

This Target Article has been accepted for publication and is currently under commentary. This article has not yet been copyedited and proofread. The article may be cited using its doi (About doi), but it must be made clear that it is not the final version.

The cultural evolution of shamanism

Manvir Singh

Department of Human Evolutionary Biology, Harvard University, Cambridge, MA 02138, USA

manvirsingh@fas.harvard.edu

Short abstract

Shamanism exists in most human societies, systematically exhibits particular features, and likely represents the first institutionalized division of labor beyond age and sex. This paper presents a cultural evolutionary theory to explain why. Competition among practitioners and the desire for individuals to control uncertain outcomes select for plausible-seeming superstitions adapted to human psychological biases. This drives claims of supernatural powers, transformation practices, and trance, and accounts for why shamanism is the only profession in many small-scale societies. I use this theory to explain how variation in social and intellectual conditions affects the form or existence of shamanism.

Long 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.

Keywords: anthropology; culture; division of labor; evolution; magic; professions; religion; shamanism; trance

A patient, debilitated by the bulbous, blood-bloated ghosts swarming through her body, sits in an unlit igloo¹. 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.

1. Introduction

The Inuit *angakok*, like the Mentawai *sikerei* (Loeb 1929), 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 (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)²; 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 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 (Frecska 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 (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’³ (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; 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 error management: Johnson et al. 2013; McKay and Efferson 2010)⁴. 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; 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 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).

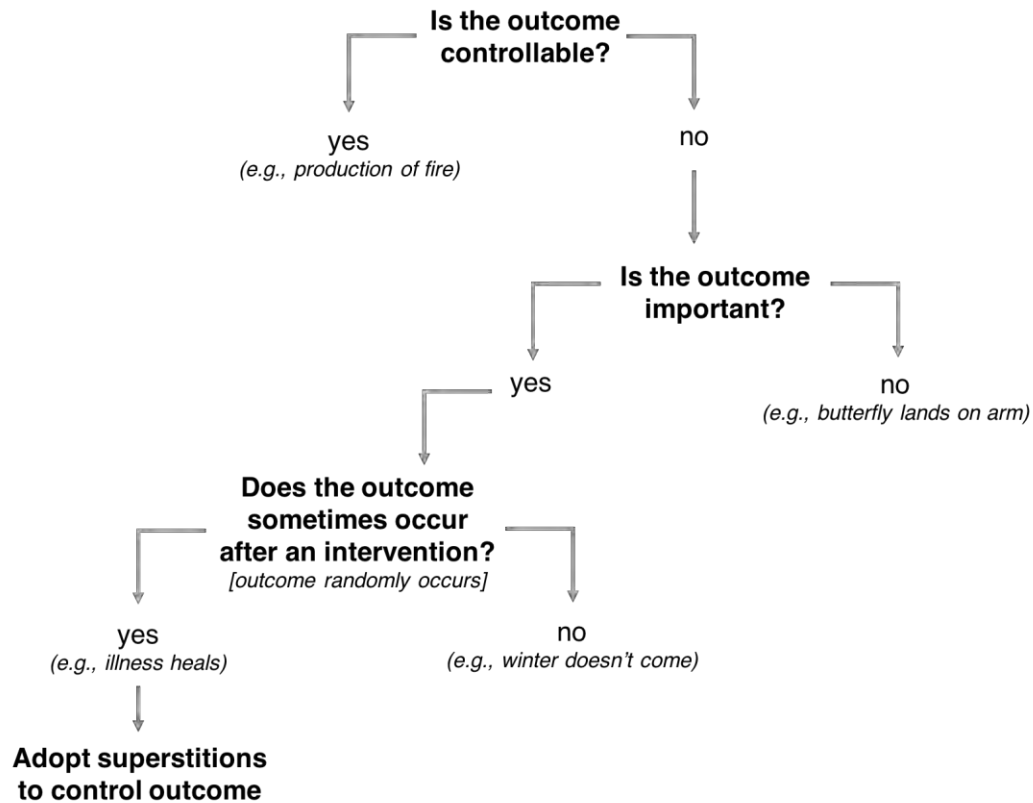


Fig. 1. Kinds of outcomes. Individuals will develop superstitions to influence or learn about the timing of uncertain outcomes (uncontrollable, important, and random). The importance of the outcome to the individual's perceived welfare and the frequency with which it occurs after an event are both continuous 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 others⁵ (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 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 psychology⁶. 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 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; 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 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; 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 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). 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.

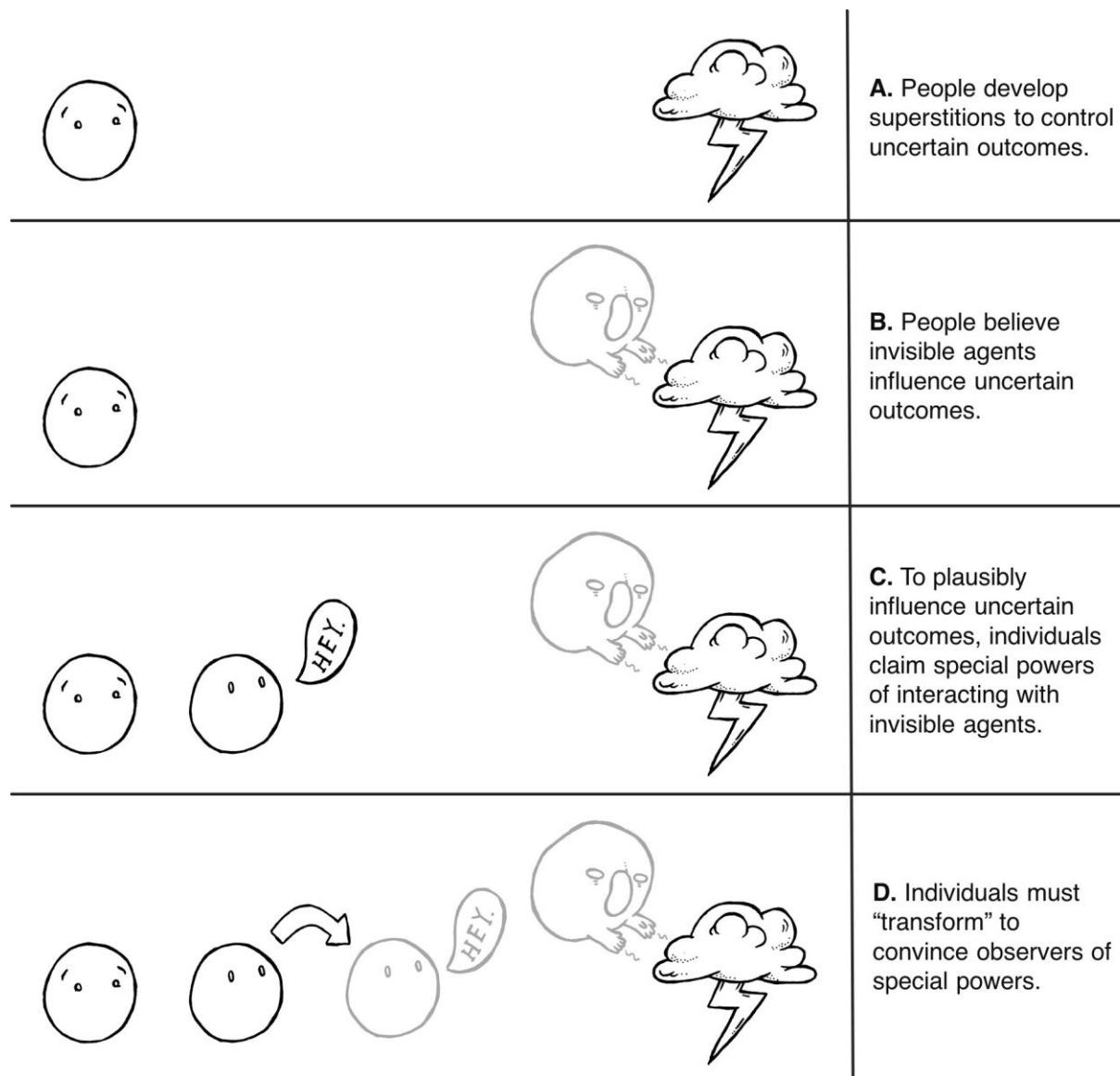


Fig. 2. Individuals' desire to find treatments selects for interventions that are the most plausible. When outcomes of uncertainty are controlled by invisible forces, cultural selection will favor individuals who claim special abilities of interacting with those forces. To increase their credibility, 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 effect⁷ (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).

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 domains⁸. Figure 3 presents the findings.

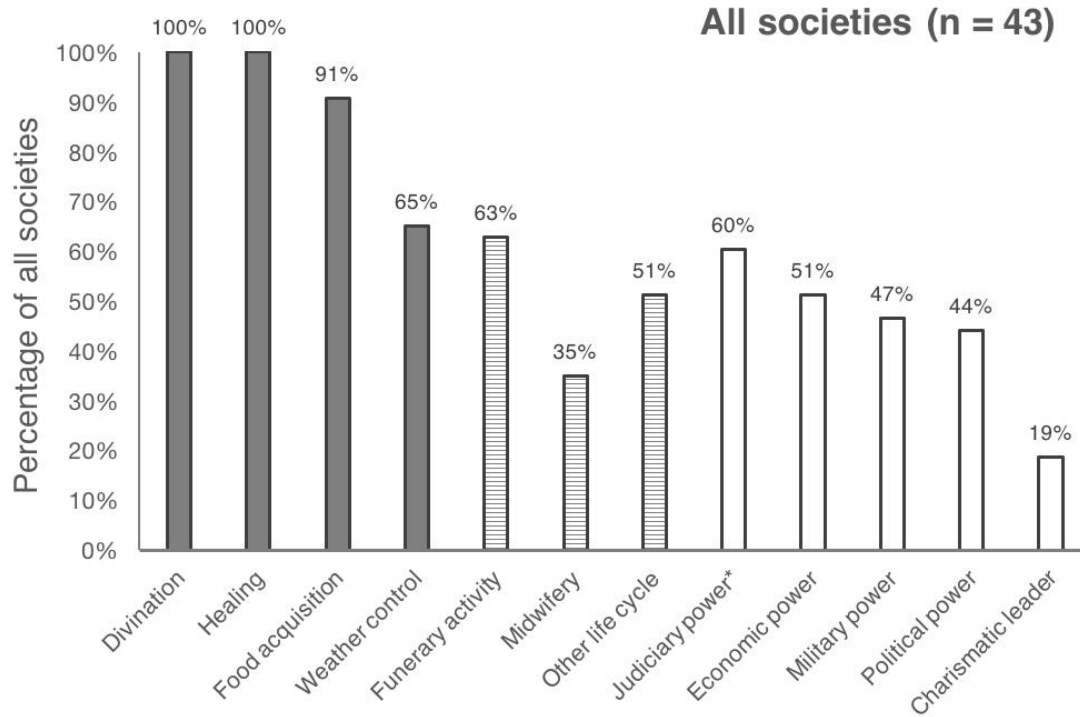
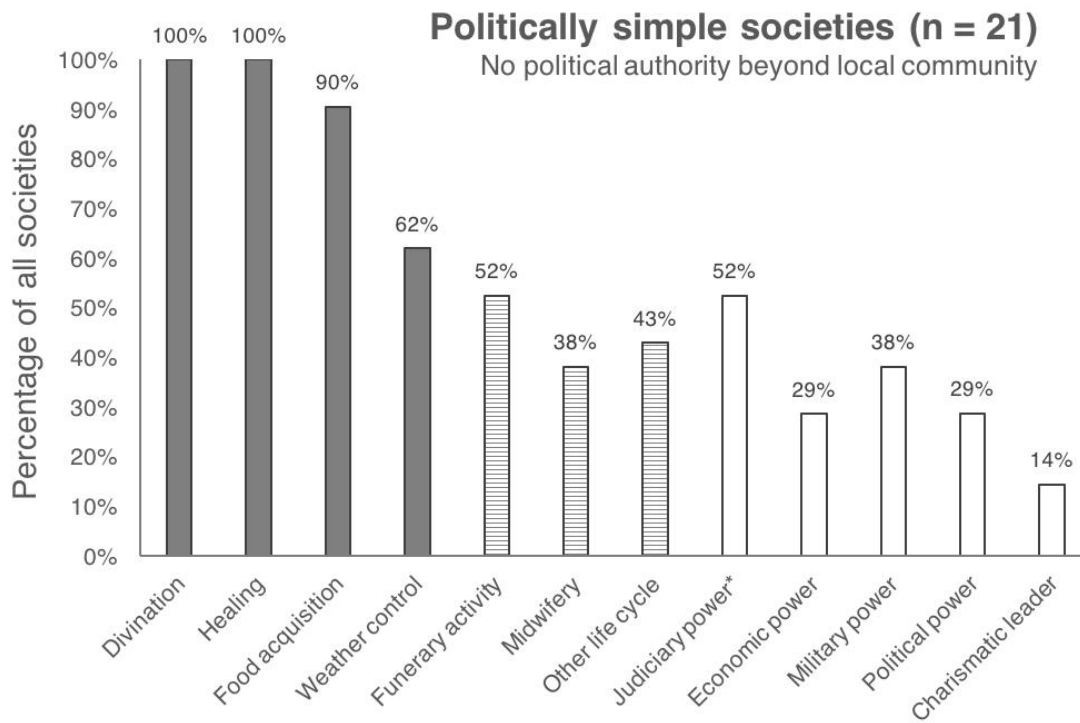
A**B**

Fig. 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 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 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 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”⁹. 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 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 state¹⁰. 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

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 1 presents a selection of examples.

Table 1. Some displays of superhuman abilities that occur during trance performances

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

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

<i>PRACTICE</i>	<i>SELECTED SOCIETIES (with sources)</i>
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), Wudjbalug (Elkin 1977, p. 75)
Spontaneous biological or behavioral anomaly, including serious illness, excessive bleeding, self-harm, isolation, epileptic fits, and frenzies	Buryats (Mikhailowskii and Wadrop 1895, p. 87), Evenks (Mikhailowskii and Wadrop 1895, p. 85), 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, claims of surgery or dismemberment by spirits or other medicine-men, debilitating illness, and bodily insertions of crystals, magical shells, or dust (Table 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).

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)¹¹, at least one trance-practitioner in 49% of societies 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 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) (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-set¹², 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 Briggie: 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: Riesenber 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. in press) – 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 4 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).

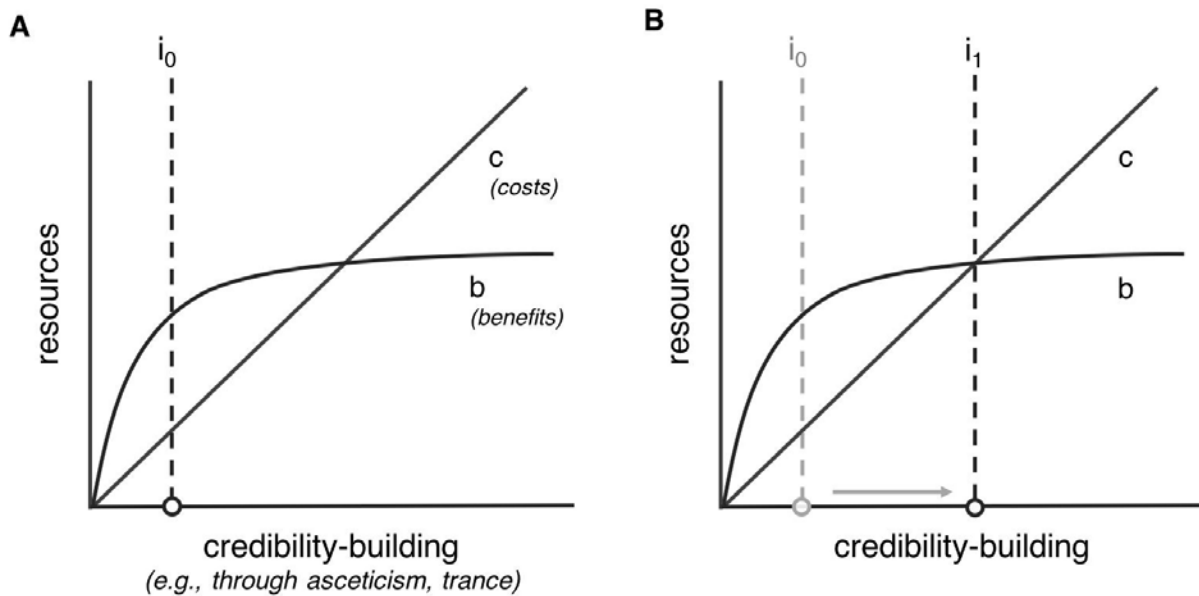


Fig. 4. A hypothesized relationship between a practitioner’s investment in credibility-building practices and payoffs. (A) A self-interested practitioner should maximize the difference between the benefits from clients (b) and the costs of investing in credibility-building (c), denoting an investment 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 5). 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.

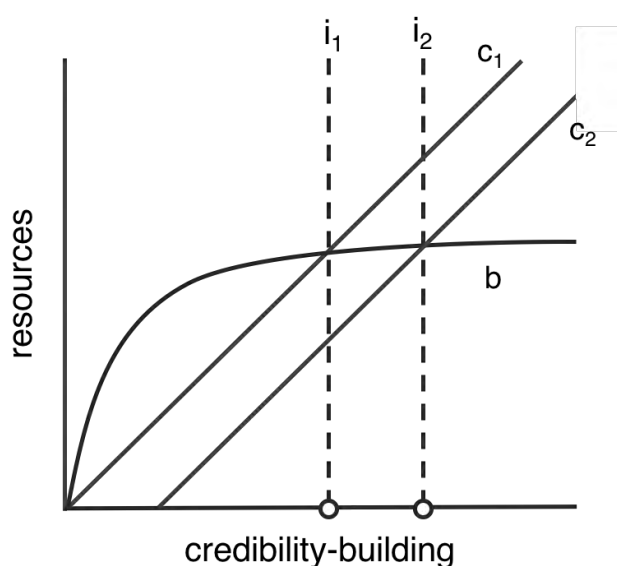


Fig. 5. Some practitioners will pay lower costs (c_2 compared to c_1) for the same level of credibility because of inherent violations of humanness, early random successes, etc. These individuals can attract credibility past the point that normal practitioners can (up to i_2 , as compared to the normal 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 2004; 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: 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.

Acknowledgements

Many thanks to Rosemary Bettle, Katia Chadaideh, Ted Kaptchuk, Martin Lang, Samuel Mehr, Graham Noblit, Vivek Venkataraman, Michael Winkelman, and five anonymous reviewers for their insightful suggestions on earlier drafts of this manuscript. I'm especially grateful to Luke Glowacki, Joe Henrich, Graham Jones, and Richard Wrangham for their detailed comments and extended discussion on these topics. This paper also benefited from feedback from the Evolutionary Psychology and Culture, Cognition, and Coevolution Labs at Harvard University. This work was funded by a graduate research fellowship from the National Science Foundation.

Literature cited

- Abbott, A. (1988) *The system of professions: An essay on the division of expert labor*. The University of Chicago Press.
- Achterberg, J. (1985) *Imagery in healing: Shamanism and modern medicine*. Shambhala.
- 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
- 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.
- 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.
- 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.
- 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.
- 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
- 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
- Best, E. (1924) *The Maori: Volume I*. 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.
- Boas, F. (1930) *The religion of the Kwakiutl Indians*. Columbia University Press.
- Bogoras, W. (1909) *The Chukchee, part 2. - religion*. E. J. Brill Ltd. and G. E. Stechert.
- 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, P. (2001) *Religion explained: The evolutionary origins of religious thought*. Basic Books.
- Boyer, P., & 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>
- 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.
- Bulbulia, J., & 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
- 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.

- 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
- 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.
- 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.
- 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.
- Damisch, L., Stoberock, B., & Mussweiler, T. (2010) Keep your fingers crossed! How
superstition improves performance. *Psychological Science* 21:1014–1020.
doi:10.1177/0956797610372631

- De Laguna, F. (1972) *Under Mount Saint Elias: The history and culture of the Yakutat Tlingit*, vol. 2. Smithsonian Institution Press.
- 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
- Devereux, G. (1961) Shamans as neurotics. *American Anthropologist* 63:1088–1090.
- Diderot, D. (1765/2001) 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
- 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.

- 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.
- Evans-Pritchard, E. E. (1937) *Witchcraft, oracles, and magic among the Azande*. Clarendon Press.
- Farthing, G. W. (1992) *The psychology of consciousness*. Prentice Hall.
- 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
- 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
- Frazer, J. (1922) *The golden bough: A study in magic and religion*. Macmillan.
- 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
- 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.
- Gmelin, J. G. (1751/2001) 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>
- Gopnik, A. (1998) Explanation as orgasm. *Minds and Machines* 8:101–118.
doi:10.1023/A:1008290415597
- 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.
- 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.

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

Haines, F. (1938) The northward spread of horses among the Plains Indians. *American*

Anthropologist 40:429–437.

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. (2004) Demography and cultural evolution: How adaptive cultural processes can

- produce maladaptive losses - the Tasmania case. *American Antiquity* 69:197–214.
- 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
- Henslin, J. M. (1967) Craps and magic. *American Journal of Sociology* 73:316–330.
- Herodotus, & Godley, A. D. (1925) *Herodotus*. Leob.
- Herskovits, M. J. (1938) *Dahomey: An ancient West African kingdom, vol. II*. J. J. Augustin.
- 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
- Hoffman, K. M., & Trawalter, S. (2016) Assumptions about life hardship and pain perception. *Group Processes & Intergroup Relations* 1368430215625781. doi:10.1177/1368430215625781
- 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 16:315–280.

<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

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.

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.

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

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.

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.

doi:Article

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

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. (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.
- 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.
- Knox, R. A. (1950) *Enthusiasm: A chapter in the history of religion, with special reference to the XVII and XVIII centuries*. Oxford University Press.
- Krippner, S. C. (2002) Conflict perspectives on shamans and shamanism: Points and counterpoints. *American Psychologist* 57:962–977. doi:10.1017/CBO9781107415324.004
- La Barre, W. (1970) *The ghost dance: Origins of religion*. Doubleday.
- Lebra, W. P. (1966) *Okinawan religion: Belief, ritual, and social structure*. University of Hawaii Press.
- 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
- 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. (1929) Shaman and seer. *American Anthropologist* 31:60–84.
- 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
- 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.
- Malinowski, B. (1948) Magic, science, and religion. In: *Magic, science and religion, and other essays* pp. 17–92. Doubleday Anchor Books.
- 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.
- 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. (1902/2001) *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.
- McClenon, J. (1997) Shamanic healing, human evolution, and the origin of religion. *Journal for the Scientific Study of Religion* 36:345–354.

- 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* 32:493-510-561. doi:10.1017/S0140525X09990975
- Mesoudi, A. (2015) Cultural evolution: A review of theory, findings and controversies. *Evolutionary Biology* . doi:10.1007/s11692-015-9320-0
- 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.
- 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.
- 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
- Murdock, G. P. (1980) *Theories of illness: A world survey*. University of Pittsburgh Press.
- Nadel, S. F. (1946) A study of shamanism in the Nuba Mountains. *The Journal of the Royal Anthropological Institute* 76:25–37.
- Narby, J., & Huxley, F. (Eds.) (2001) *Shamans through time: 500 years on the path to knowledge*. Penguin Putnam.
- 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
- Newsom, Jr., J. D. (1984) *The Hebrew prophets*. Westminster John Knox Press.
- 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., 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.

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

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.

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.

Park, W. Z. (1938) *Shamanism in western North America: A study in cultural relationships*.

Northwestern University Press.

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
- 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.
- Pinker, S. (1997) *How the mind works*. W. W. Norton & Company.
- Posner, E. A. (2000) *Law and social norms*. Harvard University Press.
- 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.
- 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., & Willard, A. K. (2015) MCI theory: A critical discussion. *Religion, Brain & Behavior* 5981:1–42. doi:10.1080/2153599X.2015.1024915
- 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.
- 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
- Rasmussen, K. (1929) *Intellectual culture of the Ighulik Eskimos*. Gyldendalske Boghandel, Nordisk Forlag.
- Rasmussen, K. (1930) *Observations on the intellectual culture of the Caribou Eskimos*. Gyldendalske Boghandel, Nordisk Forlag.
- 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.

- 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.
- 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.
- 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.
- Russell, F. (1908) The Pima Indians. *Annual Report of the Bureau of American Ethnology* 26.
<https://archive.org/details/pimaindians01russgoog>
- 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.
- 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
- Schefold, R. (1988) *Lia: Das grosse Ritual auf den Mentawai-Inseln (Indonesien)*. Dietrich Reimer Verlag.

- 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.
- Schröder, D. (1952) Zur Religion der Tujen des Sininggebietes (Kukunor). *Anthropos* 47:1–79.
- Scribner, R. W. (1993) The Reformation, popular magic, and the “disenchantment of the world.” *The Journal of Interdisciplinary History* 23:475–495.
- 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
- Singh, M., Wrangham, R. W., & Glowacki, L. (in press) Self-interest and the design of rules. *Human Nature* .
- Skinner, B. Y. B. F. (1948) “Superstition” in the pigeon. *Journal of Experimental Psychology* 38:168–172.
- Sosis, R. (2004) The adaptive value of religious ritual. *American Scientist* 92:166.
doi:10.1511/2004.46.928
- 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., & 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.
- 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.
- Swanson, G. E. (1964) *The birth of the gods: The origin of primitive beliefs*. The University of Michigan Press.
- Swanton, J. R. (1905) The Haida of Queen Charlotte Islands. *Memoirs of the American Museum*

of Natural History 8. doi:10.1038/117619a0

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

Tessmann, G. (1930) *Die Indianer nordost-Perus: grundlegende forschungen für eine systematische kulturkunde*. Friederichsen, de Gruyter & Co.

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.

Tylor, E. B. (1883) *Primitive culture: Researchers into the development of mythology, philosophy, religion, language, art and custom* Third Amer. Henry Holt and Company.

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 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.
- 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, 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.
- Walsham, A. (2008) The Reformation and “the disenchantment of the world” reassessed. *The Historical Journal* 51:497–528.
- 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

Whitehead, N., & Wright, R. (Eds.) (2004) *In darkness and secrecy: The anthropology of assault sorcery and witchcraft in Amazonia*. Duke University Press.

Whitson, J. A., & Galinsky, A. D. (2008) Lacking control increases illusory pattern perception. *Science* 322:115–117. doi:10.1126/science.1159845

Wiessner, P. (2002) The vines of complexity: Egalitarian structures and the institutionalization of inequality among the Enga. *Current Anthropology* 43:233–269.

Wilbert, J. (1987) *Tobacco and shamanism in South America*. Yale University Press.

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

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.

¹ This description of the Inuit *angakok* comes from accounts by Balikci (1963) and Rasmussen (1929).

² 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).

³ 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).

⁴ 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.

⁵ 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.

⁶ 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.

⁷ 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.

⁸ 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.

⁹ 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.

¹⁰ 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.

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

¹² For variables used, see codes pertaining to ceremonies in endnote 11.