Abstract: Singh deploys cultural evolution to explain recurrent features of shamanistic trance forms, but fails to substantively address important distinctions between these forms. Possession trance (vs. trance without possession) is disproportionately female-dominated and found in complex societies. The effects of cultural conditions on shamanism thus extend beyond its presence or absence and are vital for modeling its professionalization and spread.

Singh's article attempts to explain the cross-cultural persistence and similarity of professionalized shamanic roles as a function of cultural evolution acting within the constraints of evolved cognitive biases. At the same time, Singh purports to account for variation in the specific forms of shamanism. His choice, however, to reduce the operational definition of shamans to "practitioners who enter trance to provide services" (sect. 1, para. 1) substantially weakens the potential for true comparison among discrete forms of shamanism. And there *are* discrete forms of shamanism: Shamanic or trance practice takes predictably different forms in distinct societies in relation to several crucial axes of variation, particularly gender roles, social structure, and type of trance (Bourguignon 1973; Winkelman 1986a).

Moreover, ecstatic states such as trance are not limited to professional shamans. Hayden (2003) distinguishes shamans from mystics who enter trances but do not function as helpers or healers and, conversely, shamans from magicians who effectively harness spiritual power but do not use trance states. Therefore, focusing on competitive advertising as the function of trance within shamanic cultural forms misses something about both shamanism and trance.

Using a sample from Murdock's original Ethnographic Atlas, Bourguignon (1968) found that societies with higher levels of structural complexity were more likely to exhibit possession trance, whereas less complex societies were more likely to have trance without possession (see also Bourguignon & Evascu 1977; Winkelman 1986a). Greenbaum (1973) found that, within sub-Saharan African societies, structural rigidity, that is, highly prescribed, hierarchical social roles, predicted the existence of possession trance above and beyond social complexity. Similarly, using Murdock and Provost's (1973) societal complexity variables, Winkelman (1986a) found that the training process for shamanic healers was more likely to involve spirit possession in more complex societies, especially those with high political integration, high population density, and high levels of social stratification.

Another crucial layer of variability not acknowledged in Singh's article is that trance cults focused on spirit possession are disproportionately headed by female priests or shamans or attract a predominately female following (Lewis 1971; Sered 1994). This is no trivial detail, even if the sole focus remains on professionalization and credibility displays. A new aggregated database that one of us (Stockly) has collaborated in constructing and validating may be especially well suited for investigating both the variability between types of trance (spirit possession trance and trance without possession) and the distribution of such techniques along gender and sex lines (Stockly et al. 2017). The Sex Differences in Religion Dataset (SDRD) compiles data from existing databases and original variables coded from several ethnographic accounts into a single dataset, enabling statistical analyses using data that previously had existed only in isolation. The SDRD focuses especially on data relevant for women and gender roles within spiritual and religious traditions, including variables regarding the status of women, non-binary gender roles, marriage residence patterns, religious and cultural rituals, domestic violence, and social development for a representative worldwide sample of 215 different cultures. The sample encompasses both the Standard Cross-Cultural Sample (Murdock & White 1969) and the HRAF Probability Sample (Naroll 1967). For the present analysis, in conjunction with new SDRD codes for spirit possession, we recoded and supplemented Snarey's (1996) codes on high gods and used data originally coded by Justinger (1978), Lagacé (1977), and Huber et al. (2004).

Using the SDRP database, we conducted new analyses focused on the relationships among social structure, trance type, and gender and sex roles. Here, we report preliminary findings. For these analyses, skewness and kurtosis of all variables were within acceptable limits (±2.00) for parametric tests. Sample sizes differ as a function of variable overlap between source datasets.

Corroborating Bourguignon's earlier findings, the presence of female-dominated possession cults exhibited a significant positive Pearson product-moment correlation with larger societal population (r=.383, n=35, p=.023); more layers of institutional hierarchy within stateless societies (r=.366; n=34, p=.033); and belief in moral high gods (r=.284, n=102, p=.004). The latter association bears on recent findings in cultural evolution indicating that, as societies grow in population size and complexity, religious systems may converge toward veneration of moral high gods and monotheism (Norenzayan et al. 2016; Purzycki et al. 2016). The fact that possession cults not only thrive in such contexts but are typically dominated by women's participation calls for explanation (Lewis 1971). Perhaps shedding some light on this question, we found that female-dominated possession cults are also positively associated with relative economic deprivation (r = .343, n = 34, p = .047) and low frequency of premarital sex (r = .411, n = 35, p = .014).

Each of the above variables indexes one or more important features of what Douglas (1970; 1999) characterized as "high-grid, high-group" societies – cultures that exert high levels of hierarchical social control over strictly bounded populations. Meanwhile, female-dominated possession cults were inversely correlated with the overall social status of those who enter possession trances (r = –.365, n = 105, p < .001). This is unsurprising, given that they are women, but it further emphasizes the complex and intriguing association between strict social control and possession trance, as in Korean shamanism (Kendall 1987).

We agree with Singh that trance states are not *anthropological esoterica* (Bourguignon 1973, p. 11). Fertile opportunities for theoretical progress are missed, however, when researchers neglect the interactions among social structure and religious forms (Douglas 1970). The questions of whether a shaman in a given society is a man or woman (or a third gender; e.g., Callender & Kochems 1986) and whether that shaman's trance is characterized by the bodily intrusion of culturally posited supernatural agents or the retention of personal agency are directly relevant for Singh's agenda of mapping the strategic affordances that influence the spread of shamanic practices. Clearly, something about complex, hierarchical societies bends cultural selective pressures toward female-dominated possession trance. Why? Singh's preference for collapsing these varied distinctions is, unfortunately, a step away from, rather than toward, greater knowledge. If shamanism is nothing but "cheesecake," then it comes in far more than one flavor.

Author's Response

Why is there shamanism? Developing the cultural evolutionary theory and addressing alternative accounts

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Manvir Singh

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

manvirsingh@fas.harvard.edu **http://www.manvir.org**

Abstract: The commentators endorse the conceptual and ethnographic synthesis presented in the target article, suggest extensions and elaborations of the theory, and generalize its logic to explain apparently similar specializations. They also demand clarity about psychological mechanisms, argue against conclusions drawn about empirical phenomena, and propose alternative accounts for why shamanism develops. Here, I respond.

If intrepid travelers stumbled onto some hitherto unknown island hosting the most remote, untouched peoples, separated from the rest of humankind by tens of thousands of years and subject to their own unique cultural evolutionary histories, we would expect shamans. That peculiar constellation of trance, dance, otherness, and superpowers, shamanism occurs with such reliable consistency that several writers have branded it "universal" (Buželková 2010). Technically, it's not, but the recurrence of shamanism suggests that it develops from shared human psychological capacities, generalizable cultural evolutionary processes, and convergent social dynamics. In the target article, I proposed an account rooted in these foundations. In their 25 commentaries, leading thinkers and constructive colleagues replied.

I greatly appreciate that such a diversity of thoughtful researchers, each with a distinct expertise in some facet of human nature, have engaged with shamanism in general and this theory in particular. In this response, I summarize and reply to their insights, queries, and criticisms. In section R1, I review the proposed theory and clarify its core concepts. I then consider elaborations and generalizations of the theory (sect. R2) and further address why shamanism collapses or transforms with shifting circumstances (sect. R3). I evaluate alternative cultural evolutionary accounts, such as those proposing shamanism to be an effective division of labor or a mechanism for social bonding (sect. R4) and conclude by suggesting directions for future research (sect. R5).

R1. Reviewing and clarifying the proposed theory

In this first section, I review the cultural evolutionary theory of shamanism and clarify the central concepts. In response to commentators' questions and suggestions, I also use this space to develop components of the theory, such as outlining how shamans deviate from notions of humanness and how dramas of strangeness promote perceptions of supernatural engagement.

R1.1. On shamans

I defined *shamans* as "practitioners who enter trance to provide services" (sect. 1, para. 1). **Winkelman** rightly observes that I have combined "witch doctors, mediums, healers, priests, prophets. and others … on the basis that they all have trances" (para. 1). **Boyer** commends this avoidance of "otiose terminological quibbles" (para. 1); still, several commentators object. Winkelman points out that, according to a typology he developed, shamans are a subclass of trance practitioners restricted to foraging societies who, among other activities, transform into animals and lead ceremonies accompanied by community dancing, drumming, and singing. **Cardeña & Krippner** endorse a definition of shamanism in which practitioners fulfill the needs of the community, engage in magical flight or mediumship/possession, and possess expertise in altering one's and sometimes others' consciousness. As with others (e.g., Hultkrantz 1993; Lewis 2003), I prefer a broader definition because it captures a puzzling assemblage of traits that co-occur across time and space. This usage also encompasses practitioners who are commonly described as shamans but are sometimes left out of more selective definitions, like Japanese and Korean shamans (Blacker 1975; Kendall 1985). Nevertheless, using more restrictive criteria is valuable for carving up cultural variation and investigating the determinants of a wider array of characteristics in a more specific set of contexts.

R1.2. On superstition and invisible agents

The term *superstition* seemed to have introduced some confusion, especially in its relation to invisible agents (**Beit-Hallahmi**; **Winkelman**). By *superstitions*, I mean false beliefs in the effectiveness of interventions, following a similar usage by psychologists and evolutionary biologists (Abbott & Sherratt 2011; Foster & Kokko 2009; Ono 1987; Skinner 1948; Vyse 2014). Superstitions include blowing on dice, dancing to call rain, and visiting a shaman to heal incurable illness. Building on theoretical and empirical insights from these researchers, I argued that people adopt these false beliefs because of a bet-hedging psychology: When the costs of an intervention are sufficiently small relative to the potential benefits, and when the outcome seems to occur sometimes after the intervention, individuals benefit on average from adopting those interventions (Beck & Forstmeier 2007; Foster & Kokko 2009; McKay & Efferson 2010). For example, if I am desperate for rain and, upon dancing, find that it rains the next day, I will be predisposed to note an illusory correlation and dance during the next drought.

I agree with **Beit-Hallahmi** and **Winkelman** that the invisible agents believed to populate the world and intervene in important events represent a separate phenomenon with a distinct psychological basis, likely involving capacities that evolved for detecting agents. I also agree with **Boyer** that invoking sociocognitive biases, including agent detection, is insufficient to explain why we believe invisible forces determine random, important events and that these beliefs largely remain important, unsolved mysteries.

Both superstitions and invisible agents surround important, random, uncontrollable events, such as illness healing and the arrival of rain. People develop superstitions to control these outcomes; they also tend to believe that invisible agents oversee them. According to the proposed theory, a selection for efficacious-seeming superstitions drives the development of practitioners who supposedly interact with these invisible forces.

R1.3. On the cultural evolutionary story

I argued that shamanism develops because of a cultural selection for superstitions that seem to best control uncertain outcomes. As people choose superstitions to summon the rain, heal disease, and so forth, they drive selection for magic that exploits our psychological biases, producing practitioners who engage with invisible agents to control events of uncertainty.

Boyer notes that there is no precise connection to models of cultural transmission and that the account is most consistent with the cognitive attractor framework. I

connected the theory to cultural transmission models in note 5, including the cognitive attractor framework (referred to as "approaches by SC"). I agree that the proposed cultural evolutionary story resembles cognitive attractors insofar as it explains the prevalence of various cultural variants by examining how shared cognitive biases predispose us to find some beliefs more compelling. However, it differs from at least some cognitive attractor models in how it hypothesizes cultural design to emerge: Rather than design developing from minds consistently reconstructing variants, design is hypothesized to result mostly from clients preferentially selecting or patronizing practices that seem effective.

Boyer questions my allusion to prestige and conformity biases, and **Winkelman** asks for clarification on how "these presumptive delusions [of controlling events of uncertainty] make cultures more adaptive and outcompete others" (para. 6). To clarify, the proposed cultural evolutionary story incorporated neither prestige biases, conformity biases, nor cultural group selection. In fact, note 5 explicitly rejects several of these mechanisms; it reads, "[The proposed account] diverges from models by [Boyd and Richerson] in ignoring or downplaying the involvement of cultural group selection … 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)."

R1.4. On humanness

A major premise of my argument is that shamans encourage perceptions of their supernatural abilities by violating conceptions of humanness, allegedly becoming entities distinct from normal humans. **Haslam** critiques this claim, focusing especially on the opposing examples of shamans being more animal-like in some ways and less animal-like in others. He states that defining humanness (and deviations from it) on an axis running from most animal-like to least human-like is not useful, because supernatural agents differ in ways orthogonal to that distinction.

Haslam interprets violations of humanness to mean that a person becomes more or less animal-like. But I intended those deviations to encompass many forms of foreignness, including the following:

1. A person is more animal-like, such as sharing affinities with jaguars or birds.
2. A person has specially developed cognitive abilities, such as self-control.
3. A person has different body parts, such as new eyes, ears, or head.
4. A person's biological constitution differs, such as having special blood, organs, or magical substances within the body.
5. A person is believed to have undergone a fundamental transformation, such as from long bouts of fasting, death and resurrection, or debilitating illness.
6. A person is subject to inexplicable or rare circumstances, such as lightning strikes or an auspicious birth.
7. A person exhibits inexplicable or rare behavior or morphology, such as psychosis (see sect. R2.2) or anatomical abnormalities.

I agree with **Haslam** that shamans violate behavioral norms in many ways that convey strangeness rather than differing from one particular dimension of humanness. But I respectfully disagree that those differences can take any form and lack patterns. The ethnographic examples presented in Table 2, which include categories 3, 4, and 5, illustrate that the transformative events presumably undertaken by shamans often correspond directly with their supposed powers. For example, shamans claim new eyes or ears to justify exceptional sensory abilities, while they declare similarity to certain animals to claim those beasts' powers.

The differences delineated above reveal that many factors contribute to people's notions of superpowers, aside from a perception of supernatural beings having higher or disembodied cognition. Moreover, these intuitions of difference extend beyond the religious lore of small-scale societies, even characterizing the mythologies of contemporary Western media. The target article referred to the origin stories of superhero narratives, but other modern-day examples of supernaturalizing otherness exist. For example, Jedi have a high concentration of intelligent life forms (*midi-chlorians*) in their blood, endowing them with the power to use "the Force" (*Star Wars*: Lucas 1999), while the superhuman of Besson's (1997) *The Fifth Element* has DNA with "infinite genetic knowledge" and 200,000 (fictional) memo groups rather than the supposedly normal 40 memo groups. Importantly, these differences are not random; they reflect local conceptions of what constitutes a human and its abilities.

R1.5. On trance

As a defining feature of shamanistic practice, trance invited considerable attention among the commentators (**Cardeña & Krippner**; **Hove & Stelzer**; **Kapitany & Kavanagh**; **Linquist**; **Tabatabaeian & Jennings**; **Winkelman**). Summarizing their common points, I use this section to address four questions: (1) What is trance (as used in the target article)? (2) How might trance performances promote perceptions of supernatural contact or powers? (3) Do trance states share neurophysiological underpinnings? (4) Do trance states provide psychological benefits?

R1.5.1. What is trance? By *trance*, I mean "a temporary state that appears psychologically and behaviorally distinct from normal human functioning" (sect. 1, para. 2). In response to **Cardeña & Krippner**'s comments about distinctions in the literature, this usage is very broad. It encompasses both "ecstasy" and "trance" as used by Rouget (1985) and incorporates any cultural understanding of that temporary, dissimilar state. Cultural interpretations of trance include soul journeying, possession, mediumship, and the perception that a person's healing energy is boiling (e.g., Katz 1982). This definition also applies to most if not all altered states of consciousness – because they are defined as states of consciousness that are radically different from ordinary functioning (Tart 1972) – including the 20 outlined by Vaitl et al. (2005).

R1.5.2. How might trance performances promote perceptions of supernatural contact or powers? I argued that trance is a performance of strangeness that promotes perceptions of supernatural power. Several commentators ask for precision on how this should occur or what

strangeness entails (**Kapitany & Kavanagh; Winkelman**). I agree that explicitly outlining these social and psychological pathways is fundamental for a complete theory of shamanism, so I review and propose some explanations here.

Kapitany & Kavanagh offer a helpful account for how trance should presumably demonstrate supernatural powers or contact. They state that people are quick to detect teleology, entertain dualism, and attribute agency to the ambiguous. Thus, when they witness individuals with "unusual mental abilities" (trance), people are inclined to accept that some outside agency, probably in the form of invisible agents, is the instigator.

Kapitany & Kavanagh's hypothesis is useful, but as currently formulated, it predicts only that people will infer outside, agentic, spiritual involvement, or possession. Therefore, it cannot explain other common trance states, such as soul journeying and the medicine-induced, special sight of the Azande (Evans-Pritchard 1937). I suggest including it as one of three complementary mechanisms to describe trance:

1. *Intuitive possession.* When confronted with hard-to-explain behavior, people's belief in spirits and their tendency to attribute ambiguity to agentic forces predispose them to explain the behavior as possession (an outside spirit intervening in and causing it) (Kapitany & Kavanagh).
2. *Performative transformation.* People are impulsively skeptical of declarations of superhuman acts (e.g., claims of one's soul leaving one's body, seeing signs of witchcraft in others' bodies, or one's healing energy boiling to the point of special sight). But by acting in ways very foreign to normal human behavior, people more credibly appear to be entities distinct from normal humans with different kinds of abilities. For example, a person normally shouldn't foam at the mouth and lose touch with the sensory world; someone doing so presumably has become a different kind of entity, making declarations of special abilities more conceivable.
3. *Performances of claims.* Observers have notions of what should be involved in, for example, being possessed by a deity or leaving one's body. For example, if a possessing spirit is known to be animal-like, the practitioner should be animal-like. If the possessing deity is angry and masculine, the practitioner should mannishly fume.

Note that for all of the above-suggested mechanisms, trance becomes more convincing as the person's behavior becomes more dissimilar from ordinary human conduct. Alternative explanations become more plausible as trance departs from the expected.

Boyer emphasizes the value of examining ethnographic accounts – of connecting "attention to cultural variants" to "a rich psychology" (last para.). I agree. In that vein, I interpret the above explanations in the context of two ethnographic films that interested readers can view: *N/um Tchai* (Marshall 1969), which shows trance dancing among the !Kung, and *Magical Death* (Chagnon & Asch 1973), which shows shamanic healing and killing magic among the Yanomamö.

N/um Tchai illustrates the second mechanism. The most advanced healers of the !Kung can see illness or fetuses inside the body, tell of lions that may be lurking far away from camp, and leave their bodies to converse with the spirits of dead ancestors (Katz 1982). These abilities develop only in the deepest form of trance, full *kia*, during which they "die" (referred to as "half-death" in the film). In ascending to *kia*, healers "go into a formalized frenzy, gurgling and shrieking. In this state they may get up and run about, they fall on the fire, throwing burning coals on their hair" (Marshall 1969, minute 4). The film shows them gasping and shrieking, apparently unaware of the outside environment, until they enter the deepest trance; here, their powers are the strongest but they also demand close attention and care from the other healers. In sum, to develop the abilities necessary for curing and divining, !Kung healers must enter a very different state of being that is characterized by formalized yet strange and dissociated behaviors.

Magical Death provides an example of the third mechanism presented above: Shamans act according to observers' expectations of supernatural agents; the foreignness of this behavior adds credibility to their performance. Chagnon narrates that the shamans, intoxicated from snorting hallucinogenic powder, "gradually transformed from mortal men to spirits. The faces, gestures, and sounds were the expressions of *hekura* [spirits], not of men" (Chagnon & Asch 1973, minutes 13–14). The shamans extended and contracted their necks, erectly squatted, crawled on all fours, stretched their faces, and spoke in unintelligible languages. In behaving as the spirits they had supposedly become, the shamans more credibly engaged with the supernatural.

R1.5.3. Do trance states share neurophysiological correlates? Several researchers have previously argued that trance states recur because they produce cross-culturally consistent cognitive states (Harner 1990; Winkelman 2000). Concluding that divergent methods of trance induce contrasting states, I rejected these accounts. The varied responses expose an ongoing disagreement about this apparently simple question: **Kapitany & Kavanagh** agree with my criticism, **Cardeña & Krippner** argue for two main states ("ecstasy" and "trance"), and **Tabatabaeian & Jennings** insist on the shared cognitive and behavioral effects of vastly different altered states of consciousness. **Hove & Stelzer** accept that different techniques produce different states, although they emphasize that shifting one's mental state frequently delivers benefits (addressed in the next section).

Do different trance states, such as those induced by hallucinogens, drumming, and meditation, share neurophysiological or psychological effects? In the target article, I examined ethnographic evidence and a review of 20 altered states (Vaitl et al. 2005) suggesting otherwise. **Cardeña & Krippner** discuss patterns of variation in hypnotic states, as well as Rouget's (1985) distinction between immobile, silent states and those that are kinetic, loud, and social. Yet **Tabatabaeian & Jennings** maintain that altered states of consciousness "both share neurophysiological features and give rise to shared cognitive and behavioral effects" (para. 1). It is an exciting claim, but the literature they cite emphasizes variability. For instance, they assert that "regardless of induction method" (para 3), altered states produce greater activity in alpha, theta, and delta waves. But the cited research reports the opposite pattern with hallucinogen use (Carhart-Harris et al. 2016; Muthukumaraswamy et al. 2013; Tagliazucchi et al. 2016). Cahn and Polich's (2006) review of meditation

generally finds support for increased alpha activity, but they too highlight how different techniques and situational factors drive variation. For example, studies that controlled for relaxation reported "a lack of alpha power increases or even decreases" for transcendental meditation and yogic meditation (Cahn & Polich 2006, p. 186). Meanwhile, differences in participant expectation, test environment, participant-experimenter interactions, and experience with a tradition all potentially mediate whether and to what extent changes in neural oscillations occur.

In short, research supports the claim that distinct trance states produce various neurophysiological effects. Differences result not only from different general methods (e.g., hallucinogens versus meditation) or different practices within methods (e.g., distinct meditative practices), but also from variation in a person's psychology while entering those states.

R1.5.4. Do trance states produce psychological benefits for the practitioner? **Hove & Stelzer** conclude that different trance states produce different beneficial effects for the practitioner. They summarize research connecting psychoactive substances to psychiatric treatment, rhythmic drumming to internal processing and creativity, and altered states more generally to self-curative capacities. All of these claims are plausible. Nevertheless, the existence of benefits does not mean that shamanism culturally evolved to exploit them. Instead, we must consider unique and divergent predictions that a beneficial trance hypothesis makes about shamanism and trance. Specifically, this account's central prediction is that people will use different methods of trance induction to solve different problems contingent on the hypothesized advantage of that state. For example, people should use rhythmic drumming to foster creative thinking more generally, not only when trying to control uncertain outcomes. They should also consume hallucinogens to treat psychiatric illnesses and especially those diseases that respond best to psychoactive substances, such as "depression, anxiety, posttraumatic stress disorder, and drug addiction" (Hove & Stelzer, para. 7). Developing such an account and testing it against the proposed theory will forward our understanding of trance's place in society.

The target article largely overlooked the biological correlates of altered states, but I agree with **Hove & Stelzer, Tabatabaeian & Jennings**, and **Winkelman** that a full understanding of shamanism requires integrating these topics, especially by examining how cultural practices induce those states. I devoted little discussion to music and dance in shamanism, but these widespread practices seem closely linked to altered states, especially given recent research suggesting that healing songs around the world exhibit recurrent, perceptible musical features (Mehr et al. 2018).

R2. Elaborating the cultural evolutionary theory of shamanism

Many commentators accept the basic logic of the proposed theory, using their response to extend, nuance, generalize, or explore various implications of the account (**Boudry**; **Fiala & Coolidge**; **Glowacki**; **Johnson**; **Polimeni**; **Powers & Corlett**; **Ross & McKay**; **Steinkopf & de Barra**). In this section, I summarize these responses into three topics: (1) extensions of the basic logic to explain related features (in particular failure-resilient beliefs and dramas of illness); (2) considerations of how individual differences, especially surrounding psychosis-like experiences, may sculpt or be maintained by shamanistic practice; and (3) generalizing the theory to explain the emergence of shaman-like figures in other domains of uncertainty.

R2.1. The selective retention of failure resilience and dramatized illness

Boudry and **Steinkopf & de Barra** extend the basic logic of the cultural evolutionary theory to explain aspects of magic and shamanism overlooked in the target article. In particular, Boudry considers how failure selects for techniques and beliefs that are robust to falsification, and Steinkopf & de Barra examine how the cultural evolution of shamanism should lead to the dramatization of the client's illness.

Boudry notes that magic frequently fails. Patients die, stolen items remain unfound, the gray storm clouds recede and the drought persists. Confronted with failure, people lose faith in some practices and beliefs more than others, selecting for cultural variants that are resilient to failure. He applies the logic to both magical interventions and the capricious nature of supernatural agents. For magical interventions, he points out that upon failure, we lose more faith in some interventions (e.g., those that involve a single step) than we do in others (e.g., those that involve many steps). Consequently, we drive a cultural selection for failure-resilient magic. Meanwhile, gods and ancestor spirits only sometimes seem to respond to supplications. People in turn preferentially accept depictions of agents as fickle or prone to dissatisfaction.

Boudry's hypotheses are plausible and should be tested in future investigations of magic. They are also valuable because they emphasize the complex psychological landscape shaping beliefs in magic. In the target article, I stressed how beliefs in spirits sculpt which superstitions seem most effective, but as research on the cultural evolution of magic moves forward, we profit from considering those patterns of magical design that remain unexplained, as well as from investigating the involvement of other psychological biases (e.g., those relating to sympathetic magic: Nemeroff & Rozin 2000).

Steinkopf & de Barra recognize that the account proposed in the target article left the role of the client largely undiscussed. Addressing this gap, they deduce that shamans and patients both share an interest in playing up the patient's illness.

That shamans should dramatize their clients' illness is consistent with the proposed cultural evolutionary theory. By theatrically playing out otherwise invisible struggles, these performances support perceptions of practitioner success. When a client finally recovers, observers will more confidently accredit the shaman because they witnessed the practitioner battle the illness, remove it, or otherwise contend with it. Ethnographies frequently document the dramatization of illness removal: Shamans around the world incarnate disease and act out their struggle or success in purging it from the patient. The opening anecdote, adapted from descriptions by Balikci (1963) and

Rasmussen (1929), depicts an Inuit *angakok* battling with illness-causing ghouls. Meanwhile, the most common and oft-discussed performance of illness involves removing some tiny, pathogenic invader, such as a rock or bone, usually implanted there by some malicious force (e.g., Shuar: Harner 1968; Nepal: Hitchcock 1973; Navajo: Kluckhohn 1944).

I also agree that clients enact (and exaggerate) their illnesses to attract support and attention, but the elaboration of these performances seems driven by a separate process. Rather than developing from a selective retention of effective-seeming practices, these may evolve as individuals imitate and refine the behaviors of other people who successfully attracted care. I refer to this idea in section R3.3.2 in the discussion of possession trance.

R2.2. Psychosis

Several commentators (**Fiala & Coolidge**; **Polimeni**; **Powers & Corlett**; **Ross & McKay**) focused on psychological variation among individuals and specifically on a topic that has long attracted attention in the academic study of shamanism: psychosis (Czaplicka 1914; Devereux 1961b; Radin 1937; Silverman 1967). These authors suggest four ways by which psychosis might interact with shamanism:

1. Individuals with psychotic tendencies more easily or more successfully become shamans (Fiala & Coolidge), because, for example, they sincerely believe their own powers (and will therefore better convince others) (Powers & Corlett), others interpret their singular experiences as "special gifts" (Ross & McKay), or they find the religious world view or themes more appealing or familiar (Polimeni; Powers & Corlett).
2. Shamanic training helps individuals with psychotic tendencies control their experiences (Ross & McKay).
3. Hallucinations produce magico-religious content (Polimeni).
4. The benefits of shamanism help maintain genetic variants supporting psychosis-like and antisocial behavior (Fiala & Coolidge; Polimeni).

The first suggestion seems plausible. Communities likely regard individuals with some psychosis-like tendencies as more genuinely engaging with supernatural forces, exemplified in how frequently people attribute supernatural connection to individuals with bizarre or unexplainable behavior (see sect. 3.3.2 of the target article). The second suggestion, that training allows some individuals to control their psychotic experiences, is an intriguing speculation and worthy of investigation, especially given the potential parallels between shamans and clairaudient psychics capable of regulating their voice-hearing (**Powers & Corlett**; **Ross & McKay**). Meanwhile, hallucinations and religious beliefs both stem in part from promiscuous pattern recognition (Whitson & Galinsky 2008), so we should expect some convergent content, as posited by the third suggestion. The similarity between beliefs in malicious witchcraft by group mates and paranoid ideation presents an illustrative example of this convergence (Bentall et al. 2001; Mair 1969).

The fourth suggestion is also conceivable: If the additional benefits of being a shaman sufficiently compensate for the costs associated with psychotic-like behavior or antisociality, shamanism may have contributed to the maintenance of otherwise maladaptive genetic variants. However, evaluating this final proposition demands not only examining whether and to what extent shamanic practice carries fitness benefits for individuals with psychotic-like experiences, but also testing such an account against competing evolutionary theories of psychosis (Crespi & Badcock 2008; Del Guidice & Ellis 2016; Power et al. 2015).

Despite the plausibility of these proposed interactions between shamanism and psychosis, none of them appear necessary for the existence of shamanism. Individuals with psychotic tendencies might be more successful shamans, but as many anthropologists have shown, shamans are frequently psychologically normal individuals (see sect. 2 of the target article for examples). Meanwhile, the content of hallucinations might resemble religious world views, but given that most people subscribe to these cosmologies in most societies, invoking psychosis seems unnecessary. Returning to the example of witchcraft, in many societies, the majority of people believe that embittered group mates attempt to harm them through invisible means. Although these resemble paranoid hallucinations, this similarity means neither that psychosis-like experiences produce witchcraft narratives nor that individuals must possess psychotic tendencies to entertain those beliefs.

In summary, people with psychosis-like experiences may pay lower costs to become shamans, and they may develop the ability to control these experiences, engaging them during supposed supernatural contact. Moreover, their ideation resembles religious cosmologies, and in articulating them, they may help develop mystical world views. Nevertheless, that humans experience psychosis seems unnecessary to explain the existence and features of shamanism.

R2.3. Generalizing the cultural evolutionary theory of shamanism

As two commentators recognize, shaman-like authorities, such as war ritual specialists (**Glowacki**) and professional money managers (**Johnson**), help individuals influence and predict uncertain outcomes, although they differ from shamans in, for example, not using trance. How can we generalize the cultural evolutionary theory to (1) explain the emergence of these other uncertainty specialists, while (2) accounting for differences between them and magical trance practitioners?

Here I generalize the cultural evolutionary theory to explain the development of uncertainty specialists more broadly:

1. People are especially prone to adopting superstitions to influence or learn about important, random, uncontrollable outcomes.
2. People have models of what determines when those outcomes occur. People often believe that invisible agents control those outcomes, but these models can take other forms as well. For example, people may believe that markets behave according to very complicated, statistical trends or that they reflect the momentum and attitudes of the business world.
3. People consider practices or practitioners that supposedly interact with these forces to be more effective. In many cases, this entails influencing or learning about the behavior of invisible agents, but this varies according to the conception. If, for example, people believe that

uncertain outcomes are determined by complicated, statistical trends, then the most effective-seeming divinatory intervention may be one that uses complicated statistical methods to prophesy the outcome.

4. Competition among practitioners should (a) accelerate the cultural selection for practices that bolster the practitioner's credibility and (b) mediate the extent to which practitioners invest in these credibility-building practices.

5. Because clients consider practitioners who invest in credibility practices to be more effective, institutionalized specialization occurs. Clients prefer to patronize the subset of individuals who have invested and who have become, in the community's eyes, capable of reading and influencing the determining forces.

This generalization describes why we should expect practitioners specialized in the application of ineffective tools to influence and learn about events of uncertainty. It also predicts how those uncertainty specialists vary. Depending on their clients' model of why some uncertain outcome occurs, different practitioners will draw on distinct techniques and invest in unique credibility-building practices. For example, shamans see or communicate with spirits, ancestors, deities, and witches; to be considered capable of doing so, they deviate from notions of humanness that encourage perceptions of special powers. Meanwhile, financial asset managers might claim to use complicated mathematical models to track and predict the behavior of markets; accordingly, they should observe practices that encourage perceptions of their special ability, such as procuring advanced degrees in math or physics.

Johnson lists hedonism, psychopathy, and grueling early work schedules as potential mechanisms by which financial professionals foster a perception of "superhuman powers of market divination" (para. 4). His proposition is compelling, but do these deviations promote a perception of specific special powers? In the same way that shamans claim new eyes for superhuman sight or animal affinities for animal-like abilities, do the ways in which money managers differ and perform their specialness correspond to the special aptitudes they profess? Answering these questions will help uncover why credulous clients patronize inert money managers.

Glowacki reports that war ritual specialists typically do not undergo transformative initiations or become entities distinct from normal humans. As currently formulated, the generalized account predicts that these war ritual specialists should differ in *some* way, however. For example, if ritual specialists allege to divine the future or influence the outcomes of war, the proposed account would predict some narrative or performance of difference to encourage an acceptance of these skills. Without one, their hold over their jurisdiction should be weak, and competitors hoping to entice their clientele should invade and use more compelling techniques (such as claiming to have died and come back to life). Studying how war ritual specialists and other uncertainty specialists defend their jurisdiction will advance our understanding of the origins of specialization while also challenging or developing accounts to explain it.

R3. The collapse and transformation of shamanism

The target article aimed to explain general features of shamanism while outlining how variation in social or intellectual conditions should mediate the intensity of certain practices or the existence of shamanism. Several commentators offer additional or more nuanced explanations of why shamanism should collapse (**Baumard**; **Blackwell & Purzycki**; **Willard, Nakawake, & Jong** [**Willard et al.**]), while others ask why shamanism transforms with shifts in social complexity and religious organization (Willard et al.; **Wood & Stockly**). Incorporating these topics, especially the transformation of shamanism with growing social complexity, was outside of the scope of the investigation. Nevertheless, I agree that explaining them is necessary for a complete understanding of shamanism and the evolution of religion, so I consider them here.

R3.1. Collapse from prosperity

I listed several conditions under which shamanism should decline, such as when people stop believing that invisible agents intervene in their lives or when they accept that other individuals are unable to interact with these forces. **Baumard** agrees but asks what drives this disenchantment of the world. Drawing on life history theory, he argues that behavioral changes driven by affluence are pivotal. As people become wealthier, their behavioral strategies shift from risk-averse conservatism to being more future-oriented, risk-prone, and open-minded. This new way of thinking, being more optimistic, progressive, and experimental, facilitates the development of scientific thinking and results in a naturalizing of people's world views.

Baumard's hypothesis seems reasonable, but it raises a basic question. According to his argument, scientific thinking and experimentation revealed the natural origins of supposedly supernatural phenomena and the impossibility of human magic. Is this true? Was science crucial in demystifying the world? Integrated with historical analyses, Baumard's approach has promising potential in elucidating the decline of magic and contemporary variation in enchanted world views.

R3.2. Collapse from invaded jurisdictions

Blackwell & Purzycki and **Willard et al.** argue that shamanism should transform or collapse when competing parties more effectively provide shamans' services. They both offered medicine as an example, and I agree. Because they more reliably produce desired outcomes, alternate healing traditions with observable results should invade and consume swaths of the shaman's jurisdiction.

These commentators focused on competition with effective practices, but shamans also lose clients to traditions that are comparably ineffective. Among the Mentawai of Siberut Island (Indonesia) with whom I work, healing practices that claim origins in Europe or in Abrahamic religions increasingly find support because of their cultural roots. These off-island healing traditions hail from the same cultures as guns, motorcycles, and cell phones, so people ascribe them a legitimacy normally denied indigenous competitors.

R3.3. Transformation and shifts in social complexity

Observers of religion have long noted associations between the form of religious practice and various dimensions of social structure and religious institutionalization. **Willard et al.** and **Wood & Stockly** ask about the origins of two

important patterns often said to characterize the religious practices of complex societies: the disappearance of trance among priests and the emergence of possessed, female shamans. Here, I discuss competing hypotheses and identify open questions with the aim of shedding a preliminary light on these trends.

R3.3.1. Why do priests in organized religions less frequently employ trance? Willard et al. remark that religious authorities in organized religions use trance less frequently than their small-scale counterparts. In fact, as they point out, traditions born from shamanic prophets seem to sanitize themselves of ecstatic performances over their institutional lifetimes. To explain the shift, Willard et al. point to fidelity. Their argument is as follows: *If* (1) easily transmitted rituals outcompete harder-to-transmit ones (because easily transmitted rituals have greater fidelity, especially when there are few learners), *and* (2) routinized rituals are more easily transmitted than trance performances, *then* cultural evolution should favor routinized rituals over trance. Despite the elegance of their logic, there are reasons that this hypothesis seems unable to explain the decline of trance in organized religion, foremost among them the difference in fidelity between unorganized and organized religion. Organized religions transmit beliefs and practices with much higher fidelity than unorganized religions, not only because they have many more learners and teachers, but also because they benefit from such technologies as liturgy, specialized training, and writing. Consequently, by the logic of Willard et al.'s hypothesis, we should predict that rather than contributing to its decline, institutionalized religions would be *more likely* to retain trance than unorganized religions.

If not fidelity, then what? An alternate hypothesis postulates that trance disappears because it threatens institutionalization (O'Dea 1961). Specifically, as long as trance indicates supernatural contact or power, religious organizations must contend with charismatic startups claiming divinity and threatening its control over the mystical (Keitt 2005a; Lewis 2003). To check these plastic prophets, officials condemn trance or at least delegitimize it among laypeople. I referred to such campaigns in sections 4.3.2 and 6.2 but did not extend them to explain the more common absence of trance in organized religions.

Anecdotal accounts of young religions reveal the destabilizing nature of trance and others' attempts to thwart it. Bell (2005) documented this tension in her study of the young Korean religion Ch'ŏndogyo. Describing a conversation with an informant, she wrote, "When I ask him why the centre does not like *taegangnyŏng* ["great descent of the spirit"] he responds, '*Taegangnyŏng* changes the people's minds'… He says that officials do not like it because then 'they don't control the man'" (Bell 2005, p. 11). Even religious traditions that retain trance contrive schemes to regulate these "charismatic fires" (Poloma 1997), such as by authorizing or publicizing only some people's divine contact or instituting additional criteria for religious authority (Lewis 2003; Shepherd & Shepherd 2006; White & White 1996). Research surveying the histories of major organized religions (e.g., Keitt 2004; 2005b) can test to what extent this hypothesis explains the scarcity of trance among religious traditions in complex societies.

R3.3.2. Why the prevalence of possessed female shamans? Wood & Stockly review previous anthropological work and new results showing that, in complex societies, trance performances involve a belief of possession (a spirit entering the host's body) more frequently than in less complex societies. Moreover, these possession trances are more commonly employed by female shamans. As they ask (last para.), what "about complex, hierarchical societies bends cultural selective pressures toward female-dominated possession trance"?

The puzzling preponderance of possessed female shamans has attracted anthropological inquiry for more than half a century (e.g., Boddy 1994; Carneiro 1940; Cohen 2007; Kehoe & Gileiti 1981; Lerch 1982). Lewis (2003) proposed a widely supported account, focusing on how hierarchical societies breed oppression. I reformalize his hypothesis in three steps:

1. Hierarchical societies constrain shamanism in local environments and intensify experiences of subjugation.
2. Possession represents a strategy by which subjugated people, including women and low-status men, gain attention and care, air their grievances, and make demands. This elaborates on **Steinkopf & de Barra**'s argument that people should dramatize their illness to attract care, except that in this case, illness manifests as the bodily intrusion of invisible, malevolent beings.
3. People believe that those individuals who have been possessed can train themselves and use their proximity to the supernatural for healing, divining, controlling the weather, and so on.

In other words, the repressive environment of these hierarchical societies pushes people (and women in particular) to perform intrusive possession. Because the institutionalized religions condemn trance outside of their religious authority, they create vacant jurisdictions for local shamans. These possessed individuals fill those jurisdictions.

Critically evaluating Lewis's hypothesis is beyond the scope of this response. Nevertheless, it confronts two important questions. First, what prevents religious authorities from controlling or delegitimizing the trance of possessed female shamans? Second, shamans are frequently exclusively or predominantly men in many small-scale societies. Which forces constrain women from becoming practitioners in those contexts, and why do those forces diminish in importance in hierarchical societies?

R4. Alternate cultural selective schemes

I argued that shamanism is a product of a cultural selection for the most intuitive magic or a selection for the most effective-seeming services to influence outcomes of uncertainty. Competition among practitioners to provide these services further drives this selection while regulating the intensity of the practices that develop.

Many commentators (**Blackwell & Purzycki**; **Humphrey**; **Linquist**; **Nielsen, Fischer, & Kashima** [**Nielsen et al.**]; **Schindler, Greenberg, & Pfattheicher** [**Schindler et al.**]; **Watson-Jones & Legare**) contend that other cultural selective schemes – selecting, for example, practices that improve group competitiveness or

assuage an ever-present fear and awareness of mortality – have sculpted and thus explain the features of shamanism. Some commentators propose that these alternate selective schemes act in conjunction with a selection for intuitive magic, whereas others described them as mutually exclusive hypotheses. In this section, I address these various alternate selective schemes and examine to what extent they can explain the features of shamanism.

I agree with many of the commentators (**Blackwell & Purzycki**; **Humphrey**; **Linquist**; **Polimeni**; **Nielsen et al.**; **Watson-Jones & Legare**) that shamans likely provide benefits to clients or the group, such as by delivering herbs or reinforcing beliefs in moralistic, supernatural punishment. But in my response below, I echo the sentiment of the target article that these benefits cannot explain the recurrence of the practice or the design features discussed (trance, jurisdiction, transformative practices, professionalization).

Whether or not readers find my responses below to be compelling, I urge researchers moving forward to outline the cultural evolutionary process presumed to be responsible for the proposed design. Showing that shamanism – or any cultural practice for that matter – has some design (e.g., group-level benefits) does not establish that a cultural evolutionary process selectively retained those design features. Not only do alternate cultural selective schemes often produce convergent features (Singh et al. 2016; 2017), but as these commentaries illustrate, practices have many effects across many domains. Specifying how cultural evolutionary or social processes produce patterns of features justifies why some set of effects, rather than a practice's myriad other consequences, contribute to its appearance and stability.

R4.1. Has shamanism culturally evolved to promote cohesion or enforce cooperation?

Linquist, **Nielsen et al.**, and **Watson-Jones & Legare** propose that shamanism is selectively retained because it provides group-level benefits, either through rituals that promote social cohesion or by enforcing social commitments in which the threat of being attacked by a shaman ensures cooperative behavior.

Is shamanism the most culturally fit mechanism for cementing trust and solidarity among members of a group? It seems not. By my understanding, a much more effective technology – and one that should presumably outcompete shamanism on this metric – would involve those individuals who need to bond exchanging resources (Molm et al. 2000; 2007; Uehara 1990), participating in joint, risky endeavors (Cook et al. 2005), touching each other (Gallace & Spence 2010; Morhenn et al. 2008), and, assuming that these are indeed effective means of binding groups, *all* dancing in synchrony (Hove & Risen 2009; Reddish et al. 2013; Tarr et al. 2015) and *all* sharing traumatic, painful experiences (Bastian et al. 2014; Whitehouse & Lanman 2014; Whitehouse et al. 2017) rather than practitioners acting alone. Moreover, (1) unlike shamans, people shouldn't claim that they do not experience pain (see Table 1 of the target article); and (2) these intense bonding events should occur when cooperation and trust are most necessary, such as before collective action or when growing distrust threatens group survival (e.g., following conflict that drives group fission: Hurd 1983; Walker & Hill 2014). Last, given that shamans engage in some of the aforementioned activities with the patient alone (e.g., touching), a potentially more fruitful line of investigation might test whether performances cultivate trust between the practitioner and the client.

Aside from predicting divergent features of ceremonies, a group-bonding hypothesis leaves unexplained many of the specific features that define shamanism – for example, why a single individual should run off to the woods, return with a bloody face, and then later be summoned to declare whether it will rain in the coming days, during which he dances alone or with other prophets, violently shakes, and, delivering his divination in a thunder voice, claims to channel a rain goddess.

I have concluded that shamanism likely does not culturally evolve to foster social solidarity. What about the hypothesis that shamanism culturally evolves to promote cooperation, specifically by establishing a fear of mystical, moralistic retribution? Observers do report shamans and other religious practitioners exercising their supposed supernatural connection to enforce rules and curb predation. For example, in many societies, people visit shamans to kill individuals who have wronged them (e.g., Shuar: Harner 1972; Shilluk: Oyler 1920), potentially discouraging conflict, while medieval monks used threats of cursing to protect their property in the absence of more effective enforcement mechanisms (Leeson 2012).

Despite observations of shamans and religious clerics leveraging their supernatural connection to enforce cooperative rules, there are several lines of evidence that undermine what **Linquist** named "the commitment hypothesis." Here I review two.

First, anthropologists frequently observe shamans manipulating their supernatural authority for self-serving objectives. Inuit shamans used their supernatural authority to demand sexual favors from their clients (D'Anglure & Philibert 1993), while among the Shuar, men sometimes "gave their daughters in marriage to shamans without the customary bride-service, or even the less common bride-price, because the girls' fathers feared the bewitching power of the shamans" (Harner 1972, p. 118). This predation seems even more pronounced in complex societies. The *Ibede Goda*, a shamanic spiritual leader of the Kaffa people of Ethiopia, was fabulously rich and enjoyed the sexual company of many virgins. Orent (1969, p. 308) explained the shaman's obscene wealth, describing not only his two-story mansion of iron and glass, but his singular physique: "The *Ibede Goda* is obese. His hugeness represents the opposite of the constant quest for food in which every [Kaffa] must engage most of the year." Relatedly, rather than considering shamans to be prosocial enforcers of the common good, people often fear them as morally ambiguous agents, subject to envy and malice (Whitehead & Wright 2004). Handelman (1972, p. 92) captured this in his summary of the perceived morality of the Washoe (Great Basin) shaman: "The shaman had the capacity for both the greatest good and the greatest evil, and the figures of healer and witch were both embodied in the person of the shaman."

Second, the commitment hypothesis predicts that shamanism should be absent in those societies with strong and effective enforcement institutions. This prediction is violated by the work on neo-shamanic practices, much of

which has focused on Scandinavia (Kraft et al. 2015; Lindquist 1997), a region with enforcement mechanisms that are among the most effective in the world (Fisman & Miguel 2007). That shamanism develops in these contexts suggests a function distinct from maintaining cooperation.

R4.2. Has shamanism culturally evolved to effectively provide services?

Two commentators suggest that shamanism effectively provides services, which in turn contributes to its maintenance and explains its constituent features. **Blackwell & Purzycki** defend the hypothesis that shamanism culturally evolves to organize and signal specialized abilities, whereas **Humphrey** suggests that shamanism recurs because it elicits self-curative capacities or the placebo effect.

Blackwell & Purzycki propose that shamanism develops partly to effectively organize expertise. Focusing on herbal knowledge and cognitive insight, they go on to suggest that performances of strangeness function as honest signals of these special abilities.

There are at least two reasons to question the claim that shamanism develops to effectively organize herbal knowledge. First, many shamans do not treat with herbs: According to coding by Winkelman and White (1987), shamans in 15 of the 43 societies coded did not use herbs extensively. Moreover, when shamans do possess herbal expertise, this knowledge is typically distributed among many other minds, including with other herbalists recognized specifically for their know-how (e.g., Piaroa: Heckler 2007; Warao: Wilbert 1987b). Second, even if we accept the claim that shamans represent specialized repositories of herbal knowledge, is this more efficient than distributing knowledge among many minds? Existing research suggests not: As **Willard et al**. point out, restricting expertise to a few people, especially in small populations, risks losing knowledge and impedes accumulation.

What of the hypothesis that shamanism culturally evolves to effectively organize insight? First, and most importantly, why should shamans be more insightful than their group mates? As I have argued at various points, trance likely fails to provide insight because different methods induce dissimilar and sometimes opposing effects (although see **Hove & Stelzer**'s evidence for rhythmic drumming in particular). Second, if efficacy indeed is being maximized and societies have devised some mechanism for fostering insight (e.g., rhythmic drumming), why constrain it to one or a couple of individuals? One would expect that an advantageous technology facilitating, for example, intuiting animal behavior would be more widely shared.

Finally, do "performances of strangeness" function to signal shamans' "specialized, effective skills and abilities" (**Blackwell & Purzycki**, para. 5)? Theatrical enactments of soul loss or possession seem uninformative signs of one's herbal knowledge or cognitive specialties. Why not recite herbal remedies or demonstrate herbal treatments? If signaling cognitive insight, why not display it more directly, such as by breaking up disputes (social insight) or competing in the tracking of animals (intuiting animal behavior)? Trance performances seem deficiently designed as indications of shamans' supposed special abilities, especially in comparison to hypothetical alternatives.

The second argument of efficacy centers on the placebo effect. **Winkelman** and **Powers & Corlett** refer to placebo-driven healing effects, although **Humphrey** formulates the argument most rigorously. I interpret his hypothesis in four parts:

1. The shaman is well designed to convince the patient of genuine and effective care.
2. This performance of care elicits a placebo effect.
3. This placebo effect produces beneficial self-care.
4. This benefit sustains shamanism, which otherwise could not be maintained and would constitute "a flimsy house of cards" (Humphrey, para. 4).

I agree with points 1 and 2, but I remain skeptical of 3 and 4. Here's why. First, is the shaman's activation of placebo effect beneficial? In his commentary and elsewhere (e.g., Humphrey 2002b; Humphrey & Skoyles 2012), **Humphrey** persuasively proposes that organisms have evolved regulatory systems designed to invest in self-care under optimal conditions. This involves, for example, running a temperature or producing antibodies when the likelihood of recovery is highest, as well as (I add) turning off symptoms that would normally restrain or protect the organism, such as nausea, exhaustion, and pain. Humphrey contends that narratives and performances of supernaturalness activate the patients' "innate capacities for self-cure" (the placebo effect), thus providing genuine care. But a basic question remains: Is the triggering of these curative or alleviative capacities beneficial? As long as the shaman represents a false signal of care, the patient will initiate self-cure and turn off protective symptoms under the wrong conditions (see note 7 in the target article). For example, imagine that the patient benefits most from activating self-cure while ingesting herbs on day 1, but, expecting a shaman's treatment, holds off until a healing ceremony on day 2. By waiting, the patient has suboptimally expended resources toward recovery. The logic of adaptation warns that shaman-triggered self-healing may be to the patient's detriment.

Second, can shamanism persist solely from a *perception* of efficacy, rather than actual fitness benefits? The evidence suggests that it can. Many related traditions persist without delivering benefits, most notably the countless mantras, spells, and talismans used to sway the weather, harm envied group mates, ensure success in school exams, protect oneself from illness, multiply crop productivity, discourage one's spouse's from adultery, and so on (Evans-Pritchard 1929; Mauss 2001; Vyse 2014). Similarly, many ineffective, non-healing practitioner classes, some of them shamanic, flourish around the world; these include rainmakers (Cooke & Beaton 1939), malicious magicians for hire (Lieban 1967; Todd 1936), crystal gazers (Lang 1911), war ritual specialists (**Glowacki**), and even asset managers (**Johnson**). Their ubiquity illustrates that these practices thrive solely because of perceived efficacy.

R4.3. Has shamanism culturally evolved to assuage a fear and awareness of death's inevitability?

Schindler et al. propose that shamanism culturally evolves in part to alleviate anxieties about death; therefore, we should analyze it within a terror management theory (TMT) framework. Shamans assuage death anxieties, they contend, not

only by "providing hope of averting lethal outcomes," but also by validating belief systems about a life beyond this one.

I agree with **Schindler et al.** that shamans help control events closely tied to mortality, including illness and drought. The theory proposed in the target article explains this by examining the psychology of superstition: People adopt causally innocuous interventions to control important (roughly, fitness-relevant) events. Any event that is closely tied to mortality will be important, so TMT and the proposed theory make overlapping predictions here. But shamans also assist with achieving success in business (e.g., Korea: Kendall 1985), divining guilt (e.g., Tlingit: Emmons & De Laguna 1991), and locating lost objects (e.g., Canela: Crocker 1990), among other activities. Individuals attribute importance to these and want to control or understand them, but their relationship to death is more indirect. TMT explains a subset of the shamans' jurisdiction without providing further explanatory power.

What of the idea that people patronize or support shamans because they reinforce beliefs in an afterlife? The same criticism applies here as well: TMT predicts that shamans will behave as if these beliefs are real, paralleling the proposed cultural evolutionary theory, but as currently formulated, it cannot explain features beyond this. Furthermore, its most basic prediction – that shamanic performances acknowledge that human souls survive separately from their bodies (mind-body dualism) – fails to hold up in many contexts. Shamanic ceremonies do frequently reinforce the notion of a human soul, such as when practitioners summon the client's spirit or when their own souls leave their bodies (e.g., Desjarlais 1989; Eliade 1964; Lindquist 2004). Such portrayals are frequently absent though, such as when shamans summon and contain an illness-causing water deity (Schefold 1988), or when they eat medicines and dance to "see spiritual emanations of witchcraft floating about as lights" (Evans-Pritchard 1937, p. 178).

R5. Some suggested future directions

R5.1. Testing among competing accounts

Most, if not all, commentators support an approach to explain shamanism that jointly considers how psychology, social dynamics, and cultural evolutionary processes shape and aggregate these practices. Many commentators endorse the idea that shamanism results from a cultural selection for effective-seeming magic, but some suggest that other cultural evolutionary schemes better explain its design and dynamics. I argued against them, but I invite those researchers and others to develop these competing accounts and test them against the proposed theory. As I stressed, alternate hypotheses should specify not only the predicted design features of shamanism, but how within-group social dynamics and cultural selective schemes interact to produce this design.

A promising route for testing among competing theories is to investigate the extent to which different accounts describe and predict the features composing shamanism. The theory I proposed generated the following hypotheses for some basic constituent practices:

1. Trance is a performance of foreignness that bolsters the practitioner's claims of supernatural contact or abilities.
2. Initiating events and practices, including debilitating illness, asceticism, and theatrical performances and narratives of change, convince observers that the practitioner has changed in some fundamental way, supporting their claims of non-normal powers.
3. Shamanism professionalizes because individuals typically must "transform" to be considered capable of influencing or foreseeing events of uncertainty. Competition partly determines the degree of investment in these transformative, credibility-building practices.

Researchers developing competing accounts should present alternate hypotheses to explain these features (as many of the commentators did), allowing us to directly test the extent to which contrasting theories describe ethnographic realities.

R5.2. Unexamined questions about the design and dynamics of shamanism

I applied the proposed theory to explain trance, transformative practices, the peculiarity of the shaman, professionalization, variation in the intensity of certain practices, the conditions for collapse, and why shamanism changes with shifting social complexity and religious centralization. Still, I did not address many basic questions about the design and dynamics of shamanism, including the following:

1. Why are shamans so frequently men?
2. Why do shamanic ceremonies often involve music and dance?
3. What explains the clothing and adornment of shamans?
4. Why do shamans sometimes lose their jurisdictions to mantras, spells, and other magical techniques?
5. Why don't some magical practitioners use trance?

I devoted some attention to several of these, but the explanations offered were more preliminary than defensible. Ongoing work should use the proposed theory (or competing accounts) to examine these and other patterns of shamanism.

R5.3. The predictable development of sociocultural near-universals

Ethnographers aiming to comprehensively describe the social and cultural worlds of particular societies typically organized their reports into sections that were loosely reused across authors and cultures – for example, magic and religion, social control, family life, art. These sections were further subdivided into topics that were more specific but nevertheless familiar and common – for example, shamanism, gods, origin myths, witchcraft, property rights, marriage. The frequency of these divisions may expose the shared frames through which Western anthropologists interpreted the cultures of the world. But they also likely reflect the behavioral reality of sociocultural patterns. In the same way that gas molecules released into some room will eventually come to fill it uniformly, a hypothetical human society placed in some novel environment and devoid of complex cultural practices seems to exhibit a tendency toward developing a swath of sociocultural near-universals, including shamanism, laws

against killing (Hoebel 1954), and lullabies (Mehr & Krasnow 2017).

In the target article, I theorized how fundamental aspects of humans – such as our superstitious psychology, our biases to detect agents, and the incentive to monopolize services – interact in predictable ways to assemble shamanism. Whether or not this theory holds up, this project represents a small contribution toward characterizing why humans share such peculiar clusters of practices across time and space. Our growing understanding of psychology, sociality, and cultural evolution, combined with fresh access to large databases of ethnographic data (e.g., Ember 1997; Kirby et al. 2016; Watts et al. 2015), provides researchers with sophisticated frameworks and new empirical insights to outline how cultural variants are created and maintained. Now is a promising time to investigate why human societies reliably produce these sociocultural near-universals.

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[The letters "a" and "r" before author's initials stand for target article and response references, respectively]

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