to use the animals (such as other household ceremonies or, in the case of pigs, bride prices or penalties for crime), and (3) they give up the best portions of the meat to the shamans.

Table 1.1. Prices of twelve healing ceremonies that either only included the Sikaoinan ritual (S) or included the Sikaoinan ritual and a treatment for *kisei* (K), which is said to require no additional sacrifices. The PBID refers to the identifier in the dataset, available online. The estimated value is listed in thousands of Indonesian Rupiah (IDR); on 1 July 2017, 1000 IDR

was equivalent to about 0.075 USD. Note that not all chickens are equivalent in value. For PB03, the patient reported two sets of responses on two different occasions; both are reported in the table.

PBID	Animals sacrificed	Estimated value (thousands of IDR)	Interventions
PB30	1 large female pig and 2 chickens	1010	S
PB42	1 medium-sized pig and 2 chickens	660	S
PB66	1 medium-sized pig and 4 chickens	700	S
PB03	2 chickens // 1 rooster	160 // 100	S // S, K
PB39	2 chickens	160	S, K
PB40	2 small pigs	350	S, K
PB41	2 chickens	160	S, K
PB51	0 [<i>shaman healed his sick child</i>]	0	S, K
PB57	1 small pig, 1 chicken, and 1 duck	330	S, K
PB60	1 medium-sized pig	500	S, K
PB63	2 chickens and 1 duck	235	S, K
PB73	1 chicken	80	S, K

The second important way in which the ceremony is costly is that it redirects resources from other treatments. Of the 62 bouts of illness treated in the studied healing ceremonies, 63% (39/62) were also treated with herbal or magical remedies. For 50% of those illnesses (31/62), the patient or their family also sought healthcare at a village health post (*Poskesdes*) or community health center (*Puskesmas*). Obtaining herbal remedies and healthcare at a clinic incurs costs,

including the time involved in collecting herbs or the price of the medicine. Patients also visit alternative health providers, such as Muslim or Christian healers; these visits also consume time and resources. By spending half a day organizing and paying for a Sikaoinan ceremony, families lose the opportunity to pursue other treatment options. People's willingness to pay for Sikaoinan ceremonies, especially considering the opportunity costs, demonstrates that representations of supernatural punishment encourage them to engage in costly behavior.

2. *Elements of the ceremony reinforce belief.* Two aspects of the Sikaoinan ceremony seem to reinforce beliefs that Sikaoinan is responsible for illness. First, hosting a healing ceremony exhibits the features of a CRedibility-Enhancing Display (CRED) (Henrich 2009). It is a behavior that would only be sensible if a person held a given belief. In this case, the ceremony is sufficiently costly that someone should host it only if they believe that Sikaoinan may have caused illness. The ceremony thus reliably indicates belief, increasing the likelihood that others will adopt similar representations about Sikaoinan.

The second element of the Sikaoinan ceremony that should reinforce others' beliefs is that it features prestigious individuals speaking to the spirit. Sikerei are said to be uniquely capable of seeing spirits, including Sikaoinan. They are also trusted for their expertise, especially in Mentawai religious practice (see Supplementary Study 1 and Supplementary Figure S3), and are frequently called to intervene in conflicts, evidencing their status and people's trust in their decisions. The Sikaoinan ceremony features these reputable men speaking to the spirit, apologizing to it, coaxing it into a container, and then releasing it into the water. This performance may further reinforce that Sikaoinan is real and to be taken seriously.

3. *The natural course of recovery reinforces belief.* Eventually, most people recover from their illness. The timing of their recovery influences their theories about which treatments were

effective and, in turn, what originally caused the illness. For example, a patient who recovers soon after shamans remove Sikaoinan from their house might attribute their improvement to the ritual and thus their illness to Sikaoinan’s attack. This seems to happen: Of families that paid for a Sikaoinan ritual, 11% later reported that Sikaoinan was a reason the patient became ill. In total, 7 of 75 illness bouts were thought to have been caused by Sikaoinan after the patient recovered.

4.4. People infer features of Sikaoinan from ceremonies

Sikaoinan ceremonies occur often. In our sample of 66 healing ceremonies, nearly all of which occurred in a single year, 46 included a Sikaoinan ceremony – more than any other special intervention (Figure 1.6). Although it remains uncertain how often individuals attend the Sikaoinan ceremony, we counted 19 Sikaoinan ceremonies in a community of 262 individuals. Assuming that each ceremony draws 20 observers, we estimate that an individual has a 78% chance of attending a Sikaoinan ceremony in a given year.

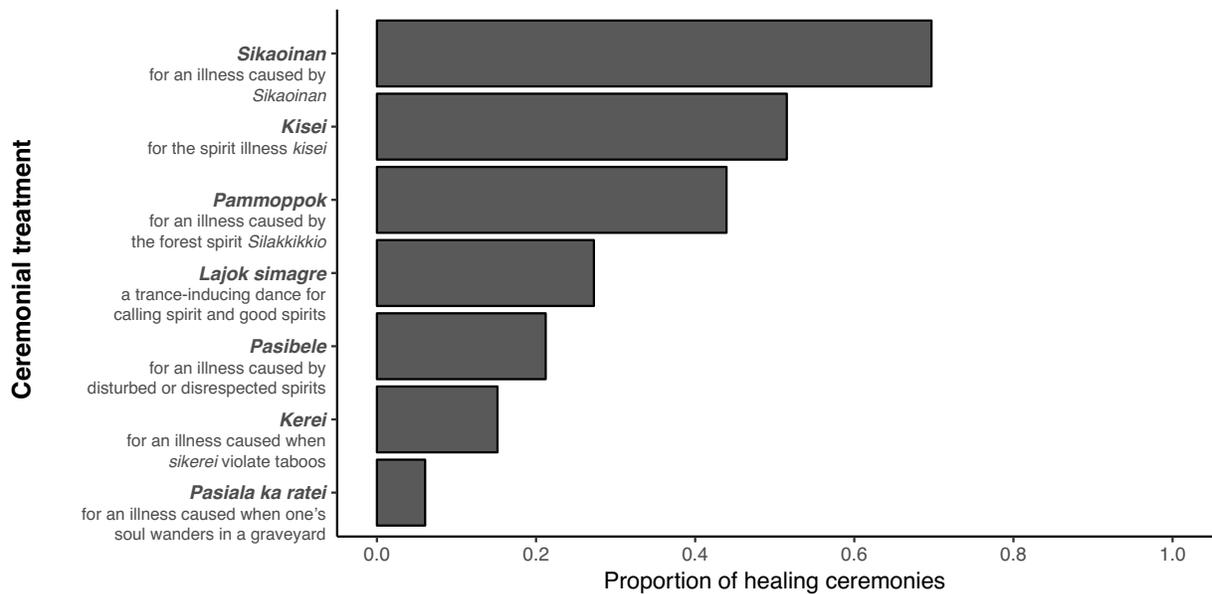


Figure 1.6. The proportion of healing ceremonies featuring different treatments. Treatments used infrequently (>0.05) have been removed.

Two lines of evidence suggest that these ceremonies transmit beliefs about Sikaoinan:

First, in explaining their answers, respondents explicitly drew inferences from the Sikaoinan ceremony, such as that Sikaoinan lives in water because shamans place it in water, that it lives near the ceiling because shamans look there during ceremonies, and that it is female because shamans refer to it (her) as “aunt”.

Second, of those features of Sikaoinan we systematically studied, all of the most widely shared beliefs are represented in the ritual or can be readily inferred. Figure 1.7 shows the extent to which participants gave similar responses about the different features of Sikaoinan, following the formula described in section 3.1. We found that participants agreed most on why Sikaoinan attacks people (not sharing), followed by the number of Sikaoinan (one) and the objects used to appease it in ritual (fabric, fishing nets, and necklaces), all of which are represented in the ritual. By contrast, elements of Sikaoinan that are not present in the ritual (how it attacks people and the kinds of illnesses it causes) showed much less agreement, both within regions (Fig. 1.7A) and across them (Fig. 1.7B).

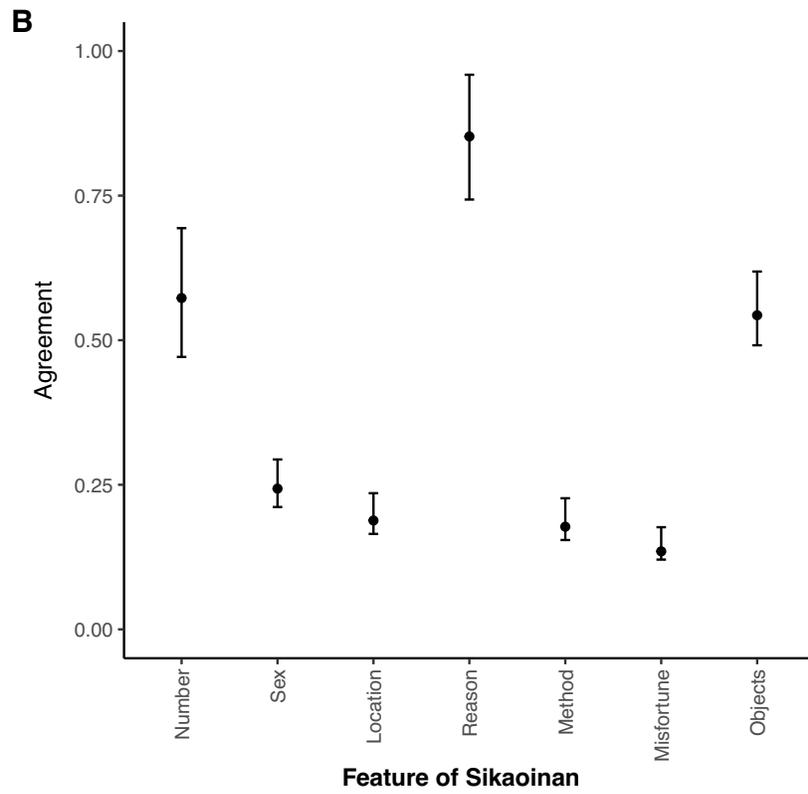
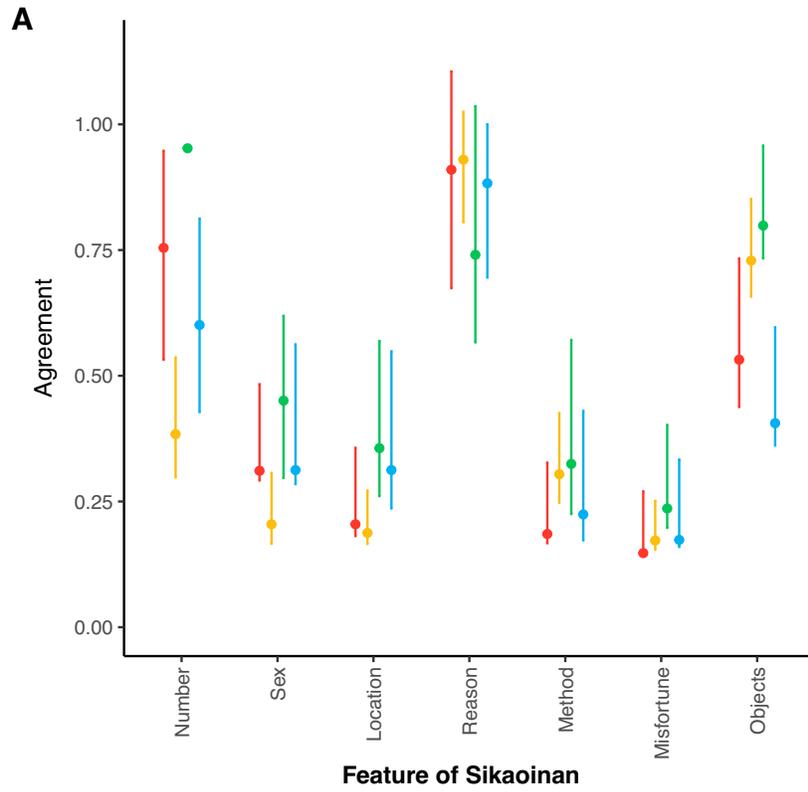


Figure 1.7. Agreement among participants about different features of Sikaoinan. Error bars are bootstrapped 95% confidence intervals (10,000 samples). Colors correspond with cultural regions: red = Sabirut; yellow = Saireireket; green = Silaoinan; blue = Taileleu. Panel A shows agreement among respondents living in the same cultural region; Panel B shows agreement among respondents pooling across cultural regions.

By this logic, we should expect higher agreement about Sikaoinan's location (water) and, possibly, its sex (female). What explains the lower values? For responses about Sikaoinan's location, the lower agreement is a result of people's diverse responses (as opposed to, for instance, a high frequency of participants replying that they didn't know). Still, the majority of responses referred to the water (e.g., river, puddles inside broken bamboo), a belief again reinforced in ritual (see Figure 1.4). For sex, the lower agreement is partly the high frequency with which participants responded that they didn't know (Supplementary Figure S4). Moreover, the participants who did respond usually replied that Sikaoinan is either female (29%) or both sexes (23%) with only 4% of respondents claiming that Sikaoinan is male. The bias towards Sikaoinan being female is what we expect on the basis of Sikaoinan's polite name (aunt) and the objects used to appease it (e.g., the fishing net, which women typically use). This evidence suggests that the Sikaoinan ceremony is a potent vehicle for transmitting cultural information and creating shared beliefs among community members.

5. Discussion

At the outset of this article, we asked three questions:

1. Are supernatural agents believed to punish non-cooperative behavior in small-scale societies and, if so, how does their jurisdiction differ from that of bigger gods in more complex societies?
2. Do beliefs in these supernatural agents motivate people to incur costs?
3. What is the relationship between belief and ritual?

For the first question, our study found strong evidence that a supernatural agent in a small-scale society is said to punish non-cooperative behavior. But in comparison with the moralizing gods of world religions, Sikaoinan's scope and domain of interest are limited. Sikaoinan doesn't care about murder, adultery, or kindness towards strangers; it attacks people who fail to share meat with fellow clan members. Meat-sharing is a prosocial act. Mentawai norms dictate that individuals share meat with fellow clan members (Scheffold 1982), but people can take advantage of this system, hoarding their own kills while enjoying the gifts of others. Beliefs in Sikaoinan thus appear to incentivize a cooperative behavior that might otherwise be undermined by self-interest. Still, however, these beliefs are limited in how much cooperation they can enforce. Sikaoinan cannot read minds, revealed in shamans' assurance to the spirit that the patient's failure to share was inadvertent. Sikaoinan is morally concerned but provincial in its scope and limited in its knowledge compared to the powerful gods of the largest-scale societies (see also Tyvan spirit-masters: Purzycki 2013, 2016).

For the second question, our findings suggest that beliefs in supernatural punishment motivate people to incur costs. Patients and their families pay for shamans to come and remove Sikaoinan from their homes, and they do so at the expense of other treatment options, such as visiting a health clinic. Moreover, shamans call other shamans to perform the ceremony, and shamans even perform the ceremony in private.

An alternative explanation for these observations is that people's representations of Sikaoinan do not motivate them to incur costs and instead families host the ceremony for reputational benefits, perhaps because it broadcasts to observers that they fear Sikaoinan and can therefore be trusted. Aside from the fact that such a hypothesis still invokes erroneous beliefs – observers would erroneously infer that the family holds Sikaoinan beliefs that make them trustworthy – readers should also be aware that conducting a Sikaoinan ceremony is an admission that one violated an important social norm. Future research should systematically identify the inferences observers make about families that host Sikaoinan ceremonies and test whether Sikaoinan beliefs have other effects on behavior, such as prosocial decision-making.

For the final question, our study showed that ritual and belief can mutually reinforce each other. People's belief that Sikaoinan harmed them or their family motivates them to call shamans to conduct the appropriate ceremony. The costly, optional, and public nature of the ceremony in turn strengthens observers' beliefs about Sikaoinan, especially the idea that Sikaoinan punishes for not sharing. The patient's recovery, such as through the spontaneous remission of the illness or, possibly, placebo effects stimulated by ritual healing (Kaptchuk 2011), further convinces patients and observers that the ceremony worked and that Sikaoinan was the originating cause of the illness. The belief-producing effects of ritual manifest in population-level variation in beliefs. Those beliefs that vary the least across individuals are represented in ritual, while those beliefs not represented vary the most. Belief motivates ritual; ritual reproduces belief.

To what extent are the beliefs and rituals we describe shaped by Muslim or Christian influence? At least four lines of evidence suggest the answer is "very little." First, the four regions studied have experienced distinct histories of religious contact and acculturation, yet they reported strikingly similar beliefs about Sikaoinan. Second, people living in the primary study

community, Buttui, have long avoided acculturation and actively maintained traditional religious beliefs. Although Catholicism has been the area for several decades, Islam only arrived in Buttui in the early 2010s. Third, the beliefs and rituals observed are consistent with those described by Schefold (1988), who, starting in 1967, conducted fieldwork with a Mentawai clan that had evaded outside contact and escaped to the interior. Finally, the people of Nias – who are the Mentawai’s closest linguistic relatives and the most similar, of 70 Indonesian communities, to the Mentawai in terms of mtDNA (Hammarström et al. 2019; Tumonggor et al. 2013) – regarded crocodiles as both gatekeepers to the underworld (Marschall 2010) and punitive agents (Bakels 1994). Nias society, however, was much more socially stratified than in Mentawai, and the punitive power of crocodiles was closely connected to the chief. There, crocodiles were said to attack condemned prisoners and to devour escapees as they crossed rivers. These lines of evidence support the conclusion that Sikaoinan’s moralistic concerns predate the presence of Christianity and Islam in Mentawai.

In closing, we hope our study demonstrates the capacity for primary ethnographic research to provide rich descriptions of behavior in diverse societies and address targeted research questions. This point is important, because, as with all sciences, the naturalistic study of religion is undergoing a methodological revolution. Researchers increasingly draw on massive online experiments, cross-cultural studies, and analyses of large-scale databases to test the behavioral and historical predictions of existing theories (Purzycki et al. 2016; Slingerland and Sullivan 2017; Watts, Sheehan, et al. 2015). These methods open up novel research programs, but they have limitations. Analyses of large-scale databases must leverage existing descriptions, and despite the richness of the ethnographic and historical record, many observers failed to document behaviors and beliefs that are most relevant for key questions. A comprehensive understanding of

human behavior requires a diverse methodological toolkit, including detailed ethnographic investigation.

Chapter 2

The cultural evolution of shamanism

Abstract

Shamans, including medicine-men, mediums, and the prophets of religious movements, recur across human societies. Shamanism also existed among nearly all documented hunter-gatherers, likely characterized the religious lives of many ancestral humans, and is often proposed by anthropologists to be the “first profession”, representing the first institutionalized division of labor beyond age and sex. This paper proposes a cultural evolutionary theory to explain why shamanism consistently develops, and in particular, (1) why shamanic traditions exhibit recurrent features around the world, (2) why shamanism professionalizes early, often in the absence of other specialization, and (3) how shifting social conditions affect the form or existence of shamanism. According to this theory, shamanism is a set of traditions developed through cultural evolution that adapts to people’s intuitions to convince observers that a practitioner can influence otherwise unpredictable, significant events. The shaman does this by ostensibly transforming during initiation and trance, violating folk-intuitions of humanness to assure group-members that he or she can interact with the invisible forces that control uncertain outcomes. Entry requirements for becoming a shaman persist because the practitioner’s credibility depends on them “transforming”. This contrasts with dealing with problems that have identifiable solutions (like building a canoe), where credibility hinges on showing results and outsiders can invade the jurisdiction by producing the outcome. Shamanism is an ancient human institution that recurs

because of the capacity of cultural evolution to produce practices adapted to innate psychological tendencies.

This article was published in Behavioral and Brain Sciences

A patient, debilitated by the bulbous, blood-bloated ghosts swarming through her body, sits in an unlit igloo². She is joined by an *angakok*, a magician and a medicine-man, who crouches in the corner, his body draped in a caribou skin.

The *angakok* is unlike himself: one of his helper spirits has possessed him, and it speaks in a rapid, strange language through his mouth. The illness-causing ghosts respond with fright, abandoning the sick person's body before hiding outside the igloo. The *angakok* sends his spirit helpers in pursuit, while members of the onlooking audience coax the evil ghosts back with half-lies: "Come in, come in," they say, "somebody here is waiting for you."

The evil ghosts return and are slaughtered. The *angakok* attacks them with his snow knife, slaying as many as he can. When he's finished, blood covers his hands, unadorned proof of the killing.

In the days afterwards, the patient slowly recovers.

Or, in the days afterwards, the patient dies. The shaman expresses a fatalistic regret: in the end, the ghosts were too numerous. One man can only kill so many ghosts when a person has broken so many taboos.

² This description of the Inuit *angakok* comes from accounts by Balikci (1963) and Rasmussen (1929).

1. Introduction

The Inuit *angakok*, like the Mentawai *sikerei* (Loeb 1929b), the Korean *mu* (Kendall 1985), the Azande *boro ngua* (Evans-Pritchard 1937), the !Kung *n/um k"ausi* (Katz 1982), and the Quaker founder George Fox (Thomas 1971), is a shaman. I here define ‘shamans’ as ‘practitioners who enter trance to provide services’. Because my objective is to identify the social and cognitive foundations of a more general, cross-cultural suite of practices and beliefs, I follow authors who prefer a broad definition of shamanism (e.g., Peters and Price-Williams 1980; Samuel 1990; Wallace 1966; Wright 2009). This usage contrasts with more specific definitions, such as reserving ‘shamanism’ for the practices of Siberian peoples (see discussion in Price 2001), or using restrictive criteria like death-and-rebirth initiations, soul journey trances, and animal helper spirits (Winkelman 1990). Although many of these traits appeared in societies outside of Siberia and Central Asia (Eliade 1964), they lack generality and exclude the trance-healing practices of many societies, including ones commonly referred to as shamanic (e.g., Kendall 1985; Loeb 1929; Nadel 1946). The ensuing discussion thus includes not only the trancing witch-doctors of hunter-gatherer societies, but also the ecstatic prophets of religious movements, the mediums of chiefdoms, and the marginal cultists of contemporary states.

Cross-cultural analyses of shamanism aim to recognize the particular cultural traits that are universally associated with this institution. This research has converged on a set of practices and beliefs that nearly always characterizes shamanic traditions (Charles 1953; Eliade 1964; Harner 1990; Peters and Price-Williams 1980; Vitebsky 1995; Winkelman 1986, 1990):

1. The practitioner enjoys jurisdiction over the treatment and diagnosis of a select set of problems, most frequently serving as a healer and diviner.
2. The practitioner is believed to have special powers that normal individuals either possess to a less developed degree or lack completely. These always include some means of seeing or interacting with invisible forces. But they can also include flight, invisibility, immunity to fire, and control of weather and animals.
3. The practitioner engages in a temporary trance state for at least some of his or her interventions. Definitions of trance vary considerably in the anthropological literature, from those that claim universal neurological states (Harner 1990; Winkelman 2000) to those that emphasize social conceptions of special powers (Rouget 1985).
Nevertheless, most usages concur that trance represents a temporary state that appears psychologically and behaviorally distinct from normal human functioning. The behavioral manifestations of trance differ within and across populations but include “trembling, shuddering, horripilation, swooning, falling to the ground, yawning, lethargy, convulsions, foaming at the mouth, protruding eyes, large extrusions of the tongue, paralysis of a limb, [etc.]” (Rouget 1985, p. 13). The cultural interpretation of this trance state is also variable and can include spirit possession (reviewed in Lewis 2003) and soul journeying (reviewed in Eliade 1964), as well as special sight (e.g., Azande: Evans-Pritchard 1937), boiling healing energy (e.g., !Kung: Katz 1982), or several of these changes simultaneously (e.g., Akawaio: Wavell et al. 1988).
4. Entrance into the practitioner class is restricted, typically by ritualistic initiations (e.g., death-and-rebirth, ritual surgery, magical treatment of body parts) or dramatic experiences (e.g., violent illness, epileptic fits, asceticism). Communities often regard

individuals with some innate peculiarity, like perennial illness (Lebra 1966; Schefold 1988), an extra finger (Bernstein 2008), epilepsy (S. F. Nadel 1946), or ambiguous sexual identity (Coleman et al. 1992; Peletz 2006), as more capable of becoming shamans.

A final important characteristic is that shamans represent a profession, often the only such group in many small-scale societies (La Barre 1970; Rogers 1982). By ‘profession’, I mean ‘a class of individuals with entry requirements whose unique expertise or abilities provide them jurisdiction over the treatment or diagnosis of some problems’. For shamans, entry requirements can include prolonged training from other shamans, special initiations, or spontaneous events, like serious illness (Eliade 1964). This usage of ‘profession’ is based on definitions in the sociological literature, such as by Abbott (1988, p. 8) and MacDonald (1995, p. 1), who respectively described professions as “exclusive occupational groups applying somewhat abstract knowledge to particular cases” and “occupations based on advanced, or complex, or esoteric, or arcane knowledge”.

Shamanism has existed in most documented human societies, including the majority of hunter-gatherers. Eliade (1964) famously reviewed ethnographic descriptions of shamans around the world, documenting similarities in practice and mythology between Siberian shamanism on the one hand and practitioners in Asia, the Americas, and Oceania on the other. Winkelman (1986, 1990) coded a modified subsample of the Standard Cross-Cultural Sample and found trance-practitioners in 43 of 47 societies surveyed. A recent review of hunter-gatherer religion

found shamans in 29 of 33 hunter-gatherer societies examined (Peoples et al. 2016)³; of the remaining four societies, the recent ancestors of one (the Siriono) likely had shamans (Walker et al. 2012; see also sect. 6.2), while an ethnographer noted that members of another (the Mbuti) visited “the local witch doctor” of nearby farmers (Putnam 1948, p. 340). Importantly, shamanism is not restricted to small-scale societies; see, for example, the *benandati* cult of medieval Italy (Eliade 1975), Romanian folkloric traditions (Eliade 1975), Neolithic China (Chang 1999), Tibetan Buddhism (Samuel 1993), contemporary Korea (Kendall 1985), founders of religious sects in twentieth-century Japan (Blacker 1975), trance channeling in the contemporary United States (Hughes 1991), the Hebrew prophets (Newsom, Jr. 1984), early religious leaders of the Camisards (Knox 1950), Quakers (Thomas 1971), and American Spiritualists (Albanese 1992), and neo-shamans in Sweden (Lindquist 1997) and the United States (Braun 2010).

That shamanism appears so regularly in human societies, especially among hunter-gatherers, suggests that it characterized the lives of many ancestral humans as well. Inferring the existence of shamanistic practice from archaeological findings is notoriously tenuous (Dubois 2009), but researchers have nevertheless argued prehistoric shamanism from burial sites (Grosman et al. 2008) and art (Dowson and Porr 2001; Lewis-Williams and Dawson 1988).

The recurrence and similarity of shamanic traditions highlight several puzzles, namely (1) why do these particular beliefs and practices so frequently develop in concert?; (2) why do

³ The authors concluded that shamanism existed in 26 societies, rather than 29. However, ethnographies from the Aka, the Botocudo, and the Sandawe strongly suggest the presence of shamans (Sandawe: Grzelczyk 2016; Aka: Hewlett et al. 2013; Botocudo: Minuendajú 1946).

shamans constitute the only professional class in many societies?; and (3) which conditions determine the existence or collapse of shamanism? These questions have remained largely absent from the evolutionary and psychological literatures, despite considerable progress in the study of religion (see Rossano 2007; Winkelman 2002; Wright 2009 for exceptions). Meanwhile, the puzzle of shamanism has attracted the attention of major anthropological theorists since the discipline's inception (e.g., Evans-Pritchard 1937; Frazer 1922; Lévi-Strauss 1963a, 1963b; Malinowski 1948; Mauss 1902/2001; Tylor 1883), but as Narby and Francis (2001, p. 8) concluded in their collection of writings on the topic from the last half-millennium, “even after five hundred years of reports on shamanism, its core remains a mystery.”

This paper presents a novel theory of shamanism based in universal cognitive dispositions and cultural evolutionary processes. The theory proposes that shamanism is a suite of practices developed through cultural evolution that adapts to people's intuitions to convince observers that a practitioner can influence otherwise uncontrollable events. The shaman does this by transforming in the eyes of the community, both during initiation and trance, assuring group-members that he or she can interact with the invisible forces that control unpredictable, significant outcomes.

The paper is structured as follows. I begin by reviewing alternate theories of shamanism in section 2. In section 3, I elaborate on the logic of the proposed theory, providing empirical and theoretical support from psychology and cultural evolution. I use section 4 to explain three central features of shamanic traditions: the jurisdiction, trance, and what I call ‘transformative practices’. Section 5 concerns why shamanism professionalizes in the absence of other specialization, while section 6 concludes with predictions for how shifting social conditions

should mediate the transformative practices and in some instances, contribute to shamanism's collapse.

2. Alternate theories of shamanism

The most salient features of shamanism to early western observers were practitioners' use of sleight of hand and their ostensible psychological pathology (Krippner 2002; Narby and Huxley 2001). These led authors to frequently describe the practice either as a form of charlatanism (Diderot 1765/2001; Gmelin 1751/2001) or psychopathology (Devereux 1961; Novakovsky 1924; Silverman 1967). Although both perspectives explain some features of shamanism, ethnographic observations challenge their simplicity. That shamans seem to believe in their and others' powers undermines a basic charlatan hypothesis (Elkin 1977; Evans-Pritchard 1937; Métraux 1944). Meanwhile, shamans in many societies do not suffer from an abnormal psychology, yet these traditions exhibit the same patterns in practice and mythology (e.g., Australia: Elkin 1977; Bhutan: van Ommeren et al. 2004; Akawaio: Wavell et al. 1988). Further, neither charlatanism nor psychosis can explain the jurisdiction of shamans or why trance is used for problem-solving. A comprehensive theory of shamanism should explain these inconsistencies.

Many authors have proposed that shamanism and related practices provide benefits to clients or the group (Achterberg 1985; Sax 2014), such as through ritually-induced social cohesion (Freckska and Kulcsar 1989), therapeutic effects mediated by placebo or hypnosis (Kaptchuk 2002, 2011; McClenon 1997), or the psychological comfort that comes from addressing uncertainty (Achterberg 1985; for a more general discussion of magic, see Malinowski 1948). As with charlatan or psychosis hypotheses, accounts emphasizing benefits do not explain

many cross-cultural patterns, including the early professionalization of the practice or why certain practices are considered efficacious. Moreover, aside from mixed results from psychology (Calin-Jageman and Caldwell 2014; Damisch et al. 2010), studies and ethnographies finding support for ritual efficacy tend to rely on reported outcomes by clients or other community members (e.g., Kleinman and Sung 1979; Raguram et al. 2002; Sax 2009). Thus it appears that most evidence of ritual efficacy concerns the community *perception* of outcomes. This does not invalidate accounts emphasizing benefits, but it suggests that shamanism may be sustained because of a perception of results.

Many approaches examine how patterns in human social and cultural life, like incest taboos (Fessler and Navarrete 2004; Lieberman et al. 2003) or folk-biology (Atran 1998), reflect universal proclivities resulting from evolved psychological mechanisms (Sperber 1985, 1996a; Sperber and Hirschfeld 2004). Winkelman's (2000, 2002) neurotheological theory of shamanism adopts this approach. The theory attributes the recurrent emergence of shamanism to (1) psychological effects of universal trance states and (2) the benefits that the shaman provides. According to this theory, trance states elicited by dancing, hallucinogens, and other triggers have an "integrative" effect on cognition, allowing cross-talk among modules evolved for theory of mind, social intelligence, and natural history. This integration enhances practitioners' social abilities, allowing them to provide useful services to the group and individual clients. Invoking cultural traditions that leverage aspects of our core psychology to produce group-level benefits, the neurotheological theory resembles recent theorizing on the cultural evolution of prosocial religion (Atran and Henrich 2010; Norenzayan 2013; Norenzayan et al. 2016; Purzycki et al. 2016).

The neurotheological theory, although ambitious, suffers from important shortcomings. Especially problematic is the central argument that shamanism involves a cross-culturally consistent trance state that integrates various aspects of cognition. First, it is unclear what an “integrated” mode of consciousness is, considering that normal human cognition involves communication and cooperation among functionally-differentiated regions (Hagmann et al. 2008; Sporns 2011). Second, research on altered states of consciousness suggests that different trance states involve non-analogous changes in physiology and cognition (Farthing 1992; Vaitl et al. 2005). Altered states induced by sensory deprivation, for example, disengage the individual from her surroundings, broaden attention, promote cognitive flexibility, and stimulate sensory dynamics (richness, vividness, synesthesia, hallucinations) (Barabasz and Barabasz 1993; Suedfeld 1980; Vaitl et al. 2005). By contrast, research conducted with pathologically starving patients suggests that extreme dieting produces the opposite effects (Ben-Tovim and Walker 1991; Grunwald et al. 2001; Roberts et al. 2007; Vaitl et al. 2005). The contrasting effects of different trance states challenge the neurotheological theory, because not only do trance states vary considerably around the world, but there even exists within-culture variation or variation between otherwise similar traditions. For example, the trance state of the Japanese *miko*, which involves “violent shaking of the clasped hands” and “stertorous breathing or roaring”, differ in all of its manifestations from those of the ascetic, who enters a “deep, comatose state of suspended animation”, his body remaining “an empty husk” (Blacker 1975, p. 22-3). Relatedly, although their shamanic institutions share many features, the Warao’s musically-induced meditative trance contrasts starkly with the narcotic trance of the Yanomamö, which includes yelling, rolling on the ground, and a seeming loss of physical control (Olsen 1975, 1998).

To sum up, explanations of shamanism have focused on single features like charlatanism, the practitioner's ostensible psychopathology, and clients' belief in the effectiveness of interventions. However, no account sufficiently explains the entire suite of features, including dramatic initiations, trance states, professionalization, or the jurisdiction of the shaman (healing and divination). Additionally, many accounts have been critiqued for failing to incorporate the role of social interactions and recent historical processes in shaping shamanism (Atkinson 1992).

3. Proposing the cultural evolutionary theory of shamanism

I propose that shamanism is a suite of practices developed through cultural evolution to convince observers that an individual can influence otherwise uncontrollable outcomes. In particular, the shaman is an individual who violates intuitions of humanness to convince group-members that he or she can interact with the invisible forces who control unpredictable, important events.

In this section, I present this theory in full, organizing it into several sections before synthesizing them and discussing how this theory generates hypotheses for the constituent features of shamanism. The sections consider (1) the psychology of superstition, (2) the cultural evolution of plausible-seeming interventions, (3a) the importance of interacting with invisible agents, and (3b) violating notions of humanness to support claims of superhuman abilities.

The theory as proposed in this section is rooted in two conceptual foundations. Research in *the cognitive underpinnings of magic and religion* has revealed how built-in, adaptive components of human psychology predispose us to adopt certain false beliefs and engage in magical thinking (Atran and Henrich 2010; Boyer 2001; Guthrie 1995; Kirkpatrick 1999; Legare and Souza 2012). The primary psychological mechanisms invoked in the proposed theory

are those involved in (and presumably evolved for) adopting beliefs (error management: Johnson et al. 2013), mentalizing (Frith and Frith 2003), developing causal explanations (F. C. Keil 2006; Lombrozo 2006), and ascribing and inferring human characteristics (“humanness”) to and from other individuals (Haslam et al. 2013). *Cultural evolutionary theory*, on the other hand, describes how the differential transmission and adoption of cultural traits leads some beliefs, practices, and institutions to propagate at the expense of others, giving rise to adaptive culture like igloos and spears, as well as magical interventions and seemingly maladaptive practices (Boyd and Richerson 1985; Claidiere et al. 2014; Mesoudi 2015; Sperber 1996a; Sperber and Hirschfeld 2004).

Note that many aspects of the cultural evolutionary theory of shamanism have been previously articulated, including the shaman’s role in dealing with uncertainty (Buyandelgeriyn 2007; Wright 2009), the function of initiation practices in delineating shamans from the rest of the group (or in supernaturalizing them) (Eliade 1964), and the dramatic nature of trance (Rouget 1985; see references in Peters and Price-Williams 1980). However, no account has synthesized these observations into a coherent framework or illustrated how they develop from core psychological dispositions or cultural evolutionary processes. Thus, it remains unknown why humans seem to so reliably produce this particular constellation of practices and beliefs.

3.1. Individuals adopt superstitions to influence significant outcomes that are random and uncontrollable.

Humans choose solutions to deal with problems, such as denying a pregnant woman smelly meat to protect her child or rubbing a rock to win a baseball game. The cognitive mechanisms for choosing among solutions must contend with the uncertainty of whether a strategy in fact works. For example, denying a pregnant woman smelly meat may seem to guarantee a healthy child

sometimes but not always; similarly, rubbing a rock may appear to ensure victory in a baseball game sometimes but not always. Individuals therefore rely on psychological heuristics to select among strategies and beliefs. Systematic errors by these heuristics lead individuals to adopt interventions that have no causal relationship to their intended outcome (Foster and Kokko 2009; Johnson et al. 2013; McKay and Dennett 2009; Vyse 2014); following previous authors, I refer to these causally innocuous actions as ‘superstitions’⁴ (Foster and Kokko 2009; Ono 1987; Skinner 1948; Vyse 2014). That similar behaviors can be induced in other species (e.g., Skinner 1948) suggests that these cognitive mechanisms have deep evolutionary histories.

Individuals are most likely to adopt superstitions when (1) the potential benefit of that intervention working is high and (2) the intervention is followed by a successful outcome some proportion of the time (Beck and Forstmeier 2007; Foster and Kokko 2009; D. D. P. Johnson 2015; Ono 1987; Vyse 2014). Superstitions can thus be thought of as bet-hedging strategies: as long as the outcome sometimes occurs after the intervention (e.g., the baseball team wins sometimes after rubbing the rock), and the cost of the intervention is sufficiently low compared to the potential benefit, an individual will benefit on average from adopting those strategies (see

⁴ Note that “superstition” here is defined solely by whether or not an intervention has an effect on its intended outcome. It thus contrasts with some colloquial uses of the word, which focus on whether or not an explanation is naturalistic. For example, consider two pregnancy taboos, one that is functional but is described through supernatural means (e.g., pregnant women should not eat rotting flesh because it angers a deity) and one that is ineffective but is legitimated through purportedly naturalistic mechanisms (e.g., pregnant women should not eat legumes because the iron endangers the baby). According to the usage in this paper, the latter (naturalistic and ineffective) would qualify as a superstition while the former would not (supernatural and effective).

error management: Johnson et al. 2013; McKay and Efferson 2010)⁵. Consequently, contexts where people are not fully able to control fitness-relevant outcomes, and where success occurs randomly, are most amenable to superstitious thinking (Greenaway et al. 2013; Giora Keinan 1994; Legare and Souza 2014; Whitson and Galinsky 2008), accounting for, among other things, (1) the use of magic for catching wild game and inviting rain, (2) the profusion of magic in the wake of deadly epidemics (e.g., Ashforth 2011), and (3) the prevalence of superstitions in Western societies, such as those surrounding gambling and sports (Burger and Lynn 2005; Henslin 1967). Moreover, within these domains, those activities with the most uncertainty and the largest benefit invite the most superstition. For example, Trobriand Islanders use magic for open-sea fishing, where “the yield varies greatly,” but not for inner lagoon fishing, which promises “abundant results without danger and uncertainty” (Malinowski 1948, p. 30). Because it sustains beliefs in ineffective interventions, the psychology of superstition provides the basis for shamanic traditions.

I will hereafter refer to those outcomes most susceptible to superstition (uncontrollable, fitness-relevant, and random) as ‘uncertain outcomes’ (see Figure 2.1). Examples of uncertain outcomes include illness healing, crops failing, and famine ending. These differ from outcomes that are controllable (e.g., the production of fire), outcomes that are uncontrollable but unimportant (e.g., a butterfly landing on one’s arm), and outcomes that are uncontrollable and important, yet never occur (e.g., winter never coming).

⁵ Mathematical models and empirical work with humans and other animals have found that organisms rely on social learning more under conditions of greater uncertainty (Boyd and Richerson 1988; Morgan et al. 2012, 2015; van Bergen et al. 2004). This shift in reliance from private information to cultural information may help sustain superstitious beliefs.

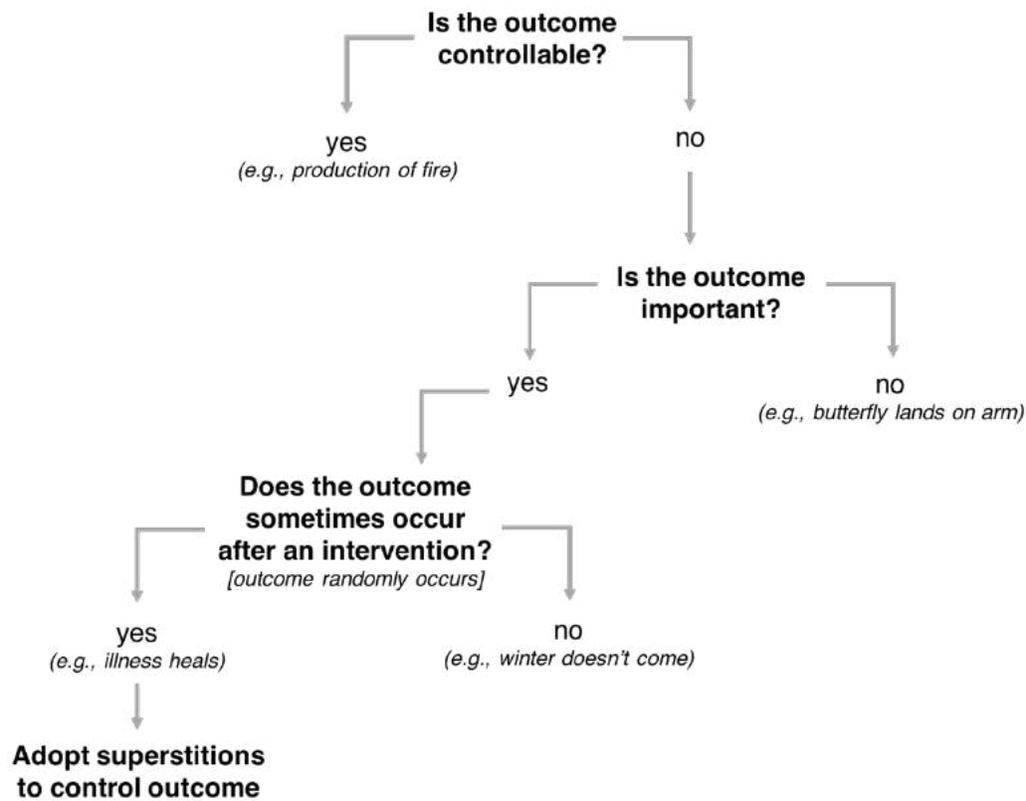


Figure 2.1. Kinds of outcomes. Individuals will develop superstitions to influence or learn about the timing of uncertain outcomes (uncontrollable, important, and random). The importance of the outcome to the individual’s perceived welfare and the frequency with which it occurs after an event are both continuous variables, but they are presented in this diagram as binary for simplification.

3.2. People’s adoption strategies drive the selective retention of effective-seeming interventions.

Cultural evolution occurs as some cultural variants are adopted and transmitted more than others⁶ (Blackmore 1999; Boyd and Richerson 1985; Sperber 1996a). The direction of cultural evolution, and whether its products are adaptive, are thus often consequences of individuals' adoption strategies (Henrich 2015; Richerson and Boyd 2008). When outcomes are observable, immediate, and predictable, individuals can easily choose innovations based on their effectiveness (Rogers 2003). For example, an individual can gauge whether some tweak to a spear allows it to fly farther, deciding to retain the successful tweaks. As people repeat this adoption strategy over time, technology will become more effective at ensuring outcomes. In short, cultural evolution can produce efficient technologies, such as spears, when the outcomes of innovations are immediate, observable, and predictable.

In the case of superstitions, cultural evolution cannot produce efficient technologies because the practices are (by definition) ineffective. But some innovations will still seem more effective because of innate or cultural intuitions about causality. Consequently, individuals will

⁶ The cultural evolutionary story here combines (and rejects aspects of) models proposed by Boyd and Richerson and co-authors (B&R) (e.g., Boyd and Richerson 1985; Henrich 2015; Richerson and Boyd 2008) and Sperber and co-authors (S&c) (e.g., Claidiere et al. 2014; Sperber 1996a; Sperber and Hirschfeld 2004). It resembles models by B&R by invoking the imitation and selective retention of successful-seeming cultural variants while appreciating that this cultural selection should drive the emergence of complex technologies. It diverges from models by B&R in ignoring or downplaying the involvement of cultural group selection (Boyd and Richerson 2010; Richerson et al. 2016) and stressing that functional technologies emerge from individuals adopting what *seems* to work (rather than from, for example, purely copying the variants of the successful or prestigious). The proposed model resembles approaches by S&c by emphasizing how our evolved cognition (and cultural beliefs) bias which variants are transmitted and adopted. It is agnostic as to whether the preferential adoption of cultural variants comes from selection or reconstruction.

retain and transmit those practices that seem most plausible, driving the cultural evolution of practices adapted to our intuitions about efficacy. For example, Legare and Souza (2012) showed that individuals regard magical procedures with more steps and specific times as more efficacious, likely biasing which magical practices spread. Similarly, innate intuitions about how substances spread through contact perpetuate beliefs in contagious magic (Nemeroff and Rozin 2000; Rozin et al. 1986).

Note that the cultural evolution of plausible-seeming practices should be accelerated once shamans exist and compete for clients. Some shamans will find techniques that better convince on-lookers of their superior efficacy; these techniques are expected to be maintained over time as other shamans copy them (Boyd and Richerson 1985; Henrich and Gil-White 2001; Schlag 1998, 1999) or as successful practitioners train more initiates. Many ethnographers have observed intense competition among shamans that should drive this cultural selection. Among the Azande, practitioners amassed prestige as effective doctors and were “envious of the encroachment” of rivals who threatened their wealth and reputation (Evans-Pritchard 1937, p. 245). Ona shamans of Tierra del Fuego faced off in public: practitioners attained states of magical trance and observers judged them according to the intensity and duration of trance, among other characteristics (Chapman 1982). Similar competitive displays occurred among the Tlingit and the Netsilik (Balikci 1963; De Laguna 1972). Buyandelgeriyn (2007, p. 132) observed that in postsocialist Mongolia, “clients choose a shaman on the basis of a careful search with diviners, lamas, and clients about an individual’s power, disposition, and the level of satisfaction with that individual’s service.” In all of these instances, clients choose practitioners according to their credibility and perceived ability, selecting for practices that promote these metrics.

The autobiography of the Kwakwaka'wakw shaman Quesalid (see Boas 1930 and Lévi-Strauss 1963) provided a telling example of how competition among shamans could drive the cultural selection of plausible-seeming interventions. Quesalid described learning how to duplicitously produce a bloody tuft of down as a purported physical embodiment of illness. But he then discovered that the nearby Koskimo shamans lacked this method, and performing it before them and their audiences, attracted much more credibility while disgracing his rivals. Although Quesalid did not describe the subsequent diffusion of the technique, he recounted how other shamans implored him to share his secrets; one even presumably used his virgin daughter to tempt Quesalid.

In summary, individuals' preferences for effective superstitions fuel the cultural evolution of plausible-seeming magical practices. Once shamans exist, the competition among them should accelerate this process.

3.3. Violating notions of humanness to apparently influence uncontrollable outcomes.

In this section, I argue that the cultural selection for plausible superstitions leads to people claiming to engage with the invisible entities (e.g., deities, spirits) who control unpredictable events. To convince potential clients that they have these special powers, these practitioners must ostensibly transform into entities distinct from normal humans.

3.3.1. People explain unpredictable outcomes with invisible, agentic forces.

Outcomes that seemingly occur randomly, like winning the lottery, being struck by lightning, or recovering from illness, cannot be accounted for by predictive theories, because the causal forces escape human perception. To explain these events, individuals invoke causal, agentic forces, like

god, fate, witchcraft, spirits, and moral justice (Baumard and Chevallier 2012; Gorsuch and Smith 1983; Gray and Wegner 2010; Harris and Giménez 2005; Legare et al. 2012; Legare and Gelman 2008; Lerner 1980; Lupfer et al. 1996; Pepitone and Saffiotti 1997; Woolley et al. 2011). These agents are usually invisible (e.g., gods, spirits), although sometimes visible actors intervene through invisible means (e.g., witches); nevertheless, I refer to them here as ‘invisible forces’ or ‘invisible agents’. Researchers have found that the tendency to attribute rare events to invisible forces occurs across cultures and throughout development (Banerjee and Bloom 2015; Heywood and Bering 2014; Swanson 1964; Wright 2009), although both age and cultural context mediate it (Norenzayan and Lee 2010; Woolley et al. 2011). Moreover, ethnological studies have identified the pervasive human tendency to attribute illness and (mis)fortune to the whims of invisible agents (Murdock 1980; Swanson 1964).

There remains a lack of consensus among psychological researchers for why humans explain anomalous outcomes with invisible agents, but growing research suggests that socio-cognitive biases and cultural transmission both play crucial roles (Banerjee and Bloom 2014b; Gorsuch and Smith 1983; Heywood and Bering 2014; Norenzayan and Lee 2010). Humans possess cognitive adaptations for attributing mental states (Frith and Frith 2003), which seem to predispose individuals to recognize intention and purpose in the world (Guthrie 1995). For example, Banerjee and Bloom (2014a) found that individuals with a greater tendency to think about mental states (highly paranoid people and highly empathetic people) are more likely to infer purpose and intention in life events. This tendency then becomes reinforced with socialization and related cultural beliefs (Norenzayan and Lee 2010; Woolley et al. 2011).

The relevance of unseen causality for shamanism is that, to be considered most effective as superstitious problem-solvers, practitioners should observe and manipulate the otherwise-

invisible causal forces. This would mean, for example, talking to spirits, identifying sorcery-caused illness, or being possessed by deities who can then converse with other community-members. Doing any of these requires convincing others that the practitioner has abilities that normal humans lack or otherwise possess to a less developed degree.

3.3.2. People more readily attribute superhuman abilities to strange individuals.

The psychological foundations of supernaturalness have been less thoroughly-investigated than superstition or explanations for rare outcomes. However, research suggests that attributions of special powers derive in part from a perception that an actor violates basic notions of folk-biology or psychology⁷. For example, Catholicism has long used the occurrence of non-explainable events (or “miracles”) to infer whether an individual has a relationship with the supernatural. A well-known class of miracles is healing otherwise incurable illness (Vidal 2007), a criterion that continues to be used today (Duffin 2016). But communities also used other signs of non-ordinariness to infer a relationship with demons or divinities, including unexplained pregnancies, perennial illness, and even apparently psychotic behavior (Keitt 2005a; Kleinberg 1992).

Research into dehumanization provides further preliminary evidence for a connection between supernaturalization and deviating from conceptions of humanness. Among North Americans, white subjects tend to dehumanize black targets, attributing to them fewer human-unique emotions (like sympathy) and implicitly associating them with apes (Costello and

⁷ The point made in this section is distinct from minimal counterintuitiveness (MCI) theory (Boyer and Ramble 2001; Purzycki and Willard 2015; Sperber 1996b). MCI contends that minimal violations of basic inferences (e.g., a plant that vanishes) persist because they are memorable; I argue that individuals violate folk-notions of humanness to increase the plausibility of their claims of supernatural abilities.

Hodson 2014; Goff et al. 2008). Relatedly, white subjects preferentially ascribe superhuman qualities, like super-strength and heightened pain tolerance, to black people as relative to other whites (Dore et al. 2014; K. M. Hoffman and Trawalter 2016; Trawalter et al. 2012; Waytz et al. 2014). More work in the psychology of humanness will elucidate whether and how these observations are linked (although see below for some proposed mechanisms).

Lastly, stories of individuals with super-powers illustrate how the ascription of non-normal abilities requires that a person be different from other humans, either at birth or through some transformation. This is best exhibited in superhero narratives, of which “the origin story is certainly a prominent and popular trope” (Hatfield et al. 2013, p. 3). Whether they concern a bite from a radio-active spider (Spiderman), extraterrestrial heritage (Superman), or underlying genetic mutations (the X-Men), origin stories involve “transformative events that set the protagonist apart from ordinary humanity” (Hatfield et al. 2013, p. 3), justifying the character’s non-human abilities. Although fictional, these stories reveal people’s conceptions of what is required for one to possess supernatural powers.

The mechanisms by which people attribute supernatural abilities to biologically- or psychologically-strange individuals have yet to be understood, but existing work suggests at least three possible psychological pathways. First, observers may have have cognitive human “templates” (Boyer 2001) or “concepts” (Carey 2009) that delineate what is possible for a normal person; claiming abilities beyond these thus requires departing from these conceptualizations. By this mechanism, deviating from humanness is a pre-requisite for supernaturalness; people would need to use other behaviors or displays to convince observers of special abilities. Second, people’s thinking about aberrant behavior may be similar to how they think about anomalous events – that is, supernatural involvement may be the most salient or plausible explanation they have to

decipher these occurrences (Gopnik 1998; F. C. Keil 2006). Finally, people may have existing mental models of supernatural agents, which designate how those agents think or how their bodies work. By defying notions of humanness in patterned ways, practitioners move towards these models of supernaturalness. In line with this hypothesis, psychologists have found that Western people conceive of supernatural agents as differing fundamentally from humans, most often in possessing human-unique capabilities, like thought or self-control, while lacking those shared with animals, like hunger or pain (Demoulin et al. 2008; Gray et al. 2007; Haslam et al. 2008). The supernaturalization of black targets by white subjects, as well as many ethnographic descriptions of shamans being more animal-like (Ojamaa 1997), indicate that perceptions of individuals as being more bestial similarly promote ascriptions of special (animal) powers.

Regardless of the mechanism, converging lines of evidence suggest that people attribute supernatural connections or powers to individuals who violate intuitions of humanness. Thus, for an individual to convince group-mates that she possesses the special ability to commune with invisible forces, she must transform in the eyes of the community or otherwise assure them that she is different from normal humans.

I propose that many features of shamanism, including trance, peculiarity, initiation practices, and self-denial, are selectively retained because they serve to transform the practitioner. By this hypothesis, trance is a drama of strangeness, comprised of displays of foreign behavior that bolster the practitioner's invocations of supernatural powers. Meanwhile, the initiation practices, self-denial, and peculiarity of practitioners appear to convince the community that the practitioner is more stably biologically and psychologically strange. Individuals claim to have a new skeleton, to have died and come back to life, to have been operated on by spirits (Eliade 1964), because doing so assures the community that the person has transformed into an entity

different from normal humans, capable of abilities inaccessible to normal bodies. I review the ethnographic support for these hypotheses in section 4 and relate them to the professionalization of shamanism in section 5.

3.4. Synthesis: The cultural evolutionary theory of shamanism

Some highly important outcomes are uncontrollable and random (Figure 2.1). Cognitive mechanisms for decision-making and developing explanations predispose people to (1) adopt causally innocuous interventions (superstitions) to influence these events, and (2) believe in unseen causal forces that control these uncertain outcomes.

Individuals will prefer to use those interventions that appear the most effective, selecting for practices that are adapted to intuitions of causality and efficacy (Figure 2.2). The most successful-appearing practices will involve practitioners claiming to recognize and interact with the invisible causal agents that determine whether these outcomes occur. These practitioners must convince group-mates of their non-normal powers while warding off constant invasion from others aiming to invade their jurisdiction. This selects for transformation practices and mythologies (e.g., asceticism, claims of death and rebirth), which convince observers that the practitioner is different and capable of performing feats otherwise impossible for normal human bodies. Practitioners also need to indicate to observers their supernatural powers while administering their interventions, driving the cultural evolution of displays of behavioral strangeness, or trance.

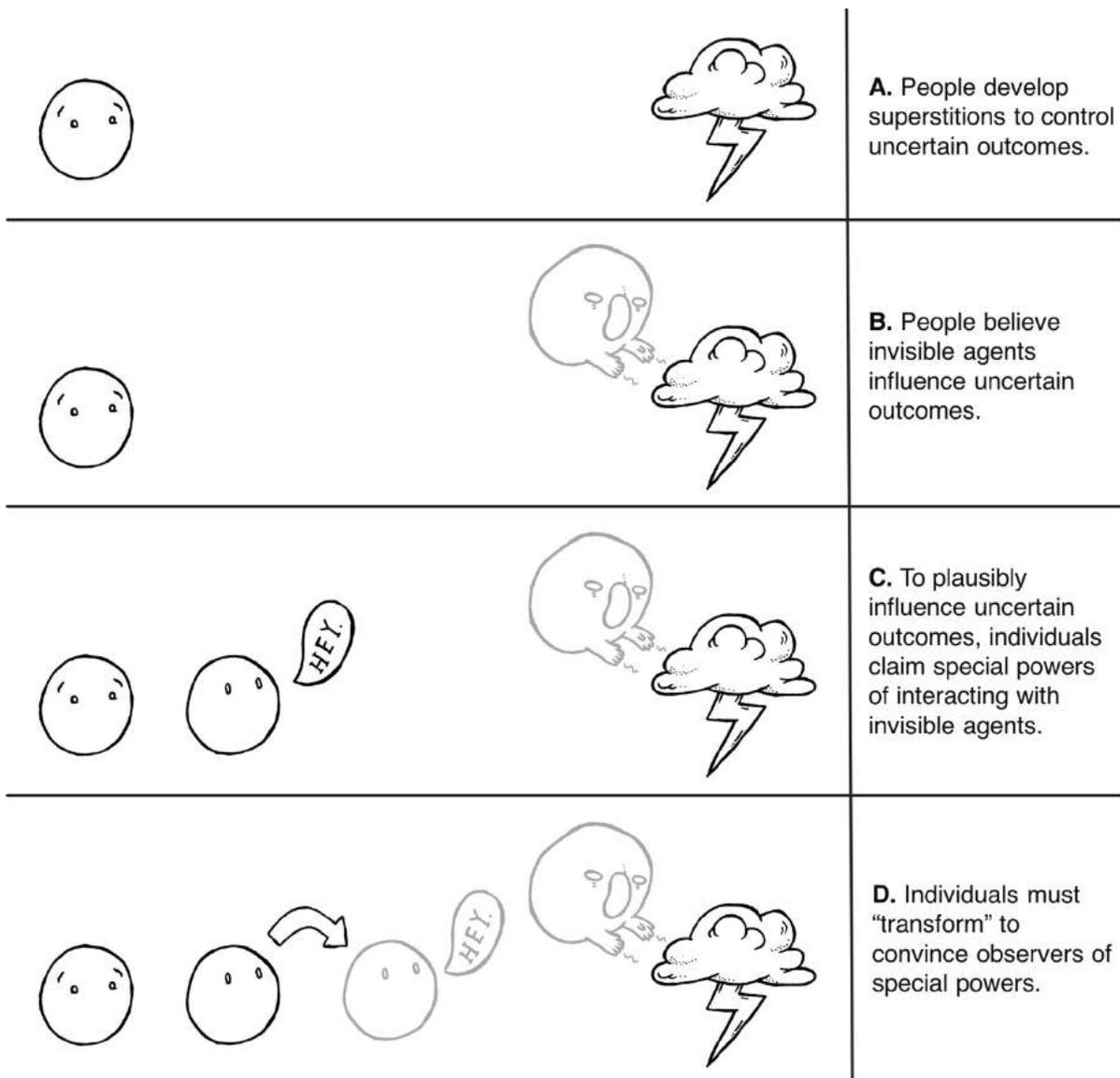


Figure 2.2. Individuals' desire to find treatments selects for interventions that are the most plausible. When outcomes of uncertainty are controlled by invisible forces, cultural selection will favor individuals who claim special abilities of interacting with those forces. To increase their credibility, those individuals must violate folk intuitions of humanness, resulting in trance, transformation practices and mythologies, and the predisposition for peculiar individuals to be shamans.

This theory is agnostic as to whether shamans provide benefits to clients or the group. It posits only that the practices surrounding shamanism develop to promote observer perception of efficacy. Although these might provide benefits through the placebo effect⁸ (Kaptchuk 2002, 2011; Kaptchuk and Miller 2015; Kleinman and Sung 1979), those added benefits are not necessary for the emergence or maintenance of the practice.

4. Explaining the core features of shamanism.

To this point, I have used theoretical and empirical insights from psychology and cultural evolution to propose a cultural evolutionary theory of shamanism. In this section, I examine how the theory explains three core features of shamanism: the jurisdiction of shamans, dramas of strangeness during interventions (trance), and practices that serve to transform the shaman.

4.1. The shaman's jurisdiction focuses on controlling uncertainty.

According to cultural evolutionary theory, shamans will have jurisdiction over influencing and delivering information about outcomes that are unpredictable, fitness-relevant, and uncontrollable (uncertain outcomes).

⁸ Researchers frequently cite the placebo effect as a potential mechanism by which the shaman provides benefits to community-members (Achterberg 1985; Kleinman and Sung 1979; McClenon 1997). But shamans may alternatively end up harming community-members by triggering a placebo response. The shaman's presence may indicate to the organism that it is receiving genuine medical care, leading it to either mitigate symptoms that would protect it (nausea, pain) or re-allocate resources to self-care (Humphrey 2002). If the shaman is a false indication of genuine care, re-allocating resources or mollifying symptoms might be maladaptive, further endangering the patient.

Comparative ethnographic evidence supports this claim. Winkelman and White (1987) coded 115 magico-religious practitioners across 45 societies, encompassing priests, trance practitioners, and cultural notions of witches and sorcerers. 75 practitioners representing 43 societies used trance to provide services, qualifying them as shamans. Using their data-set, I calculated how frequently shamans had jurisdictions over uncertain outcomes as compared to how often they offered services in other domains⁹. Figure 2.3 presents the findings.

⁹ The data-set is available for download at https://www.researchgate.net/profile/Michael_Winkelman2/publications?category=data. Shamans were determined to be those practitioners who use trance to provide services (variable 209, codes 1-7). For tabulating the frequency with which shamans had different jurisdictions, I used all of the codes concerning social roles (political powers: variables 13-16; life cycle activities: 17-19) and then the four general domains of uncertainty available in the data-set: health care (variable 68), socio-economic activities (variable 160; validated with variables 161, 163, 165, and 167), and weather control (variable 48). To organize societies by complexity, I merged Winkelman and White's (1987) data-base with the Ethnographic Atlas (Gray 1999), choosing corresponding societies based on shared culture names and shared bibliographic materials. I used EA-variable 33 ("Jurisdictional hierarchy of local community") to distinguish between complex societies (code > 1) and simple societies (code = 1). Note that the Paiute and Tuareg each corresponded with several societies in the Ethnographic Atlas, but all Paiute societies were coded as simple while all Tuareg societies were complex.

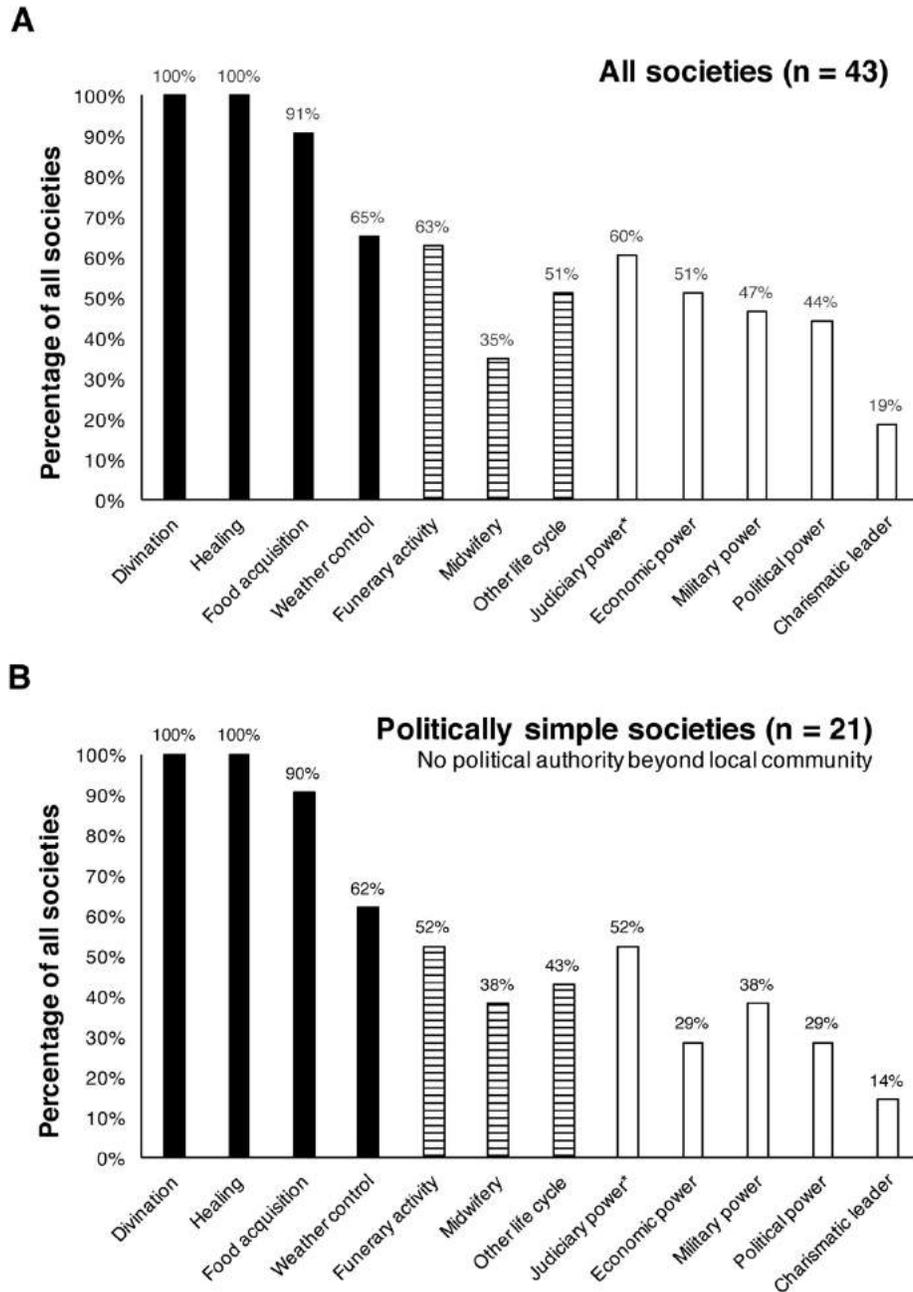


Figure 2.3. The percentage of societies in which shamans provide a given service or role, according to coding by Winkelman and White (1987); organized by all societies (A) and politically simple societies (B). Dark gray bars signify a jurisdiction that involves influencing or providing information about uncertain outcomes; striped bars indicate assisting or ceremonially overseeing life cycle activities (funerals, birth, initiations); white bars denote decision-making in

other domains of social life. “Judiciary power” is noted with an asterisk because it includes overcoming uncertainty (divination of guilt). See main text for details and endnote 8 for a discussion of methods.

Shamans overwhelmingly offered control over important, uncontrollable outcomes. The most pervasive and important uncertain outcome among humans is recovering from serious illness: trance practitioners treated it in every society examined. Successes and failures in food acquisition, including helping to find game and reap successful crop yields, represent another class of important, uncontrollable events: shamans assisted in promoting these activities in 91% of societies. Weather is similarly random and uncontrollable and bears dramatically on people’s lives: trance practitioners were coded as controlling weather patterns in 65% of societies. Lastly, shamans provided otherwise inaccessible information (divination) in all societies surveyed. This included information about the cause of illnesses, guilt, future events, and the locations of lost or stolen objects.

Figure 2.3 also illustrates that shamans irregularly contributed to other aspects of social life. Although they assist in various life cycle activities, including birth, funerals, and initiations, and they enjoy leadership roles, such as in military affairs or coordinating economic activities, shamans serve these roles much less frequently than they help overcome uncertainty. This difference is more pronounced when removing chiefdoms and states and examining small-scale societies specifically (see Figure 2.3B). Notably, those two domains that appear most commonly outside of uncertainty seem the consequence of shamans’ magical interventions. First, they were coded as mediating or settled disputes in 60% of the societies – but this is likely inflated, because the coders included divining guilt as reflective of judiciary influence. Second, shamans’

pronounced role in funerary activities, corresponding with some researchers' observations of shamans as psychopomps (Bäckman and Hultkrantz 1978; Eliade 1964; Hultkrantz 1993), seems a result of their unique relationship with the spirit world. Still, that shamans have roles outside of uncertainty suggests that their liminal status affords them a special prestige that translates into leadership and ceremonial positions.

Ethnographies reveal that when shamans provide services outside of those in Figure 2.3, these also involve controlling uncertain outcomes. For example, in addition to calling wild game, healing illness, and controlling weather, Netsilik shamans stopped the cracking of ice, which endangered camps and was uncontrollable but resolved randomly (Balikci 1963). Majangir shamans (southwestern Ethiopia) not only divine, treat illness, and influence natural events, but also more generally “confer protection and good luck” (Stauder 1972, p. 156). Haida shamans cured illness, foretold events, and divined the locations of stranded whales, but they also accompanied war parties to warn of unpredictable ambushes and point out auspicious places to attack (Corlett 1935).

Note that these jurisdictions and abilities apply to the practitioners of Abrahamic religions as well. For example, Thomas (1971, p. 26) wrote about medieval Christian saints: “By the twelfth and thirteenth centuries the *Lives* of the Saints had assumed a stereotyped pattern. They related the miraculous achievement of holy men, and stressed how they could prophesy the future, control the weather, provide protection against fire and flood, magically transport heavy objects, and bring relief to the sick.” Pentecostal and charismatic priests habitually engage in healing and divination (Csordas 2007). Some scholars even accredit the recent proliferation of these movements, which now comprise more than a quarter of all Christians, to the centrality and allure of divine healing (Brown 2011).

A final prediction regarding jurisdiction is that shamans will exist as long as uncertain outcomes exist – that is, as long as there are important, uncontrollable events that individuals want to influence or about which they want information. I review this prediction in section 6.2.

4.2. Trance is a drama of strangeness.

Trance (or ecstasy) is a famously ambiguous and ill-defined concept (Rouget 1985).

Contemporary researchers often implicitly or explicitly regard it as an altered state of consciousness that shares a common neurophysiological basis across societies and stimulates similar experiences (Achterberg 1985; Harner 1990; Hove et al. 2015; Winkelman 1986, 2004). For example, Harner (1990) argued for the existence of a Shamanic State of Consciousness (SSC), while Winkelman (2000) hypothesized the “integrative mode of consciousness”¹⁰. In contrast to these claims, however, growing research in altered states of consciousness has shown that states brought on by sensory deprivation, drumming, starvation, meditation, hallucinogens, relaxation, and other inducements produce profoundly different physiological and psychological effects (Vaitl et al. 2005).

The proposed cultural evolutionary theory of shamanism hypothesizes trance to be a drama of strangeness: by violating folk-intuitions for how a human should behave, practitioners convince onlookers of their heightened supernatural powers or experiences. This hypothesis does not necessitate that trance states have the same neurological and physiological correlates across

¹⁰ Winkelman (2000) differentiated among three main types of altered state of consciousness – soul journey shamanism, meditation, and possession – but regarded all of them as enabling the integrative mode of consciousness.

societies, although similar triggers (e.g., hallucinogens or music) likely produce analogous experiences.

The theatrical nature of trance does not mean that an individual engaged in it is “faking”. In fact, cultural selection should favor interventions that convince both the client and the shaman of the shaman’s ability, as long as the client’s perception of successful treatment is influenced by the shaman’s faith (see the benefits of self-deception: Hartwig and Bond, Jr. 2014; ten Brinke et al. 2012; Trivers 2000, 2011). Medical researchers have found that physician expectations increase the magnitude of the placebo effect, suggesting that the shaman’s confidence does indeed influence client belief (Crow et al. 1999; Gracely et al. 1985; Gryll and Katahn 1978). Consequently, cultural selection should develop practices that change the felt experience while making the shaman’s behavior seem as non-human as possible. For example, the healing songs that so frequently characterize shamanic ceremonies may culturally evolve to engage this genuine-seeming super-human state¹¹. Future research will reveal whether songs involved in shamanic ceremonies exhibit convergent features around the world that serve this function.

This hypothesis of trance makes several unique predictions that diverge from the accounts of Harner (1990) and Winkelman (2000). Here I consider three: (1) trance states should include other spectacles to promote perceptions of supernatural powers, aside from non-human

¹¹ The proposed theory offers at least two hypotheses for why shamanism is so frequently linked to music: (1) songs engage a credible-seeming trance state (see also Rouget 1985); (2) songs bolster client or community credulity. These hypotheses make divergent predictions about which songs will be selectively retained. But, assuming that people respond similarly to music around the world, both of these hypotheses predict common musical features of shamanic healing songs across musical systems.

behaviors; (2) trance practices including more human-like behaviors are perceived of as less genuine; and (3) re-framing trance behaviors as natural parts of human behavior undermines them as indications of supernatural powers or connection.

4.2.1. Trance states include other displays that promote perceptions of supernatural powers.

If trance states are culturally selected to assure observers that the practitioner has special powers, these performances should incorporate other spectacles that promote this perception, aside from displays of strangeness. Ethnographic accounts of trance frequently document exhibitions of purported superhuman abilities, supporting this prediction. Table 2.1 presents a selection of examples.

Table 2.1. Some displays of superhuman abilities that occur during trance performances.

Superhuman ability displayed	Selected societies (with sources)
------------------------------	-----------------------------------

Immunity to fire, including walking on and swallowing hot coals	<p>Fon (Herskovits 1938, p. 165)</p> <p>Ivilyuqaletem (Hooper 1920, p. 331)</p> <p>Japanese (Blacker 1975, p. 250-1)</p> <p>!Kung (Marshall 1965, p. 272)</p> <p>Mentawai (Schefold 1988, p. 202)</p> <p>Nakhi (Rock 1959, p. 801)</p> <p>Nlaka'pamux (Teit 1900, p. 362)</p> <p>Paiute (Park 1938, p. 57)</p> <p>Tlingit (Emmons and De Laguna 1991, p. 373)</p> <p>Yahgan (Gusinde 1961, p. 1354)</p>
Immunity to other pain and injury, including walking on swords and being stabbed without bleeding or suffering lasting harm	<p>Azande (Evans-Pritchard 1937, p. 189)</p> <p>Koreans (Lee 1981, p. 149, 211)</p> <p>Koryak (Jochelson 1905, p. 51-2)</p> <p>Kyrgyz (Castagné 1930, p. 87)</p> <p>Saami (Karsten 1955, p. 61)</p> <p>Wanapum prophet Smohalla (Mooney 1896, p. 719)</p>

Possessing inaccessible knowledge, especially speaking languages one doesn't otherwise know	Evenks (Jochelson 1905, p. 51-2) Greeks (Herodotus and Godley 1925, p. 135) Haida (Swanton 1905, p. 38) Ifugao (Barton 1946, p. 121) Jahai (Eliade 1964, p. 96) Monguor (Schröder 1952, p. 29) Wintu (DuBois 1935, p. 97) Yakut (Sieroszewski 1902, p. 314)
Physical impossibilities, including removing one's nose, creating matter, turning water into blood, and freeing oneself from chains	Apache (Opler 1941, p. 263-4) Chukchi (Bogoras 1909, p. 444, 448) Mapuche (Métraux 1942, p. 313-4) Nuxalk (McIlwraith 1948, p. 566-7)

4.2.2. Trance performances including more "human-like" behaviors are considered less genuine.

If the strangeness of a practitioner's behaviors in trance evidences their supernatural connection, observers should use the normalcy of behavior as an indication of false trance. Accounts of dubious observers support this prediction. Monguor shamans of China were considered inauthentic if, in their trance states, they responded frightfully to the crack of a whip and if their bodies bled when they sat on thorns (Schröder 1952). Meanwhile, Blacker (1975, p. 263) described how a Japanese community complained of the unenergetic performance of a possessed shaman: "The *miko's* performance had been so languid that it was difficult to realize that she was possessed at all." This was in contrast to a previous shaman, whose dramatic divinations included violent flailing, levitation, and screaming in a bass voice, inviting questions and enthusiasm from

the crowd. The author later concluded, “In every case we noticed that a trance was approved by the village as ‘good’ and genuine when the medium’s behavior was violent, inhuman, and strange. Behavior ordinary or human – as in a decorous waving of the wand or a polite use of language – was instantly condemned as weak and unconvincing” (p. 277). Note that this also provides an example of cultural selection: preferentially patronizing shamans with inhuman trances should promote the retention and spread of those practices.

4.2.3. Trance practices lose legitimacy when they are absorbed into normal human functioning.

The examples above illustrate that trance comprised of normal human behaviors fails to convince observers of a practitioner’s power. By the same logic, this hypothesis predicts that trance will lose legitimacy if it becomes absorbed into normal human functioning. This is what occurred in sixteenth and seventeenth century Europe (Heyd 1981; Keitt 2004, 2005a). Natural philosophers argued that trance behaviors were within the purview of normal human functioning; officials in the Church promoted these arguments to delegitimize local practitioners and maintain their monopoly on the supernatural. For example, Huarte de San Juan argued that the intense concentration of prolonged prayer could lead to a loss of sense of touch (Keitt 2005a). This naturalization invalidated trance behavior as a sign of supernaturalness, raising the standards for indications of supernatural connection.

4.3. Initiation practices and self-denial serve to transform the shaman.

According to the cultural evolutionary theory of shamanism, the practices involved in becoming a shaman convince an individual’s group-mates that the initiate has transformed, making one’s claims of supernatural powers more credible. Those individuals with biological or psychological

peculiarities more easily become shamans because they pay lower costs to convince their group-mates of their liminal nature.

4.3.1. Initiation practices indicate biological or psychological change or strangeness.

Shamanic initiation practices frequently involve an individual acting in foreign ways or otherwise transforming, famously reviewed by Eliade (1964); some examples are presented in Table 2.2.

According to a Nomlaki person (northern California), “when a person starts to become a doctor, he gets out of his head; he won’t talk but just stands around as though he doesn’t know you, like a man who is unconscious. His eyes, ears, and nose may be bloody, and instead of tears, blood is in his eyes. He gets and worse, just like a dog with running fits, and finally he runs off”

(Goldschmidt 1951, p. 358). Yaghan initiates had to painfully rub their faces until a new layer of skin supposedly appeared (Gusinde 1961). Among the Andaman Islanders, one could become an *oko-jumu* by dying and coming back to life (Radcliffe-Brown 1964). Such individuals were thought capable of communing with the dead, granting them insight into “curing illness and in preventing bad weather” (Radcliffe-Brown 1964, p. 178). Claims of initiates dying and then enjoying new powers are common in shamanic initiations: Winkelman and White (1987) reported that trance-practitioners in 9 societies of 43 were said to experience death and re-birth during initiation or trance.

Table 2.2. Purported shamanic initiation practices involve a biological or psychological transformation of the initiate.

Practice	Selected societies (with sources)
----------	-----------------------------------

Death and re-birth, including through illness or supposed ingestion and regurgitation by monsters	Andaman Islanders (Radcliffe-Brown 1964, p. 178) Aztec (Corlett 1935, p. 166) Bororo (Métraux 1944, p. 203) Inuit (Thalbitzer 1909, p. 454) Maidu (Gifford 1927, p. 244) Mapuche (Métraux 1942, p. 315) Nuba (Nadel 1946, p. 29)
Surgery, dismemberment, or magical treatment of body parts, especially eyes, ears, and head	Anmatyerre (Spencer and Gillen 1904, p. 480-1) Dayak (Gomes 1911, p. 178) Haitians (Métraux 1959, p. 200) Igbo (McCall 2000, p. 207) Mentawai (Loeb 1929, p. 68-9) Yanomamö (Jokic 2008)
Transmission of magical substances, including dust, crystals, magic shells, and the phlegm of existing shamans	Aranda (Spencer and Gillen 1899, p. 524) Azande (Evans-Pritchard 1937, p. 224-6) Chamicuro (Tessmann 1930, p. 406) Kwakwaka'wakw (Boas 1930, p. 4) Manasi (Métraux 1943, p. 25) Maori (Best 1924, p. 245) Ojibwa (Corlett 1935, p. 124-5) Pima (Russell 1908, p. 257) Wudjubalug (Elkin 1977, p. 75)

Spontaneous biological or behavioral anomaly,	Buryats (Mikhailowskii and Wadrop 1895, p. 87)
including serious illness, excessive bleeding,	Evenks (Mikhailowskii and Wadrop 1895, p. 85)
self-harm, isolation, epileptic fits, and frenzies	Japanese prophet Deguchi Nao (Blacker 1975, p. 133)
	Koreans (Kendall 1985, p. 37, 57)
	Niassans (Loeb 1935, p. 155)
	Nomlaki (Goldschmidt 1951, p. 358)
	Uzbeks (Basilov 1995)

Other frequently occurring shamanic initiations similarly involve the candidate's body or physiology changing: these include, for example, magical treatment of an initiate's eyes or ears (Figure 2.4), claims of surgery or dismemberment by spirits or other medicine-men, debilitating illness, and bodily insertions of crystals, magical shells, or dust (Table 2.2). Wilbert (1987) observed how heavy tobacco consumption among South American shamans helped transform initiates' eyes and voices, making credible claims of otherworldly senses. Citing the shamans' "acuteness of vision, night vision, wakefulness, a caraña-masked raspy voice, a furred or rough tongue, and a pungent body odor" (p. 195), the author further hypothesized that the physiological effects of tobacco also legitimated the shamans' supposed affinity with jaguars. Among the Igbo, men staged a performance in which they killed a dog, removed its eyes, and then allegedly replaced a healer-initiate's eyes with the animal's (McCall 2000). The ethnographer quoted an informant who said, "Now he will be able to see spirits just as dogs are able to see spirits" (McCall 2000, p. 27).



Figure 2.4. A Mentawai shaman (sikerei) treats an initiate's eyes with turmeric and other potent, magical substances so that he can see otherwise invisible spirits.

4.3.2. Group-mates conceive of ascetic practices as transforming initiates.

Becoming a shaman frequently involves observing periods of asceticism and other costly practices, not only during initiation but throughout one's tenure as a shaman as well. According to coding by Winkelman and White (1987)¹², at least one trance-practitioner in 49% of societies

¹² The following variables were used: sex prohibition, initiation (variable 188); sex prohibition, ceremonial (variables 214 and 240); food prohibition, initiation (variable 189); food prohibition, ceremonial (variables

observed prohibitions on sex either during training or in preparation for ceremonies, while shamans in 53% and 72% of societies respectively refrained from eating certain foods or underwent social isolation. Shamans in 83% of societies observed at least one of those forms of self-denial. The proposed theory hypothesizes that observing these practices convinces one's group-mates of one's psychological or biological foreignness.

Observers' interpretations of a person's self-denial or pain have not been systematically studied, but psychological and ethnographic research suggests that people conceive of these experiences as transformative – an intuition captured in adages like “no pain, no gain” and “what doesn't kill you makes you stronger”. For example, Hoffman and Trawalter (2016) found that the white perception of black people having a heightened pain tolerance is driven by folk intuitions about the transformative nature of hardship.

Ethnographers, group-members, and practitioners commonly intuit that austerity serves to extricate a practitioner from “his ‘normal’ state...[turning] him into another man” (Mauss 1902/2001, p. 51). For example, Rasmussen (1930, p. 55) quoted the Inuit shaman Igjugârjuk: “True wisdom is only to be found far away from people, out in the great solitude, and it is not found in play but only through suffering. Solitude and suffering open the human mind, and therefore a shaman must seek his wisdom there.” Blacker's (1975) Japanese interlocutors described similar transformative effects of ascetic living; one shaman claimed that subsisting on pine needles was “conducive to the development of second sight and clairaudient hearing” (p. 87). Other Japanese shamans testified “that it was just when they felt that cold, hunger, and

215 and 241); social isolation, initiation (variable 190); social isolation, ceremonial (variables 216 and 242).

sleeplessness had brought them to the verge of collapse that they suddenly felt themselves flooded with a new and mysterious strength. With this access of power they felt themselves to be different people from those they had been in the past” (p. 102-3).

The above ethnographic anecdotes reveal that practitioners use self-denial and self-harm to promote a perception of change and ensuing supernaturalization. Future work will uncover the particular psychological mechanisms by which these prohibitions indicate to observers that a practitioner transforms.

4.3.3. Initiation practices and self-denial do not signal cooperative intent.

A potential alternative interpretation of these practices, and of costly prohibitions in particular, is that they indicate that a practitioner is a cooperative group member, through signaling either commitment or belief (see Bulbulia and Sosis 2011; Irons 2001; Sosis 2004 for discussions of cooperative costly signaling). Given that communities often fear shamans as potentially malicious sorcerers (Brown 1989; Whitehead and Wright 2004), such a hypothesis at first seems plausible. However, at least four lines of evidence suggest that a cooperative costly signaling hypothesis fails to explain the observances of shamans.

Cooperative costly signals indicate cooperative intent either through demonstrating an intention to stay in the group (commitment) or by showing that an individual subscribes to a religious system that also includes cooperative beliefs (belief). But many of the austere practices of shamanism qualify as neither of these. First, many observances do not exhibit the requisite features of a commitment signal. Commitment signals involve suffering a cost now to reveal one’s intention of staying in a relationship (and reaping benefits later) (Joseph Bulbulia and Sosis 2011; Posner 2000). For example, gifting a diamond ring reveals that an individual is willing to

suffer the large costs today, because he intends to collect the benefits of a pair-bonded relationship over the long-term. Thus, commitment signals require that the benefits are offset in time from the costs. However, many taboos on shamans (and on magico-religious practitioners more broadly) occur perennially, such as throughout the life course or during every ceremonial period: according to Winkelman and White's (1987) data-set¹³, shamans in 49% of societies refrained from sex, food, or social contact during ceremonies. Because a practitioner pays the costs of the taboos and reaps the benefits of social living simultaneously, observing the prohibitions cannot signal his or her intention to stay in a group.

Second, while many of these behaviors do not signal commitment, they also fail to bespeak adherence to charitable religious rules or beliefs. This is because an individual can easily observe the prohibitory practices (e.g., self-denial during ceremonies) without believing in the enforcement supporting the cooperative ones (e.g., beliefs in afterlife).

The third line of evidence suggesting that self-denial fails to signal a cooperative disposition is that people often believe it to foster abilities required for distinctly malicious activities, such as sorcery. For example, among the Jivaro, both shamans and malevolent sorcerers “must induce [spirit darts from which they derive power] to remain in their bodies by purifying themselves. They spend months in jungle isolation, fasting and practicing sexual abstinence” (Brown 1989, p. 8). Similarly, the Barama River Carib claimed that observing austerities helped transform one into a *kanaima*, a shadowy spirit bent on revenge (Gillin 1932), while English people of the early modern period believed in black-fasting, “a maleficent activity designed to secure the death of some specified victim” (Thomas 1971, p. 512; see the account of Mabel

¹³ For variables used, see codes pertaining to ceremonies in endnote 11.

Brigge: van Patten 1983). In other instances, self-denial is said to cultivate abilities unrelated to cooperative intent. For example, the Canela believed that observing taboos helped develop a person not only into a shaman, but into “a great warrior, a tireless runner, or a reliable hunter” as well (Crocker 1990, p. 317). The Haida made similar claims, connecting self-denial to “success in hunting, fishing, war, etc.” (Swanton 1905, p. 40). These examples reveal that people regard observing costly prohibitions as cultivating some dimension orthogonal to cooperativeness.

Finally, the many examples reviewed reveal that emic perspectives of shamanic austerities emphasize transformation and supernaturalization rather than as demonstrating a cooperative nature.

5. On the professionalization of shamanism

In most hunter-gatherer societies where shamanic traditions appear, shamanism represents the only profession (La Barre 1970; Rogers 1982). In this section, I use the proposed theory to explain why.

To reiterate, by ‘profession’, I mean ‘a class of individuals with entry requirements whose unique expertise or abilities provide them jurisdiction over the treatment or diagnosis of some problems’. This does not presume a professional organization nor does it necessitate full-time specialization. Note that according to this definition, variation in skill does not qualify as a profession. For example, some individual might be especially proficient at canoe-making, and people might know him as such and favor his canoes. But unless a group of canoe-makers exists who enjoys jurisdiction over making canoes, and becoming a canoe-maker involves observing entry requirements, there is no profession.

5.1. Shamanism professionalizes because individuals must transform to claim the jurisdiction.

According to the sociology of professions, individuals want to claim jurisdiction over the treatment or diagnosis of some problem, like healing illnesses or mediating conflict, because doing so carries material and social benefits. By jurisdiction, I mean that a party has a claim over providing some service (Abbott 1988). The benefits of holding a jurisdiction come from having a unique skill or ability that others prize, which ensures compensation for services, social prestige, and valued social partners (Tooby and Cosmides 1996). Shamans across societies receive payment in exchange for their services (Rogers 1982), including pigs and coconuts (Mentawai: Loeb 1929), tobacco (Ojibwa: Ritzenthaler 1963), yams and sponges (Pohnpei: Riesenberg 1948), freshly killed deer (Miwok: Powers 1877), sexual partners (Guyana: Roth 1915; Inuit: Stefánsson 1914), and slaves (Haida: Corlett 1935). Becoming a shaman also provided a way for low-status individuals to attain prestige, such as in some hierarchical societies of the Pacific Northwest (Gunn 1966), while in other instances, shamans were regarded as attractive sexual partners. For example, Katz (1982, p. 186) quoted the !Kung shaman Toma Zho: “The women really did like the healers. Whenever I see one who is getting num [healing energy], I say, ‘Think of the sex the guy’s going to get!’”

Sociologists studying professions in industrial societies have identified several conditions under which parties maintain jurisdiction over problems (Abbott 1988). First, parties should have unique skills or expertise that others believe are necessary for diagnosing the problem, administering the treatment, or inferring the treatment from diagnosis (Coy 1989; Freidson 1970). For example, physicians are considered the chief healers in many industrial societies because of a conception that their university training grants them the exclusive know-how in

diagnosing and treating ailment (Freidson 1970). Likewise, shamans should maintain jurisdiction if people believe that only shamans have the skills or abilities necessary for controlling uncertain outcomes. Second, a party maintains its jurisdiction when competitors purporting to possess alternative interventions are unable to invade and subsequently dominate the jurisdiction (Abbott 1988). Mechanisms preventing such invasion include the perceived inferior efficacy of alternate interventions, as well as the current party enforcing barriers to competition, as was the case with medieval guilds (Ogilvie 2014).

To this point in the paper, I have argued that an individual aiming to invade the shaman's jurisdiction has to observe the existing transformative practices or devise novel ways of garnering supernatural credibility. Some hopeful shamans may convince their group-mates of their competence because of lucky early successes or inherent strangeness (like having an extra finger), but according to the proposed theory, most individuals will need to transform in the eyes of the community. These transformative practices, such as long bouts of asceticism or ceremonies of supposed eye replacement and surgery, represent entry requirements for holding the jurisdiction. They in turn create a separate class of individuals (those who have transformed) uniquely capable of influencing uncertain outcomes. Consequently, shamanism professionalizes: a class of individuals with entry requirements develops with near-exclusive jurisdiction over some services.

Shamanism professionalizes because individuals typically must invest in transformative practices in order to be considered capable of influencing uncertain outcomes. In contrast, jurisdictions involving technical knowledge (like making canoes or cooking sago) do not professionalize, because individuals are capable of producing technical outcomes without having to observe entry requirements. The professionalization of technical knowledge requires that only

those individuals who have observed some entry requirements are capable of providing the service. This in turn requires either that (1) some individuals enjoy a monopoly over technical knowledge or (2) technical knowledge is sufficiently complicated such that it requires prolonged, intensive training. Neither of these typically holds true in small-scale societies. High levels of interaction and limited personal privacy make technical knowledge difficult to conceal, even when actors explicitly try to control it (e.g., Lindstrom 1984). Moreover, the simplicity of physical technology means that “imitators can often replicate new techniques after only minimal observations” (Suchman 1989, p. 1272). The difficulty of controlling technical knowledge is illustrated by the ease and rapidity with which technologies like the domesticated sweet potato (Wiessner 2002), the horse (Haines 1938), and the bow-and-arrow (Bettinger and Eerkens 1999) diffused through societies. The horse is notable: not only did adoption require special knowledge for use and care, but societies actively opposed its diffusion, as demonstrated by the Spaniards’ laws against Native Americans riding horses (Haines 1938).

In summary, entry requirements are maintained for jurisdictions over uncertainty: individuals must observe transformative practices to convince onlookers of their competency. In contrast, in small-scale societies, entry requirements are difficult to maintain for technical jurisdictions: technical knowledge easily spreads and technology is simple enough, so individuals outside of the jurisdiction can produce the outcome.

5.2. Self-serving barriers to entry do not explain shamanism’s professionalization.

Prohibitions on novices sometimes advantage existing practitioners, suggesting that shamans use entry requirements for self-serving ends. For example, Canela initiates were forbidden from having sex with young girls, although they were permitted to enjoy sexual relationships with

post-menopausal women (Crocker 1990), removing a source of sexual competition for adult shamans. The !Kung healer Kau Dwa explained that novices must first eat food specifically prepared by and shared with an existing practitioner; otherwise, they risk death (Katz 1982).

Despite evidence of selfish rule-making, it cannot by itself explain the existence of entry requirements for becoming a shaman. Self-interested rule enforcement necessitates that these individuals already have supernatural credibility (Singh et al. 2017) – but it fails to explain the source of this credibility. The cultural evolutionary theory, which posits that gaining supernatural credibility involves transformative displays, addresses this gap while also explaining entry requirements. Thus, self-interested enforcement can exacerbate entry requirements, but the need for practitioners to transform to gain credibility seems to explain their existence in the first place.

6. Social conditions affect the practices and existence of shamanism

Although the constituent practices and beliefs of shamanism recur around the world, many aspects of it vary across contexts, while some societies fail to sustain shamanic traditions. In this section, I use the cultural evolutionary theory first to explain how social conditions can mediate the intensity of shamanic practices and then to postulate why shamanism is absent in some societies.

6.1. Competition and the benefits of shamanhood mediate entry requirements.

I have established that initiation practices and requirements convince observers of a practitioner's transformation, justifying claims of supernatural powers. According to the cultural evolutionary

theory, these practices can then intensify or relax depending on the competition for the jurisdiction.

Figure 2.5 illustrates a hypothetical scenario in which a shaman's investment in credibility-building practices (e.g., asceticism, death-and-rebirth, trance) carries costs, while increasing clients' willingness to pay the practitioner (benefits). This willingness reflects the clients' increasing faith in the practitioner's abilities, although it asymptotes because clients can only pay so much. Note that the practitioner prefers to invest some amount (i_0) but that competition from other practitioners should push this investment up until the benefits of shamanhood are equivalent to the costs of investment (i_1). This trend resembles a more general phenomenon observed in economics, wherein competition for clients drives up the (perceived) quality of the service (Domberger and Sherr 1989; Matsa 2011; Mazzeo 2003; Olivares and Cachon 2009).

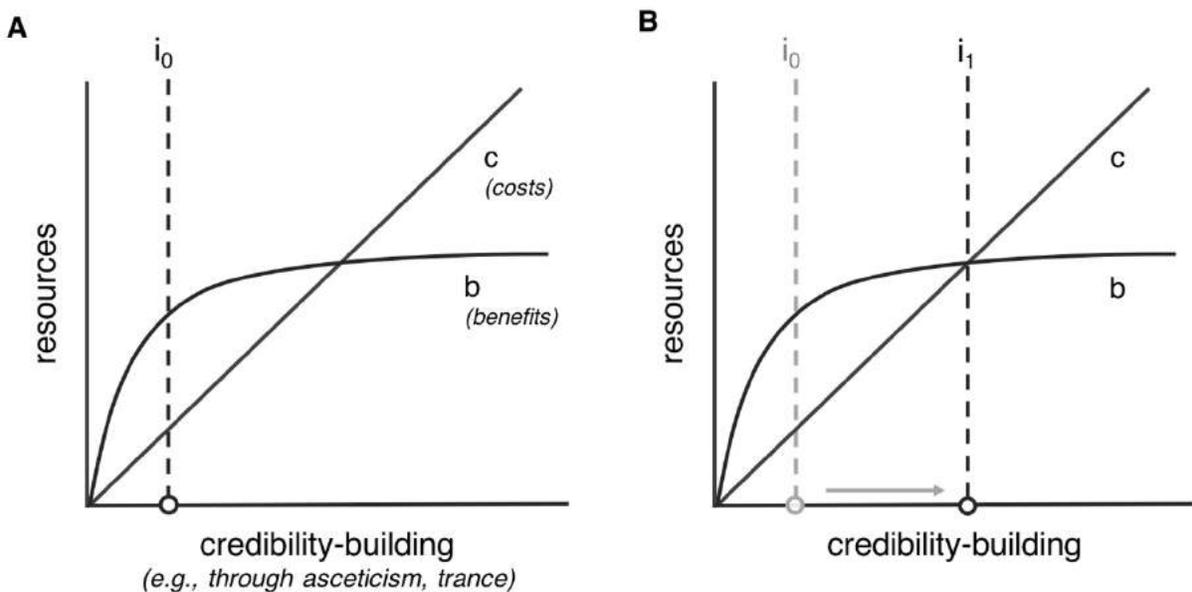


Figure 2.5. A hypothesized relationship between a practitioner's investment in credibility-building practices and payoffs. (A) A self-interested practitioner should maximize the difference between the benefits from clients (b) and the costs of investing in credibility-building (c), denoting an investment of i_0 . (B) Competition among practitioners will push the level of investment as far as (but not passing) the point at which costs equal benefits (i_1).

Ethnographic observations support the prediction that greater competition promotes practitioner investment in credibility-building practices, while reductions in competition co-occur with lower investments. For example, I presented earlier the anecdote of an unenergetic possession performance in a Japanese community. This reduced investment seemed a consequence of a decline in competition: Blacker (1975, p. 263) observed that the community “had to make do with the present creature, despite her feebleness, because she was the only *miko* left in the entire area.”

Some hopeful shamans will pay a lower cost to convince observers of their non-normality (see Figure 2.6). These individuals, who might possess an extra finger (Bernstein 2008), ambiguous sexual identity (Coleman et al. 1992; Peletz 2006), or epilepsy (Loeb 1924), can thus garner more credibility and more easily attract a clientele.

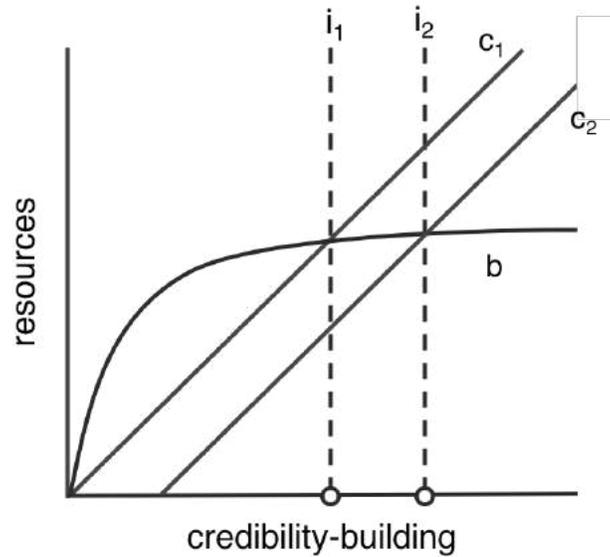


Figure 2.6. Some practitioners will pay lower costs (c_2 compared to c_1) for the same level of credibility because of inherent violations of humanness, early random successes, etc. These individuals can attract credibility past the point that normal practitioners can (up to i_2 , as compared to the normal investment limit of i_1), more easily invading jurisdictions.

Formalizing the intuitions reveals other pathways by which social dynamics will impact shamanic practice. For example, if clients' willingness to pay goes up, practitioners should invest more in credibility-building practices, providing a hypothesized mechanism for how asceticism elaborates with increasing societal wealth (Baumard et al. 2015). Relatedly, the entry requirements should become less demanding when clients' willingness to pay decreases, such as if shamans become less valued. This seems to explain the loosening of taboos involved in becoming a Comanche medicine-person. As the jurisdiction of traditional doctors gave way to Western medicine, a Comanche medicine-woman observed that the taboos discouraged an increasingly acculturated youth from becoming shamans. Thus, she "[deleted] certain tabus from her

Medicine way in order to make the acquisition of her powers more palatable to a twentieth-century Comanche” (Jones 1972, p. 43).

If clients become less willing to pay but the entry requirements for becoming a shaman cannot change, fewer initiates should enter, contributing to the collapse of the institution. This seems to have occurred in with *vegetalista* traditions among Peruvian mestizos (Luna 1984). Luna (1984) remarked, “None of the four informants I worked with has a successor. They all complain that young people are not interested or are not able to endure the diet and continence necessary for learning from the plants.”

I have considered how competition for the jurisdiction should maintain and mediate entry requirements for becoming a shaman. But as stated in section 5.1, as long as observers afford special expertise to shamans, existing practitioners can also capitalize on their influence to selfishly erect barriers to entry. For example, fearing encroaching competition, shamans might ratchet up the intensity of entry requirements, justifying the barriers in their esoteric knowledge or singular communication with the supernatural. Evans-Pritchard (1937) observed a failed attempt at this among the Azande, when the foreign witch-doctor Bögwözu tried to impose taboos on novices to control the flood of new shamans.

Whether entry requirements develop emergently or intentionally, the outcome is the same. The intensity of these requirements is in part determined by the competition for this jurisdiction and the benefit that controlling the jurisdiction provides. Entry requirements that are too high discourage initiates from becoming shamans.

6.2. Conditions for collapse

Shamanism is widespread, but it is not ubiquitous. Although shamans in various forms have continued to populate Western, industrialized societies (e.g., Ferguson 1928; Hughes 1991; Lindquist 2004), people patronize them much more infrequently than have done in other cultural contexts. Similarly striking is their variability among small-scale societies and among hunter-gatherers in particular. Shamanic traditions existed in North and South America, Europe, Asia, Africa, and Oceania (Corlett 1935; Eliade 1964; Peters and Price-Williams 1980), yet ethnographers reported their absence among hunter-gatherers like the Tiwi, Siriono, Mbuti, and Hadza (Peoples et al. 2016).

What explains variation in shamanic traditions among hunter-gatherers and the practice's more recent collapse in Western, industrialized societies? The cultural evolutionary theory of shamanism identifies at least seven conditions under which shamanism should dissolve:

1. *The benefits of shamanism decrease but entry requirements are unchanging.* I discussed above that the benefits of shamanism can change when clients' willingness to pay decreases. If the entry requirements do not change in concert, fewer or even no new initiates should join, weakening or destroying the institution. Nevertheless, this does not explain why clients would be less willing to patronize shamans.
2. *Cultural complexity declines.* Shamanism is a complex set of practices, often involving ceremonies, initiations, mythologies, and music. Thus, like other forms of complex culture, it can disappear following demographic fragmentation, isolation, and bottlenecks (Henrich 2004b; Shennan 2001). This likely explains the absence of shamans among the Siriono (Peoples et al. 2016), who also lacked musical instruments, games, poison, watercraft, and fire-making knowledge (Holmberg 1969; Isaac 1977). Cultural phylogenetics reveal that the ancestors of the Siriono almost

certainly had shamans, but that this practice was lost along with canoes, corporate structure, and other cultural traits (Walker et al. 2012), possibly driven by the demographic destruction following European colonization.

3. *Powerful parties control jurisdiction.* Parties competing for the jurisdiction of controlling uncertainty will campaign against shamanism if they possess sufficient power. This is best exemplified in the actions taken by various Christian churches towards local magicians and prophets. For instance, Catholic Churches in late medieval England approved of supernatural rituals “prescribed by God and the Church”, such as those pertaining to the Mass, holy water, and the healing activities of saints – “the remainder was diabolical and to be abhorred” (Thomas 1971, p. 255). Following the Reformation, the Spanish Catholic Church controlled access to the supernatural by using science to delegitimize trance: “Inquisitors often pointed out how physical infirmities and natural forces at work within the human body could simulate supernaturally infused spiritual gifts” (Keitt 2005b, p. 77).

The final four conditions correspond with basic components of the theory as presented in Figure 2.2: modifying any of these will affect shamanism:

4. *A society experiences less uncertainty.* According to this theory, and the writings of many other researchers (Malinowski 1948), magical practices result from individuals trying to control important, uncontrollable events. As individuals are better able to deal with this uncertainty – or if they confront less of it – they will depend less on shamans. Although a world completely devoid of uncertain outcomes seems implausible, Hart and Pilling (1960) offered this hypothesis to explain the absence of shamanism among the Tiwi. Citing the adequate rainfall, the consistent food supply, a dearth of

dangerous animals, the rarity of tropical diseases, climatic docility, and the absence of antagonistic neighbors, the ethnographers concluded, “[The Tiwi] never invented magic to control their environment because their physical environment was on the whole a satisfactory and not a hostile universe” (p. 88).

5. *People do not think that invisible forces influence uncertain outcomes.* People across societies believe that invisible forces influence uncertain outcomes: Murdock (1980) reported that every society in the SCCS believed that some illness was caused by supernatural forces, while psychologists have found that even atheists believe that anomalous events are driven by purposeful forces (Banerjee and Bloom 2015). Nevertheless, the cultural evolutionary theory predicts that ceasing to attribute causality to invisible forces should drive the dissolution of shamanism.
6. *People do not think that humans are capable of interacting with invisible forces.* In some instances, people will believe that it is impossible to engage with invisible forces through practitioners, despite accepting that these forces exist. Shamanism should not exist under these circumstances.
7. *Trance behaviors no longer indicate non-humanness (or supernaturalness).* The theory hypothesized that trance behaviors are dramas of strangeness, used to convince onlookers of a person’s non-human abilities or interactions. I have discussed how the naturalization of trance led people to turn to other means of communicating their otherness.

Thomas (1971) implicated these changes, especially points 4, 5, and 6, in England’s waning reliance on magical interventions, although some changes were more impactful and longer-lasting than others. For example, he reviewed evidence paralleling the decline of magic

with an improved capacity for people to protect themselves against capriciousness (point 4 above), such as through insurance and fire-fighting technologies. But he also argued that “magic lost its appeal before the appropriate technical solutions had been devised to take its place” (p. 656). Supposedly more important in the decline of magic were the changes discussed in points 5 and 6: a tendency towards believing that events occur according to natural laws, and in the cases of an interfering God, believing that human actions are devoid of supernatural effect (Thomas 1971).

The origins, timing, and pervasiveness of these intellectual changes are highly-debated among historians (Bailey 2006; Scribner 1993; Walsham 2008) and addressing them exceeds the scope of this paper. Still, the substitution of mystical explanations with naturalistic ones has been neither ubiquitous nor permanent (Saler 2006). Humans everywhere are endowed with the same socio-cognitive biases that so routinely steer us into believing in unseeable, purposeful forces and the powers of supernaturalized humans. Many westerners, although familiar with scientific epistemologies, continue to subscribe to an enchanted worldview, one populated with out-of-body experiences, chains of reincarnation, transmissible healing energy, and suspicions of witchcraft (Partridge 2005). This cosmology in turn supports a gamut of contemporary trance-practitioners – the channelers (Hughes 1991), neo-shamanic journeyers (Lindquist 2004), charismatic healers (Robbins 2004), and other specialists who, in inspired and altered states, resemble the shamans of ancient and recent human history.

7. Conclusion

Previous accounts have conceived of the shaman as a charlatan, a psychotic, an inspired priest, a performer, a psychoanalyst, a guardian, and a doctor. Following this theory, I propose an addition to the list: the shaman as cheesecake. That is, the shaman as “an exquisite confection crafted to tickle the sensitive spots of our mental facilities” (Pinker 1997, p. 534). In the same way that cultural evolution and bakeries have devised sweets configured for our Stone Age sense organs, cultural evolution and ingenious performers have assembled myths and customs that hack our psychologies to placate our anxieties.

Chapter 3

Why do leaders observe costly prohibitions?

Inferences about self-denying shamans

Abstract

Religious leaders refrain from sex and food across human societies. Researchers argue that this avoidance influences people's perceptions of leaders' underlying traits, but few, if any, quantitative data exist testing these claims. Here we show that shamans in a small-scale society observe costly prohibitions and that observers, in turn, infer cooperativeness, religious belief, and supernatural power. We investigated taboos on shamanic healers, known as *sikerei*, among the rainforest horticulturalist Mentawai people of Siberut Island. We found that shamans must observe permanent taboos on various animals, as well as prohibitions on sex and food during initiation and ceremonial healing. Using vignettes, we evaluated Mentawai participants' inferences about taboo adherence, testing three different but not mutually exclusive mechanisms: cooperative costly signaling, credibility-enhancing displays, and supernatural otherness. We found support for all three: Mentawai participants infer self-denying shamans to be (1) cooperative, (2) sincere believers in the religious rules, and (3) dissimilar from normal humans and with greater supernatural powers. People's inferences about religious self-denial are multidimensional and consistent with several functional accounts.

This article was coauthored with Joseph Henrich.

1. Introduction

Prohibitions can be severe for religious leaders. Although laypeople often refrain from food or sex (Iannaccone 1992; Olson and Perl 2001), their avoidance tends to be mild compared to the self-denial adhered to by leaders and practitioners. The Buddhist laity in China enjoys the freedom to “keep to a semi-vegetarian diet, or adopt a vegetarian diet for a limited period of time” (Kieschnick 2005, p. 186). In contrast, Buddhist “monks and nuns in China are expected to maintain a vegetarian diet, and as far one can tell, in general they take the prohibition seriously” (Kieschnick 2005, p. 186). Similarly, Jain laypeople must observe the five Lesser Vows, including avoiding being overly-attached to their possessions (Dundas 2002). In contrast, Jain monks and nuns abide by the much more severe Greater Vows, including abandoning their material possessions completely. And while their lay counterparts might occasionally abstain from sex, Aztec priests, Catholic priests, and Daoist monks are (or were) required to be life-long celibates (Bell and Sobo 2001; Herrou 2012; Qirko 2002). Importantly, leaders’ self-denial is not restricted to world religions and large-scale societies. Winkelman and White (1987) coded ethnographic information about trance practitioners (shamans) in a representative sample of human societies. Practitioners abstained from food, sex, or social contact in 83% of societies coded (Singh 2018).

Why should religious leaders observe such costly prohibitions, especially given that they can exploit their position to devise self-serving rules (Singh et al. 2016, 2017)? One proposal is that leaders’ self-denial promotes perceptions of underlying traits (Henrich 2009; Norenzayan et al. 2016; Singh 2018; Sosis and Alcorta 2003). In this research, we tested three such hypotheses: cooperative costly signaling (Sosis and Alcorta 2003), credibility-enhancing displays (Henrich

2009), and supernatural otherness (Eliade 1958; Mauss 2001). These hypotheses posit, respectively, that observers infer cooperativeness, religious belief, and supernatural power from normative self-denial.

According to the cooperative costly signaling hypothesis, costly behaviors serve as reliable signals of an actor's cooperative intent (Joseph Bulbulia and Sosis 2011; Gintis et al. 2001; Irons 2001; Sosis and Alcorta 2003). For example, costly behaviors might indicate that an individual is committed to cooperating with members of a particular group (Posner 2000; Sosis 2006) or that they believe in a religious system which includes cooperative doctrines (Henrich 2009). Researchers have examined whether behaviors like possession and donating to charities act as costly signals of cooperativeness (Hall et al. 2015; Power 2017a, 2017b), but few if any quantitative studies have tested whether this hypothesis explains the ascetic practices of religious leaders.

Aside from broadcasting cooperativeness, self-denial may also indicate the sincerity or depth of one's belief. Developing this intuition, researchers have modeled how costly actions, termed credibility enhancing displays (CREDS), coevolve culturally with certain beliefs (Henrich 2009; Wildman and Sosis 2011). CREDS function as cues to social learners that a cultural model (i.e., someone from whom social information is learned) genuinely subscribes to the beliefs he or she espouses. For example, consider a model who tells a learner that it is safe to consume some mushroom. In response to a learner's reasonable apprehension, the model can enhance their credibility by taking a bite of the mushroom – that is, by engaging in a behavior that would be sensible only if the model genuinely believes the beliefs they espouse.

Researchers argue that cultural evolution may favor CREDS by ensuring the faithful transmission of religious beliefs and practices across generations. For instance, recent work

suggests that costly, religious displays may have developed to instill stronger beliefs in a powerful, moralizing god (Norenzayan et al. 2016). By this logic, religious systems may place prohibitions on religious leaders, often related to food, wealth, and sex, because these taboos make them more effective as transmitters of the faith.

A growing body of research provides evidence for CREDs in different informational and behavioral domains (e.g., Kraft-Todd et al. 2018; Willard and Cingl 2017). When betting on the validity of stories, subjects who witness others put down money are more likely to do the same (Willard et al. 2016). Internet-users in the U.S. who recall their caregivers engaging in behaviors such as religiously-inspired charity are more likely to believe in God and hold that belief with greater confidence (Lanman and Buhrmester 2017). Despite these advances, no work has tested whether a CREDs model explains the severe, religious restrictions of religious leaders.

Crucially, some behaviors can serve as both CREDs and cooperative costly signals (Joseph Bulbulia and Sosis 2011), such as if a person demonstrates that they believe in a moralistic, punishing god. However, not all cooperative costly signals are CREDs – because a behavior might signal cooperativeness through channels other than belief – and not all CREDs are cooperative costly signals – because, among other reasons, there are many beliefs that a person can hold (such as that a mushroom is safe to eat) that do not make them more cooperative.

A third explanation for why practitioners observe costly prohibitions is what we refer to here as supernatural otherness. According to this hypothesis, observers infer that someone who self-denies is different from normal humans. This supposed difference makes it more conceivable that the self-denier has superhuman powers such as healing or divine contact (Eliade 1958; Mauss 2001). Researchers have not specified how or why observers should understand

individuals who self-deny to be distinct from normal humans, but potential mechanisms include perceptions that they have strange preferences or unique cognitive abilities enabling their abstention or that they undergo a transformation as a result of the denial, such as becoming purer (V. Smith 2007).

These three hypotheses posit that observers infer distinct traits from normative self-denial, but they are not mutually exclusive. It might be the case, for instance, that observers infer cooperativeness and supernatural power from leaders' prohibitions but not religious belief. In such a case, we would find support for the cooperative costly signaling and supernatural otherness hypotheses while rejecting the CREDs hypothesis. In short, behaviors may develop to fulfill many social functions rather than a single prototypical one.

To test whether any or all of these hypotheses help explain why religious leaders observe costly prohibitions, we investigated taboos on shamans among the Mentawai of Siberut Island (Indonesia). Examining these dynamics among the Mentawai offers at least two advantages compared to research in industrialized populations with Abrahamic religions. First, as a belief system including, among other attributes, shamanism and an animist worldview (Loeb 1929a, 1929b; Schefold 1988), Mentawai religion shares characteristics with the traditional religions of small-scale societies around the world (Peoples et al. 2016; Singh 2018). Studying Mentawai religion thus permits generalizations to a diversity of contexts, most of which are less relevant when examining the centralized religions of complex societies (Boyer in press; Boyer and Baumard 2016). Second, religious systems include many practices and beliefs, some of them recent variations due to cultural drift, others more functionally important and stable over time (see Currie and Mace 2014; Rogers and Ehrlich 2008). The unique arrangement of Siberut Island, which contains many cultural regions that differ slightly in their practices and beliefs,

allows us to identify those taboos on shamans that are shared across cultural regions and thus more likely to be functionally important.

1.1. *Mentawai and sikerei*

The Mentawai of Siberut Island are forest-dwelling sago-horticulturalists who live in river valleys separated by hilly expanses of forest (Tulius 2012) (Fig. 3.1A). At least 11 major valleys cover the island, each hosting a set of communities who speak their own dialect and decorate themselves with unique tattoo motifs. Throughout the rest of this paper, we refer to the set of communities who reside in the same valley and share a dialect as a cultural region.

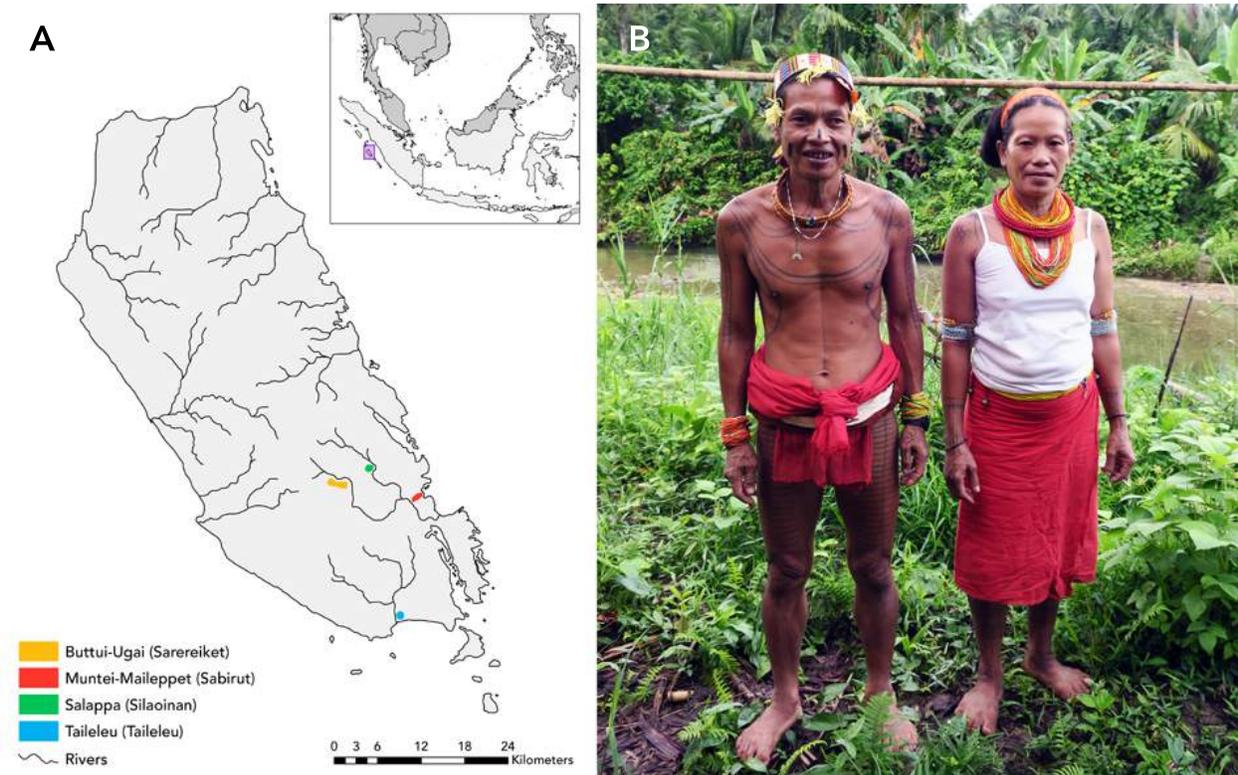


Figure 3.1. (A) Siberut Island, the largest island of the Mentawai Archipelago (Indonesia).

Colored dots represent different study sites; the legend specifies the villages surveyed with the cultural region in parentheses. Indonesia is colored light gray in the inset, while other countries are in dark gray. (B) A Mentawai shaman and his wife.

Missionaries and government programs have transformed the religious lives of people living elsewhere in the Mentawai Archipelago, but dense tracts of forests have hindered these efforts on Siberut (Schefold 1988). This, in combination with struggles by Mentawai clans to resist these programs, has allowed the traditional religious system to survive relatively intact in the interior of Siberut, bolstered by a strong shamanic institution. Nevertheless, tourism, the spread of Islam, settlement agendas by the government, and the expansion of formal education are rapidly transforming Mentawai social and cultural life (Delfi 2013, 2017; Hammons 2010), making ethnographic investigations invaluable.

Mentawai shamans are a class of men believed to possess the unique ability of seeing otherwise invisible spirits (Loeb 1929b). These spirits include the ghosts of ancestors, deities that cause sickness (e.g., *Sikaoinan*, a water-dwelling spirit, sometimes described as a crocodile, who punishes stinginess: Singh et al. 2019), and human souls, whose departure from the body manifests as illness. As healers, shamans are experts in herbal medicine and the special songs used for communicating with various spirits. In some cultural regions, shamans are marked by their continued use of the loincloth and their full-body tattoos (Figure 3.1B).

Shamans and their wives are both known as *sikerei*; other individuals are referred to as *simata* (uncooked, unripe, immature). Because only male *sikerei* are believed to see spirits and invited to heal illness during healing ceremonies – and because the term is commonly used to describe those individuals who provide these services – we use *sikerei* to refer to male *sikerei*

unless otherwise specified.

Sikerei treat illness in *pabetei*, healing ceremonies that last from one day to a week. Families of sick people invite one to six shamans to administer treatments, which can include providing herbs, sweeping away evil spirits, beckoning a sick person's soul, and summoning the water spirit Sikaoinan and removing it from the house. Shamans enter trance during a special nighttime treatment, known as *lajok simagre*, during which several shamans dance and summon beneficent spirits, some of whom possess the practitioners.

Shamans benefit from healing patients through gifts of meat. As a part of healing ceremonies, patients and their families must sacrifice pigs and chickens (Singh et al. 2019). These are shared with family members as well as with the attending shamans, who consume the meat at the ceremony and are given portions to take home. Different interventions require different sacrifices, and many people informally refer to the sacrificed animals as a form of payment (Singh et al. 2019).

Not all shamans are equally successful. Figure 3.2 shows how often different shamans were called to heal patients in a sample of 44 healing ceremonies occurring in two villages in interior Siberut (see Singh et al. 2019 for details on the dataset). Notably, a single shaman was called for 14 ceremonies (32%); the next most successful shaman was called for 6 (14%). The median number of ceremonies in which a shaman healed a patient was 3; the mode was 1. That shamans compete for profitable healing opportunities suggests that they should benefit from promoting perceptions of prosociality, credibility, and supernatural power.

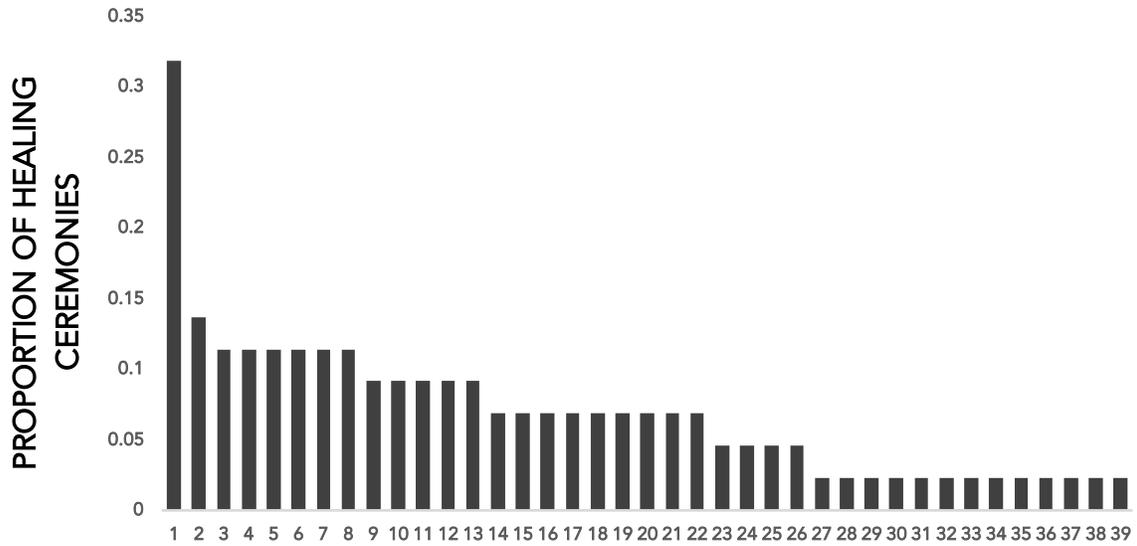


Figure 3.2. The frequency with which 39 different shamans were called to heal patients in a sample of 44 ceremonies. Each number on the horizontal axis refers to a different shaman.

A man hoping to become a shaman can start by erecting and inhabiting a small house in the forest (*pulaeat*), observing taboos while dedicating himself to raising chickens and pigs. After days or weeks there, the novice finds a shaman-guru (*sipauma*) who typically demands pigs, durian trees, coconut trees, and sago. In return, the guru teaches the novice the herbal remedies and songs required for healing while treating the trainee’s eyes to help him see spirits. Some initiates do not move to a forest house; instead, their training begins with a severe, untreatable illness, perceived by others as a sign that a person must become a shaman.

The sikerei must constantly observe taboos, or *keikei* (Loeb 1929a; Schefold 1988). As with shamans around the world (Eliade 1964; Narby and Huxley 2001), the Mentawai sikerei must abstain from sex and various food items during initiation and ceremonial periods, in addition to permanently refraining from several hunted animals. The severity of sex taboos in

particular is captured in the frequent remark that, in becoming a sikerei, one's wife becomes one's sister.

We used costly prohibitions on Mentawai shamans (*keikei sikerei*) to evaluate whether and how observing religious taboos promotes perceptions of cooperativeness, credibility, and supernatural power. We first documented those taboos that apply to shamans and investigated the costliness of a subset of those prohibitions. We then used vignettes to probe participants' inferences about self-denying shamans and test the three hypotheses reviewed earlier.

2. Study 1: What are the taboos on shamans?

We first documented the activities and food items that are tabooed to shamans during initiation, during healing ceremonies, and permanently. By examining which prohibitions are shared across river valleys, we identified the taboos that are most resilient to change and which thus seem most functionally important (Currie and Mace 2014).

2.1. Methods

We interviewed 88 participants about taboos on shamans across four cultural regions of southern Siberut (see Figure 3.1A; Sabirut: $n = 20$; Sarereiket: $n = 27$; Silaoinan: $n = 21$; Taileleu: $n = 20$), asking about temporary taboos during initiation and healing as well as permanent taboos that apply through a shaman's lifetime. One participant was excluded from the permanent dietary taboo condition because of admitted ignorance. All participants provided informed consent before the study. The Harvard University Committee on the Use of Human Subjects approved this study and all others described in this paper.

We collected initiation and healing taboos using free-lists. We collected permanent dietary taboos, in contrast, using a checklist of 14 items. We developed the checklist after administering pilot interviews in three cultural regions (Sareireket, Sabirut, Simatalu). Thirteen of the 14 items in the checklist were those mentioned by more than one respondent during pilot interviews. The fourteenth (Mentawai langur, *Presbytis potenziani*) is commonly said to be freely consumed by shamans and was included to both confirm participant comprehension and to discourage participants from assuming that all items in the list were tabooed.

We excluded instances when participants specified that an item on the checklist was tabooed to shamans only during special periods. If a respondent mentioned that an item was permanently tabooed to a shaman but also temporarily tabooed during initiation and healing, we only included it as a permanent prohibition. If a participant listed a permanent dietary taboo but then specified that it only applied during healing ceremonies, we included it only as a periodic taboo during healing. We categorized taboos at two levels, first grouping similar responses and then aggregating those taboos within super-ordinate categories, such as taboos pertaining to sex, eating, and grooming.

We did not use inferential analyses on the free-list data; instead we present the raw frequencies of commonly cited taboos (see Figure 3.3 and Supplementary Table S1). The checklist data, on the other hand, was analyzed with cultural consensus analyses using the AnthroTools package in R (Purzycki and Jamieson-Lane 2017).

2.2. Results: Taboos during healing and initiation

Figure 3.3 shows those items that respondents mentioned in at least three cultural regions for at least one of the two categories of prohibition.



Figure 3.3. Prohibitions on shamans during initiation and healing ceremonies, according to free-lists by respondents in four cultural regions of southern Siberut. Rows correspond with responses from the regions of Sabirut (SAB), Sarereiket (SAR), Silaoinan (SIL), and Taileleu (TAI). White cells occur when no participants in a cultural region reported a taboo, dark blue cells occur when all participants reported a taboo, and transitional shades denote intermediate frequencies. The free-list response columns only include those taboos that were reported in at least three cultural regions for at least one domain. “Fast intermittently” is labeled with an asterisk because it is a prescription rather than a prohibition. The five aggregated columns refer to super-ordinate categories that contain the responses on the left and others; for example, “Cooking/work” includes “Clear brush for gardening”, “Cut/break”, “Plant”, “Work (general)”, and other work-related prohibitions that were reported in low frequencies. Raw frequencies appear in Supplementary Table S1.

Participants reported 54 taboos on shamans during initiation, 13 of which were mentioned in at least three cultural regions. Seven prohibitions appeared across all of the sites: eating without self-control, eating sour foods, committing adultery, having sex with one's spouse, having sex with anyone, and doing any kind of work (including hunting, repairing a house, or tending to one's gardens). To eat with self-control means to eat only when sitting down in a house with others, ideally when the food being served was prepared at an earlier time. To eat without self-control, in contrast, is to eat while walking or casually sitting, or to eat food that has been foraged and immediately prepared, like freshwater fish or taro leaves.

Taboos during healing ceremonies are similar to those observed during initiation. Participants mentioned 52 prescriptions that apply to shamans during healing. No taboos were mentioned in only three cultural regions; nine were mentioned in all study regions. As with taboos on shamans during initiation, taboos during healing ceremonies center on work, food, and sex. Figure 3.3 displays the frequencies with which participants listed different prohibitions along with aggregated frequencies (see Supplementary Table S1).

2.3. Results: Permanent dietary taboos

Using cultural consensus analyses, we determined that five animal species are tabooed in all four cultural regions: eels (*Anguilla bicolor*), flounders (Pleuronectiformes), gibbons (*Hylobates klossii*), the white morph of the simakobu monkey (*Simias concolor*), and three-striped squirrels (*Lariscus obscurus*) (see Fig. 3.4 and Supplementary Tables S2 and S3). Confirming respondents' honesty and comprehension, only one participant of eighty-seven replied that Mentawai langurs are tabooed, and they specified that this was a special case that required unique circumstances.

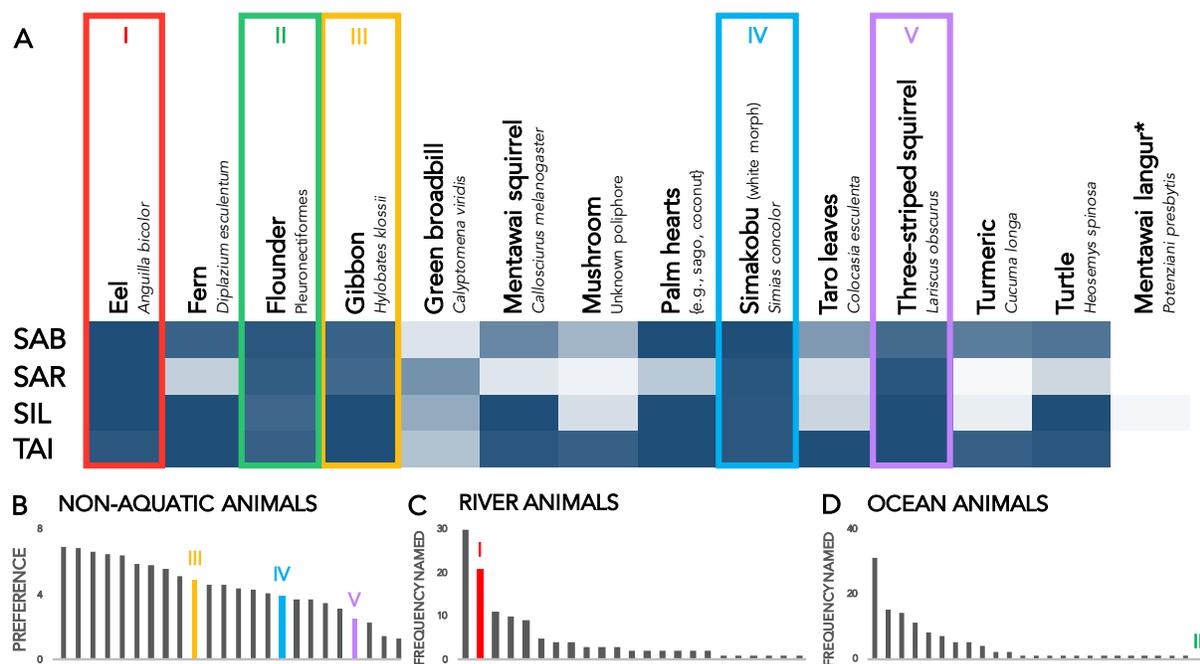


Figure 3.4. Permanent dietary taboos on shamans (A) and individuals' preferences for those food items (B, C, D). Panel A: Participants in four cultural regions of southern Siberut (Sabirut, Sarereiket, Silaoinan, and Taileleu) answered “yes” or “no” to whether fourteen food items are permanently tabooed to shamans. White cells occur when no participant reported that an item was prohibited, dark blue cells occur when all participants reported a prohibition, and transitional shades denote intermediate frequencies. Cultural consensus analyses identified five food items as being tabooed across all four regions, indicated in colored boxes. The Mentawai langur was included as a control because it is freely and commonly consumed by shamans. Panels B, C, and D: Because of methodological limitations, different tasks were administered to measure how the prohibited foods ranked in people’s dietary preferences. Panel B shows

respondents' preferences for twenty-four foraged animals, including the three non-aquatic species consistently prohibited to shamans (III: gibbon; IV: simakobu monkey [white morph]; V: three-striped squirrel). Panels C and D show the number of times different river (C) and ocean (D) animals were named as the most preferred and frequently consumed items; the items tabooed to shamans were mentioned second most frequently (I: eel) and not at all (II: flounder). Raw frequencies appear in Supplementary Table S2.

3. Study 2: How costly are shamans' dietary taboos?

We found that shamans across southern Siberut observe periodic prohibitions on sex and unconstrained eating. They are also permanently prohibited from five foraged food items. The periodic taboos, especially those on sex, appear decisively costly, but the costliness of the permanent dietary taboos is more unclear. We thus used ranking tasks to establish the relative costs of abstaining from eels, flounders, gibbons, white simakobu monkeys, and three-striped squirrels.

3.1. Methods

To detect whether and how costly permanent dietary taboos are for shamans, we conducted two tasks probing Mentawai participants' dietary preferences.

First, we investigated the costs of giving up non-aquatic, tabooed animals. We assembled as exhaustive a list as possible of Mentawai wildlife by consulting the appendix of a conservation plan printed by the Indonesian Ministry of Forestry (PHPA 1995), collected photographs of each species mentioned in the report, and convened with focus groups of Mentawai participants

to determine the edibility and local name of each animal. The compiled list excluded all aquatic species, representing only *iba sibara ka leleu* (meat of the jungle). After incorporating edible insects and mollusks, we concluded with a list of 77 consumed, non-aquatic species (74 species excluding the items commonly tabooed to shamans).

To determine how the three tabooed, non-aquatic food items ranked in comparison with other non-aquatic, foraged animals, we presented non-shamans ($n = 40$) with photographs of 24 animals, 21 randomly drawn from the list of 74 animals alongside the three tabooed species found on land (*Hylobates klossii*, *Simias concolor* [white], *Lariscus obscurus*; see Supplementary Table S4 for a list of the twenty-four animals). All participants gave informed consent. The photographs were presented randomly in a grid of 4 photographs by 6 photographs. Participants divided the 24 items into two groups of 12, one including animals they would never eat again and one including animals they would continue to eat. They sub-divided these groups again, and so on and so forth, until they produced eight piles, producing a ranking of foraged items from “most willing to give up” (ranking = 1) to “least willing to give up” (ranking = 8). We calculated each item’s mean ranking.

We targeted willingness-to-give-up because this integrates people’s preference for an animal with its availability. For example, denying oneself a high-quality animal that is rarely encountered is less costly than rejecting an item that is of slightly lower quality but frequently encountered. Willingness-to-give-up captures this asymmetry, and participants appeared to consider both their preference for an item and its availability when making their decisions. In contrast, questions about which items participants enjoy the most or find the most delicious are easily swayed by highly favored items that are frequently tabooed or rarely encountered, distorting estimates of the cost of prohibition.

Because we could not obtain a list of consumed, aquatic species with accompanying photographs, we administered a different task to determine the costs of renouncing eels and flounders. We asked the same subjects to name six aquatic, foraged animals, selecting three from the river and three from the ocean. We specifically asked participants to consider both the frequency with which they ate those items and their preference for those animals in making their selections. We identified synonyms and determined each item's ranking by counting the number of times it was named.

3.2. Results

The items vary considerably in people's self-reported willingness to give them up (Fig. 3.4B-D). Among the 24 foraged land animals, items tabooed to shamans ranked as tenth (*Hylobates klossii*), sixteenth (*Simias concolor* [white]), and twenty-first (*Lariscus obscurus*) in people's dietary preferences (see mean rankings and standard deviations in Supplementary Table S4).

In naming the river species that they enjoyed the most and consumed most frequently, participants listed the item tabooed to shamans, *Anguilla bicolor*, second, preferring it to all freshwater species aside from shrimp. In marked contrast, no participant mentioned flounders when naming favored saltwater species.

4. Study 3: What do observers infer about self-denying shamans?

We have established that Mentawai shamans observe costly periodic prohibitions, as well as permanent dietary prohibitions with more ambiguous or varied costs. We therefore conducted an experiment in the field to probe whether self-denial by shamans promotes any dimension of

religious credibility, specifically testing the predictions of the cooperative costly signaling, CREDs, and supernatural otherness hypotheses.

4.1. Methods: Participants and procedure

Participants ($n = 96$) were opportunistically recruited in two villages in the interior of Siberut Island. All participants gave informed consent.

We presented each participant with two shamans introduced as pretend characters. We counterbalanced the characters' images and background details, including how many children they have, whether they are knowledgeable about making canoes, and whether they have lots of gardens. We also randomized the category of self-denial (food/sex). In the following example, the first character (Aman Dong Dong) refrains from foraged food items; the counter-balanced information has been labeled and distinguished from the treatment information:

Self-denying character:

Aman Dong Dong, here, is a shaman. He follows all of the shaman taboos.

He has two children; he is knowledgeable in making canoes. [counter-balanced text]

He does not eat pangolins, Pagai Island macaques, and flying foxes. [treatment text]

Control character:

Aman Paule, here, is also a shaman. He follows all of the shaman taboos.

He has three children; he has a lot of gardens. [counter-balanced text]

He does not like to eat chili; he likes to eat cassava leaves. [treatment text]

The treatment text in the sex condition was “Every day he does not sleep with [=have sex with] his wife.”

We specified that the shaman abstains from eating pangolins, Pagai Island macaques, and flying foxes, because these animals, like two items tabooed to shamans (gibbons, white simakobu monkeys), constitute a class of hunted animals afforded special reverence, known as *matei keccak* (dead soul).

We then asked participants two comprehension questions that also served to prime the relevant information: (1) Food condition: *Who does not eat flying foxes?* // Sex condition: *Who does not sleep with their wife every day?*; (2) *Who does not like to eat chili?* If a participant failed, we re-read the character descriptions. We then asked participants questions about the characters’ belief, cooperativeness, power, and difference from other humans (see Supplementary Materials for the full list of questions). The questions were administered in one of four randomized orders. We again asked the comprehension questions at the end of the experiment to verify that participants remembered which character exhibited which traits. Supplementary Table S5 and Supplementary Figure S1 present the raw data.

4.2. Methods: Analysis

We conducted the task with 96 participants. To ensure the quality of the data reported, we only analyzed the responses of respondents who passed a series of comprehension and attention checks. We used an especially conservative set of inclusion criteria in an attempt to remove any individuals who may have misunderstood the experiment, although note that the analyses produce largely similar results when including excluded participants, although the effect sizes are smaller (Supplementary Table S6). First, we excluded subjects who failed the final

comprehension check ($n = 12$). Second, we excluded participants whose answers contradicted for at least three of four pairs of questions targeting the same inference (questions *beli1* and *beli3*; *coop1* and *coop2*; *powe1* and *powe2*; *diff1* and *diff2* in the Supplementary Materials) ($n = 11$). Third, we excluded participants who, in their responses, alternated between the characters for at least 13 of the 14 questions ($n = 9$) (e.g., naming the first character, then the second, then the first, and so on). Twenty-six participants failed at least one check (six failed more than one). Two more participants were removed from analyses for experimenter error, yielding a final sample size of 68 respondents.

We conducted all statistical analyses in R (R Core Team 2015). The code used for analyses is available on the OSF project website: <https://osf.io/3mbkz>.

We first used factor analysis to test whether the latent constructs were unidimensional (see Supplementary Methods for more details about determining the latent constructs). Two trait-constructs, belief and power, were unidimensional. Cooperativeness and difference, meanwhile, were not. Two questions about cooperativeness (*coop3* and *trus1*) and one question about difference (*diff1*) did not load with the other questions. We thus removed those questions from subsequent analyses. The internal reliability was high for three of the four resulting traits (Cronbach's $\alpha > 0.75$ for belief, cooperativeness, and power), but lower for difference (Cronbach's $\alpha = 0.55$).

We modeled the probability that a participant selected the self-denying character for questions about each of the four traits. Using the *glmer* function of the *lme4* package (Bates et al. 2015), we ran a logistic regression in which the domain of the trait inference was used to predict whether a participant selected the self-denying character. We included sex, counterbalanced

information, and category of self-denial (food or sex) as covariates and a random effect for each participant ID. We used the effects package (Fox and Weisberg 2019) to produce average probabilities and the emmeans package (Lenth 2019) to test (1) whether the probabilities differed from each other, adjusting for multiple comparisons using Holm-Bonferonni and (2) whether the category of self-denial (food or sex) had an effect on trait inferences. Significance was defined at an alpha level of 0.05.

4.3. Results

Fig. 3.5 displays the mean estimated probabilities that a participant selects the self-denying character for questions about each of the four traits. Respondents are more likely to regard the self-denying shaman as a stronger believer in Mentawai religious beliefs (average estimated probability (P) = 0.92; 95% CI = [0.85, 0.96]), more cooperative (P = 0.88; 95% CI = [0.79, 0.94]), more different from normal humans (P = 0.78; 95% CI = [0.64, 0.88]), and more supernaturally powerful (P = 0.84; 95% CI = [0.72, 0.91]).

We conducted pairwise comparisons among all coefficients to test for differences. We found that the odds that a participant selects a self-denying shaman for a question about belief are 3.19-times the odds that they choose the tabooed shaman for a question about difference (SE = 1.08; z-ratio = 3.42; p < 0.01). We also found a marginally significant difference between the odds that a participant selects a self-denying shaman for a question about belief as compared to the odds they choose the self-denier for a question about power (odds-ratio = 2.20; SE = 0.68; z-ratio = 2.54; p = 0.055). Otherwise, there were no significant differences among the coefficients (see Supplementary Table S7).

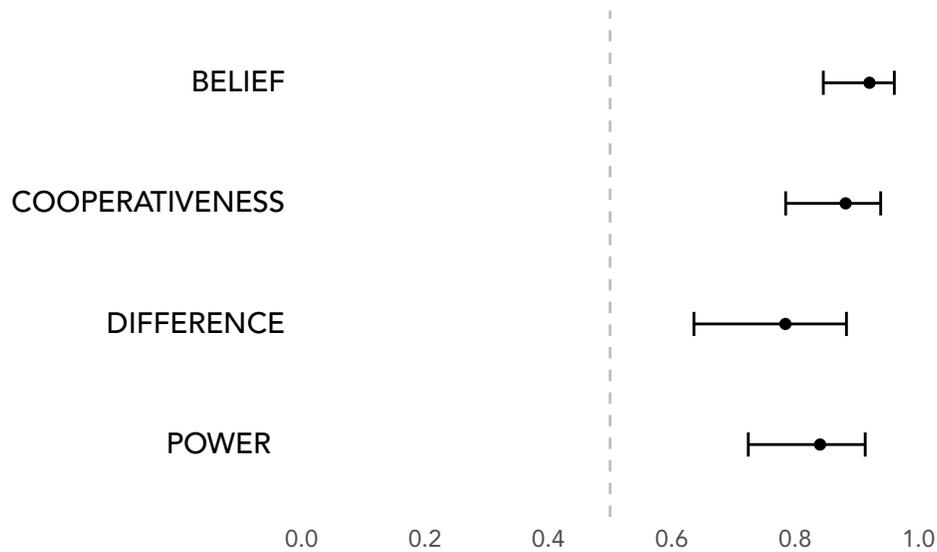


Figure 3.5. Estimated probabilities that a participant reports a self-denying shaman as having a particular trait. A probability of 1 indicates that participants always infer self-denying shamans to exhibit that trait, whereas a probability of 0 indicates that participants never infer self-denying shamans to exhibit that trait. A probability of 0.5, marked with a dotted line, indicates chance. Error bars represent 95% confidence intervals.

We found no effect for the category of self-denial (odds ratio = 0.399; SE = 0.242; $p = 0.13$). In other words, respondents made similar inferences about shamans who refrained from sex as they did about shamans who refrained from eating various food items.

5. Discussion

Mentawai taboos impose enduring costs on shamans, such as by barring them from having sex during healing ceremonies and permanently forbidding them from consuming valued items. We

found that participants infer shamans who abstain from food and sex to be more cooperative, sincere in their belief, supernaturally powerful, and psychologically and physically dissimilar. The strongest effects were on perceived belief.

This research is significant for at least three reasons. First, it represents a quantitative examination of why religious leaders engage in costly self-denial. Although evolutionary and psychological researchers have studied practices like possession, ritual scarring, and church attendance (Hall et al. 2015; Power 2017a; Sosis et al. 2007), and although they commonly posit functional hypotheses for leaders' celibacy and asceticism (Henrich 2009; Norenzayan et al. 2016; Singh 2018; Sosis and Alcorta 2003), little to no quantitative research has tested these accounts. Second, this study provides the first experimental evidence that costly behaviors can simultaneously garner perceptions of supernatural power and difference from normal humans. This is consistent with wisdoms about the metamorphic nature of pain and hardship (Glucklich 2001; K. M. Hoffman and Trawalter 2016; McCullough and Willoughby 2009), but it suggests that, whether or not pain and denial *actually* change a person, psychological mechanisms predispose people to interpret those behaviors as transformative. Lastly, this research advances our understanding of the origins of institutionalized leadership in human societies. Religious authority often translates into leadership roles beyond the supernatural, such as in providing social security, organizing economic activity, or arbitrating conflict (Singh 2018; Soler 2016). This research identifies self-denial as a potential mechanism by which shamans and other practitioners maintain their authority, even in small-scale societies.

Many scholars emphasize the costliness of prohibitions (Barker et al. 2019; Iannaccone 1994; Sosis 2006), but our research indicates that other factors might also influence which behaviors are prohibited. In line with the emphasis on costliness, we found that shamans are

tabooed from sex and freely eating during healing ceremonies and initiations. But we also found that for permanent dietary taboos, cost seems tangential to whether an item is prohibited.

Consider eels and flounders, both of which are prohibited to shamans. Eels ranked as the second most frequently consumed and favored river species. The communities surveyed live along rivers and regularly fish in them, so this suggests a real, appreciable cost. In contrast, no participant named flounders when listing their preferred food items. This is not surprising. The Mentawai living in the interior of Siberut never come into contact with flounders, and in follow-up conversations, several participants admitted to never having eaten one.

Rather than only banning valuable food items, these permanent dietary taboos may also target peculiar animals. People regard atypical entities as impure or sacred (Douglas 2002; Henrich and Henrich 2010; Leach 1964; Sperber 1996b), so rejecting them may enhance perceptions of a practitioner's difference. In fact, all of the foods tabooed to shamans are known as *makatai* (bad, broken, evil), and, with the exception of the three-striped squirrel, all are categorical anomalies. Gibbons are likened to humans (Schefold 1972, 1982). The flounder is literally regarded as a split fish (*laitak katsila*). The white simakobu is the only white primate on the island. And eels are described as slippery and, in myths, are compared to snakes (Loeb 1929c).

Readers should be aware of at least two limitations of our field experiment. First, the self-denying character engaged in voluntary self-denial beyond the typical restrictions observed by shamans. All shamans are expected to permanently reject eels, gibbons, and so on, as well as sex and uncontrolled eating during healing ceremonies, but the treatment character went beyond these restrictions, abstaining either from other hunted animals or completely from sex. Thus, our experiment risks capturing participants' inferences about additional self-denial rather than

inferences about adherence to typical prohibitions. Second, and relatedly, the experimental characters rejected items different from those normally forbidden to Mentawai shamans. Rather than rejecting eels, gibbons, and so on, the characters in the food-prohibition condition abandoned flying foxes, pangolins, and Pagai Island macaques. How confident can we be that the inferences people made about these hypothetical forms of self-denial are equivalent to the inferences they make about normative abstention?

These points are important to consider, and future research should further probe how these variables bias people's inferences. Still, at least two lines of evidence suggest that our interpretation is justified. First, participants seemed to make very similar inferences about a shaman who refrained from having sex relative to the inferences they made about a shaman who denied himself hunted animals. Second, many participants spontaneously referred to the self-denying character as *makeikei* (tabooed), regardless of his prohibition. In doing so, they likened the novel forms of self-denial to other taboos, considering the shamans along a single dimension of prohibition. These two points suggest that participants' inferences were not unique to the specific items but instead constituted more generalizable perceptions of people who self-deny.

Even if one rejects that participants considered characters along a single dimension of self-denial, the most conservative interpretation is that Mentawai participants infer several cooperativeness, credibility, and supernatural power from shamans who self-deny and that those inferences seem similar whether shamans refrain from sex or from eating several notable, large animals.

In sum, we have provided evidence that religious leaders in a small-scale society observe permanent and periodic prohibitions and, in doing so, garner religious credibility and perceptions of supernatural powers. This project helps elucidate why figures across time and space, from the

shamans of rainforest horticulturalists to the memorialized prophets of the world's major religions, have rejected sex, food, and social contact on their journeys toward leadership and apparent divinity.

Chapter 4

Magic, explanations, and evil

On the origins and design of witches and sorcerers

Abstract

In nearly every documented society, people believe that some misfortunes are caused by malicious group mates using magic or supernatural powers. Here I report global patterns in these beliefs and propose a theory to explain them. Using the newly-created Mystical Harm Survey, I show that several conceptions of malicious mystical practitioners recur around the world, including sorcerers (who use learned spells), possessors of the evil eye (who transmit injury through their stares and words), and witches (who possess superpowers, pose existential threats, and engage in morally abhorrent acts). I argue that these beliefs develop from three cultural selective processes: a selection for intuitive magic, a selection for plausible explanations of impactful misfortune, and a selection for demonizing myths that justify mistreatment. Separately, these selective schemes produce traditions as diverse as shamanism, conspiracy theories, and campaigns against heretics – but around the world, they jointly give rise to the odious and feared witch. I use the tripartite theory to explain the forms of beliefs in mystical harm and outline ten predictions for how shifting conditions should affect those conceptions. Societally-corrosive beliefs can persist when they are intuitively appealing or they serve some believers' agendas.

This article is forthcoming in Current Anthropology.

“I fear them more than anything else,” said Don Talayesva¹⁴ about witches. By then, the Hopi man suspected his grandmother, grandfather, and in-laws of using dark magic against him.

1. Introduction

Beliefs in witches and sorcerers are disturbing and calamitous. Sterility, illness, death, rainstorms, burnt-down houses, bald spots, attacks from wild animals, lost foot races, lost reindeer races, the puzzling behavior of a friend or spouse – the enigmatic, the impactful, the bothersome – all can spark suspicions of neighbors using magic and dark powers; all can precipitate violence. The suspects are sometimes normal humans, learned in dark magic, but other times, they are rumored to be odious and other. They devour babies, fornicate with their menstruating mothers, and use human skulls for sports. They become bats and black panthers, house pythons in their stomachs, and direct menageries of attendant nightbirds. They plot the destruction of families and then dance in orgiastic night-fests.¹⁵

Humans in nearly every documented believe that some illnesses and hardships are the work of envious or malignant group mates. Hutton (2004; 2017) reviewed ethnographies from

¹⁴ The quotation comes from autobiography of Don Talayesva (Talayesva and Simmons 1942, p. 379).

¹⁵ The quotes by Don Talayesva (opening) and the Santal guru Kolean Haram (section 3) demonstrate that these beliefs are disturbing (Forsyth 2016; Singh 2019c). The destruction mentioned in section 3 demonstrates that they're calamitous. Table 4.2 and section 6.2.1 describe the events that trigger suspicions of mystical harm. Table 4.3 features examples of animal transformations and attendants. Yamba witches were said to devour children (Gufler 1999), Apache witches had sex with menstruating family members (Basso 1969), Akan witches used human skulls for soccer (Debrunner 1961), and Santal witches met naked in nighttime assemblies, danced, and copulated with their spirit familiars (Archer 1974). Nyakyusa witches had pythons in their bellies (Wilson 1951).

three hundred non-European societies and documented pervasive beliefs in sorcerers, witches, the evil eye, and aggressive shamans. Of the 60 societies in the Probability Sample File of the Human Relations Area Files – a pseudo-random sample of well-documented human societies – 59 believed in some form of human-induced mystical harm, the only exception being the Kogi of Colombia¹⁶ (sect. 2). European societies have historically held similar beliefs, embodied in the Roman *strix* (Oliphant 1913, 1914), the Saxon *striga* (Cohn 1976), and most famously, the witches of the Great European Witch Hunt (Cohn 1976), and colonial New England (Karlsen 1987).

Beliefs about harmful practitioners are profoundly similar across vastly distant societies (Kluckhohn 1959; Needham 1978). The European witches of the late modern period were said to eat human flesh, engage in obscene activities, and assemble in conspiratorial, orgiastic nighttime gatherings (Cohn 1976). Similar behaviors were suspected of witches among the Yamba of Cameroon (Gufler 1999), the Santal of South Asia (Archer 1984), and the Navajo of the American Southwest (Kluckhohn 1944), among many other societies (Hutton 2017; Mair 1969; see sect. 2). And just as people worldwide believe in sensational and atrocious witches, they also often suspect that sickness and death are the work of ordinary people secretly practicing dark

¹⁶ The ethnographic texts included in eHRAF did not describe mystical harm beliefs in two PSF societies: the Koreans and the Kogi. But researchers elsewhere have reported sorcery beliefs in Korea (Walraven 1980), so their omission seems due to ethnographers underreporting the topic. Meanwhile, Reichel-Dolmatoff (1997, p. 141; 1976, p. 286) explicitly stressed the absence of beliefs in mystical harm among the Kogi. Nevertheless, in describing Kogi lineages, he made a vague comment suggesting that people do in fact believe in mean-spirited, uncanny harm: “Both groups, the Hukúkui as well as the Mitamdú, are further regarded as vaguely dangerous and endowed with rather evil powers” (Reichel-Dolmatoff 1997, p. 250).

magic (e.g., Trobriand Islanders: Malinowski 1922; Tswana: Schapera 1952; Niimiipuu: Walker, Jr. 1967).

In this paper, I refer to people believed to use magic or supernatural powers to injure others as *practitioners of mystical harm*¹⁷. This term is broad, including, for example, beliefs about werewolves, abhorrent witches, people whose stares transmit illness, and neighbors who use voodoo dolls in secret. *Magic* refers to occult methods with instrumental ends, such as spells, curses, rites, manipulated objects, and everyday superstitions. Magic can be used¹⁸ to produce socially-justified ends, such as healing people or succeeding in gambling, as well as less acceptable objectives, such as inducing illness. I use refer to harmful magic as *sorcery*. Methods of sorcery include cursing, stabbing voodoo dolls, and placing charmed poisons in people's paths.

Sorcerers are people who use magic for malicious ends – that is, people who use sorcery. *Witches*, on the other hand, exhibit up to three sets of characteristics: (1) They are existentially threatening, (2) they have supernatural powers, and (3) they are morally repugnant. Some practitioners qualify as both sorcerers and witches, such as those believed to both use magic and

¹⁷ I choose the term *mystical* to refer to harm that is transmitted either through magical means (e.g., spells, buried poisons, voodoo dolls) or supernatural powers (e.g., transforming into an animal and attacking someone, inflicting misfortune through an inadvertent envious stare). This usage follows Evans-Pritchard (1937), who contrasted *mystical causation* with *natural causation*, and Needham (1978:26), who defined a *witch* as “someone who causes harm to others by mystical means”, corresponding closely with my term *practitioner of mystical harm*.

¹⁸ Whenever I refer to the effects of magic (e.g., producing illness) or the features of a malicious practitioner (e.g., flying and eating corpses), I refer to *beliefs* about those traditions rather than actual consequences or traits.

engage in activities like graveyard conspiracies and cannibalism. I justify these definitions in section 2.

The ubiquity of mystical harm beliefs and their striking similarities raise two basic questions:

1. Why do humans believe in mystical harm?
2. Why do those beliefs take the form that they do?

This paper advances a tripartite theory to answer those questions. I propose that beliefs in mystical harm, and beliefs about who orchestrates it, are the result of three cultural selective processes:

1. *Selection for intuitive magic.* As people try to influence others' misfortune, they selectively retain intuitive magic, producing compelling spells and charms for harming others. This produces intuitive harmful magic, but more relevantly, it convinces people that sorcery works and that other group members practice it.
2. *Selection for plausible explanations of misfortune.* People look for explanations for why things go wrong. When they feel threatened, they suspect distrusted group mates; when they believe in sorcery, it provides a straightforward explanation for how a distrusted rival harmed them from afar. Over time, iteratively searching for plausible explanations shapes beliefs about sorcerers to become increasingly compelling, although the same process can produce explanations that do not include sorcery, including beliefs about werewolves, the evil eye, and conspiratorial governments.
3. *Selection for demonizing narratives.* Actors bent on eliminating rivals devise demonizing myths to justify their rivals' mistreatment. These campaigns often target and transform malicious practitioners, both because people suspect that malicious

practitioners transmit harm and because individuals accused of mystical harm are easily demonized and abused.

On their own, these three processes produce beliefs and practices as varied as gambling superstitions, conspiracy theories, and vitriolic campaigns against heretics, but in societies around the world, they combine to produce the archetypal, odious image of the witch.

2. Cross-cultural patterns

Researchers struggle over whether beliefs about harmful practitioners are similar across cultures. Many have emphasized commonalities (e.g., Mair 1969; Kluckhohn 1959), but others have criticized drawing these comparisons, one scholar concluding that “anthropologists have committed a possibly grave error in using the same term [*witchcraft*] for other cultures” (Crick 1973, p. 18).

The most important effort in documenting cross-cultural patterns in these beliefs was conducted by Hutton (2017; see also Hutton 2004). Hutton reviewed ethnographies in three hundred extra-European societies and identified five characteristics that malicious magicians around the world share with the early modern European conception of the witch. Namely, they tend to (1) cause harm using non-physical, “uncanny” methods, (2) represent internal threats to their communities, (3) gain their abilities through training or inheritance, (4) have qualities that incite horror and loathing, and (5) give rise to strategies of resistance, including counterspells and murderous campaigns. Hutton also reviewed, among other things, similarities in witches’ heinous activities and the social conditions that inspire violence towards suspected malicious practitioners.

Hutton's project was ambitious, but he sampled societies opportunistically, risking the overrepresentation of peculiar beliefs. He also chose not to systematically code traits, such as how frequently practitioners are believed to kill people or associate with animals. These limitations prevented him from drawing strong inferences about how these beliefs compare around the world.

I designed the Mystical Harm Survey (MHS) to systematically capture beliefs about mystical harm in a representative sample of the world's societies. The dataset covers the 60 societies of the Probability Sample File of the Human Relations Area Files, a pseudo-random sample of well-documented cultures that were selected to make inferences about humanity more generally (see the Supplementary Materials for more details). The full dataset is available at osf.io/492mj and includes beliefs about 103 malicious practitioners (or practices) from 58 societies. The analyses reported here exclude leaders (e.g., elders, chiefs, senior lineages) and public magicians (e.g., shamans, priests), because these practitioners are public, institutionalized classes who advertise and perform their powers rather than simply being conceptions of group mates causing misfortune (including leaders and magicians produces nearly identical results; compare Supplementary Table 2 with Supplementary Table 4).¹⁹

I used Principal Components Analysis to reduce the 49 raw variables in the Mystical Harm Survey (e.g., does a practitioner consume flesh? do they cause economic harm?) to two derived variables (or principal components)²⁰, shown in Figure 4.1 (see Supplementary Materials

¹⁹ Hereafter, I refer to this restricted dataset as the MHS and to the dataset including leaders and public magicians as the expanded MHS.

²⁰ There are two reasons to report a two-factor solution. First, a scree plot (Supplementary Figure 1) shows a dramatic change in slope (or elbow) at the third component; after the second component, the

for details). This method exposes the axes along which practitioners vary the most and, thus, the cross-cultural structure of these beliefs. Both of the derived variables are interpretable: The first dimension represents how witchy malefactors are; the second distinguishes sorcerers, as classically understood, from the evil eye.



Figure 4.1. Results of logistic PCA showing practitioners of mystical harm. A single point represents a belief about a practitioner in a society (such as the Trobriand flying witch or the Amhara evil eye); the accompany numbers refer to the unique practitioner ID numbers (see Supplementary Table 1). The points are colored according to the terms used by the

additional dimensions explain equivalent and smaller proportions of variance. Second, the third component is uninterpretable (see Supplementary Table 3). The first and second components explain 23.1% and 16.8% of the total variance, respectively (39.9% in total).

ethnographer(s) who described them. They are scaled according to the number of paragraphs coded in that society, ranging from 1 paragraph (practitioner 63) to 1,976 (practitioners 1 and 2). The images refer to the features that characterize a given quadrant: eye = evil eye (unintentional harm through stares or words); effigy = sorcery (learned magic); owl = witchiness (superhuman abilities, moral abhorrence, threat).

Practitioners high on the first variable (PC1) are witches.²¹ They are believed to kill people, cause illness, eat human flesh, desecrate corpses, use magic, fly, turn invisible, commit atrocities at night and in the nude, congregate in secretive meetings, transform into animals or use them as familiars, and engage in obscenities like incest and nymphomania; shamans and other magicians are often suspected of being witches (see Supplementary Table 2 for loadings). Practitioners low on this dimension lack these qualities. Contrary to many writers' impressions (e.g., Chaudhuri 2012; Mace et al. 2018; Sanders 1995), I did not find strong evidence that witches are more frequently women than men.

The second derived variable (PC2) separates everyday sorcerers from the evil eye. Practitioners low on PC2 use harmful magic, including spells, voodoo dolls, and magical poisons. They attack their neighbors and family members but sometimes target out-group individuals as well. Ethnographers often state that anyone can qualify as one of these practitioners, although men and public magicians are suspected more often. Practitioners high on PC2, in contrast, tend

²¹ Several variables, all of which appeared very infrequently in the MHS, had unstable loadings that collapsed when the data from a single region were excluded from the PCA (see Supplementary Materials, section 2.2 and Supplementary Tables 5 and 6). I have not reported these unstable loadings here, but see Supplementary Table 2 for the full factor matrix.

to possess the evil eye or blasting word: They harm people through their stares and comments, often inadvertently. Their powers derive from physiological differences, such as special eyes, rather than from learning specific methods or rites.

A surprising finding is that practitioners high on PC2 also tend to fly and eat human flesh. But this is less characteristic of the evil eye and more a feature of cannibals, ghouls, and lycanthropes (humans who transform into animals). In fact, no practitioner labeled “evil eye” by an ethnographer was said to fly or consume human flesh. Cannibals, ghouls, and lycanthropes likely appear with the evil eye in Figure 4.1, because they all tend not to use sorcery (shifting them high on PC2) and they lack most other witchy qualities (shifting them low on PC1).

In Figure 4.1, I colored the points according to the ethnographer’s name for that practitioner. These colors cluster, showing that terms like “sorcerer” or “witch” in fact capture cross-culturally recurrent beliefs. Sorcerers (blue) are normal humans who use effigies, curses, and other spells to harm their rivals. Descriptions of sorcerers are very similar to descriptions of people generally knowing and using dark magic (purple). Possessors of the evil eye (yellow) harm people with their stares and words, often unintentionally. They do not employ spells, and their powers tend to be inborn rather than actively procured. Witches (pink) are much more variable across societies, but they share up to three sets of traits: (1) They are threatening (e.g., they kill and conspire in secret, nighttime meetings), (2) they are supernaturally powerful (e.g., they fly and transform into animals), and (3) they are abhorrent (e.g., they consume human flesh and desecrate corpses) (see Figure 4.2). This results of the PCA suggest that witchiness is a dimension rather than a discrete trait – that is, some societies describe practitioners who are more threatening, supernaturally powerful, and abhorrent than the practitioners described in other societies.



Figure 4.2. (A) *Witches' Sabbath* (Goya, 1798; ©Museo Lázaro Galdiano, Madrid) and (B) *Witches' Flight* (Goya, 1798; ©Photographic Archive Museo Nacional del Prado) depict conceptions of witches held by many medieval Europeans. The witches are nude and nocturnal; they fly, kill babies, devour human flesh, associate with nighttime animals, and conspire with evil spirits. Despite their strangeness and particularity, these traits were not restricted to medieval European witches. People around the world – including the Tlingit (Pacific Northwest), the Akan (West Africa), and the Trobriand Islanders (South Pacific) – held similar conceptions of witches.

The analysis helps reconcile a historic debate about the difference between witches and sorcerers. Evans-Pritchard (1937) drew a strict boundary between the two, specifying that malicious practitioners are *either* normal humans who use magic (sorcerers) *or* different entities who do not use magic, instead attacking with supernatural powers (witches). He used the dichotomous scheme to describe Azande beliefs in particular, but other anthropologists applied the same typology to different ethnographic contexts (e.g., Reynolds 1963; but see Turner 1964).

Figure 4.1 reveals that Evans-Pritchard's witch-sorcerer binary does not generalize. Some heinous, supernaturally powerful practitioners (witches) only attack with supernatural stares and thoughts, such as those of the Azande (9) and Akan (1), but many are believed to also employ spells, charms, and other material magic. Some witches, for example, stuffed effigies into the carcasses of dead puppies (Tlingit: De Laguna 1972, p. 730); others recited spells to fly (Trobriand Islanders: Malinowski 1922, p. 241) or used horseshoes and keys to conjure evil spirits (Colonial New England: Karlsen 1987, p. 9). Thus, witches resemble other malicious practitioners, such as sorcerers or possessors of the evil eye, except transformed along a dimension of witchiness, made more threatening, more abhorrent, and more supernaturally powerful.

3. Existing theories of mystical harm

The most influential theories of mystical harm ascribe a function to these beliefs, often regarding them as group-level adaptations. Most popular is the theory that these beliefs discourage socially unacceptable behavior. According to this theory, *if* people suspect that their irate neighbors will attack them with evil spells and powers, *then* people will refrain from upsetting each other, both

to avoid being attacked by mystical harm and to avoid being accused (Beattie 1963; Walker, Jr. 1967; Whiting 1950).

Faulkingham (1971, p. 112) summarized this theory in observations of the Hausa (Niger): “Sorcery beliefs in Tudù provide people with strong motivations to be gregarious and to avoid quarrels. One is hesitant to be silent, alone, or bickering, lest he be accused of being a sorcerer. Further, people are reticent to exacerbate quarrels, for they may become ensorcelled.” But he also recognized that these beliefs entail major costs: “While sorcery beliefs have these social control functions, I believe that the villagers pay a high psychological price, since hostile emotions are relentlessly proscribed” (Faulkingham 1971, p. 112).

Other researchers have echoed Faulkingham’s second point, disputing cooperation theories by noting how sorcery and witchcraft beliefs sow distrust and provoke quarreling (Gershman 2016; see Hutton 2017, p. 35 and works cited therein). Among the Kapauku Papuans, most wars in one region (Mapia) started because of presumed sorcery; in another (Kamu), sorcery accounted “for about thirty per cent of the conflicts” (Pospisil 1958, p. 154). Other examples of contexts in which sorcery and witchcraft accusations bred violence abound (e.g., Gebusi: Knauff 2010; Rajputana: Skaria 1997; Yolngu: Warner 1958; Zulus: Bryant 1929). Suspicions of magical harm can even inspire vitriol among family members, such as when a Klamath woman slayed “her own mother for the fatal bewitchment of her child” (Stern 1965, p. 21). An ethnographer quoted the Santal (South Asia) guru Kolean Haram, who summarized the sociological and psychological stresses of witchcraft beliefs: “The greatest trouble for Santals is witches. Because of them we are enemies of each other. If there were no witches, how happy we might have been” (Archer 1984, p. 482).

Other scholars argue that beliefs in mystical harm explain misfortune. Evans-Pritchard (1937) famously proposed this hypothesis in his report on Azande witchcraft. But the claim that witchcraft beliefs explain misfortune cannot account for many features of those beliefs. Most notably, why should people suspect that *group mates* engineer misfortune through *magic or supernatural powers* when they can already blame gods, water demons, and other purported, invisible harmful forces? Addressing this gap, Boyer (2001) pointed out that we are predisposed to think about other people harming us. Humans are social animals, he observed, constantly engaged in reciprocal favors. Thus, he hypothesized, we have evolved psychological mechanisms that often interpret misfortune either as someone cheating us or as punishment for apparently cheating others. As people adopt or develop explanations that conform to these expectations, they produce beliefs in mystically powerful cheaters and cheater-detectors: “People who give others the evil eye are overreacting cheater-detectors and witches are genuine cheaters” (Boyer 2001, p. 200).

I borrow elements of the explanation hypothesis, but Boyer’s formulation suffers from some of the same flaws as Evans-Pritchard’s: Both leave the content of witchcraft beliefs largely unexplained, including why people use spells or charms or why witches transform into animals and mutilate corpses. Boyer’s account also confronts a problematic inconsistency: If people with the evil eye are “overreacting cheater-detectors”, then why is the evil eye linked so often to envy (Dundes 1992), rather than feelings of being cheated?

Finally, many researchers connect mystical harm beliefs to sociological events, such as the envy, inequality, and redistribution associated with social change (Bohannan 1958; Comaroff and Comaroff 1999), the control of women (Hester 1992; Natrella 2014), and scapegoating (Oster 2004). But these accounts remain atomized and disconnected. They focus on single

determinants (such as rising inequality), most of which only apply in some circumstances, while failing to describe many of the features of mystical harm beliefs.

I have left out many other explanations for these beliefs, including ones that invoke repressed sexual impulses (Cohn 1976), distorted perceptions of existing or historic cults (Murray 1921), the inadvertent consumption of ergot fungi (Alm 2003; Caporael 1976), and delusions resulting from psychiatric illness (Field 1970). These accounts suffer from many of the same criticisms as those reviewed above. Not only do they fail to explain the content of mystical harm beliefs, they also leave open the question of how shifting conditions should elicit some beliefs but not others.

4. Introducing the tripartite theory: Cultural selection

I propose that mystical harm beliefs develop from the interaction of three cultural selective processes. *Cultural selection* occurs when people preferentially retain particular practices or beliefs, such as because they appear to more effectively produce a desired outcome (Blackmore 1999; Boyd and Richerson 1985; Campbell 1965; Sperber 1996a). For example, the cultural selection of effective killing technology occurs as people adopt and maintain tools that kill animals or enemies. As people modify their tools and keep the effective versions, they iteratively fashion technology well-designed for killing, like sleek spears or bows-and-arrows. Notably, cultural selection occurs whenever people use culturally-transmitted practices for some desired end and they apply regular criteria to evaluate the effectiveness of those practices. Thus, selection can produce sleek killing technology, but it can also produce chairs, cheesecake, Disney movies, and other delights that satisfy desires humans want.

Cultural selective processes are significant for two reasons. First, they produce complex traditions that no single individual could have devised in a single moment (Henrich 2015). But just as importantly (although less frequently appreciated), these processes *retain* those traditions. A spear, for example, may be used frequently yet remain unchanged for centuries. Although it does not evolve, people selectively retain it for assassinating game and enemies.

Many scholars assume that cultural selective processes are protracted, involving generations and many individuals, but they don't have to be. Yes, selective processes can occur over many generations: Myths demonizing Jews, for example, evolved over decades as people throughout Europe borrowed and modified each other's existing productions (Cohn 1967). But cultural selection can also produce complex beliefs on very short time-scales with many fewer participants, such as if several people concoct, maintain, and revise heinous myths about a feared sub-group in the hours or days following a catastrophe.

I propose that mystical harm beliefs develop from three cultural selective schemes that produce and maintain (1) intuitive techniques of harmful magic, (2) plausible explanations of misfortune, and (3) myths that demonize a subgroup. The three proposed schemes occur under different circumstances and frequently act independently of each other, separately producing superstitions, conspiracy theories, and propaganda. But they also interact and develop each other's products, giving rise to beliefs in sorcerers, lycanthropes, evil eye possessors, and abhorrent witches. In the following sections, I elaborate on each of these selective processes.

5. Magic

Figure 4.1 shows that people in many societies suspect that their misfortunes are caused by others using sorcery. Why do people accept that sorcery works and presume that others practice it? Here, I argue that these convictions develop from a *selection for intuitive magic*. People adopt superstitions because of a predisposition to note spurious correlations between cheap actions (such as wearing special underwear) and important, unpredictable outcomes (such as winning a football game). As they then select among superstitions, they choose the most compelling ones, driving the development and maintenance of intuitive magic (see Singh 2018 for an expanded version of this argument). As a consequence, people accept the efficacy of magic, including harmful sorcery, and understand that other group mates know it and might practice it.

5.1. The selective retention of intuitive magic

5.1.1. People adopt superstitions (magic) to influence significant outcomes that are important and unpredictable

Rubbing rocks before giving speeches, wearing special underwear during football matches, blowing on dice before letting them roll – we regularly use superstitions to nudge uncertainty in our favor. Humans adopt *magic* or *superstitions*, which I define as interventions that have no causal bearing on their intended outcome, when those outcomes are important (roughly, fitness-relevant) and occur randomly (G. Keinan 2002; Malinowski 1948; Ono 1987). Such outcomes include victory in war, the arrival of rain, recovery from illness, and rivals becoming sick, dying, or suffering economic losses. That we adopt superstitions to control these outcomes seems a result of a kind of bet-hedging psychology. When the costs of an intervention are sufficiently small relative to the potential benefits (like wearing special underwear to win a football match),

and when the outcome seems to occur sometimes after the intervention, individuals benefit on average from adopting those interventions (McKay and Efferson 2010; Johnson et al. 2013). The predisposition to adopt superstitions to control uncertainty provides the basis for magical practices across human societies (Vyse 2014), including, I propose, magic for harming others.

5.1.2. People selectively retain magical interventions that seem the most effective

Magic should culturally evolve to become more apparently effective. Humans have intuitions predisposing us to regard some magical techniques, such as those with more steps and repetition (Legare and Souza 2012), as more potent than others. As magic-users iteratively innovate and select these more effective-seeming techniques, they produce intuitive magic. People around the world share biases about how causality and efficacy work, so this selective process should produce cross-cultural similarities in magical techniques (e.g., Nemeroff and Rozin 2000; Rozin et al. 1986), discussed below.

5.2. Ethnographic evidence for intuitive magic

At its basis, a selection for intuitive magic demands that people actually attempt to harm each other using magical means. It also predicts that magic will be effective-seeming and that common intuitive principles will characterize both harmful magic and other superstitions. Both claims are supported by the ethnographic record.

5.2.1. People attempt harmful magic

People are notoriously reticent about discussing harmful magic with ethnographers, let alone admitting to using it (e.g., Ames 1959, p. 264; Nadel 1954, p. 164). Nevertheless, researchers

have successfully documented direct and indirect evidence of people using private sorcery. During his time with the Azande, Evans-Pritchard discovered two bundles of bad medicine in one of his huts. One was engineered “to destroy the popularity of the settlement where I lived by killing some people and making the rest afraid to remain there” (Evans-Pritchard 1937, p. 402). The other was planted to kill the anthropologist. Richards (1935) examined the magical horns collected in a Bemba village during a witch-hunting movement in what-is-now Zambia. Although the vast majority were harmless medicine containers, “11 out 135 horns were admitted by every one to be undeniably bad destructive magic, that is to say, prepared for the injury of others” (Richards 1935, p. 453). Researchers report other examples such as these (e.g., Anglo-Saxon England: Crawford 1963; Wogeo: Hogbin 1938, p. 231; Tlingit: Emmons and De Laguna 1991, p. 410), although people’s admissions of using sorcery and even accounts of other people discovering evidence are difficult to interpret because of the possibility of deception.

Less contestable evidence of people using sorcery is the frequency with which specialists sell harmful services and magicians or laypeople performing evil magic to harm out-group enemies. Specialists sold harmful services in 26 of the 58 societies coded in the expanded MHS, while in at least 10 of those societies, practitioners used magic and supernatural powers to attack enemies of rival groups.

5.2.2. Malicious magic is governed by the same intuitive principles as other kinds of magic

The strongest evidence that magic, both harmful and otherwise, develops from a selection for effective-seeming practices is that all kinds of magic are governed by the deeply intuitive principles of sympathetic magic.

Sympathetic magic refers to two causal principles – *the law of contagion* and *the law of similarity* (or *homeopathy*) – which guide magic around the world (J. G. Frazer 1920). The law of contagion refers to the implicit belief that “physical contact between [a source object] and [a target object] results in the transfer of some effect or quality (essence) from the source to the target” (Nemeroff and Rozin 2000, p. 3). This principle covers contamination or pollution, in which a negative substance qualitatively changes a target object, as well as notions that acting on a part (for example, on a lock of hair) can have an effect on the whole (for example, the person who once owned it). That we wrongly but frequently believe in contagious magic seems in part a misfiring of psychological mechanisms evolved for noting contamination and illness transmission and perhaps overinterpreting the lingering effects of objects on each other (Apicella et al. 2018; Rozin and Nemeroff 2002).

In contrast to contagion, the law of similarity or homeopathy refers to the impression that “things that resemble each other at a superficial level” – like a voodoo doll that resembles a person – “also share deeper properties” (Nemeroff and Rozin 2000, p. 3) – for example, that acting on the doll produces effects on the imitated target. It remains unclear why people so habitually make this association, but as with the law of contagion, it likely reflects misfiring biases in causal reasoning.

Frazer (1920, Ch. III) famously documented examples of both contagious and similarity-based magic around the world. Among his many cases of contagious magic, he noted that people often believe that one can affect a target by magically treating the impressions it leaves, such as footprints. Footprints feature in malicious magic, like when people tamper with a target’s prints to induce illness or pain, and in hunting magic, like when pursuers locate the tracks of animals and doctor them to slow the target (see Table 4.1). Among his many examples of similarity-

based magic, Frazer (1920) documented the frequent belief that one can influence a target by creating and manipulating an effigy of it. Table 1 reviews examples of both malicious and non-malicious magic that uses effigies.

Table 4.1. Malicious magic is governed by the same intuitive principles of sympathetic causality that structure other kinds of magic. *Examples documented by Frazer (1920).

Magical method	Examples of malicious magic (societies with references)	Examples of other magic (societies with references)
Treating the footprints of a target, such as to harm a person (malicious magic) or aid in the capture or warding off of animals (other magic)	*Chero *Maori Natinixwe (Wallace and Taylor 1950, pp. 189-90) Niimíípu (Walker, Jr. 1967, p. 74) Siwai (Oliver 1955, p. 87) Tswana (Schapera 1952, p. 45)	Ainu (Munro 1963, p. 113) Azande (Lagae 1999, pp. 146-47) Fox (Jones 1939, pp. 23-24) *Khoikhoi *Nlaka’pamux Persians (Massé and Messner 1954, p. 282)
Manufacturing and treating an effigy, such as to injure a target (malicious magic) or induce birth or drive away neighbors (other magic)	Ancient Egyptians (Budge 1901, p. 75) Colonial New England (Karlsen 1987, p. 8) *Kenyah *Malay *Ojibwe	*Basotho Egyptians (Ammār 1954, p. 89) *Inuit *Japanese *Nisenan Pomo (Aginsky 1939, pp. 212-13)

6. Explanations

The selection of intuitive magic convinces people that malevolent magic is effective and that others practice it. How does this then transform into beliefs about sorcerers and witches who cause harm?

In this section, I propose that, under certain circumstances, people's hypervigilant tendencies lead them to suspect that group mates engineer inexplicable misfortunes. As they iteratively consider how those group mates harmed them, people maintain a *selection for plausible explanations of misfortune*. When they believe that sorcery is effective, people may suspect and develop beliefs about sorcerers, although they may consider other means of transmitting harm, such as animal transformation, the evil eye, and even governmental conspiracies.

6.1. *Selection for plausible explanations of misfortune*

6.1.1. *People suspect distrusted group members in the wake of impactful, negative outcomes*

Whether we lose a wallet or observe an epidemic sweeping through our community, we commonly attribute impactful, hard-to-explain events, especially negative ones, to the wicked intentions of other humans (Tennen and Affleck 1990). These tendencies seem to have evolved to vigilantly recognize threat (Raihani and Bell 2018). Our social lives are marked by conflict, so we benefit from tracing and anticipating when spiteful others harm us, even if it means making

occasional mistaken attributions (see error management: Johnson et al. 2013; McKay and Efferson 2010).

A growing body of literature, most of it in the psychological sciences, shows that a person is most likely to suspect other people for causing some misfortune under four conditions:

- (1) The person feels threatened (Abalakina-paap et al. 1999; Mashuri and Zaduqisti 2015; Mirowsky and Ross 1983; Saalfeld et al. 2018);
- (2) They are distrustful of others (Abalakina-paap et al. 1999; Raihani and Bell 2017; van Prooijen and Jostmann 2013);
- (3) They confront an event that is hard to explain (Rothschild et al. 2012; van Prooijen and Douglas 2017; van Prooijen and Jostmann 2013);
- (4) That event is impactful (McCauley and Jacques 1979; van Prooijen and Douglas 2017; van Prooijen and van Dijk 2014).

These conditions are enlightening for two reasons. First, they provide evidence for adaptive hypotheses of paranoid thinking. People benefit from identifying mean-spirited rivals who conspire to harm them, so it's reasonable that our psychology has evolved to seek out these individuals when they are most likely to harm us. Second, identifying these conditions generates predictions for the contexts under which people are most likely to develop beliefs in mystical harm. If some adaptive psychological machinery provides a psychological foundation for sorcery and witchcraft, then the conditions that trigger that psychology should in turn breed suspicions of mystical harm. I discuss these predictions in section 6.2.

6.1.2. People selectively retain plausible explanations for how group mates harmed them

Humans constantly seek explanations (Frazier et al. 2009; Lombrozo 2006). When your money-purse goes momentarily missing in a coffee shop and you suspect the wait staff or your fellow patrons, you automatically consider the various ways by which they might have accomplished their misdeed. You deem some explanations likelier than others – for example, that it was stolen once rather than stolen and returned and then stolen again, or that it was stolen by the grungy crust-punk rather than by the well-to-do suburban family to his left. The process of inferring an explanation by comparing hypotheses against each other and selecting the best among them is known as “inference to the best explanation” (Harman 1965).

People suffer many hard-to-explain misfortunes, such as illness, the death of a loved one, and a burnt-down house. I propose that as they search for explanations for how suspected rivals engineered those harms, they retain the most plausible explanations. A distrustful person whose livestock dies, for example, will search for an explanation for how a rival committed the act. They will consider explanations that they have learned, concoct other stories, and ask knowledgeable group mates. As other people suffer similar, inexplicable injuries, and as people share their conclusions and suspicions with each other, communities spin more and more conceivable tales for how heinous group members abused them from afar. When people believe in the efficacy of malicious magic (following section 5), it provides a sufficient and parsimonious answer, easily accounting for invisible, distant harm.

In societies without strong beliefs in magic, this selective process still occurs, although it converges on different explanations. One explanation is that powerful governments mastermind misfortune. In his analysis on paranoia in US politics, Hofstadter (1964) noted that people often attribute their troubles to distrusted governments or the puppeteers controlling them, such as the Catholics, Free-Masons, and Illuminati. Barkun (2013) showed that these theories evolve.

Milton Cooper, for example, tweaked and synthesized existing theories about the Illuminati, the CIA, the Kennedy assassination, observations of cattle mutilations, and the AIDs epidemic. His super-conspiracy theories comprehensively explained both the momentous and the puzzling, producing an unparalleled appeal. As I write this, his 1991 book *Behold a Pale Horse* (Cooper 1991) ranks 2,998th among all books on Amazon.com, besting the highest-selling editions of *The Iliad*, *War and Peace*, and *Uncle Tom's Cabin*.

Beliefs about mystical practitioners should evolve like contemporary conspiracy theories. Over time, they should become more internally consistent and plausible while encompassing a wider set of inscrutable events.

6.2. Ethnographic evidence for plausible explanations of misfortune

I have argued that beliefs in mystical harm develop to explain how distrusted group mates attacked a person from afar. At least two basic predictions follow: (1) Beliefs in mystical harm should track distrust and suspicions of harmful intent, and (2) malicious practitioners should be suspected of causing calamitous, negative events, especially ones for which people lack alternative explanations. Meanwhile, that these beliefs develop from a selection for the most plausible explanations clarifies why malicious practitioners often associate with, and transform into, animals.

6.2.1. Accusations of mystical harm track distrust and suspicions of harmful intent

People who suffer calamity overwhelmingly suspect individuals with a presumed interest in harming them. When several girls fell into possessed fits in Salem Village in 1692, many of the girls' families' political rivals were suspected of attacking the girls and their allies (Boyer and

Nissenbaum 1974). Among the Azande, “A witch attacks a man when motivated by hatred, envy, jealousy, and greed... Therefore a Zande in misfortune at once considers who is likely to hate him” (Evans-Pritchard 1937, p. 100). For the Trobriand Islanders, “the passions of hatred, envy, and jealousy” are expressed “in the all powerful sorcery of the *bwaga’u* [sorcerer] and *mulukwasi* [witch]” (Malinowski 1922, p. 395). Many ethnographers studying other societies have made similar comments (e.g., Tlingit: De Laguna 1972, p. 730; Tikopia: Firth 1954, p. 114; Ona: Gusinde 1971, p. 1102; Tukano: Reichel-Dolmatoff 1971, p. 156-157; Pawnee: Weltfish 1965, p. 337).

People regard envy in particular as a potent, malicious emotion. They not only suspect that envious individuals want to harm them, but in societies everywhere, people believe that the emotion itself transmits mystical harm, such as through covetous stares (the evil eye) or jealous compliments (the blasting word) (Dundes 1992). Beliefs in the harmful effects of envy likely exist because envy drives malice. Individuals who experience envy are more likely to injure better-positioned targets (Miceli and Castelfranchi 2007; R. H. Smith and Kim 2007) and even derive pleasure when envied persons suffer (R. H. Smith et al. 1996; van de Ven et al. 2015). Thus, a person who expresses envy betrays a desire to harm, making them a key suspect after things go wrong.

The theory proposed here also predicts that beliefs about witches, sorcerers, and evil eye possessors should prosper in communities with lower levels of trust compared to those with

higher levels. This explains why mystical harm beliefs increase with conditions that exacerbate distrust, such as growing inequality and the resulting rise in envy (e.g., Lederman 1981).²²

6.2.2. Mystical harm explains impactful and unexplainable misfortunes

I argued that paranoid tendencies intensify when the impact of a misfortune is high and it is unexplainable. If beliefs in mystical harm develop from these tendencies, people should fault malicious practitioners for high-impact and inexplicable injuries.

People overwhelmingly accuse malicious practitioners of causing impactful hardship. Of the 83 practitioners or practices in the MHS, at least 78% were said to cause illness, 77% death, 30% economic trouble, and 16% catastrophes (such as hailstorms or epidemics). In total, 94% were reported as producing at least one of those outcomes.

Ethnographic descriptions often focus on the inexplicability of these hardships (e.g., Nsenga: Reynolds 1963, p. 19; Kerala Brahmins: Parpola 2000, p. 221). The Navajo attributed illnesses to witchcraft when they were “mysterious from the Navaho point of view” or “persistent, stubbornly refusing to yield to usual Navaho treatment” (Kluckhohn 1944, p. 54). Other strange circumstances, such as the appearance of unexplained tracks, were taken as further evidence.

When the Tiwi experienced a decrease in mortality from fighting, raids, and neglected wounds,

²² Analyzing Pew survey data in nineteen sub-Saharan African, Gershman (2016) reported a robust, negative correlation between the prevalence of mystical harm beliefs and several measures of trust. He acknowledged that the evidence was correlational yet preferred the interpretation that mystical harm beliefs erode trust. This is reasonable – people who understand illness and death to be the handiwork of evil group members should grow more distrustful of them – but the proposed theory also predicts the opposite direction of causality. As I discussed, people who distrust others should suspect them of causing unexplainable misfortunes, and sorcery provides a parsimonious explanation.

they attributed the resulting increase in natural deaths to a rise in poison sorcery (Pilling 1958, p. 123).

People attribute random calamities aside from death, disaster, illness, and material loss to mystical malice. Ten of the 83 practitioners in the MHS were said to produce sterility; 12 influenced love and attraction. Witches in colonial New England were rumored to cause clumsiness, falling, fires, forgetfulness, barrenness, deformed children, spoiled beer, storms, sleep paralysis, and unusual behavior in animals (such as a cow wandering off or a sow knocking its head against a fence) (Karlsen 1987). Table 4.2 includes every example of harm or misfortune recorded in the MHS that does not qualify as death, injury, love, sterility, catastrophe, or economic trouble. Nearly early all are inexplicable and bothersome.

Table 4.2. Every example of harm or misfortune recorded in the MHS that does not relate to death, injury, sickness, love, sterility, catastrophe, or economic trouble. Citations appear in the MHS dataset.

Society (with practitioner* and MHS practitioner ID)	Harm of misfortune
Akan, <i>obayifo</i> /witch [1]	Accidents (including lorry accidents); bad behavior of wife; becoming a drunkard; burnt-down house; cracks in buildings; ill luck; poor performance on school exams; pregnant men
Amhara, <i>buda</i> /evil eye [3]	Croaking or worsening of singer's voice
Aymara, <i>laiqa</i> /sorcerer [8]	Accidents; failure in fishing

Azande, <i>aboro mangu</i> /witch [9]	Burnt-down hut; coldness of prince towards subject; failed magic; ruined performance of witch-doctor; sulkiness or unresponsiveness of wife
Azande, <i>aira kele ngwa</i> /sorcerer [10]	Outcome of divination (poison oracle)
Azande, <i>irakörindel</i> /possessor of teeth [11]	Broken items, including stools, pots, and bowls
Azande, women's sexual magic [12]	Bad luck
Chukchee, sorcery [22]	Losing strength while wrestling; slowing down in a foot- or reindeer-race
Chuuk, <i>souboud</i> /sorcerer [23]	Disturbed growth; falling or tripping during competition (basketball)
Dogon, <i>yadugonu</i> /witch [27]	Temporary muteness
Highland Scot, <i>buidseachd</i> /witchcraft [40]	Stuck or overturned truck
Hopi, <i>bowaka</i> /witch [42]	Malicious gossip; misbehavior of children
Iroquois, witch [47]	Confusion in sports competitions
Lau Fijians, raw eyes [61]	Skin discoloration (i.e., becoming tan)
Lozi, <i>muloi</i> /witch [64]	Inability to perform acrobatics; inability to score during football
Ojibwa, <i>windigo</i> /cannibal spirit [71]	Overturned canoes
Pawnee, witch [74]	Stopped rain
Santal, sorcery [77]	Deception
Saramaka, sorcery [78]	Boat accidents
Tarahumara, <i>sukurúame</i> /sorcerer [89]	Outcomes of competitions (e.g., races); twins

Tiv, <i>mbatsav</i> /witch [91]	Appearance of baldspots; bad dreams; burnt clothes; “whatever goes wrong if there is no more convenient explanation”
Tlingit, land otter sorcery [93]	Disappearance

*The indigenous term for the practitioner or practice with the ethnographer’s term or translation

6.2.3. *Animals associated with mystical harm explain impactful misfortune and invisible harm*

Those animals associated with malevolent supernatural practitioners provide further evidence that these beliefs serve as compelling explanations of misfortune. Table 4.3 displays all of the animals associated with harmful practitioners recorded in the MHS, separated into those animals believed to be transformed practitioners and those animals that act as their servants, steeds, or helpers.

Table 4.3. Every example in the MHS of practitioners either transforming into animals (including the practitioner’s soul entering or becoming an animal) or working with animals (including spirit familiars taking animal form). Citations appear in the MHS dataset.

Animals into which practitioners transform	
Society (with practitioner* and MHS practitioner ID)	Animal
Akan, <i>obayifo</i> /witch [1]	Antelopes, bulls, bushpigs, centipedes, cows, crop worms, crocodiles, dogs, hyenas, leopards, lions,

	lizards, owls, rats, red deer, snakes (including poisonous ones), squirrels, tsetse fly
Amhara, <i>buda</i> /evil eye [3]	Hyenas
Azande, <i>aboro mangu</i> /witch [9]	Bats
Bahia Brazilians, <i>lobishomem</i> /werewolf [15]	Wolves
Dogon, lycanthrope [28]	Eagles, panthers
Eastern Toraja, <i>topokantoe</i> /sorcerer [29]	Snakes
Eastern Toraja, <i>taoe mepongko</i> /werewolf [30]	Buffalo, cats, deer, dogs, pigs, white ants
Garo, lycanthropy [36]	Any beast or reptile, including crocodiles, snakes, and tigers
Hopi, <i>bowaka</i> /witch [42]	Animals, including coyotes, foxes, lizards, and wolves
Iroquois, witch [47]	Any animal, including dogs, pigs, turkeys, and owls
Kapauku, <i>meenoo</i> /cannibal [53]	Dogs, hawks
Lozi, <i>muloi</i> /witch [64]	Hyenas, lions
Mataco, <i>ayieu</i> /sorcerer [68]	Horses, jaguars, venomous reptiles (including rattlesnakes)
Santal, <i>tonbi</i> /witch [76]	Bears
Serbs, <i>vještice</i> /witch [79]	Insects, reptiles, sparrows
Tiv, <i>mbatsav</i> /witch [91]	Chicken leopards (?), crocodiles, foxes, leopards, lions, monkeys, owls, witch cats (?), other birds (<i>akiki</i> , <i>kpire</i>)
Tlingit, <i>nukwsati</i> /witch [92]	Cranes, geese, owls, porpoises, sea lions

Trobriand Islanders, <i>yoyova</i> /flying witches [94]	Fireflies, flying foxes, nightbirds
Wolof, <i>doma</i> /witch [101]	Ants, cats, donkeys, hyenas, monkeys, owls, snakes, vultures

Animals associated with practitioners

(e.g., familiars, mounts)

Society (with practitioner* and MHS practitioner ID)	Animal
Akan, <i>obayifo</i> /witch [1]	Antelopes, bats, chameleons, cocks, crabs, dogs, eagles, electric fish, goats, horses, house flies, leopards, lions, lizards, lice, owls, rats, smart hawks (?), snakes (including black mambas, black snakes, green mambas, puff adders, pythons, spitting cobras, thrush striped snakes), soldier ants, tsetse flies, wasps, weaver birds, wolves
Amhara, <i>buda</i> /evil eye [3]	Hyenas
Aymara, <i>laiqa</i> /sorcerer [8]	Nighthawks, owls
Azande, <i>aboro mangu</i> /witch [9]	Nocturnal birds and animals, including bats, jackals, and owls
Bahia Brazilians, <i>lobishomem</i> /werewolf [15]	Dogs
Bemba, <i>muloshi</i> /witch [17]	Magical birds, owl-like birds
Blackfoot, medicine [18]	Spiders
Chukchee, sorcery [22]	Dogs, reindeer
Eastern Toraja, <i>taoe mepongko</i> /werewolf [30]	Black cats, snakes

Eastern Toraja, <i>taoe meboetoe</i> /werewolf [31]	Black cats
Garo, lycanthropy [36]	Animals that live in the forest, including elephants, crocodiles, snakes and other reptiles, and tigers
Hopi, <i>boɔwaka</i> /witch [42]	Lizards
Lozi, <i>muloi</i> /witch [64]	Jackals, lizards, nightjars, owls, rats, water-snakes
Ojibwa, witchcraft [72]	Snakes, wolverines
Pawnee, witch [74]	Owls
Santal, <i>tonbi</i> /witch [76]	Dogs, tigers
Serbs, <i>vještice</i> /witch [79]	Birds, insects, small reptiles, snakes
Tarahumara, <i>sukurúame</i> /sorcerer [89]	Invisible birds
Tiv, <i>mbatsav</i> /witch [91]	Cats, nightjars, owls, snakes
Tzeltal, witch [100]	Snakes

*The indigenous term for the practitioner or practice with the ethnographer's term or translation

A cursory glance reveals that many of the animals fall into one of two categories. First are those creatures responsible for calamities, such as man-killers and crop-destroyers. Snakes, bears, tigers, wolves, and crocodiles all attack humans, leaving wounded individuals searching for explanations. Hypervigilant people should immediately suspect their enemies, and ethnographic descriptions show that this frequently occurs. To the Akan, snakes bring “sudden and most unpleasant death”, so “anyone who has a narrow escape from a snake comes to ask who sent it and why” (Field 1970, p. 130). Archer (1984, p. 486) recorded an incident among the Santal of

South Asia when a man was mauled by two bears. He soon consulted a witch finder to learn who was behind the attack.

Another class of ruinous misfortune is the destruction of crops. The Akan accused witches of becoming squirrels, rats, crop worms, antelopes, bush pigs, cows, bulls, dogs, and red deer – but all of those suspicions followed incidents when those animals consumed or destroyed a person’s harvest (Debrunner 1961).

The second major category includes those animals whose alliance or transformation explains how dark practitioners commit their wickedness unseen, such as owls, nightjars, flying foxes, and fireflies. In all of these instances, people seem confident that a group mate harmed them and, noticing these animals flitting about, find their appearance the missing explanatory piece for how a distrusted rival harmed them.

Several animals do not fall into the above categories, but their associations with malicious practitioners still seem to parsimoniously explain puzzling events. The Tlingit believed that witches could become porpoises and sea lions, but these suspicions occurred when those animals behaved enigmatically, lacking “the normal fear of human beings displayed by ordinary wild animals” (de Laguna 1972, p. 731). Thus, an ailing sea lion that remained near people’s houses and porpoises that swam too close to shore were suspected of being metamorphosed witches.

Hyenas were associated with malicious magicians among the Wolof, Amhara, and Lozi, as well as many cultures not included in the MHS, such as the Kaguru of Tanzania (Beidelman 1975) and Persians in medieval India (Ivanow 1926). This association seems the result of demonizing narratives feeding back on plausible explanations. If people believe that certain individuals have superpowers and feast on human flesh (as shown in Figure 4.1 and discussed in

the next section), they should start to suspect transformation when they witness nocturnal hyenas digging up corpses.

7. Evil

The above two processes fail to explain the extreme heinousness of witches, such as their cannibalism and graveyard conspiracies. Here, I propose that these features develop from a *selection for demonizing narratives* – specifically, from a selection for those traits that justify the mistreatment of accused practitioners and even spur other group mates to remove them.

7.1. *Selection for demonizing narratives*

7.1.1. *People promote demonizing narratives when they want to justify mistreatment of a group*

The cannibalism, conspiratorial meetings, and existential threat posed by witches are peculiar commonalities, but they are not unique. Sociologists studying moral panics and elimination campaigns in Western contexts have documented similar “folk devils”, with target groups ranging from youth sub-cultures (S. Cohen 1972) to Jews (Cohn 1966, 1967). Their analyses, together with insights from psychological research, reveal why these narratives recur with such consistency around the world.

Folk demonization usually occurs because one group – hereafter, the Campaigners – wants to justify the mistreatment of another – hereafter, the Targets (Goode and Ben-Yehuda 2009). Targets can be social groups, such as Jews or heretics, but they can also be those people who do some behavior, like people who use LSD (Goode 2008).

Campaigners demonize Targets for several, non-exclusive reasons, including (a) competition, such as when removing Targets opens up resources, (b) existential fear, such as when Targets are believed to threaten Campaigners, and (c) moral campaigns, such as when Campaigners want to curb some behavior. The foundations of these motivations can be legitimate, like if removing victims frees up benefits that the Campaigners can enjoy (e.g., Philip IV's motivation to arrest the Knights Templar: Barber 2006), or mistaken, such as when Campaigners wrongly understand Targets to be threatening (e.g., panics about satanic groups: Victor 1989).

To mistreat Targets, Campaigners must often gain the approval of other group mates – hereafter, the Condoners. They can secure this approval by promoting sensational myths that justify abusing the Targets. People might craft these myths deliberately, as in many propaganda campaigns (e.g., Desforges 1999), but they can also do so unconsciously. People reflexively attend to and exaggerate evidence that supports their goals and their claims (Kunda 1990; Nickerson 1998), a tendency arguably designed to sway others (Mercier and Sperber 2011).

As Campaigners refine portrayals of Targets that justify and urge violence, they selectively retain demonizing narratives. The iterative crafting of heinous myths about Jews illustrates this process. For example, Cohn (1967) tracked the history of *The Rabbi's Speech*, a fabricated speech by a chief rabbi describing the Jews' plot to control finance and undermine Christianity. The speech started as a fictional chapter in an 1868 novel recounting a conspiratorial meeting between representatives of the twelve tribes of Israel and the Devil. In the years afterwards, the chapter was borrowed, modified, distributed in pamphlets, and reprinted as purported fact. In an 1881 version from France, the many speeches had been consolidated into a

single address, the satanic element was absent, and a note was included explaining that the document came from a forthcoming book by an English diplomat, vouching for its authenticity.

7.1.2. Demonizing narratives develop and are maintained during stressful uncertainty

For demonizing narratives to flourish, Condoners need to believe them. But this is often not the case because people are armed with cognitive adaptations that recognize and protect against deception (Sperber et al. 2010). In fact, ethnographers occasionally report people's skepticism about the existence or portrayals of evil magicians (e.g., Tswana: Schapera 1952, p. 44).

Condoners should be gullible or credulous in at least two conditions. First, they should accept information when it comes from influential or trusted sources, such as religious authorities or the media. Second, and more relevantly, people should become receptive when they need valuable information, especially during times of unexplainable stress. Research on social learning and gossip show that uncertainty, especially about important events, motivates individuals to pursue social information (Boyd and Richerson 1988; Laland 2004; Morgan et al. 2012; Rosnow 1991).

In conclusion, times of unexplainable disaster breed paranoid suspicion while leaving injured parties intensely credulous. This combination of mistrust and gullibility allows fearful or exploitative campaigners to invent abominable witches.

7.2. Ethnographic evidence for demonization

7.2.1. Witches are well-designed to induce punitive outrage

In section 2, I showed that witches exhibit many common features, two of the most striking being (1) their threatening nature and (2) their moral abhorrence, especially their cannibalism and defilement of human bodies. These behaviors ignite severe punitive ire, encouraging violence towards those actors.

Depicting a group as an existential threat – organized and secretive yet powerful and conspiratorial – is effective, because, in short, people want to remove threats. A vast literature shows that people are more willing to invest in collective action when they feel existentially threatened (e.g., Johnson and Frickel 2011; Berry 2015; Maher 2010). Meanwhile, researchers note that people use past harms committed by a group to justify violence and mistreatment towards it (Sullivan et al. 2012) and people forgive aggressors when reminded of these wrongs (Wohl and Branscombe 2009). If narratives develop to maximally support and provoke violence towards demonized Targets, Targets should be portrayed as representing as large a threat as is believable.

Aside from conspiratorially plotting destruction, witches engage in atrocious behaviors, most frequently cannibalism and corpse desecration, but also acts such as necrophilia (e.g., Navajo: Kluckhohn 1944) and incest (e.g., Apache: Basso 1969; Kaguru: Beidelman 1963). What accounts for their pervasiveness? As readers can attest, these acts trigger an intense, visceral moral outrage (Haidt et al. 2000). For the !Kung, “the two worst sins, the unthinkable, unspeakable sins, are cannibalism and incest” (Marshall 1962, p. 229), while among the Comanche, “the very idea that one of them might under stress eat another person was vigorously repulsed” (Wallace and Hoebel 1952, p. 70). In fact, the repugnance at cannibalism is so intense that some societies even claim to forbid the consumption of animals that resemble humans,

exemplified in taboos on the Amazon river dolphin and nutria (a large semiaquatic rodent) among the Warao (Wilbert 1972, p. 69).

One possible reason for our revulsion at acts like cannibalism and necrophilia is that they indicate that an actor is dangerous and not to be trusted. People may have evolved psychological mechanisms to select social partners who are predictable and safe. Any individual who even *considers* an atrocious behavior, like consuming flesh, having sex with dead bodies, or mutilating corpses, reveals an underlying preference that makes them perilous social partners (M. Hoffman et al. 2015; Tetlock 2003). Our revulsion at these acts may be enhanced by feelings of disgust, which have been shown to heighten moral judgment (Schnall et al. 2008).

Regardless of why we abhor cannibalism and other obscenities, the broader point is that those acts invite severe punitive outrage, making them potent for justifying and urging elimination. Should some other set of behaviors provoke greater outrage, the proposed theory predicts that witches will do those instead (assuming that people will believe the accusations).

7.2.2. Witches resemble the demonized targets of other moral panics and eradication campaigns

The traits of witches are sensational and atrocious, but they are not unique. Other panics and campaigns of mistreatment – such as attacks on heretics and dissidents, moral panics during times of stress, and conspiracy scares – similarly transform targets into witch-like demons. Table 4.4 lists some examples. Note how frequently these groups supposedly pose existential threats and violate sacred values.

Table 4.4. The targets of moral panics and elimination campaigns resemble witches, especially by posing existential threats and violating sacred values.

Selected groups	Traits ascribed (with references)
Christians, 100s, Roman Empire	Worship a donkey-god or genitals of priest; engage in secretive meetings, infanticide, child-cannibalism, and nighttime, incestuous orgies; “threaten the whole world and the universe and its stars with destruction by fire” (Felix and Rendall 1972, p. 337-41)
Knights Templar, early 1300s, France	Deny Christ; spit, trample, and urinate on the cross; engage in homosexual practices, including disrobing newcomers and kissing them; collect in secret meetings at night; are bound by oaths enforced by death; swear to advance the Order at all costs, lawful or not (Barber 2006, p. 202-203)
Fratricelli “de opinione” (radical Christian sect), 1466, Rome	Enjoy nighttime orgies in crypts; sacrifice a small boy, make powder from his body, and consume it communally in wine during mass (Cohn 1976, p. 46)
Catholics, mid-1800s, United States	“The anti-Catholics invented an immense lore about libertine priests, the confessional as an opportunity for seduction, licentious convents and monasteries... Infants born of convent liaisons were baptized and then killed” (Hofstadter 1964, p. 80-81).
Mau Mau rebels, 1950s, Kenya	Mutilate victims’ corpses; take secretive oaths at night that involve obscenities like public masturbation and drinking menstrual blood (Lonsdale 1990, p. 398-400)
Communists, 1965, Indonesia	Murder, torture, and castrate generals; woman’s Communist group dances naked at night; plot nation-wide purge of anti-Communists (Henry 2014; Wieringa 2011)

Tutsis, early 1990s, Rwanda Send women to seduce Hutu and infiltrate positions of power; plot a war to reestablish control, massacre Hutu, and establish Nilotic empire across Africa; admire Nazis and engage in cannibalism; elders kill and pillage and rape girls and women (Desforges 1999, p. 72-83)

8. Discussion

8.1. The origins of sorcerers, lycanthropes, the evil eye, and witches

Table 4.5 displays the three cultural selective processes hypothesized to be responsible for shaping beliefs in practitioners of mystical harm. Figure 4.3 shows how those processes interact to produce some of the malicious practitioners identified in Figure 4.1 (sorcerers, the evil eye, lycanthropes, and witches).

Table 4.5. The three cultural selective schemes responsible for beliefs in practitioners of mystical harm.

CULTURAL SELECTIVE SCHEME: What is being selectively retained?	CONTEXTS: When should we expect it to occur?	FEATURES OF BELIEFS IN MYSTICAL HARM: Which features of mystical harm beliefs does this process produce?
Intuitive magic (section 5): Effective-seeming interventions for harming or killing others	When people want to harm rivals	That harm can be transmitted through sympathetic means (contagion, similarity); that

		harmful magic is effective and that others do it
Plausible explanations (section 6): Explanations for impactful misfortune	Following unexplainable, harmful misfortune, especially when people are distrustful or persecuted	That impactful and unexplainable harm is caused by magic and supernatural powers; that malicious practitioners are envious or offended; that they associate with animals, especially man-killers and nighttime or tiny animals
Demonizing narratives (section 7): Narratives that justify and urge mistreatment of a target group	When influential individuals aim to remove a sub-group; during stressful uncertainty	That malicious practitioners are threatening (e.g., conspire, kill); that they violate sacred values (e.g., eat corpses)

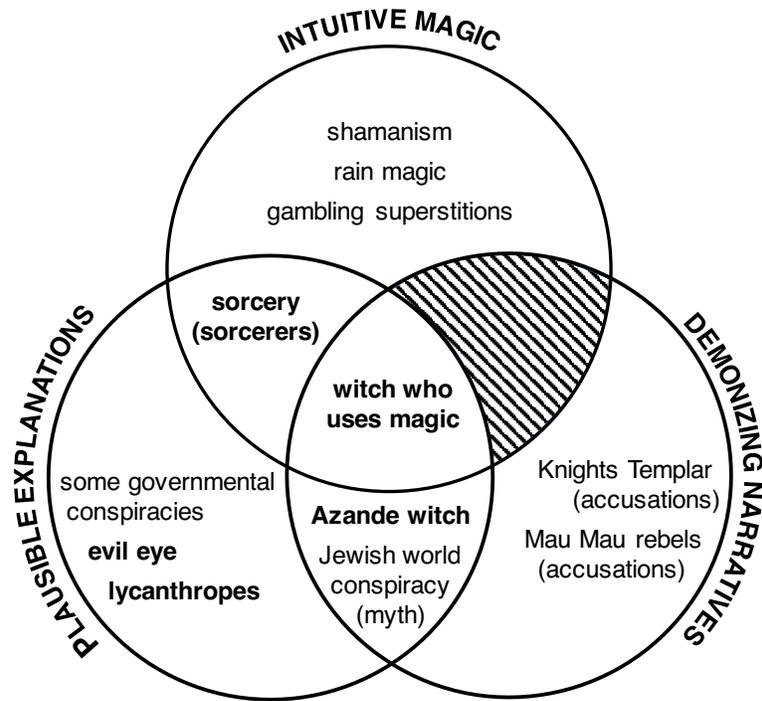


Figure 4.3. The three selective schemes responsible for beliefs in practitioners of mystical harm. Practitioners of mystical harm are bolded; examples of other practices and beliefs are unbolded. The intersection of demonizing narratives and intuitive magic is filled because no beliefs should exist there – any demonizing narrative in which the target uses magic should also blame the target for terrible events, shifting them to the center.

According to the theory outlined here, sorcerers are the result of both a selection for intuitive magic and a selection for plausible explanations. The selection for intuitive magic produces compelling techniques for controlling uncertain outcomes, including rain magic, gambling superstitions, and magic aimed at harming others, or sorcery. Once people accept that this magic is effective and that other people practice it, it becomes a plausible explanation for

misfortune. A person who feels threatened and who confronts unexplainable tragedy will easily suspect that a rival has ensorcelled them. As people regularly consider how others harm them, they build plausible portrayals of sorcerers.

Beliefs about werewolves, werebears, weresnakes, and other lycanthropes also develop from a selection for plausible explanations. Baffled as to why an animal attacked them, a person suspects a rival of becoming or possessing an animal and stalking them at night. This explanation becomes more conceivable as the lycanthrope explains other strange events and as conceptions of the lycanthrope become more plausible. Many societies ascribe transformative powers to other malicious practitioners (see Table 4.3), showing that people also suspect existing practitioners after attacks by wild animals.

Beliefs in the malignant power of stares and words likewise develop to explain misfortune. As reviewed earlier, people around the world connect jealousy and envy to a desire to induce harm. Thus, people who stare with envy or express a compliment are suspected of harboring malice and an intention to harm. A person who suffers a misfortune remembers these stares and suspects those people of somehow injuring them. In regularly inferring how envious individuals attacked them, people craft a compelling notion of the evil eye.

Why suspect the evil eye rather than sorcery? There are at least two possibilities. First, an accused individual may ardently vow not to know sorcery or to have attacked the target (see these claims among the Azande, both described in text: Evans-Pritchard 1937, p. 119-125; and shown in film: Singer 1981, minute 21). Alternatively, given beliefs that effective sorcery requires powers that develop with age, special knowledge, or certain experiences, it may seem unreasonable that a young or unexperienced group mate effectively ensorcelled the target. In

these instances, the idea that the stare itself harmed the target may provide a more plausible mechanism.

The famous odious, powerful witch, I propose, arises when blamed malicious practitioners become demonized. People who fear an invisible threat or who have an interest in mistreating competitors benefit from demonizing the target, transforming them into a heinous, threatening menace. Thus, witches represent a confluence of two and sometimes all three cultural selective processes.

In Figure 4.1, I showed that beliefs about malicious practitioners exist along two dimensions. The tripartite theory accounts for this structure. All of the practitioners displayed are plausible explanations of how group mates inflict harm. One dimension (SORCERY-EVIL EYE) distinguishes those explanations of misfortune that include magic (sorcerers) from those that do not (evil eye, lycanthrope). The other dimension shows the extent to which different practitioners have been demonized. In short, all beliefs about harmful practitioners are explanations; sometimes they use magic, sometimes they're made evil.

8.2. Ten predictions

The proposed theory generates many predictions for how shifting conditions should drive changes in beliefs about malicious practitioners. I referred to several of these throughout the paper. Here are ten (the section of the paper is noted when a prediction is discussed in the paper):

1. People are more likely to believe in sorcerers as sorcery techniques become more effective-seeming.

2. People are more likely to ascribe injury to mystical harm when they are distrustful of others, persecuted, or otherwise convinced of harmful intent. (sect. 6.2.1)
3. The emotions attributed to malicious practitioners will be those that most intensely and frequently motivate aggression. (sect. 6.2.1)
4. People are more likely to attribute injury to mystical harm when they lack alternative explanations. (sect. 6.2.2)
5. The greater the impact of the misfortune, the more likely people are to attribute it to mystical harm. (sect. 6.2.2)
6. Practitioners of mystical harm are more likely to become demonized during times of stressful uncertainty.
7. The traits ascribed to malicious practitioners will become more heinous or sensational as Condoners become more trustful or reliant on information from Campaigners.
8. Malicious practitioners will become less demonized when there is less disagreement or resistance about their removal.
9. The traits that constitute demonization will be those that elicit the most punitive outrage, controlling for believability. (sect. 7.2.1)
10. Malicious practitioners whose actions can more easily explain catastrophe, such as those who employ killing magic compared to love magic, will be easier to demonize.

8.3. The cultural evolution of harmful beliefs

Social scientists, and especially those who study the origins of religion and belief, debate over whether cultural traditions evolve to provide group-level benefits (Baumard and Boyer 2013; Norenzayan et al. 2016). Reviving the analogy of society as an organism, some scholars maintain

that cultural traits develop to ensure the survival and reproduction of the group (Wilson 2002). These writers argue that traditions that undermine societal success should normally be culled away, while traditions that enhance group-level success should spread (Boyd and Richerson 2010).

In this paper, I have examined cultural traits with clear social costs: mystical harm beliefs. As sources of paranoia, distrust, and bloodshed, these beliefs divide societies, breeding contempt even among close family members. But I have explained them without invoking group-level benefits. Focusing on people's (usually automatic) decisions to adopt cultural traditions, I have shown that beliefs in witches and sorcerers are maximally appealing, providing the most plausible explanations and justifying hostile aims. Corrosive customs recur as long as they are useful and cognitively appealing.

Supplementary materials

Supplementary materials are available at the following links.

Chapter 1

- Data: <https://osf.io/492mj/>
- Other supplementary materials: <https://osf.io/rzhtw/>

Chapter 3

- Data & code: <https://osf.io/3mbkz/>
- Other supplementary materials: <https://osf.io/jf9z3/>

Chapter 4

- Data & code: <https://osf.io/bjq6f/>
- Other supplementary materials: <https://osf.io/kvsxn/>

References

- Abalakina-paap, M., Stephan, W. G., Craig, T., & Gregory, W. L. (1999) Beliefs in Conspiracies. *Political Psychology* 20:637–647.
- Abbott, A. (1988) *The system of professions: An essay on the division of expert labor*. The University of Chicago Press.
- Acemoglu, D., Robinson, J. A., & Verdier, T. (2003) *Kleptocracy and divide-and-rule: A model of personal rule* (No. 10136).
- Achterberg, J. (1985) *Imagery in healing: Shamanism and modern medicine*. Shambhala.
- Aginsky, B. W. (1939) Population control in the Shanel (Pomo) tribe. *American Sociological Review* 4:209–216.
- Albanese, C. L. (1992) On the matter of spirit: Andrew Jackson Davis and the marriage of God and Nature. *Journal of the American Academy of Religion* 60:1–17.
doi:10.1179/0308018815Z.000000000108
- Alm, T. (2003) The Witch Trials of Finnmark, Northern Norway, during the 17th Century: Evidence for Ergotism as a Contributing Factor. *Economic Botany* 57:403–416.
doi:10.1663/0013-0001(2003)057[0403:TWTOFN]2.0.CO;2
- Ames, D. (1959) Belief in “witches” among the rural Wolof of the Gambia. *Africa* 29:263–273.
- Ammār, Ḥāmid (1954) *Growing up in an Egyptian village: Silwa, province Of Aswan*. Routledge and Kegan Paul Ltd.
- Apicella, C. L., Rozin, P., Busch, J. T. A., Watson-Jones, R. E., & Legare, C. H. (2018) Evidence from hunter-gatherer and subsistence agricultural populations for the universality of contagion sensitivity. *Evolution and Human Behavior* .
papers2://publication/uuid/0545B852-08F3-4979-848D-FFD24E70B4D1
- Archer, W. G. (1974) *The hill of flutes: Life, love, and poetry in tribal India : a portrait of the Santals*. University of Pittsburgh Press.
- Archer, W. G. (1984) *Tribal law And justice: A report on the Santal*. Concept.
- Ashforth, A. (2011) AIDS, religious enthusiasm and spiritual insecurity in Africa. *Global Public Health* 6:S132–S147. doi:10.1080/17441692.2011.602702
- Atkinson, J. M. (1992) Shamanisms today. *Annual Review of Anthropology* 21:307–330.

- Atran, S. (1998) Folk biology and the anthropology of science: Cognitive universals and cultural particulars. *Behavioral and Brain Sciences* 21:547–609. doi:10.1017/S0140525X98001277
- Atran, S., & Henrich, J. (2010) The evolution of religion: How cognitive by-products, adaptive learning heuristics, ritual displays, and group competition generate deep commitments to prosocial religions. *Biological Theory* 5:18–30. http://hal-ens.archives-ouvertes.fr/ijn_00505193/. Accessed 24 March 2014
- Bäckman, L., & Hultkrantz, Å. (1978) *Studies in Lapp shamanism*. Almqvist & Wiksell International.
- Bailey, M. D. (2006) The disenchantment of magic: Spells, charms, and superstition in early European witchcraft literature. *American Historical Review* 111:383–404.
- Bakels, J. (1994) But his stripes remain: On the symbolism of tiger in the oral tradition of Kerinci, Sumatra. In: *Text and Tales: Studies in Oral Tradition* pp. 33–51.
- Balikci, A. (1963) Shamanistic behavior among the Netsilik Eskimos. *Southwestern Journal of Anthropology* 19:380–396.
- Banerjee, K., & Bloom, P. (2014a) Why did this happen to me? Religious believers' and non-believers' teleological reasoning about life events. *Cognition* 133:277–303. doi:10.1016/j.cognition.2014.06.017
- Banerjee, K., & Bloom, P. (2014b, October 19) Does everything happen for a reason? *The New York Times*, p. SR12.
- Banerjee, K., & Bloom, P. (2015) “Everything happens for a reason”: Children’s beliefs about purpose in life events. *Child Development* 86:503–518. doi:10.1111/cdev.12312
- Barabasz, A. F., & Barabasz, M. (Eds.) (1993) *Clinical and experimental restricted environmental stimulation: New developments and perspectives*. Springer-Verlag.
- Barber, M. (2006) *The trial of the Templars* 2nd ed. Cambridge University Press.
- Barker, J. L., Power, E. A., Heap, S., Puurtinen, M., & Sosis, R. (2019) Content, cost, and context: A framework for understanding human signaling systems. *Evolutionary Anthropology: Issues, News, and Reviews* 86–99. doi:10.1002/evan.21768
- Barkun, M. (2013) *A culture of conspiracy: Apocalyptic visions in contemporary America* 2nd Editio. University of California Press.
- Barrett, H. C. (2015) *The shape of thought: How mental adaptations evolve*. Oxford University Press.

- Barrett, J. L. (2000) Exploring the natural foundations of religion. *Trends in Cognitive Sciences* 4:29–34.
- Barro, R. J., & McCleary, R. M. (2006) Religion and economic growth across countries. *American Sociological Review* 68:760. doi:10.2307/1519761
- Barth, F. (1975) *Ritual and knowledge among the Baktaman of New Guinea*. Yale University Press.
- Barton, R. F. (1946) *The religion of the Ifugao*. American Anthropological Association.
- Basilov, V. N. (1995) The “shamanic disease” in Uzbek folk beliefs. *Shaman* 3:5–15.
- Basso, K. H. (1967) *Heavy with hatred: An ethnographic study of Western Apache witchcraft*. Stanford University.
- Basso, K. H. (1969) *Western Apache witchcraft*. The University of Arizona Press.
- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015) Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67:1–48.
- Baumard, N., & Boyer, P. (2013) Explaining moral religions. *Trends in Cognitive Sciences* 17:272–280. doi:10.1016/j.tics.2013.04.003
- Baumard, N., & Chevallier, C. (2012) What goes around comes around: The evolutionary roots of the belief in immanent justice. *Journal of Cognition and Culture* 12:67–80. doi:10.1163/156853712X633938
- Baumard, N., Hyafil, A., Morris, I., & Boyer, P. (2015) Increased affluence explains the emergence of ascetic wisdoms and moralizing religions. *Current Biology* 25:10–15.
- Beattie, J. (1963) Sorcery in Bunyoro. In: *Witchcraft and sorcery in East Africa* eds. J. Middleton & E. H. Winter, pp. 27–55. Routledge & Paul.
- Beck, J., & Forstmeier, W. (2007) Superstition and belief as inevitable by-products of an adaptive learning strategy. *Human Nature* 18:35–46. doi:10.1007/BF02820845
- Beidelman, T. O. (1963) Witchcraft in Ukaguru. In: *Witchcraft and sorcery in East Africa* eds. J. Middleton & E. H. Winter, pp. 57–98. Routledge & Paul.
- Beidelman, T. O. (1975) Ambiguous animals: Two theriomorphic metaphors in Kaguru folklore. *Africa* 45:183–200.
- Bell, S., & Sobo, E. J. (2001) Celibacy in cross-cultural perspective: An overview. In: *Celibacy, culture, and society* eds. E. J. Sobo & S. Bell, . The University of Wisconsin Press.

- Ben-Tovim, D. I., & Walker, M. K. (1991) Further evidence for the Stroop Test as a quantitative measure of psychopathology in eating disorders. *International Journal of Eating Disorders* 10:609–613.
- Bernstein, A. (2008) Remapping sacred landscapes: Shamanic tourism and cultural production on the Olkhon Island. *Sibirica* 7:23–46. doi:10.3167/sib.2008.070203
- Berry, M. (2015) From violence to mobilization: Women, war, and threat in Rwanda. *Mobilization: An International Quarterly* 20:135–156.
- Best, E. (1924) *The Maori: Volume 1*. The Polynesian Society.
<http://nzetc.victoria.ac.nz/tm/scholarly/tei-Bes01Maor.html>
- Bettinger, R. L., & Eerkens, J. (1999) Point typologies, cultural transmission, and the spread of bow-and-arrow technology in the prehistoric Great Basin. *American Antiquity* 64:231–242.
- Blacker, C. (1975) *The catalpa bow: A study of shamanistic practices in Japan*. George Allen & Unwin Ltd.
- Blackmore, S. (1999) *The meme machine*. Oxford University Press.
- Bloom, P. (2007) Religion is natural. *Developmental Science* 10:147–151. doi:10.1111/j.1467-7687.2007.00577.x
- Boas, F. (1896) The limitations of the comparative method of anthropology. *Science* 4:901–908.
- Boas, F. (1930) *The religion of the Kwakiutl Indians*. Columbia University Press.
- Boehm, C. (2008) A biocultural evolutionary exploration of supernatural sanctioning. In: *Evolution of religion: Studies, theories, and critiques* eds. J. Bulbulia, R. Sosis, E. Harris, R. Genet, C. Genet, & K. Wyman, . Collins Foundation Press.
- Bogoras, W. (1907) *The Chukchee, part 2. - religion*. E. J. Brill Ltd. and G. E. Stechert.
- Bohannon, P. (1958) Extra-processual events in Tiv political institutions. *American Anthropologist* 60:1–12.
- Booker, C. (2004) *The seven basic plots: Why we tell stories*. Continuum.
- Bourke, J. G. (1892) *The medicine-men of the Apache*. Bureau of American Ethnology.
<https://archive.org/details/medicinemenofapa00bourrich/mode/2up>
- Boyd, R., & Richerson, P. J. (1985) *Culture and the evolutionary process*. University of Chicago Press.

- Boyd, R., & Richerson, P. J. (1988) An evolutionary model of social learning: The effects of spatial and temporal variation. In: *Social learning: Psychological and biological perspectives* eds. T. R. Zentall & B. G. Galef, . Lawrence Erlbaum Associates.
- Boyd, R., & Richerson, P. J. (2010) Transmission coupling mechanisms: Cultural group selection. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences* 365:3787–95. doi:10.1098/rstb.2010.0046
- Boyer, Pascal (in press) Informal religious activity outside hegemonic religions: Wild traditions and their relevance to evolutionary models. *Religion, Brain & Behavior*.
- Boyer, Pascal (2001) *Religion explained: The evolutionary origins of religious thought*. Basic Books.
- Boyer, Pascal (2018) *Minds make societies: How cognition explains the world humans create*. Yale University Press.
- Boyer, Pascal (2019) Informal religious activity outside hegemonic religions: wild traditions and their relevance to evolutionary models. *Religion, Brain and Behavior* . doi:10.1080/2153599X.2019.1678518
- Boyer, Pascal, & Baumard, N. (2016) The diversity of religious systems across history: An evolutionary cognitive approach. In: *The Oxford handbook of evolutionary psychology and religion* eds. T. K. Shackelford & J. R. Liddle, . Oxford University Press.
- Boyer, Pascal, & Ramble, C. (2001) Cognitive templates for religious concepts: Cross-cultural evidence for recall of counter-intuitive representations. *Cognitive Science* 25:535–564. <http://www.sciencedirect.com/science/article/pii/S0364021301000453>
- Boyer, Paul, & Nissenbaum, S. (1974) *Salem possessed: The social origins of witchcraft*.
- Braun, S. B. (2010) *Neo-shamanism as a healing system: Enchanted healing in a modern world*. The University of Utah.
- Brown, C. G. (2011) Introduction: Pentecostalism and the globalization of illness healing. In: *Global Pentecostal and Charismatic healing* ed. C. G. Brown, pp. 3–27. Oxford University Press.
- Brown, M. F. (1989) Dark side of the shaman. *Natural History* 98:8–10.
- Bryant, A. T. (1929) *Olden times in Zululand and Natal*. Longmans, Green and Co.
- Budge, E. A. W. (1901) *Egyptian magic*. Kegan, Paul, Trech and Trübner & Co. https://archive.org/details/EgyptianMagic_51
- Bulbulia, Joseph, & Sosis, R. (2011) Signalling theory and the evolution of religious cooperation.

Religion 41:363–388. doi:10.1080/0048721X.2011.604508

- Burger, J. M., & Lynn, A. L. (2005) Superstitious behavior among American and Japanese professional baseball players. *Basic and Applied Social Psychology* 27:71–76. doi:10.1207/s15324834basp2701
- Buyandelgeriyn, M. (2007) Dealing with uncertainty: Shamans, marginal capitalism, and the remaking of history in postsocialist Mongolia. *American Ethnologist* 34:127–147. doi:10.1525/ae.2007.34.1.127.American
- Calin-Jageman, R. J., & Caldwell, T. L. (2014) Replication of the superstition and performance study by Damisch, Stoberock, and Mussweiler (2010). *Social Psychology* 45:239–245. doi:10.1027/1864-9335/a000190
- Campbell, D. T. (1965) Variation and selective retention in socio-cultural evolution. In: *Social Change in Developing Areas: A Reinterpretation of Evolutionary Theory* eds. H. R. Barringer, G. I. Blanksten, & R. W. Mack, pp. 19–49. Schenkman Publishing Company.
- Caporael, L. R. (1976) Ergotism: The Satan loosed in Salem? *Science* 192:21–26.
- Carey, S. (2009) *The origin of concepts*. Oxford University Press.
- Castagné, J. (1930) Magie et exorcisme chez les Kazak-Kirghizes et autres peuples turks orientaux. *Revue des Études Islamiques* 4:53–151.
- Chang, K.-C. (1999) China on the eve of the historical period. In: *The Cambridge History of Ancient China: From the Origins of Civilization to 221 BC* eds. M. Loewe & E. L. Shaughnessy, pp. 37–73. Cambridge University Press. doi:10.5260/CHOL9780521470308
- Chapman, A. M. (1982) *Drama and power in a hunting society: The Selk'nam of Tierra del Fuego*. Cambridge University Press.
- Charles, L. H. (1953) Drama in shaman exorcism. *The Journal of American Folklore* 66:95–122.
- Chaudhuri, S. (2012) Women as easy scapegoats: Witchcraft accusations and women as targets in tea plantations of India. *Violence Against Women* 18:1213–1234. doi:10.1177/1077801212465155
- Chwe, M. S.-Y. (2001) *Rational ritual*. Princeton University Press.
- Claidiere, N., Scott-Phillips, T. C., & Sperber, D. (2014) How Darwinian is cultural evolution? *Philosophical Transactions of the Royal Society B* 369:20130368. <http://www.nicolas.claidiere.fr/wp-content/uploads/HowDarwinian-ClaidiereEtal.pdf>. Accessed 2 April 2014

- Clingingsmith, D., Khwaja, A. I., & Kremer, M. (2009) Estimating the impact of the Hajj: Religion and tolerance in Islam's global gathering. *Quarterly Journal of Economics* 124:1133–1170.
- Cohen, D., Nisbett, R. E., Bowdle, B. F., & Schwarz, N. (1996) Insult, aggression, and the southern culture of honor: An “experimental ethnography.” *Journal of Personality and Social Psychology* 70:945–960. doi:10.1037//0022-3514.70.5.945
- Cohen, S. (1972) *Folk devils and moral panics: The creation of the Mods and Rockers*. MacGibbon and Kee.
- Cohn, N. (1966) The myth of the Jewish world-conspiracy: A case study in collective psychopathology. *Commentary* 41:35–42.
- Cohn, N. (1967) *Warrant for genocide: The myth of the Jewish world-conspiracy and the Protocols of the Elders of Zion*. Harper & Row.
- Cohn, N. (1976) *Europe's inner demons*. Paladin.
- Coleman, E., Colgan, P., & Gooren, L. (1992) Male cross-gender behavior in Myanmar (Burma): A description of the acault. *Archives of Sexual Behavior* 21:313–321.
- Comaroff, J., & Comaroff, J. L. (1999) Occult economies and the violence of abstraction: Notes from the South African postcolony. *American Ethnologist* 26:279–303.
- Cooper, M. W. (1991) *Behold a pale horse*. Light Technology Publishing.
<https://archive.org/details/WilliamCooperBeholdAPaleHorse1991>
- Corlett, W. T. (1935) *The medicine-man of the American Indian and his cultural background*. Charles C. Thomas.
- Costello, K., & Hodson, G. (2014) Explaining dehumanization among children: The interspecies model of prejudice. *British Journal of Social Psychology* 53:175–197. doi:10.1111/bjso.12016
- Coy, M. W. (1989) From theory. In: *Apprenticeship: From theory to method and back again* ed. M. W. Coy, pp. 1–11. State University of New York Press.
- Crawford, J. (1963) Evidences for witchcraft in Anglo-Saxon England. *Medium Ævum* 32:99–116.
- Crick, M. (1973) Two styles in the study of witchcraft. *Journal of the Anthropological Society of Oxford* 4:17–31.
- Crocker, W. H. (1990) *The Canela (Eastern Timbira), I: An ethnographic introduction*.

Smithsonian Institution Press.

- Crow, R., Gage, H., Hampson, S., Hart, J., Kimber, A., & Thomas, H. (1999) The role of expectancies in the placebo effect and their use in the delivery of health care: A systematic review. *Health Technology Assessment* 3:1–90.
- Csordas, T. J. (2007) Global religion and the re-enchantment of the world. *Anthropological Theory* 7:295–314.
- Currie, T. E., & Mace, R. (2014) Evolution of cultural traits occurs at similar relative rates in different world regions. *Proceedings of the Royal Society B* 281:20141622.
- Damisch, L., Stoberock, B., & Mussweiler, T. (2010) Keep your fingers crossed! How superstition improves performance. *Psychological Science* 21:1014–1020.
doi:10.1177/0956797610372631
- Dawkins, R. (1986) *The blind watchmaker: Why the evidence of evolution reveals a universe without design*. W. W. Norton & Company.
- De Laguna, F. (1972) *Under Mount Saint Elias: The history and culture of the Yakutat Tlingit, vol. 2*. Smithsonian Institution Press.
- Debrunner, H. W. (1961) *Witchcraft in Ghana: A study on the belief in destructive witches and its effect on the Akan tribes*. Presbyterian Book Depot Ltd.
- Delfi, M. (2013) Islam and Arat Sabulungan in Mentawai. *Al-Jami'ah: Journal of Islamic Studies* 51. doi:10.14421/ajis.2013.512.475-499
- Delfi, M. (2017) Local belief system, tatouage, tradition and adaptation in Mentawai. In: *Proceedings of the 3rd International Indonesian Forum for Asian Studies* pp. 900–911.
- Demoulin, S., Saroglou, V., & Van Pachterbeke, M. (2008) Infra-humanizing others, supra-humanizing gods: The emotional hierarchy. *Social Cognition* 26:235–247.
doi:10.1521/soco.2008.26.2.235
- Dennett, D. (1995) *Darwin's dangerous idea*. Penguin.
- Desforges, A. (1999) *Leave none to tell the story: Genocide in Rwanda*. Human Rights Watch.
- Devereux, G. (1961) Shamans as neurotics. *American Anthropologist* 63:1088–1090.
- Diderot, D. (2001) Shamans are imposters who claim they consult the Devil - and who are sometimes close to the mark. In: *Shamans Through Time: 500 Years on the Path to Knowledge* eds. J. Narby & F. Huxley, pp. 32–35. Penguin Putnam.

- Domberger, S., & Sherr, A. (1989) The impact of competition on pricing and quality of legal services. *International Review of Law and Economics* 9:41–56.
- Dore, R. A., Hoffman, K. M., Lillard, A. S., & Trawalter, S. (2014) Children's race bias in perceptions of others' pain. *British Journal of Developmental Psychology* 32:218–231. doi:10.1111/bjdp.12038
- Douglas, M. (2002) *Purity and danger: An analysis of concept of pollution and taboo*. Routledge.
- Dowson, T. A., & Porr, M. (2001) Special objects – special creatures: Shamanistic imagery and the Aurignacian art of south-west Germany. In: *The archaeology of shamanism* ed. N. S. Price, pp. 165–177. Routledge.
- DuBois, C. (1935) Wintu ethnography. *University of California Publications in American Archaeology and Ethnology* 36. <http://digitalassets.lib.berkeley.edu/anthpubs/ucb/text/ucp036-002.pdf>
- Dubois, T. A. (2009) *An introduction to shamanism*. Cambridge University Press.
- Duffin, J. (2016, September 6) Pondering miracles, medical and religious. *The New York Times*, p. A21.
- Dundas, P. (2002) *The Jains* 2nd Editio. Routledge.
- Dundes, A. (Ed.) (1992) *The evil eye: A casebook*. The University of Wisconsin Press.
- Durham, W. H. (1991) *Coevolution: Genes, culture, and human diversity*. Stanford University Press.
- Edelman, B. (2009) Red light states: Why buys online adult entertainment? *Journal of Economic Perspectives* 23:209–220. doi:10.1257/jep.23.1.209
- Eliade, M. (1958) *Rites and symbols of initiation: The mysteries of birth and rebirth*. Harper Colophon.
- Eliade, M. (1964) *Shamanism: Archaic techniques of ecstasy*. Princeton University Press.
- Eliade, M. (1975) Some observations on European witchcraft. *History of Religions* 14:149–172.
- Elkin, A. P. (1977) *Aboriginal men of high degree* 2nd Editio. University of Queensland Press.
- Emmons, G. T., & De Laguna, F. (1991) *The Tlingit Indians Anthropological Papers of the American Museum of Natural History* Vol. 70. University of Washington Press and the American Museum of Natural History. <http://digitallibrary.amnh.org/handle/2246/253>

- Evans-Pritchard, E. E. (1937) *Witchcraft, oracles, and magic among the Azande*. Clarendon Press.
- Farthing, G. W. (1992) *The psychology of consciousness*. Prentice Hall.
- Faulkingham, R. H. (1971) *Political support in a Hausa village*. Michigan State University.
- Felix, M., & Rendall, G. H. (1972) Octavius. In: *Tertullian, Minucius Felix* eds. T. R. Glover & G. H. Rendall, pp. 303–437. Harvard University Press. <https://ryanfb.github.io/loebolus-data/L250.pdf>
- Ferguson, C. W. (1928) *The confusion of tongues: A review of modern isms*. Doubleday, Doran & Company, Inc.
- Fessler, D. M. T., & Navarrete, C. D. (2004) Third-party attitudes toward sibling incest: Evidence for Westermarck's hypotheses. *Evolution and Human Behavior* 25:277–294. doi:10.1016/j.evolhumbehav.2004.05.004
- Field, M. J. (1970) *Search for security: An ethno-psychiatric study of rural Ghana*. W. W. Norton & Company.
- Firth, R. (1954) The sociology of "magic" in Tikopia. *Sociologus* 4:97–116.
- Forsyth, M. (2016) The regulation of witchcraft and sorcery practices and beliefs. *Annual Review of Law and Social Science* 12:331–51. doi:10.1146/annurev-lawsocsci-110615-084600
- Foster, K. R., & Kokko, H. (2009) The evolution of superstitious and superstition-like behaviour. *Proceedings. Biological sciences / The Royal Society* 276:31–7. doi:10.1098/rspb.2008.0981
- Fox, J., & Weisberg, S. (2019) *An R companion to applied regression* 3rd Ed. Sage. <http://tinyurl.com/carbook>
- Frazer, J. (1922) *The golden bough: A study in magic and religion*. Macmillan.
- Frazer, J. G. (1920) *The golden bough: A study in magic and religion, vol. 1 (The magic art and the evolution of kings, vol. I)* 2nd editio. Macmillan and Co. <https://archive.org/details/TheGoldenBough-Part1-TheMagicArtAndTheEvolutionOfKingsVol.1>
- Frazier, B. N., Gelman, S. A., & Wellman, H. M. (2009) Preschoolers' search for explanatory information within adult-child conversation. *Child Development* 80:1592–1611.
- Frecska, E., & Kulcsar, Z. (1989) Social bonding in the modulation of the physiology of ritual trance. *Ethos* 17:70–87.

- Freidson, E. L. (1970) *Profession of medicine: A study of the sociology of applied knowledge*. Dodd, Mead & Co.
- Frith, U., & Frith, C. D. (2003) Development and neurophysiology of mentalizing. *Philosophical Transactions of the Royal Society B* 358:459–473. doi:10.1098/rstb.2002.1218
- Gershman, B. (2016) Witchcraft beliefs and the erosion of social capital: Evidence from Sub-Saharan Africa and beyond. *Journal of Development Economics* 120:182–208. doi:10.1016/j.jdeveco.2015.11.005
- Gervais, W. M., & Henrich, J. (2010) The Zeus Problem: Why Representational Content Biases Cannot Explain Faith in Gods. *Journal of Cognition and Culture* 10:383–389. doi:10.1163/156853710X531249
- Gifford, E. W. (1927) Southern Maidu religious ceremonies. *American Anthropologist* 29:214–257.
- Gillin, J. (1932) Crime and punishment among the Barama River Carib of British Guiana. *American Anthropologist* 36:331–344.
- Gintis, H., Smith, E. A., & Bowles, S. (2001) Costly signaling and cooperation. *Journal of Theoretical Biology* 213:103–119. doi:10.1006/jtbi.2001.2406
- Glucklich, A. (2001) *Sacred pain: Hurting the body for the sake of the soul*. Oxford University Press.
- Gmelin, J. G. (2001) Shamans deserve perpetual labor for their hocus-pocus. In: *Shamans Through Time: 500 Years on the Path to Knowledge* eds. J. Narby & F. Huxley, pp. 27–28. Penguin Putnam.
- Goff, P. A., Eberhardt, J. L., Williams, M. J., & Jackson, M. C. (2008) Not yet human: Implicit knowledge, historical dehumanization, and contemporary consequences. *Journal of Personality and Social Psychology* 94:292–306. doi:10.1037/0022-3514.94.2.292
- Goldschmidt, W. (1951) *Nomlaki ethnography*. University of California Press.
- Gomes, E. H. (1911) *Seventeen years among the Sea Dyaks of Borneo: A record of intimate association with the natives of the Bornean jungles*. J.B. Lippincott Company. <https://books.google.com/books/reader?id=SBYWAAAAYAAJ&printsec=frontcover&output=reader&pg=GBS.PA178>
- Goode, E. (2008) Moral panics and disproportionality: The case of LSD use in the sixties. *Deviant Behavior* 29:533–543. doi:10.1080/01639620701839377
- Goode, E., & Ben-Yehuda, N. (2009) *Moral panics: The social construction of deviance* 2nd ed. Wiley-Blackwell.

- Gopnik, A. (1998) Explanation as orgasm. *Minds and Machines* 8:101–118. doi:10.1023/A:1008290415597
- Gopnik, A. (2000) Explanation as orgasm and the drive for causal knowledge: The function, evolution, and phenomenology of the theory formation system. In: *Cognition and explanation* eds. F. Keil & R. Wilson, pp. 299–323. MIT Press. doi:10.1111/j.0956-7976.2004.00758.x
- Gorsuch, R., & Smith, C. S. (1983) Attributions of responsibility to God: An interaction of religious beliefs and outcomes. *Journal for the Scientific Study of Religion* 22:340–352. doi:10.2307/1385772
- Gracely, R. H., Dubner, R., Deeter, W. R., & Wolskee, P. J. (1985) Clinicians' expectations influence placebo analgesia. *The Lancet* 1:43.
- Gray, H. M., Gray, K., & Wegner, D. M. (2007) Dimensions of mind perception. *Science* 315:10–619. doi:10.1126/science.1134475
- Gray, J. P. (1999) A corrected Ethnographic Atlas. *World Cultures* 10:24–85.
- Gray, K., & Wegner, D. M. (2010) Blaming god for our pain: Human suffering and the divine mind. *Personality and Social Psychology Review* 14:7–16. doi:10.1177/1088868309350299
- Greenaway, K. H., Louis, W. R., & Hornsey, M. J. (2013) Loss of control increases belief in precognition and belief in precognition increases control. *PLoS ONE* 8. doi:10.1371/journal.pone.0071327
- Grosman, L., Munro, N. D., & Belfer-Cohen, A. (2008) A 12,000-year-old Shaman burial from the southern Levant (Israel). *Proceedings of the National Academy of Sciences of the United States of America* 105:17665–9. doi:10.1073/pnas.0806030105
- Grunwald, M., Ettrich, C., Assmann, B., Dähne, A., Krause, W., Busse, F., & Gertz, H.-J. (2001) Deficits in haptic perception and right parietal theta power changes in patients with anorexia nervosa before and after weight gain. *International Journal of Eating Disorders* 29:417–428.
- Gryll, S. L., & Katahn, M. (1978) Situational factors contributing to the placebo effect. *Psychopharmacology* 57:253–261.
- Grzelczyk, M. (2016) Rituals and sacred places of the Sandawe people (Kondoa region, Tanzania) in the past and the present. *Revista Santuários, Cultura, Arte, Romarias, Peregrinações, Paisagens e Pessoas* 1–6.
- Gufler, H. (1999) Witchcraft beliefs among the Yamba (Cameroon). *Anthropos* 94:181–198. doi:10.2307/40465701

- Gunn, S. W. A. (1966) Totemic medicine and shamanism among the Northwest American Indians. *Journal of the American Medical Association* 196:700–706.
- Gusinde, M. (1961) *The Yamana: The life and thought of the water nomads of Cape Horn*. Human Relations Area Files.
- Gusinde, M. (1971) *The Fireland Indians, vol. 1: The Selk'nam, on the life and thought of a hunting people of the Great Island of Tierra del Fuego*. Human Relations Area Files.
- Guthrie, S. E. (1995) *Faces in the clouds: A new theory of religion*. Oxford University Press.
- Hagmann, P., Cammoun, L., Gigandet, X., Meuli, R., Honey, C. J., Wedeen, V. J., & Sporns, O. (2008) Mapping the structural core of the human cerebral cortex. *PLoS Biology* 6:e159. doi:10.1371/journal.pbio.0060159
- Haidt, J., Björklund, F., & Murphy, S. (2000) *Moral dumbfounding: When intuition finds no reason*. [http://faculty.virginia.edu/haidtlab/articles/manuscripts/haidt.bjorklund.working-paper.when intuition finds no reason.pub603.doc](http://faculty.virginia.edu/haidtlab/articles/manuscripts/haidt.bjorklund.working-paper.when%20intuition%20finds%20no%20reason.pub603.doc)
- Haines, F. (1938) The northward spread of horses among the Plains Indians. *American Anthropologist* 40:429–437.
- Hall, D. L., Cohen, A. B., Meyer, K. K., Varley, A. H., & Brewer, G. A. (2015) Costly signaling increases trust, even across religious affiliations. *Psychological Science* 26:1368–1376. doi:10.1177/0956797615576473
- Hammarström, H., Forkel, R., & Haspelmath, M. (2019) Glottolog 4.1. Max Planck Institute for the Science of Human History. <http://glottolog.org>. Accessed 6 February 2020
- Hammons, C. S. (2010) *Sakaliou: Reciprocity, mimesis, and the cultural economy of tradition in Siberut, Mentawai Islands, Indonesia*. University of Southern California.
- Harman, G. H. (1965) The inference to the best explanation. *The Philosophical Review* 74:88–95.
- Harner, M. (1990) *The way of the shaman*. Harper & Row.
- Harris, P., & Giménez, M. (2005) Children's acceptance of conflicting testimony: The case of death. *Journal of Cognition and Culture* 5:143–164. doi:10.1163/1568537054068606
- Hart, C. W. M., & Pilling, A. R. (1960) *The Tiwi of north Australia*. Holt, Rinehart, and Winston, Inc.
- Hartwig, M., & Bond, Jr., C. F. (2014) Lie detection from multiple cues: A meta-analysis. *Applied Cognitive Psychology* 28:661–676.

- Haslam, N., Kashima, Y., Loughnan, S., Shi, J., & Suitner, C. (2008) Subhuman, inhuman, and superhuman: Contrasting humans with nonhumans in three cultures. *Social Cognition* 26:248–258. doi:10.1521/soco.2008.26.2.248
- Haslam, N., Loughnan, S., & Holland, E. (2013) The psychology of humanness. In: *Objectification and (de)humanization: 60th Nebraska Symposium on Motivation* Vol. 60, pp. 53–71. Springer New York. doi:10.1007/978-1-4614-6959-9
- Hatfield, C., Heer, J., & Worcester, K. (2013) Historical considerations. In: *The superhero reader* pp. 3–6. University Press of Mississippi.
- Henrich, J. (2004a) Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of Economic Behavior & Organization* 53:3–35. doi:10.1016/S0167-2681(03)00094-5
- Henrich, J. (2004b) Demography and cultural evolution: How adaptive cultural processes can produce maladaptive losses - the Tasmania case. *American Antiquity* 69:197–214.
- Henrich, J. (2009) The evolution of costly displays, cooperation and religion: credibility enhancing displays and their implications for cultural evolution. *Evolution and Human Behavior* 30:244–260. doi:10.1016/j.evolhumbehav.2009.03.005
- Henrich, J. (2015) *The secret of our success: How culture is driving human evolution, domesticating our species, and making us smarter*. Princeton University Press.
- Henrich, J., & Gil-White, F. J. (2001) The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior* 22:165–196. doi:10.1016/S1090-5138(00)00071-4
- Henrich, J., & Henrich, N. (2010) The evolution of cultural adaptations: Fijian food taboos protect against dangerous marine toxins. *Proceedings. Biological sciences / The Royal Society* 277:3715–24. doi:10.1098/rspb.2010.1191
- Henrich, J., & McElreath, R. (2008) Dual inheritance theory: The evolution of human cultural capacities and cultural evolution. In: *Oxford Handbook of Evolutionary Psychology* eds. R. Dunbar & L. Barrett, pp. 555–570. Oxford University Press.
- Henry, A. H. (2014) Polluting the waters: A brief history of anti-Communist propaganda during the Indonesian massacres. *Genocide Studies International* 8:153–175. doi:10.3138/gsi.8.2.03
- Henslin, J. M. (1967) Craps and magic. *American Journal of Sociology* 73:316–330.
- Herodotus, & Godley, A. D. (1925) *Herodotus*. Leob.

- Herrou, A. (2012) Daoist monasticism at the turn of the twenty-first century: An ethnography of a Quanzhen Community in Shaanxi province. In: *Daoism in the twentieth century: Between eternity and modernity* eds. D. A. Palmer & X. Liu, pp. 82–107. University of California Press.
- Herskovits, M. J. (1938) *Dahomey: An ancient West African kingdom, vol. II*. J. J. Augustin.
- Hester, M. (1992) *Lewd women and wicked witches: A study of the dynamics of male domination*. Routledge.
- Hewlett, B. S., Mongosso, J. S., King, R., & Lehmann, A. C. (2013) Searching for the truth: The poison oracle among Central African foragers and farmers. In: *Magic, Witchcraft and Religion: A Reader in the Anthropology of Religion* pp. 316–322. McGraw Hill.
- Heyd, M. (1981) The reaction to enthusiasm in the seventeenth century: Towards an integrative approach. *The Journal of Modern History* 53:258–280.
- Heywood, B. T., & Bering, J. M. (2014) “Meant to be”: How religious beliefs and cultural religiosity affect the implicit bias to think teleologically. *Religion, Brain & Behavior* 4:183–201. doi:10.1080/2153599X.2013.782888
- Hill, K. R., Walker, R. S., Bozicević, M., Eder, J., Headland, T., Hewlett, B., et al. (2011) Co-residence patterns in hunter-gatherer societies show unique human social structure. *Science (New York, N.Y.)* 331:1286–9. doi:10.1126/science.1199071
- Hoffman, K. M., & Trawalter, S. (2016) Assumptions about life hardship and pain perception. *Group Processes & Intergroup Relations* 1368430215625781. doi:10.1177/1368430215625781
- Hoffman, M., Yoeli, E., & Nowak, M. A. (2015) Cooperate without looking: Why we care what people think and not just what they do. *Proceedings of the National Academy of Sciences* 112:1727–1732. doi:10.1073/pnas.1417904112
- Hofstadter, R. (1964) The Paranoid Style in American Politics. *Harper's Magazine* 77–86.
- Hogan, P. C. (2003) *The mind and its stories: Narrative universals and human emotion*. Cambridge University Press.
- Hogbin, H. I. (1938) Social reaction to crime: Law and morals in the Schouten Islands, New Guinea. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 68:223–262.
- Holmberg, A. R. (1969) *Nomads of the long bow: The Siriono of eastern Brazil*. The Natural History Press.
- Hooper, L. (1920) The Cahuilla Indians. *University of California Publications in American*

- Archaeology and Ethnology* 16:315–380.
<https://archive.org/details/cahuillaindians00hooprich>
- Hove, M. J., Stelzer, J., Nierhaus, T., Thiel, S. D., Gundlach, C., Margulies, D. S., et al. (2015) Brain network reconfiguration and perceptual decoupling during an absorptive state of consciousness. *Cerebral Cortex* . doi:10.1093/cercor/bhv137
- Howell, P. P. (1954) *A manual of Nuer law: Being an account of customary law, its evolution and development in the courts established by the Sudan government*. Oxford University Press for the International African Institute.
- Hughes, D. J. (1991) Blending with an other: An analysis of trance channeling in the United States. *Ethos* 19:161–184.
- Hultkrantz, Å. (1993) Introductory remarks on the study of shamanism. *Shaman* 1:5–16.
- Humphrey, N. (2002) Great expectations: The evolutionary psychology of faith-healing and the placebo effect. In: *Psychology at the turn of the millenium, vol. 2: Social, development, and clinical perspectives* eds. C. von Hofsten & L. Bäckman, pp. 225–246. Psychology Press.
- Hutton, R. (2004) Anthropological and Historical Approaches To Witchcraft: Potential for a New Collaboration? *The Historical Journal* 47:413–434. doi:10.1017/S0018246X03003558
- Hutton, R. (2017) *The witch: A history of fear, from ancient times ot the present*. Yale University Press.
- Iannaccone, L. R. (1992) Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. *Journal of Political Economy* 100:271–291.
- Iannaccone, L. R. (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: *Evolution and the capacity for commitment* ed. R. M. Nesse, pp. 292–309. Russell Sage Foundation.
- Isaac, B. L. (1977) The Siriono of Eastern Bolivia: A reexamination. *Human Ecology* 5:137–154.
- Ivanow, W. (1926) Muhammadan child-killing demons. *Man* 26:195–199.
- Jochelson, W. (1905) The Koryak: Religion and myths. *Memoirs of the American Museum of Natural History* 10. <http://digitallibrary.amnh.org/handle/2246/27>
- Johnson, D. D. P. (2015) *God is watching you: How the fear of god makes us human*. Oxford University Press.

- Johnson, D. D. P., Blumstein, D. T., Fowler, J. H., & Haselton, M. G. (2013) The evolution of error: Error management, cognitive constraints, and adaptive decision-making biases. *Trends in Ecology & Evolution* 28:474–481. doi:10.1016/j.tree.2013.05.014
- Johnson, E. W., & Frickel, S. (2011) Ecological threat and the founding of U.S. national environmental movement organizations, 1962–1998. *Social Problems* 58:305–329. doi:10.1525/sp.2011.58.3.305.306
- Jokic, Z. (2008) Yanomami shamanic initiation: The meaning of death and postmortem consciousness in transformation. *Anthropology of Consciousness* 19:33–59. doi:10.1111/j.1556-3537.2008.00002.x
- Jones, D. E. (1972) *Sanapia, Comanche medicine woman*. Holt, Rinehart, and Winston, Inc.
- Jones, P. N. (2006) Shamanism: An inquiry into the history of the scholarly use of the term in English-speaking North America. *Anthropology of Consciousness* 17:4–32.
- Jones, W. (1939) *Ethnography of the Fox Indians*. Government Printing Office.
- Kapitány, R., Nelson, N., Burdett, E. R., & Goldstein, T. R. (2019) *The child's pantheon: Children's hierarchical belief structure in real and non-real figures*.
- Kaptchuk, T. J. (2002) The placebo effect in alternative medicine: Can the performance of a healing ritual have clinical significance? *Annals of Internal Medicine* 136:817–825.
- Kaptchuk, T. J. (2011) Placebo studies and ritual theory: a comparative analysis of Navajo, acupuncture and biomedical healing. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* 366:1849–1858. doi:10.1098/rstb.2010.0385
- Kaptchuk, T. J., & Miller, F. G. (2015) Placebo effects in medicine. *The New England Journal of Medicine* 373:8–9. doi:10.1056/NEJMp1506446
- Karlsen, C. F. (1987) *The devil in the shape of a woman: Witchcraft in colonial New England*. W. W. Norton & Company.
- Karsten, R. (1955) *The religion of the Samke: Ancient beliefs and cults of the Scandinavian and Finnish Lapps*. E.J. Brill. <http://ehrafworldcultures.yale.edu/document?id=ep04-005>
- Katz, R. (1982) *Boiling energy: Community healing among the Kalahari Kung*. Harvard University Press.
- Keil, F. C. (2006) Explanation and understanding. *Annual Review of Psychology* 57:227–254. doi:10.1146/annurev.psych.57.102904.190100.Explanation
- Keinan, G. (2002) The Effects of Stress and Desire for Control on Superstitious Behavior.

- Personality and Social Psychology Bulletin* 28:102–108. doi:10.1177/0146167202281009
- Keinan, Giora (1994) Effects of stress and tolerance of ambiguity on magical thinking. *Journal of Personality and Social Psychology* 67:48–55. doi:10.1037/0022-3514.67.1.48
- Keitt, A. (2004) Religious enthusiasm, the Spanish Inquisition, and the disenchantment of the world. *Journal of the History of Ideas* 65:231–250.
- Keitt, A. (2005a) *Inventing the sacred: Imposture, Inquisition, and the boundaries of the supernatural in Golden Age Spain*. Brill.
- Keitt, A. (2005b) The miraculous body of evidence: Visionary experience, medical discourse, and the Inquisition in seventeenth-century Spain. *The Sixteenth Century Journal* 36:77–96.
- Kendall, L. (1985) *Shamans, housewives, and other restless spirits: Women in Korean ritual life*. University of Hawaii Press.
- Khemlani, S. S., & Johnson-Laird, P. N. (2011) The need to explain. *The Quarterly Journal of Experimental Psychology* 64:2276–2288. doi:10.1080/17470218.2011.592593
- Kieschnick, J. (2005) Buddhist vegetarianism in China. In: *Of tripod and palate: Food, politics, and religion in traditional China* ed. R. Sterckx, pp. 186–212. Palgrave Macmillan.
[http://www.urbanlab.org/articles/China/religion/Chinese and Asia religions/Food__Politics__and_Religion_in_Traditional_China.pdf#page=195](http://www.urbanlab.org/articles/China/religion/Chinese%20and%20Asia%20religions/Food__Politics__and_Religion_in_Traditional_China.pdf#page=195)
- Kirkpatrick, L. A. (1999) Toward an evolutionary psychology of religion and personality. *Journal of Personality* 67:921–952.
- Kleinberg, A. M. (1992) *Prophets in their own country: Living saints and the making of sainthood in the later Middle Ages*. University of Chicago Press.
- Kleinman, A., & Sung, L. H. (1979) Why do indigenous practitioners successfully heal? *Social Science and Medicine* 13:7–26.
- Kluckhohn, C. (1944) *Navaho witchcraft*.
- Kluckhohn, C. (1959) Recurrent Themes in Myths and Mythmaking. *Daedalus* 88:268–279.
- Knauff, B. (2010) *The Gebusi: Lives transformed in a rainforest world* 2nd Editio. McGraw Hill.
- Knox, R. A. (1950) *Enthusiasm: A chapter in the history of religion, with special reference to the XVII and XVIII centuries*. Oxford University Press.
<https://archive.org/details/tribesandcastes00croogoog>
- Kraft-Todd, G. T., Bollinger, B., Gillingham, K., Lamp, S., & Rand, D. G. (2018) Credibility-

- enhancing displays promote the provision of non-normative public goods. *Nature* 563:245–248. doi:10.1038/s41586-018-0647-4
- Krippner, S. C. (2002) Conflict perspectives on shamans and shamanism: Points and counterpoints. *American Psychologist* 57:962–977. doi:10.1017/CBO9781107415324.004
- Kunda, Z. (1990) The case for motivated reasoning. *Psychological Bulletin* 108:480–498. doi:10.1037/0033-2909.108.3.480
- La Barre, W. (1970) *The ghost dance: Origins of religion*. Doubleday.
- Lagae, C. R. (1999) *The Azande or Niam-Niam: Zande organizations, religious and magical beliefs, family customs*. HRAF.
- Laland, K. N. (2004) Social learning strategies. *Learning & Behaviour* 32:4–14.
- Lang, M., Purzycki, B. G., Apicella, C. L., Atkinson, Q. D., Bolyanatz, A., Cohen, E., et al. (2019) Moralizing gods, impartiality and religious parochialism across 15 societies. *Proceedings of the Royal Society B: Biological Sciences* 286:20190202. doi:10.1098/rspb.2019.0202
- Lanman, J. A., & Buhrmester, M. D. (2017) Religious actions speak louder than words: exposure to credibility-enhancing displays predicts theism. *Religion, Brain and Behavior* 7:3–16. doi:10.1080/2153599X.2015.1117011
- Leach, E. (1964) Anthropological aspects of language: Animal categories and verbal abuse. In: *New directions in the study of language* ed. E. H. Lenneberg, pp. 23–63.
- Lebra, W. P. (1966) *Okinawan religion: Belief, ritual, and social structure*. University of Hawaii Press.
- Lederman, R. (1981) Sorcery and social change in Mendi. *Social Analysis* 8:15–27.
- Lee, J. Y. (1981) *Korean shamanistic rituals*. Mouton Publishers.
- Legare, C. H., Evans, E. M., Rosengren, K. S., & Harris, P. L. (2012) The coexistence of natural and supernatural explanations across cultures and development. *Child Development* 83:779–793. doi:10.1111/j.1467-8624.2012.01743.x
- Legare, C. H., & Gelman, S. A. (2008) Bewitchment, biology, or both: The co-existence of natural and supernatural explanatory frameworks across development. *Cognitive Science* 32:607–642. doi:10.1080/03640210802066766
- Legare, C. H., & Souza, A. L. (2012) Evaluating ritual efficacy: Evidence from the supernatural. *Cognition* 124:1–15. doi:10.1016/j.cognition.2012.03.004

- Legare, C. H., & Souza, A. L. (2014) Searching for control: Randomness increases the evaluation of ritual efficacy. *Cognitive Science* 38:152–161. doi:10.1111/cogs.12077
- Lenth, R. (2019) Package “emmeans.” <https://cran.r-project.org/web/packages/emmeans/emmeans.pdf>
- Lerner, M. J. (1980) *The belief in a just world*. Springer US.
- Lévi-Strauss, C. (1963a) The sorcerer and his magic. In: *Structural Anthropology, Vol. 1* pp. 167–185. Basic Books.
- Lévi-Strauss, C. (1963b) The effectiveness of symbols. In: *Structural Anthropology, Vol. 1* pp. 186–204. Basic Books.
- Lewis-Williams, J. D., & Dawson, T. A. (1988) The signs of all times: Entoptic phenomena in Upper Paleolithic art. *Current Anthropology* 29:201–245.
- Lewis, I. M. (2003) *Ecstatic religion: A study of shamanism and spirit possession* Third Ed. Routledge. doi:10.4324/9780203241080
- Lieberman, D., Tooby, J., & Cosmides, L. (2003) Does morality have a biological basis? An empirical test of the factors governing moral sentiments relating to incest. *Proceedings. Biological Sciences / The Royal Society* 270:819–826. doi:10.1098/rspb.2002.2290
- Lindquist, G. (1997) *Shamanic performances on the urban scene: Neo-shamanism in contemporary Sweden*. Dept. of Social Anthropology, Stockholm University.
- Lindquist, G. (2004) Bringing the soul back to the self: Soul retrieval in neo-shamanism. *Social Analysis* 48:157–173.
- Lindstrom, L. (1984) Doctor, lawyer, wise man, priest: Big-men and knowledge in Melanesia. *Man* 19:291–309.
- Loeb, E. M. (1924) The shaman of Niue. *American Anthropologist* 26:393–402.
- Loeb, E. M. (1929a) Mentawai religious cult. *University of California Publications in American Archaeology and Ethnology* 25:185–247.
- Loeb, E. M. (1929b) Shaman and seer. *American Anthropologist* 31:60–84.
- Loeb, E. M. (1929c) Mentawai myths. *Bijdragen tot de Taal-, Land-en Volkenkunde van Nederlandsch-Indië* 85:66–244.
- Loeb, E. M. (1935) *Sumatra, its history and people*. Verlag des Institutes für Völkerkunde der Universität Wien.

- Lombrozo, T. (2006) The structure and function of explanations. *Trends in Cognitive Sciences* 10:464–470. doi:10.1016/j.tics.2006.08.004
- Lonsdale, J. (1990) Mau Maus of the mind: Making Mau Mau and remaking Kenya. *The Journal of African History* 31:393–421.
- Luna, L. E. (1984) The concept of plants as teachers among four mestizo shamans of Iquitos, northeastern Perú. *Journal of Ethnopharmacology* 11:135–156.
- Lupfer, M. B., Tolliver, D., & Jackson, M. (1996) Explaining life-altering occurrences: A test of the “god-of-the-gaps” hypothesis. *Journal for the Scientific Study of Religion* 35:379–391.
- Macdonald, K. M. (1995) *The sociology of the professions*. Sage.
- Mace, R., Thomas, M. G., Wu, J., He, Q., Ji, T., & Tao, Y. (2018) Population structured by witchcraft beliefs. *Nature Human Behaviour* 2:39–44. doi:10.1038/s41562-017-0271-6
- Maher, T. V (2010) Threat, resistance, and collective action: The cases of Sobibór, Treblinka, and Auschwitz. *American Sociological Review* 75:252–272. doi:10.1177/0003122410365305
- Mair, L. (1969) *Witchcraft*.
- Malinowski, B. (1922) *Argonauts of the western Pacific: An account of native enterprise and adventure in the archipelagoes of Melanesian New Guinea*. George Routledge & Sons, Ltd.
- Malinowski, B. (1948) Magic, science, and religion. In: *Magic, science and religion, and other essays* pp. 17–92. Doubleday Anchor Books.
- Marschall, W. (2010) Nias and Simeulue. In: *Aceh, history, politics, and culture* eds. A. Graf, S. Schröter, & E. Wieringa, pp. 227–242. Institute of Southeast Asian Studies.
- Marshall, L. (1962) !Kung Bushman religious beliefs. *Africa* 32:221–252.
- Marshall, L. (1965) The !Kung Bushmen of the Kalahari Desert. In: *Peoples of Africa* ed. J. L. Gibbs, Jr., pp. 243–278. Holt, Rinehart, and Winston, Inc.
- Mashuri, A., & Zaduqisti, E. (2015) The effect of intergroup threat and social identity salience on the belief in conspiracy theories over terrorism in indonesia: Collective angst as a mediator. *International Journal of Psychological Research* 8:24–35.
- Massé, H., & Messner, C. A. (1954) *Persian beliefs and customs*. Human Relations Area Files.
- Matsa, D. A. (2011) Competition and product quality in the supermarket industry. *The Quarterly Journal of Economics* 126:1539–1591. doi:10.1093/qje/qjr031

- Mauss, M. (2001) *A general theory of magic*. Routledge.
- Mazzeo, M. J. (2003) Competition and service quality in the U.S. airline industry. *Review of Industrial Organization* 22:275–296.
- McCall, J. C. (2000) *Dancing histories: Heuristic ethnography with the Ohafia Igbo*. University of Michigan Press.
- McCauley, C., & Jacques, S. (1979) The popularity of conspiracy theories of presidential assassination: a bayesian analysis. *Journal of Personality and Social Psychology* 37:637–644. doi:10.1037/0022-3514.37.5.637
- McClenon, J. (1997) Shamanic healing, human evolution, and the origin of religion. *Journal for the Scientific Study of Religion* 36:345–354.
- McCullough, M. E., Kurzban, R., & Tabak, B. A. (2013) Cognitive systems for revenge and forgiveness. *Behavioral and Brain Sciences* 1–58. doi:10.1017/S0140525X11002160
- McCullough, M. E., & Willoughby, B. L. B. (2009) Religion, self-regulation, and self-control: Associations, explanations, and implications. *Psychological Bulletin* 135:69–93. doi:10.1037/a0014213
- McIlwraith, T. F. (1948) *The Bella Coola Indians, vol. 1*. University of Toronto Press. <http://ehrafworldcultures.yale.edu/document?id=ne06-001>
- McKay, R., & Efferson, C. (2010) The subtleties of error management. *Evolution and Human Behavior* 31:309–319. doi:10.1016/j.evolhumbehav.2010.04.005
- McKay, R. T., & Dennett, D. C. (2009) The evolution of misbelief. *Behavioral and Brain Sciences* 32:493–510; discussion 510–561. doi:10.1017/S0140525X09990975
- Mehr, S. A., Singh, M., Knox, D., Ketter, D. M., Pickens-Jones, D., Atwood, S., et al. (2019) Universality and diversity in human song. *Science* 366:eaax0868. doi:10.1126/science.aax0868
- Mehr, S. A., Singh, M., York, H., Glowacki, L., & Krasnow, M. M. (2018) Form and function in human song. *Current Biology* 28:356–368. doi:10.1016/j.cub.2017.12.042
- Mercier, H., & Sperber, D. (2011) Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Sciences* 34:57–74; discussion 74–111. doi:10.1017/S0140525X10000968
- Mesoudi, A. (2015) Cultural evolution: A review of theory, findings and controversies. *Evolutionary Biology* . doi:10.1007/s11692-015-9320-0

- Mesoudi, A. (2017) Pursuing Darwin's curious parallel: Prospects for a science of cultural evolution. *Proceedings of the National Academy of Sciences* 114:7853–7860. doi:10.1073/pnas.1620741114
- Métraux, A. (1942) Le shamanisme araucan. *Revista del Instituto de Antropología de la Universidad Nacional de Tucumán* 2:309–362.
- Métraux, A. (1943) The social organization and religion of the Mojo and Manasi. *Primitive Man* 16:1–30.
- Métraux, A. (1944) Les shamanisme chez les Indiens de l'Amérique du Sud Tropicale. *Acta Americana* 2:197–219, 320–341. doi:10.1017/CBO9781107415324.004
- Métraux, A. (1959) *Voodoo in Haiti*. Oxford University Press.
- Miceli, M., & Castelfranchi, C. (2007) The envious mind. *Cognition and Emotion* 21:449–479. doi:10.1080/02699930600814735
- Mikhailowskii, V. M., & Wadrop, O. (1895) Shamanism in Siberia and European Russia, being the second part of "Shamanstvo." *The Journal of the Anthropological Institute of Great Britain and Ireland* 24:62–100. http://rbedrosian.com/Folklore/Folklore_Shamanism_Russia_1895.pdf
- Minuendajú, C. (1946) Social organization and beliefs of the Botocudo of Eastern Brazil. *Southwestern Journal of Anthropology* 2:93–115.
- Mirowsky, J., & Ross, C. E. (1983) Paranoia and the structure of powerlessness. *American Sociological Review* 48:228–239.
- Mooney, J. (1896) The Ghost-Dance-Religion and the Sioux Outbreak of 1890. In: *Fourteenth Annual Report of the Bureau of Ethnology, 1892-1893* pp. 653–1140. Government Printing Office.
- Morgan, T. J. H., Laland, K. N., & Harris, P. L. (2015) The development of adaptive conformity in young children: Effects of uncertainty and consensus. *Developmental Science* 18:511–524. doi:10.1111/desc.12231
- Morgan, T. J. H., Rendell, L. E., Ehn, M., Hoppitt, W., & Laland, K. N. (2012) The evolutionary basis of human social learning. *Proceedings of the Royal Society. Series B, Biological Sciences* 279:653–662. doi:10.1098/rspb.2011.1172
- Munro, N. G. (1963) *Ainu creed and cult*. Columbia University Press.
- Murdock, G. P. (1980) *Theories of illness: A world survey*. University of Pittsburgh Press.

- Murray, M. A. (1921) *The witch cult in western Europe*. Clarendon Press.
- Muthukrishna, M., Shulman, B. W., Vasilescu, V., & Henrich, J. (2014) Sociality influences cultural complexity. *Proceedings of the Royal Society B* 281:20132511.
- Nadel, S. F. (1946) A study of shamanism in the Nuba Mountains. *The Journal of the Royal Anthropological Institute* 76:25–37.
- Nadel, Siegfried Frederick (1954) *Nupe religion*. Routledge & Paul.
- Narby, J., & Huxley, F. (Eds.) (2001) *Shamans through time: 500 years on the path to knowledge*. Penguin Putnam.
- Natrella, K. T. (2014) Witchcraft and women: A historiography of witchcraft as gender history. *Binghamton Journal of History* 15. <https://www.binghamton.edu/history/resources/journal-of-history/k-natrella.pdf>
- Needham, R. (1978) *Primordial characters*. University Press of Virginia.
- Nemeroff, C., & Rozin, P. (2000) The makings of the magical mind: The nature and function of sympathetical magical thinking. In: *Imagining the impossible: Magical, scientific, and religious thinking in children* pp. 1–34. doi:10.1017/CBO9780511571381.002
- Nettle, D. (2005) The wheel of fire and the mating game: Explaining the origins of tragedy and comedy. *Journal of Cultural and Evolutionary Psychology* 3:39–56. doi:10.1556/jcep.3.2005.1.3
- Newsom, Jr., J. D. (1984) *The Hebrew prophets*. Westminster John Knox Press.
- Nickerson, R. (1998) Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology* 2:175–220. doi:10.1037/1089-2680.2.2.175
- Norenzayan, A. (2013) *Big gods: How religion transformed cooperation and conflict*. Princeton University Press.
- Norenzayan, A., & Lee, A. (2010) It was meant to happen: Explaining cultural variations in fate attributions. *Journal of Personality and Social Psychology* 98:702–720. doi:10.1037/a0019141
- Norenzayan, A., & Shariff, A. F. (2008) The origin and evolution of religious prosociality. *Science* 322:58–62. doi:10.1126/science.1158757
- Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016) The cultural evolution of prosocial religions. *Behavioral and Brain Sciences* 39:e1. doi:10.1017/S0140525X14001356

- Novakovsky, S. (1924) Arctic or Siberian hysteria as a reflex of the geographic environment. *Ecology* 5:113–127.
- Ogilvie, S. (2014) The economics of guilds. *Journal of Economic Perspectives* 28:169–192. doi:10.1257/jep.28.4.169
- Ojamaa, T. (1997) The shaman as a zoomorphic human. *Folklore: Electronics Journal of Folklore* 4:77–92.
- Oliphant, S. G. (1913) The story of the strix: Ancient. *Transactions and Proceedings of the American Philological Association* 44:133–149.
- Oliphant, S. G. (1914) The story of the strix: Isidorus and the glossographers. *Transactions and Proceedings of the American Philological Association* 44:49–63.
- Olivares, M., & Cachon, G. P. (2009) Competing retailers and inventory: An empirical investigation of General Motors' dealerships in isolated U.S. markets. *Management Science* 9:1586–1604. doi:10.1287/mnsc.1090.1050
- Oliver, D. L. (1955) *A Solomon Island society: Kinship And leadership among the Siuai Of Bougainville*. Harvard University Press.
- Olsen, D. A. (1975) Music-induced altered states among Warao shamans. *Journal of Latin American Lore* 1:19–33.
- Olsen, D. A. (1998) Yanomamö (Yanomam and Sanima subtribes). In: *The Garland Encyclopedia of World Music, vol. 2: South America, Mexico, Central America, and the Caribbean* eds. D. A. Olsen & D. E. Sheehy, pp. 169–175. Garland Publishing, Inc.
- Olson, D. V. A., & Perl, P. (2001) Variations in strictness and religious commitment within and among five denominations. *Journal for the Scientific Study of Religion* 40:757–764. doi:10.1111/0021-8294.00090
- Ono, K. (1987) Superstitious behavior in humans. *Journal of the Experimental Analysis of Behavior* 47:261–271. doi:10.1901/jeab.1987.47-261
- Opler, M. E. (1941) *An Apache life-way: The economic, social, and religious institutions of the Chiricahua Indians*. University of Chicago Press.
- Oster, E. (2004) Witchcraft, weather and economic growth in Renaissance Europe. *Journal of Economic Perspectives* 18:215–228.
- Park, W. Z. (1938) *Shamanism in western North America: A study in cultural relationships*. Northwestern University Press.

- Parpola, M. (2000) *Kerala Brahmins in transition: A study of a Namputiri family*. Finnish Oriental Society.
- Partridge, C. (2005) *The re-enchantment of the West, vol. 2: Alternative spiritualities, sacralization, popular culture and occulture*. T&T Clark International.
- Peletz, M. G. (2006) Transgenderism and gender pluralism in Southeast Asia since early modern times. *Current Anthropology* 47:309–340.
- Peoples, H. C., Duda, P., & Marlowe, F. W. (2016) Hunter-gatherers and the origins of religion. *Human Nature* . doi:10.1007/s12110-016-9260-0
- Peoples, H. C., & Marlowe, F. W. (2012) Subsistence and the evolution of religion. *Human Nature* 23:253–269. doi:10.1007/s12110-012-9148-6
- Pepitone, A., & Saffiotti, L. (1997) The selectivity of nonmaterial beliefs in interpreting life events. *European Journal of Social Psychology* 27:23–35. doi:10.1002/(SICI)1099-0992(199701)27:1<23::AID-EJSP805>3.0.CO;2-B
- Peters, L. G., & Price-Williams, D. (1980) Towards an experiential analysis of shamanism. *American Ethnologist* 7:397–418.
- Pew Research Center (2017) *The changing global religious landscape*.
- PHPA (1995) *Siberut National Park Integrated Conservation and Development Management Plan, vol. 3: Appendices*. Jakarta, Indonesia.
- Pilling, A. R. (1958) *Law and feud in an aboriginal society of north Australia*. University of California, Berkeley.
- Pinker, S. (1997) *How the mind works*. W. W. Norton & Company.
- Posner, E. A. (2000) *Law and social norms*. Harvard University Press.
- Pospisil, L. J. (1958) *Kapauku Papuans and their law*. Yale University: Department of Anthropology.
- Power, E. A. (2017a) Discerning devotion: Testing the signaling theory of religion. *Evolution and Human Behavior* 38:82–91. doi:10.1016/j.evolhumbehav.2016.07.003
- Power, E. A. (2017b) Social support networks and religiosity in rural South India. *Nature Human Behavior* 1:0057. doi:10.1038/s41562-017-0057
- Powers, S. (1877) *Tribes of California*. Government Printing Office.

- Price, N. S. (2001) An archaeology of altered states: Shamanism and material culture. In: *The archaeology of shamanism* ed. N. Price, pp. 3–16. Routledge.
- Pulliam, H. R., & Dunford, C. (1980) *Programmed to learn: An essay on the evolution of culture*. Columbia University Press.
- Purzycki, B. G. (2013) The minds of gods: A comparative study of supernatural agency. *Cognition* 129:163–179. doi:10.1016/j.cognition.2013.06.010
- Purzycki, B. G. (2016) The evolution of gods' minds in the Tyva Republic. *Current Anthropology* 57:S000–S000. doi:10.1086/685729
- Purzycki, B. G., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., Willard, A. K., et al. (2016) Moralistic gods, supernatural punishment and the expansion of human sociality. *Nature* 1–10. doi:10.1038/nature16980
- Purzycki, B. G., & Jamieson-Lane, A. (2017) AnthroTools: An R Package for Cross-Cultural Ethnographic Data Analysis. *Cross-Cultural Research* 51:51–74. doi:10.1177/1069397116680352
- Purzycki, B. G., & Sosis, R. (2019) Resistance, subversion, and the absence of religion in traditional societies.
- Purzycki, B. G., & Willard, A. K. (2015) MCI theory: A critical discussion. *Religion, Brain & Behavior* 5981:1–42. doi:10.1080/2153599X.2015.1024915
- Purzycki, B. G., Willard, A. K., Kundtov, E., Apicella, C., Atkinson, Q., Bolyanatz, A., et al. (2020) The Moralization Bias of Gods' Minds: A Cross-Cultural Test.
- Putnam, P. (1948) The Pygmies of the Ituri Forest. In: *A reader in general anthropology* ed. Carleton S. Coon, pp. 322–342. Henry Holt and Company.
- Qirko, H. (2002) The institutional maintenance of celibacy. *Current Anthropology* 43:321–329.
- R Core Team (2015) R: A language and environment for statistical computing. R Foundation for Statistical Computing. <http://www.r-project.org/>
- Radcliffe-Brown, A. R. (1964) *The Andaman Islanders* First Free. The Free Press.
- Raguram, R., Venkateswaran, A., Ramakrishna, J., & Weiss, M. G. (2002) Traditional community resources for mental health: A report of temple healing from India. *British Medical Journal* 325:38–40. doi:10.1136/bmj.325.7354.38
- Raihani, N. J., & Bell, V. (2017) Paranoia and the social representation of others: A large-scale game theory approach. *Scientific Reports* 7:4544. doi:10.1038/s41598-017-04805-3

- Raihani, N. J., & Bell, V. (2018) An evolutionary perspective on paranoia. *Nature Human Behaviour* . doi:10.1038/s41562-018-0495-0
- Rasmussen, K. (1929) *Intellectual culture of the Iglulik Eskimos*. Gyldendalske Boghandel, Nordisk Forlag.
- Rasmussen, K. (1930) *Observations on the intellectual culture of the Caribou Eskimos*. Gyldendalske Boghandel, Nordisk Forlag.
- Reichel-Dolmatoff, G. (1971) *Amazonian cosmos: The sexual and religious symbolism of the Tukano Indians*. University of Chicago Press.
- Reichel-Dolmatoff, G. (1976) Training for the priesthood among the Kogi of Colombia. In: *Enculturation in Latin America: An anthology* pp. 265–288. UCLA Latin American Center Publications.
- Reichel-Dolmatoff, G. (1997) *The Kogi: A tribe of the Sierra Nevada de Santa Marta, Colombia, vol. 1*. HRAF.
- Reynolds, B. (1963) *Magic, divination and witchcraft among the Barotse of northern Rhodesia*. Chatto and Windus.
- Richards, A. I. (1935) A modern movement of witch-finders. *Africa* 8:448–461.
- Richardson, J. (1940) *Law and status among the Kiowa Indians*. J. J. Augustin Publisher.
- Richerson, P., Baldini, R., Bell, A., Demps, K., Frost, K., Hillis, V., et al. (2016) Cultural group selection plays an essential role in explaining human cooperation: A sketch of the evidence. *Behavioral and Brain Sciences* 39:e30. doi:10.1017/S0140525X1400106X
- Richerson, P. J., & Boyd, R. (2008) *Not by genes alone: How culture transformed human evolution*. University of Chicago Press.
- Riesenberg, S. H. (1948) Magic and medicine in Ponape. *Southwestern Journal of Anthropology* 4:406–429.
- Ritzenthaler, R. (1963) Primitive therapeutic practices among the Wisconsin Chippewa. In: *Man's image in medicine and anthropology* ed. I. Galdston, pp. 316–334. International Universities Press.
- Robbins, J. (2004) The globalization of Pentecostal and charismatic Christianity. *Annual Review of Anthropology* 33:117–43. doi:10.1146/annurev.anthro.32.061002.093421
- Roberts, M. E., Tchaturia, K., Stahl, D., Southgate, L., & Treasure, J. (2007) A systematic review and meta-analysis of set-shifting ability in eating disorders. *Psychological Medicine*

37:1075–1084. doi:10.1017/S0033291707009877

- Rock, J. F. (1959) Contributions to the shamanism of the Tibetan-Chinese borderland. *Anthropos* 54:796–818.
- Roes, F., & Raymond, M. (2003) Belief in moralizing gods. *Evolution and Human Behavior* 24:126–135. doi:10.1007/s12110-014-9214-3
- Rogers, D. S., & Ehrlich, P. R. (2008) Natural selection and cultural rates of change. *Proceedings of the National Academy of Sciences of the United States of America* 105:3416–3420. doi:10.1073/pnas.0711802105
- Rogers, E. (2003) *The diffusion of innovations*. The Free Press.
- Rogers, S. L. (1982) *The shaman: His symbols and his healing power*. Charles C. Thomas.
- Rosnow, R. L. (1991) Inside rumor: A personal journey. *American Psychologist* 46:484–496.
- Rossano, M. J. (2007) Supernaturalizing social life: Religion and the evolution of human cooperation. *Human Nature* 18:272–294. doi:10.1007/s12110-007-9002-4
- Roth, W. E. (1915) An inquiry into the animism and folk-lore of the Guiana Indians. *Annual Report of the Bureau of American Ethnology* 30:103–386.
- Rothschild, Z. K., Landau, M. J., Sullivan, D., & Keefer, L. A. (2012) A Dual-Motive Model of Scapegoating : Displacing Blame to Reduce Guilt or Increase Control. 102:1148–1163. doi:10.1037/a0027413
- Rouget, G. (1985) *Music and trance: A theory of the relations between music and possession*. The University of Chicago Press.
- Rozin, P., Millman, L., & Nemeroff, C. (1986) Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology* 50:703–712.
- Rozin, P., & Nemeroff, C. (2002) Sympathetic magical thinking: The contagion and similarity “heuristics.” In: *Heuristics and biases: The psychology of intuitive judgment* eds. T. Gilovich, D. Griffin, & D. Kahneman, pp. 201–216. Cambridge University Press. doi:10.1017/CBO9780511808098.013
- Russell, F. (1908) The Pima Indians. *Annual Report of the Bureau of American Ethnology* 26. <https://archive.org/details/pimaindians01russgoog>
- Saalfeld, V., Ramadan, Z., Bell, V., & Raihani, N. J. (2018) *Differences in social rank and political affiliation encourage paranoid attributions*. <https://psyarxiv.com/jxkv3/>

- Saler, M. (2006) Modernity and enchantment: A historiographic review. *The American Historical Review* 111:692–716.
- Samuel, G. (1990) *Mind, body and culture: Anthropology and the biological interface*. Cambridge University Press.
- Samuel, G. (1993) *Civilized shamans: Buddhism in Tibetan societies*. Smithsonian Institution.
- Sanders, A. (1995) *A deed without a name: The witch in society and history*. Berg Publishers.
- Sax, W. (2014) Ritual healing and mental health in India. *Transcultural Psychiatry* 51:829–849. doi:10.1177/1363461514524472
- Sax, W. S. (2009) *God of justice: Ritual healing and social justice in the Central Himalayas* Vol. 1. Oxford University Press. doi:10.1017/CBO9781107415324.004
- Schapera, I. (1952) Sorcery and witchcraft in Bechaunaland. *African Affairs* 51:41–52.
- Schefold, R. (1972) Religious involution: internal change, and its consequences, in the taboo system of the Mentawaians. *Tropical Man* 5:46–81.
- Schefold, R. (1982) The culinary code in the puliaijat ritual of the Mentawaians. *Bijdragen tot de Taal-, Land-en Volkenkunde* 138:64–97. doi:10.1163/22134379-90003482
- Schefold, R. (1988) *Lia: Das grosse Ritual auf den Mentawai-Inseln (Indonesien)*. Dietrich Reimer Verlag.
- Schefold, R. (2007) Ambivalent blessings: Head-hunting on Siberut (Mentawai) in a comparative Southeast Asian perspective. *Anthropos* 102:479–494.
- Scheub, H. (1975) *The Xhosa ntsomi*. Clarendon Press.
- Schlag, K. H. (1998) Why imitate, and if so, how? A boundedly rational approach to multi-armed bandits. *Journal of Economic Theory* 78:130–156.
- Schlag, K. H. (1999) Which one should I imitate? *Journal of Mathematical Economics* 31:493–522.
- Schnall, S., Haidt, J., Clore, G. L., & Jordan, A. H. (2008) Disgust as embodied moral judgment. *Personality and Social Psychology Bulletin* 34:1096–1109. doi:10.1177/0146167208317771
- Schröder, D. (1952) Zur Religion der Tujen des Sininggebietes (Kukunor). *Anthropos* 47:1–79.
- Scott-Phillips, T., Blanke, S., & Heinz, C. (2018) Four misunderstandings about cultural

- attraction. *Evolutionary Anthropology* 27:162–173. doi:10.1002/evan.21716
- Scribner, R. W. (1993) The Reformation, popular magic, and the “disenchantment of the world.” *The Journal of Interdisciplinary History* 23:475–495.
- Shariff, A. F., & Rhemtulla, M. (2012) Divergent Effects of Beliefs in Heaven and Hell on National Crime Rates. *PLoS ONE* 7:e39048. doi:10.1371/journal.pone.0039048
- Shariff, A. F., Willard, A. K., Andersen, T., & Norenzayan, A. (2015) Religious priming: A meta-analysis with a focus on prosociality. *Personality and Social Psychology Review* . doi:10.1177/1088868314568811
- Shennan, S. (2001) Demography and cultural innovation: a model and its implications for the emergence of modern human culture. *Cambridge Archaeology Journal* 11:5–16.
- Sieroszewski, W. (1902) Du chamanisme d’après les croyances des Yakoutes (suite). *Revue de l’histoire des religions* 46:299–338.
- Silverman, J. (1967) Shamans and acute schizophrenia. *American Anthropologist* 69:21–31. doi:10.1525/aa.1967.69.1.02a00030
- Singer, A. (1981) *Witchcraft among the Azande*. Royal Anthropological Institute.
- Singh, M. (2018) The cultural evolution of shamanism. *Behavioral and Brain Sciences* 41:e66. doi:10.1017/S0140525X17001893
- Singh, M. (2019a) *The sympathetic plot: Identifying and explaining a universal narrative structure*. <https://osf.io/p8q7a/>
- Singh, M. (2019b, October 8) Orphans and their quests. *Aeon* . <https://aeon.co/essays/what-makes-the-sympathetic-plot-a-universal-story-type>
- Singh, M. (2019c, October 30) People suspected of witchcraft are still being persecuted and killed. *Vice* . https://www.vice.com/en_us/article/evj7zw/witchcraft-related-violence-un
- Singh, M., Glowacki, L., & Wrangham, R. W. (2016) Self-interested agents create, maintain, and modify group-functional culture. *Behavioral and Brain Sciences* 39:e30, 40–41. doi:10.1017/S0140525X15000242
- Singh, M., & Henrich, J. (2019) Self-denial by shamans promotes perceptions of religious credibility. PsyArXiv. <https://psyarxiv.com/kvtqp>
- Singh, M., Kaptchuk, T. J., & Henrich, J. (2019) Small gods, rituals, and cooperation: The Mentawai crocodile spirit Sikaoinan. *SocArXiv* . doi:10.31235/osf.io/npkdy

- Singh, M., Wrangham, R. W., & Glowacki, L. (2017) Self-interest and the design of rules. *Human Nature* 28:457–480. doi:10.1007/s12110-017-9298-7
- Skaria, A. (1997) Women, witchcraft and gratuitous violence in colonial western India. *Past & Present* 155:109–141.
- Skinner, B. Y. B. F. (1948) “Superstition” in the pigeon. *Journal of Experimental Psychology* 38:168–172.
- Slingerland, E., & Sullivan, B. (2017) Durkheim with data: The Database of Religious History. *Journal of the American Academy of Religion* 85:312–347. doi:10.1093/jaarel/lfw012
- Smith, R. H., & Kim, S. H. (2007) Comprehending envy. *Psychological Bulletin* 133:46–64. doi:10.1037/0033-2909.133.1.46
- Smith, R. H., Turner, T. J., Garonzik, R., Leach, C. W., Urch-Druskat, V., & Weston, C. M. (1996) Envy and schadenfreude. *Personality and Social Psychology Bulletin* 22:158–168. doi:10.1177/01461672962222005
- Smith, V. (2007) *Clean: A history of personal hygiene and purity*. Oxford University Press.
- Soler, M. (2016) The Faith of Sacrifice: Leadership Trade-Offs in an Afro-Brazilian Religion. *Human Nature* 27:372–394. doi:10.1007/s12110-016-9264-9
- Sosis, R. (2004) The adaptive value of religious ritual. *American Scientist* 92:166. doi:10.1511/2004.46.928
- Sosis, R. (2006) Religious behaviors, badges, and bans: Signaling theory and the evolution of religion. In: *Where god and science meet: How brain and evolutionary studies alter our understanding of religion* ed. P. McNamara, Vol. 1.
- Sosis, R., & Alcorta, C. (2003) Signaling, Solidarity, and the Sacred: The Evolution of Religious Behavior. *Evolutionary Anthropology* 12:264–274. doi:10.1002/evan.10120
- Sosis, R., Kress, H. C., & Boster, J. S. (2007) Scars for war: evaluating alternative signaling explanations for cross-cultural variance in ritual costs. *Evolution and Human Behavior* 28:234–247. doi:10.1016/j.evolhumbehav.2007.02.007
- Spencer, B., & Gillen, F. J. (1899) *The native tribes of central Australia*. Macmillan and Co., Ltd. https://books.google.com.au/books/about/The_Native_Tribes_of_Central_Australia.html?id=0RYXAAAAYAAJ
- Spencer, B., & Gillen, F. J. (1904) *The northern tribes of central Australia*. Macmillan and Co. <https://archive.org/details/northerntribesc00gillgoog>

- Sperber, D. (1985) Anthropology and psychology: Towards an epidemiology of representations. *Man* 20:73–89.
- Sperber, D. (1996a) *Explaining culture: A naturalistic approach*. Blackwell Publishers Ltd.
- Sperber, D. (1996b) Why are perfect animals, hybrids and monsters food for symbolic thought? *Method & Theory in the Study of Religion* 8:143–169.
- Sperber, D., Clément, F., Heintz, C., Mascaro, O., Mercier, H., Origgi, G., & Wilson, D. (2010) Epistemic vigilance. *Mind and Language* 25:359–393. doi:10.1111/j.1468-0017.2010.01394.x
- Sperber, D., & Hirschfeld, L. A. (2004) The cognitive foundations of cultural stability and diversity. *Trends in Cognitive Sciences* 8:40–46. doi:10.1016/j.tics.2003.11.002
- Sporns, O. (2011) The human connectome: A complex network. *Annals of the New York Academy of Science* 1224:109–125. doi:10.1111/j.1749-6632.2010.05888.x
- Stauder, J. (1972) Anarchy and ecology: Political society among the Majangir. *Southwestern Journal of Anthropology* 28:153–168.
- Stefánsson, V. (1914) The Stefánsson-Anderson Arctic Expedition of the American Museum: Preliminary ethnological report. *Anthropological Papers of the American Museum of Natural History* 14:1–395.
- Stern, T. (1965) *The Klamath Tribe: A people and their reservation*. University of Washington Press.
- Suchman, M. C. (1989) Invention and ritual: Note on the interrelation of magic and intellectual property in preliterate societies. *Columbia Law Review* 89:1264–1294.
- Suedfeld, P. (1980) *Restricted environmental stimulation: Research and clinical applications*. John Wiley & Sons.
- Sullivan, D., Landau, M. J., Branscombe, N. R., & Rothschild, Z. K. (2012) Competitive victimhood as a response to accusations of ingroup harm doing. *Journal of Personality and Social Psychology* 102:778–795. doi:10.1037/a0026573
- Swanson, G. E. (1964) *The birth of the gods: The origin of primitive beliefs*. The University of Michigan Press.
- Swanton, J. R. (1905) Contributions to the ethnology of the Haida. *Memoirs of the American Museum of Natural History* 8. doi:10.1038/117619a0
- Talayasva, D. C., & Simmons, L. W. (1942) *Sun Chief: The autobiography of a Hopi Indian*. Yale

University Press.

- Teit, J. (1900) The Thompson Indians of British Columbia. *Memoirs of the American Museum of Natural History* 2:163–392.
- ten Brinke, L., Porter, S., & Baker, A. (2012) Darwin the detective: Observable facial muscle contractions reveal emotional high-stakes lies. *Evolution and Human Behavior* 33:411–416. doi:10.1016/j.evolhumbehav.2011.12.003
- Tennen, H., & Affleck, G. (1990) Blaming others for threatening events. *Psychological Bulletin* 108:209–232. doi:10.1037/0033-2909.108.2.209
- Tessmann, G. (1930) *Die Indianer nordost-Perus: grundlegende forschungen für eine systematische kulturkunde*. Friederichsen, de Gruyter & Co.
- Tetlock, P. E. (2003) Thinking the unthinkable: sacred values and taboo cognitions. *Trends in Cognitive Sciences* 7:320–324. doi:10.1016/S1364-6613(03)00135-9
- Thalbitzer, W. (1909) The heathen priests of east Greenland (angakut). In: *Verhandlungen des XVI. Internationalen Amerikanisten-Kongresses* pp. 447–464. A. Hartleben's Verlag.
- Thomas, K. (1971) *Religion and the decline of magic*. Charles Scribner's Sons.
- Tooby, J., & Cosmides, L. (1996) Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. *Proceedings of the British Academy* 88:119–143. doi:10.1002/(SICI)1520-6300(1998)10:5<681::AID-AJHB16>3.3.CO;2-I
- Trawalter, S., Hoffman, K. M., & Waytz, A. (2012) Racial bias in perceptions of others' pain. *PLoS One* 7:1–8. doi:10.1371/journal.pone.0048546
- Trivers, R. (2000) The elements of a scientific theory of self-deception. *Annals of the New York Academy of Sciences* 907:114–31. <http://www.ncbi.nlm.nih.gov/pubmed/10818624>
- Trivers, R. (2011) *The folly of fools*. Basic Books.
- Tulius, J. (2012) *Family stories: oral tradition, memories of the past, and contemporary conflicts over land in Mentawai - Indonesia*. Leiden University.
- Tumonggor, M. K., Karafet, T. M., Hallmark, B., Lansing, J. S., Sudoyo, H., Hammer, M. F., & Cox, M. P. (2013) The Indonesian archipelago: an ancient genetic highway linking Asia and the Pacific. *Journal of Human Genetics* 58:165–73. doi:10.1038/jhg.2012.154
- Turner, V. W. (1964) Witchcraft and sorcery: Taxonomy versus dynamics. *Africa* 34:314–325.
- Tylor, E. B. (1883) *Primitive culture: Researchers into the development of mythology, philosophy,*

religion, language, art and custom Third Amer. Henry Holt and Company.

- Tylor, E. B. (1920) *Primitive culture: Researches into the development of mythology, philosophy, religion, language, art, and custom, vol. 2* 6th Ed. John Murray.
<https://archive.org/details/primitiveculture02tylouoft>
- Vaitl, D., Birbaumer, N., Gruzelier, J., Jamieson, G., Kotchoubey, B., Kubler, A., et al. (2005) Psychobiology of altered states of consciousness. *Psychological Bulletin* 131:98–127.
doi:10.1037/0033-2909.131.1.98
- van Bergen, Y., Coolen, I., & Laland, K. N. (2004) Nine-spined sticklebacks exploit the most reliable source when public and private information conflict. *Proceedings. Biological sciences / The Royal Society* 271:957–962. doi:10.1098/rspb.2004.2684
- van de Ven, N., Hoogland, C. E., Smith, R. H., van Dijk, W. W., Breugelmans, S. M., & Zeelenberg, M. (2015) When envy leads to schadenfreude. *Cognition and Emotion* 29:1007–1025. doi:10.1080/02699931.2014.961903
- van Gennep, A. (1961) *The rites of passage*. University of Chicago Press.
- van Ommeren, M., Komproe, I., Cardena, E., Thapa, S. B., Prasain, D., de Jong, J. T. V. M., & Sharma, B. (2004) Mental illness among Bhutanese shamans in Nepal. *The Journal of Nervous and Mental Disease* 192:313–317. doi:10.1097/01.nmd.0000122381.09491.7f
- van Patten, J. K. (1983) Magic, prophecy, and law of treason in Reformation England. *The American Journal of Legal History* 27:1–32.
- van Prooijen, J.-W., & Douglas, K. M. (2017) Conspiracy theories as part of history: The role of societal crisis situations. *Memory Studies* 10:323–333. doi:10.1177/1750698017701615
- van Prooijen, J.-W., & Jostmann, N. B. (2013) Belief in conspiracy theories: The influence of uncertainty and perceived morality. *European Journal of Social Psychology* 43:109–115.
doi:10.1002/ejsp.1922
- van Prooijen, J.-W., & van Dijk, E. (2014) When consequence size predicts belief in conspiracy theories: The moderating role of perspective taking. *Journal of Experimental Social Psychology* 55:63–73. doi:10.1016/j.jesp.2014.06.006
- Victor, J. S. (1989) A rumor-panic about a dangerous satanic cult in western New York. *New York Folklore* 15:23–49.
- Vidal, F. (2007) Miracles, science, and testimony in post-Tridentine saint-making. *Science in Context* 20:481–508. doi:10.1017/S0269889707001391
- Vitebsky, P. (1995) *The shaman: Voyages of the soul trance, ecstasy, and healing from Siberia to the*

- Amazon*. Little, Brown and Company.
- Vyse, S. (2014) *Believing in magic: The psychology of superstition*. Oxford University Press.
- Walker, Jr., D. E. (1967) Nez Perce sorcery. *Ethnology* 6:66–96.
- Walker, R. S., Wichmann, S., Mailund, T., & Atkisson, C. J. (2012) Cultural phylogenetics of the Tupi language family in lowland South America. *PLoS ONE* 7:e35025. doi:10.1371/journal.pone.0035025
- Wallace, A. F. C. (1966) *Religion: An anthropological view*. Random House.
- Wallace, E., & Hoebel, E. A. (1952) *The Comanches: Lords of the south Plains*. University of Oklahoma Press.
- Wallace, W. J., & Taylor, E. S. (1950) Hupa sorcery. *Southwestern Journal of Anthropology* 6:188–196.
- Walraven, B. C. A. (1980) The social significance of sorcery and sorcery accusations in Korea. *Asiatische Studien: Zeitschrift der Schweizerischen Asiengesellschaft* 34:69–90.
- Walsham, A. (2008) The Reformation and “the disenchantment of the world” reassessed. *The Historical Journal* 51:497–528.
- Warner, W. L. (1958) *A black civilization: A social study of an Australian tribe*. Harper & Brothers.
- Watts, J., Greenhill, S. J., Atkinson, Q. D., Currie, T. E., Bulbulia, J., & Gray, R. D. (2015) Broad supernatural punishment but not moralizing high gods precede the evolution of political complexity in Austronesia. *Proceedings of the Royal Society B* 282:20142556.
- Watts, J., Sheehan, O., Atkinson, Q. D., Bulbulia, J., & Gray, R. D. (2016) Ritual human sacrifice promoted and sustained the evolution of stratified societies. *Nature* 1–7. doi:10.1038/nature17159
- Watts, J., Sheehan, O., Greenhill, S. J., Gomes-Ng, S., Atkinson, Q. D., Bulbulia, J., & Gray, R. D. (2015) Pulu: Database of Austronesian supernatural beliefs and practices. *PLoS ONE* 10:1–17. doi:10.1371/journal.pone.0136783
- Wavell, S., Butt, A., & Epton, N. (1988) *Trances*. Antara Book Company.
- Waytz, A., Hoffman, K. M., & Trawalter, S. (2014) A superhumanization bias in Whites’ perception of Blacks. *Social Psychological and Personality Science* 1–8. doi:10.1177/1948550614553642
- Weltfish, G. (1965) *The lost universe: With a closing chapter on “The universe regained.”* Basic

Books.

- White, C. J. M., & Norenzayan, A. (2019) Mental models: Associations between beliefs about karma and God, moral values, and prosocial behavior. *PsyArxiv* .
<https://psyarxiv.com/a7398/>
- Whitehead, N., & Wright, R. (Eds.) (2004) *In darkness and secrecy: The anthropology of assault sorcery and witchcraft in Amazonia*. Duke University Press.
- Whitehouse, H. (2002) Modes of religiosity: Towards a cognitive explanation of the sociopolitical dynamics of religion. *Method & Theory in the Study of Religion* 293–315.
- Whitehouse, H., & Lanman, J. A. (2014) The Ties That Bind Us. *Current Anthropology* 55:674–695. doi:10.1086/678698
- Whiting, B. B. (1950) *Paiute sorcery*. The Viking Fund Inc.
- Whitson, J. A., & Galinsky, A. D. (2008) Lacking control increases illusory pattern perception. *Science* 322:115–117. doi:10.1126/science.1159845
- Wieringa, S. E. (2011) Sexual slander and the 1965/66 mass killings in Indonesia: Political and methodological considerations. *Journal of Contemporary Asia* 41:544–565.
doi:10.1080/00472336.2011.610613
- Wiessner, P. (2002) The vines of complexity: Egalitarian structures and the institutionalization of inequality among the Enga. *Current Anthropology* 43:233–269.
- Wilbert, J. (1972) *Survivors of Eldorado: Four Indian cultures of South America*. Praeger Publishers.
- Wilbert, J. (1987) *Tobacco and shamanism in South America*. Yale University Press.
- Wildman, W. J., & Sosis, R. (2011) Stability of groups with costly beliefs and practices. *Journal of Artificial Societies and Social Simulation* 14:6.
- Willard, A. K., & Cingl, L. (2017) Testing theories of secularization and religious belief in the Czech Republic and Slovakia. *Evolution and Human Behavior* 38:604–615.
doi:10.1016/j.evolhumbehav.2017.01.002
- Willard, A. K., Henrich, J., & Norenzayan, A. (2016) Memory and belief in the transmission of counterintuitive content. *Human Nature* 27:221–243. doi:10.1007/s12110-016-9259-6
- Wilson, D. S. (2002) *Darwin's cathedral: evolution, religion, and the nature of society*. University of Chicago Press.
- Wilson, E. O. (1998) *Consilience: The unity of knowledge*. Knopf.

- Wilson, M. H. (1951) Witch beliefs and social structure. *American Journal of Sociology* 56:307–313.
- Winkelman, M. (1986) Trance states: A theoretical model and cross-cultural analysis. *Ethos* 14:174–203.
- Winkelman, M. (2000) *Shamanism: The neural ecology of consciousness and healing*. Bergin & Garvey.
- Winkelman, M. (2002) Shamanism and cognitive evolution. *Cambridge Archaeological Journal* 12:71–101. doi:10.1017/S00959774302000045
- Winkelman, M. (2004) Shamanism as the original neurotheology. *Zygon* 39:193–217. doi:10.1111/j.1467-9744.2004.00566.x
- Winkelman, M. J. (1986) Magico-religious practitioner types and socioeconomic conditions. *Behavior Science Research* 20:17–46. doi:10.1177/106939718602000102
- Winkelman, M. J. (1990) Shamans and other “magico-religious” healers: A cross-cultural study of their origins, nature, and social transformations. *Ethos* 18:308–352.
- Winkelman, M. J., & White, D. (1987) A cross-cultural study of magico-religious practitioners and trance states: Database. *HRAF Research Series in Quantitative Cross-Cultural Data III*. doi:10.13140/RG.2.1.4381.2720
- Wohl, M., & Branscombe, N. R. (2009) Group threat, collective angst, and ingroup forgiveness for the war in Iraq. *Political Psychology* 30:193–217. doi:10.1111/j.1467-9221.2008.00688.x
- Woolley, J. D., Boerger, E. A., & Markman, A. B. (2004) A visit from the Candy Witch: Factors influencing young children’s belief in a novel fantastical being. *Developmental Science* 7:456–468. doi:10.1111/j.1467-7687.2004.00366.x
- Woolley, J. D., Cornelius, C. A., & Lacy, W. (2011) Developmental changes in the use of supernatural explanations for unusual events. *Journal of Cognition & Culture* 11:311–337. doi:10.1163/156853711X591279
- Wright, R. (2009) *The evolution of god*. Little, Brown and Company.