

Timothy L. Hubbard

Causal Representation and Shamanic Experience

Abstract: *Causal representation in shamanic consciousness is compared with causal representation in ordinary waking consciousness. Causal representation in shamanic experience and in ordinary waking experience can engage strategies involving attribution of intentionality (beliefs, desires, mental states), heuristics (representativeness, availability, intentionality, property transmission), and magical thinking (transmutation, similarity, thought-action fusion, contagion, illusion of control, tempting fate). Such strategies have consequences involving social biases (fundamental attribution error; correspondence bias, in-group/out-group differences, totemism), locus of control, authorship of actions, and supernaturalizing of social life. Similarities of causal representation in shamanic experience and in ordinary waking experience have implications for theories of mind and theories of causal representation, and these implications involve use of metaphor and analogy, modular processing of social information, use of behavioural criteria for mental states, differences between physical causality and social causality, property transmission in causal representation, and whether causal representation involves general or state-specific processes. Principles of causal representation in shamanic consciousness appear consistent with principles of causal representation in ordinary waking consciousness.*

Keywords: Causal representation, causal information, shamanism, magical thinking, heuristics, intentional stance, social attribution, modularity, cognition

Correspondence:

Timothy Hubbard, Department of Psychology, Texas Christian University, Fort Worth, TX 76129 USA Tel: 817-995-9355

Email: timothyleehubbard@gmail.com

Journal of Consciousness Studies, 19, No. 5–6, 2012, pp. 202–28

Copyright (c) Imprint Academic 2011
For personal use only -- not for reproduction

Western culture has held a variety of views about shamanism (for review, Krippner, 2002; Narby and Huxley, 2001; Winkelman, 2010), and shamanism has been suggested to reflect psychopathology or regressive behaviour (Devereux, 1961; Silverman, 1967; but see Noll, 1983; Walsh, 2001), charlatanism or trickery (Hansen, 2001; Warner, 1980), devil worship (Narby and Huxley, 2001), altered states of consciousness (Eliade, 1964; Heinze, 1990; Ripinsky-Naxon, 1993), heightened awareness (Berman, 2000), or lack of a western education (Frazer, 1963; Levi-Strauss, 1966; Tylor, 1871). There has been a resurgence of interest in shamanic ideas and phenomena (e.g. Harner, 1990; Ripinsky-Naxon, 1993; Winkelman, 2010), and shamanism has recently been suggested to provide an important vehicle for understanding issues in neuroscience, social psychology, psychological therapy, and ecological psychology (Krippner, 2002; 2007; Winkelman, 2004). In keeping with the theme of this special issue on varieties of causation in consciousness, causal representation in shamanic experience, and how ideas from psychological and cognitive science regarding causal representation in ordinary waking experience might apply to shamanic experience, is considered. The focus will be on causal representation rather than on causation *per se*; that is, cognitive processing involving perceived and judged causal relationships, rather than actual causal relationships, will be considered.

The term 'shaman' has been suggested to derive from 'saman' of the language of the Tungus people of Siberia, and to refer to 'one who is excited, moved, or raised', 'to know', or 'inner heat' (Krippner, 2000; Walsh, 2007). Traditionally, a shaman is defined as someone who voluntarily enters and uses an altered state of consciousness in order to serve his or her community, and shamanism has been defined as a technology of ecstasy (Eliade, 1964). During a shamanic state, a shaman might experience 'soul flight' or 'journeying' in which he or she has visions involving travel to Lower Worlds (spiritual realms typically entered by descending through a cave, hole, or cenote), Upper Worlds (spiritual realms typically entered by ascending a ladder, tree, or mountain), and less frequently, a Middle World (our 'ordinary reality' including sacred and powerful locations on Earth), or a shaman might voluntarily and temporarily embody some other spirit. During such experiences, a shaman is believed to carry out a specific task (e.g. retrieving a lost or stolen soul) or obtain needed information (e.g. how to treat an illness or ensure a successful hunt), and successful completion of these tasks often involves assistance from supernatural entities (for discussion, Eliade, 1964; Kalweit, 1992; Krippner, 2002; 2007; Peters and Price-Williams, 1980; Walsh, 1990; 2007; for

discussion of differences between shamans and other types of magico-spiritual practitioners, Winkelman, 1992).

To a person within a shamanic culture or group, shamanic practices might be represented as causal in producing specific responses or behaviours in human or non-human elements in the natural world. Causal representations reflect judged or perceived causality and do not necessarily reflect actual causality. Even though causal representation in ordinary waking consciousness is generally presumed to approximate principles of causation (although there are exceptions, e.g. naïve physics, Genter and Stevens, 1983; inferences of causality from correlation, Onwuegbuzie and Daniel, 2002), no claims regarding the relationship of causal representation in shamanism or in ordinary waking consciousness to actual principles of causation are intended. Instead, the consideration here involves how judgments and perceptions of causality (i.e. how causal representation) in shamanic experience might be related to judgments and perceptions of causality in ordinary waking experience. To the extent that shamanic experience and waking experience arise from the same human mind, causal representation in shamanic experience and causal representation in waking experience might exhibit similar types of bias in prediction or explanation. Cognitive strategies involved in causal representation are discussed in Part I, and social consequences of those strategies are discussed in Part II. Implications for theories of mind and for theories of causal representation are discussed in Part III, and a brief summary and conclusions are presented in Part IV.

Part I: Cognitive Strategies

Many of the tasks required of a shaman involve solving problems that might not initially have a clear or obvious path to a solution. Shamans deal with this uncertainty in problem-solving by using a variety of methods, including adopting an intentional stance toward non-human elements of the natural world, employing various heuristics, and engaging in several types of magical thinking. As will be noted, such strategies are similar to those used by non-shamans in problem-solving.

The Intentional Stance

Attribution of beliefs, desires, and mental states to a non-human stimulus has been referred to as adopting an 'intentional stance' toward that stimulus (Dennett, 1987; 1988), and an intentional stance is different from a 'physical stance' (in which understanding of a stimulus's

behaviour is based on physical properties of that stimulus) or a 'design stance' (in which understanding of a stimulus's behaviour is based on how that stimulus is designed to function). In the absence of other information, adoption of an intentional stance toward a stimulus aids an individual in generating explanations of past behaviours and predictions of future behaviours for that stimulus. Adoption of an intentional stance toward a non-human entity or an event allows an individual to use social interactions with other people, as well as knowledge of the self as a rational agent possessing beliefs, desires, and mental states, as tools and analogies to aid in predicting or explaining behaviour of that entity or event. An intentional stance is useful in predicting behaviours of a wide range of stimuli (e.g. non-human animals, plants, natural inanimate stimuli such as lightning, human artefacts such as thermostats; Dennett, 1997). Although literature on the intentional stance has not addressed shamanism, the shamanic viewpoint toward non-human elements of the natural world seems consistent with an intentional stance, and adoption of an intentional stance toward non-human elements of the natural world is typical of shamanic practice.

Adopting an intentional stance or a physical stance results in differences in causal representation. For example, an intentional stance regarding a violent storm might suggest the storm reflects beliefs, desires, or mental states of some element of nature. Just as a person might be violent or loud when angry, perhaps violence or loudness of a storm might be interpreted as the anger of nature; just as a person who has been angered might be appeased by gifts, sacrifices, and confessions of error, perhaps an angry nature might be appeased by gifts, sacrifices, and confessions of error. In contrast, a physical stance regarding a violent storm might suggest the storm reflects a clash of warm air and cold air, and that gifts, sacrifices, and confessions of error would not have any impact on the storm. Interestingly, differences in causal representation are reflected in differences in cortical activity: adoption of an intentional stance is linked with increased activation of bilateral anterior paracingulate cortex (Gallagher *et al.*, 2002). Adoption of an intentional stance is not necessarily mutually exclusive with other types of descriptions; however, an intentional stance might in some circumstances provide more useful predictions or explanations (and broader generalizability) than would other types of descriptions (*cf.* Fodor's, 1974, arguments regarding reductionism and multiple realizability in science; also Dennett, 1997).

Heuristics

Even if knowledge of typical social interactions and of the self is used as a guide, a shaman who attempted to cure an illness, ensure a successful hunt, or contact a supernatural realm would still be faced with uncertainty. Contemporary research on normative problem-solving behaviour has documented a number of strategies that people use when faced with uncertainty in problem-solving; these strategies are referred to as *heuristics* and are ‘shortcuts’ or ‘rules of thumb’ that offer approximate solutions for minimal cognitive effort (Gigerenzer and Todd, 1999; Kahneman, Slovic and Tversky, 1982). Two of the most well-known heuristics include *representativeness* (the likelihood that some stimulus is a member of a set is determined by how closely that stimulus resembles known members of that set) and *availability* (the judged frequency of an item or category reflects how easily examples of that item or category may be perceived or remembered). To the extent that problem-solving by a shaman requires determination of the cause of some event (e.g. illness) or a need to manipulate some circumstance (e.g. where to go to ensure a successful hunt), causal representation forms an important part of shamanic practice; as discussed below, the representativeness heuristic and availability heuristic appear to contribute to causal representation in shamanism directly and also indirectly through different forms of magical thinking.

Consideration of the intentional stance is consistent with the possibility of an heuristic based on adoption of an intentional stance. Such an intentionality heuristic would suggest that if individuals do not possess sufficient physical knowledge or design knowledge regarding an object, then those individuals might attribute intentionality to the object and treat that object as if it were a rational agent that possessed beliefs, desires, and other mental states (*cf.* an intentionality bias, Rosset, 2008). Evidence for such an heuristic is widespread in descriptions of shamanic experience; however, use of an intentional stance is not limited to shamans or to those in shamanic cultures. Even in scientific-technological cultures, individuals without physical knowledge or design knowledge of technological artefacts might adopt an intentional stance toward some artefact (e.g. ‘that photocopy machine hates me’, ‘the thermostat thinks the room is too hot’, ‘the chess program wants to get its Queen out early’) or other stimulus (*cf.* Dennett, 1997), although the extent to which such attributions are believed as literally true is probably relatively small. Heuristic use of an intentional stance in shamanic settings and in non-shamanic

settings reveals a similarity between problem-solving of shamans and problem-solving of non-shamans: both groups appeal to an heuristic to determine the cause of some behaviour or event when faced with problem-solving in the face of uncertainty.

Magical Thinking

In the absence of causal knowledge, an individual might engage in one of several types of 'magical thinking'. Although magical thinking is considered immature or pathological by many contemporary scientists (e.g. Zusne and Jones, 1989), such a cognitive strategy is surprisingly widespread even in scientific-technological cultures (e.g. Subbotsky, 2010). Types of magical thinking most relevant to shamanic experience include transmutation, similarity, thought-action fusion, contagion, illusion of control, and tempting fate.

Transmutation. The belief that a substance or object can be transformed into a different substance or object is referred to as *transmutation*. Within shamanic cultures, a shaman wearing a mask or costume depicting an entity (e.g. god, spirit, animal) is not considered to be a human in disguise, but he or she is instead considered to become (i.e. be transformed into) the depicted entity (e.g. Eliade, 1964; Gell, 1975; but see Pollock, 1995). Given the extreme conditions that often accompany shamanic rituals (e.g. fasting, sleep deprivation, psychoactive drugs, monotonous stimulation), individuals with a shamanic worldview might be more likely to imaginatively transform a stimulus in a way consistent with transmutation (e.g. in a typical shamanic initiation, an individual has an experience of his or her body being taken apart and then reassembled into a purer and more spiritual form). Transmutation is also found in cultures that are non-shamanic (e.g. in a Roman Catholic communion ritual, the wafer and wine are transmuted into the flesh and blood of Christ). Transmutation might involve representativeness, as a mask more closely resembles the entity depicted by that mask than it resembles a human wearing that mask;¹ more broadly, substances or objects that are transmuted tend to

[1] The representativeness heuristic is most commonly associated with judgments of probabilistic reasoning (e.g. did this stimulus come from that population of stimuli?), and in the absence of an explicit judgment of probability, representativeness might not initially seem applicable to other types of judgments discussed here. However, in transmutation, the law of similarity, totemism, and attributions of authorship of action, the source of the substance, object, attribution, or entity must be determined, and this determination might involve an implicit judgment of probability. According to the representativeness heuristic, an observed entity or event is more likely to come from a population of entities or events with similar characteristics than from a population of entities or events with different characteristics. Thus, the more a specific substance, object, attribute, or entity resembles some other substances, objects, attribute, or entities, the more likely that specific

resemble the substances or objects into which they are transmuted (e.g. red wine into blood), and this similarity increases the likelihood they will be perceived as those substances or objects.

Similarity. A belief that a desired effect is more likely to occur if the cause more closely resembles that effect is referred to as the *law of similarity* (e.g. Frazer, 1963; Rozin, Millman and Nemeroff, 1986). For example, injuring or destroying an image of an individual was believed in many cultures to bring injury or death to that individual, as an image of a given individual resembles that individual more than it resembles any other individual (even if only in name). Analogously, some indigenous peoples in northwestern North America believed that placing a painted image of a fish in a body of water would lead to the appearance of actual fish. The importance of resemblance is highlighted in that a painted image of a fish resembles a live fish more closely than anything else (other than a live fish) a shaman might place in the water. Similarly, in medieval Europe, the mandrake plant was believed to have medicinal value because its roots resemble the shape of the human body, and in earlier times, prominence in the night sky of Mars, a planet the colour of blood, was thought to portend war and conflict. Like transmutation, the law of similarity might be related to the representativeness heuristic, as the most effective cause is the one that most closely resembles the desired effect. Along these lines, it might be easier to transfer properties of a cause object into an effect object if the effect object already resembles that into which it would be transmuted.

Thought-Action Fusion. A belief that thoughts and actions are inextricably linked is referred to as *thought-action fusion* (e.g. Berle and Starcevic, 2005; Shafran and Rachman, 2004). There are two main forms of thought-action fusion: *TAF moral* in which thinking a morally unacceptable thought is believed to be morally equivalent to engaging in the unacceptable event or action depicted in that thought, and *TAF likelihood* in which thinking of a specific event or action is believed to cause (or increase the likelihood of) the event or action depicted in that thought. TAF likelihood appears more closely related to shamanism and to causal representation than is TAF moral, as shamanic tasks are generally concerned with bringing about (i.e. causing) a specific action, event, or outcome. The idea of thought-action fusion is consistent with interpreting images and experiences arising during shamanic experience as reflecting a form of reality as valid as that

substance, object, or entity might be represented as coming from, more closely related to, sharing more properties with, or leading to other examples of, that larger population of substances, objects, attributions, or entities.

reflected by (perceptual) images and experiences arising during ordinary waking experience; indeed, the visualized locations and entities experienced in shamanism are interpreted as having their own objective existence (e.g. similar to that of visualized buddhas or mandalas in Tantric Buddhism; Ray, 2001). Having their own objective existence, such imaged or experienced stimuli could potentially act as causal agents or objects. Similarly, TAF likelihood is consistent with ideas in non-shamanic cultures regarding the impact of prayer and visualization and the power of positive thinking.

Contagion. A belief that objects previously in contact with each other continue to influence each other even after having been separated is referred to as the *law of contagion* (e.g. Frazer, 1963; Nemeroff, 1995; Nemeroff and Rozin, 1994; Rozin *et al.*, 1989; also referred to as *thought-object fusion*, Gwilliam, Well and Cartwright-Hatton, 2004). Such a notion underlies voodoo (vodoun) and other rituals in which possession of some previous part of a person (e.g. lock of hair, fingernail clipping) or possession of an object previously worn or used by a person (e.g. piece of jewellery) could be used to influence that person from a distance. Similarly, items in the medicine bundle of a shaman are believed to convey the power of their place of origin to the shaman, and properties of a specific animal are transferred to those who eat that animal or who have that animal as a totem, guide, or ally. Intriguingly, the law of contagion appears consistent with the possibility of functional connections between an individual and the natural world (e.g. for discussion, Hardy, 1998; Hubbard, 2002), non-local effects and entanglement in quantum physics and potential psi phenomena (e.g. Radin, 2006), and existence of a psychological or social form of causality in which physical contact is not required (e.g. Schlottmann *et al.*, 2006). In all of these cases, objects that are not physically connected nonetheless appear causally connected.

Illusion of Control. A belief that the likelihood of a specific desired outcome is significantly higher than the objective probability of that outcome is referred to as the *illusion of control* (e.g. Langer, 1975; Wohl and Enzle, 2002). More specifically, when individuals are presented with a chance event (e.g. roll of the dice, spin of a roulette wheel), they believe they can control or influence that event (e.g. perhaps because of thought-action fusion) and increase the likelihood of a more desirable outcome. By having a shaman attempt to counteract illness or bad fortune caused by a malevolent sorcerer, journey to a Master of Animals (a supernatural entity within mythologies of many shamanic groups and who protects animals from over-exploitation by

humans) to ensure a successful hunt, or engage in other typical shamanic activities, an illusion of control regarding outcomes of these activities might occur. Illusion of control is related to causal representation: any attempt to control an entity or an event is to attempt a causal relationship with that entity or event such that one's actions influence the behaviour or outcome of that entity or event. The illusion of control is also related to the illusion of conscious will, in which an individual feels he or she is causally responsible for a specific outcome (*cf.* Wegner, 2002). Within a shamanic culture or group, shamanic experience might similarly create an illusion of conscious will.

Tempting Fate. A belief that a negative outcome to a situation is more likely to occur if one is overly prideful regarding one's contributions to the outcome or if one is careless regarding one's responsibilities in that situation is referred to as *tempting fate* (e.g. Risen and Gilovich, 2008). An example of this can be seen in the extreme adherence to taboo within shamanic cultures; breaking a taboo is an extremely serious offence, as such a behaviour is believed to offend the spirits and lead to negative consequences for one's self and for one's group (e.g. Eliade, 1964; Walsh, 2007). A reluctance to tempt fate is also seen in scientific-technological (non-shamanic) populations, and such a reluctance has been attributed to the availability heuristic (i.e. because of loss aversion, potential negative consequences are more easily generated than are potential positive consequences — i.e. individuals can usually think of more ways for a situation to go wrong than of ways for that situation to go right — and so a negative outcome is thought to be more likely; Risen and Gilovich, 2008). Alternatively, it might be that existence of taboos and adherence to taboos in shamanic cultures and in scientific-technological cultures reflects accidental associations of actions and specific outcomes that do not have an opportunity for subsequent falsification (e.g. Skinner, 1948; but see Aeschleman, Rosen and Williams, 2003; Staddon and Simmelhag, 1971).

Part II: Social Consequences

Given that shamanic activities are usually undertaken to aid other members of the community, shamans are important social functionaries (Hultkrantz, 1973; Townsend, 1999). The intentional stance adopted by shamans toward the natural world suggests that social biases exhibited in the causal representation of behaviours of humans might also be exhibited in the causal representation of behaviours of non-human elements of the natural world. We see examples of this in

social attribution, locus of control, attribution of authorship of action, and supernaturalizing of human social life.

Social Attribution

Adoption of an intentional stance toward an element of the natural world could make it seem likely that such an element possesses awareness of an individual's desires or actions (and might be influenced by appeals from that individual). Such an intentional relationship between a shaman and the natural world is a social one, and so principles of social cognition operative in ordinary consciousness might also be operative in shamanic consciousness and influence how the shaman represents causality regarding actions of non-human elements of the natural world. We see examples of this in the fundamental attribution error, correspondence bias, in-group/out-group differences, and totemism.

Fundamental Attribution Error. A tendency to underestimate contributions of situational variables to an individual's behaviour in a given situation is referred to as the *fundamental attribution error* (for review, Ross, 1977). As a consequence, observers are more likely to attribute an individual's behaviour to a trait or disposition of that individual. For example, if we pass a person in the corridor and he does not acknowledge us, we are more likely to judge that person as acting as he did because 'he is just that kind of person' (e.g. rude or thoughtless) rather than because of any situational factors (e.g. in a hurry or preoccupied). If a similar bias is applied to the natural world, then any action of nature would be judged to result from a trait or disposition of nature rather than from situational factors. For example, a falling rock or a violent storm would be attributed to a trait of nature (e.g. easy to anger) rather than to a situational factor (e.g. erosion of supporting soil or a clash of warm air and cold air). Indeed, a trait view of nature would presumably be more favoured if knowledge of physical mechanisms was not available and an intentional stance was more likely to be adopted (*cf.* Malinowski, 1954). Even so, it is not clear whether an increase in attribution of human-like traits to non-human elements of the natural world led to shamanism or whether shamanism led to an increase in attributions of human-like traits to non-human elements of the natural world.

Correspondence Bias. A tendency to draw inferences about a person's unique traits and dispositions from behaviours that could instead be explained by the situations in which those behaviours occur is referred to as the *correspondence bias* (e.g. Gilbert and Malone,

1995).² Surprisingly, the extent to which the person's behaviour appears freely chosen or not freely chosen does not significantly impact such inferences; for example, if an individual writes an essay or gives a speech in support of a particular viewpoint, observers are more likely to believe that particular viewpoint reflects the individual's own actual viewpoint even if those observers know that individual was instructed or coerced to present that particular viewpoint (e.g. Jones and Harris, 1967; Shweder, 1977). The notion of the correspondence bias can be easily broadened to include magical thinking (e.g. the cause of a misfortune might be attributed to thought-action fusion if an individual was thinking evil thoughts, *cf.* Pronin *et al.*, 2006; also Millar, 1984) and elements of the natural world (e.g. the cause of a misfortune might be attributed to an angered nature spirit). Interestingly, such a broadening suggests a contribution of the representativeness heuristic or the law of similarity to the correspondence bias, as the extent to which behaviour of a non-human element of the natural world resembles human behaviour might make it appear more likely that such behaviour comes from the same sources as human behaviour (e.g. mental states).

In-group/Out-group Differences. The shaman's adoption of an intentional stance toward non-human elements of the natural world could also result in an expansion of the in-group of the shaman. Typically, the in-group of any individual consists of a small set of humans with whom that individual is in some way affiliated, and these in-group members are evaluated more positively and perceived as more similar to the individual than are out-group members (for review, Stephan, 1985). Using social relationships with others in the in-group and knowledge of the self to model causal relationships in the natural world would make the modelled elements of the natural world appear more similar to the individual, and thus more likely to be contained within the in-group of that individual. As a consequence, if a portion of the natural world is considered as part of the in-group (e.g. as in totemic relationships), then that portion of the natural world would be treated more positively than would other portions of the natural world, or than if that portion of the natural world is not considered as part of the in-group. This is consistent with observations that in shamanic

[2] There is debate regarding whether the fundamental attribution error and correspondence bias are separate biases or different aspects of the same bias (*cf.* Gawronski, 2004; Krull, 2001), but most researchers stress a decrease in attention to situational factors in the fundamental attribution error and an increase in attention to traits or dispositions in the correspondence bias. Given this, the fundamental attribution error and correspondence bias are presented separately, but whether they are separate biases or different aspects of the same bias does not impact the issues discussed here.

societies there are generally strict prohibitions against hunting, harming, or consuming one's totem animal, and these prohibitions are analogous to prohibitions against hunting, harming, or consuming other human beings within one's in-group.³

Totemism. Just as knowledge of the self and of one's mental states and social behaviours of humans provides an analogy or metaphor for understanding non-human elements of the natural world if an intentional stance toward those elements is adopted, so too can knowledge of non-human elements of the natural world provide an analogy or metaphor for understanding one's self and other humans. If characteristics of a non-human animal are extended to an individual or to a group, then that non-human animal is considered to be a totem for that individual or group. More specifically, totemic thought involves an analogical relationship between natural history knowledge and social knowledge (Levi-Strauss, 1966; Winkelman, 2002) such that differences among human groups are represented by differences between animal species. Salient characteristics and properties of totem animals are thought to apply to humans who have that animal species as a totem, and this might involve application of the representativeness heuristic, law of similarity, or increased similarity of the in-group. A related issue involves animal allies or guardian spirits, as such entities are believed to empower shamans with specific abilities; such allies or guardians also provide a representational system and model for self-differentiation and self-development (e.g. Swanson, 1973).

Locus of Control

As noted earlier, magical thinking often involves an illusion of control over an event that is not controllable. However, it is not just the amount of control potentially exercised over a given force, action, or event that influences causal representation, but whether that control is exercised by the individual or by some outside force or entity beyond the individual (and outside that individual's control). The extent to which an individual believes that he or she can control or predict what happens to him or her is referred to as *locus of control* (for review, Lefcourt, 1982; also Rotter, 1966); in general, an *internal locus* (in which the individual believes that he or she controls what happens to

[3] Objectification and withdrawal of intentionality from the natural world would make elements of the natural world appear less similar to the individual, and thus less likely to be contained within the in-group of that individual. Indeed, such a notion parallels the 'de-enchantment' and subsequent destruction and endangerment of the natural environment that accompanied the rise of science and the industrial revolution and has led to calls for a 're-enchantment' of the natural world (Berman, 1981) and a more 'sacred science' (Peat, 1994).

him or her) leads to more adaptive or healthier responding than does an *external locus* (in which the individual believes that an external force such as God, fate, or chance controls what happens to him or her). Shamanic practices can redirect the perceived locus of control of an individual from a non-human element of the natural world to a human shaman, and this can provide (perception of) a more internal locus of control for the individual, family, or clan (as the cause is viewed as controllable by the shaman, and through appeal to the shaman, controllable by the individual, family, or clan), thus helping that individual, family, or clan cope more easily with a given situation.

Authorship of Actions

Whether actions or events are perceived to be caused by one's self or caused by some agent other than one's self is suggested to involve *authorship processing* (Wegner and Sparrow, 2004). Although in many cases one's causal role (e.g. authorship) in an action or event might appear obvious, in other cases one's causal role is not clear (e.g. did the computer crash because I pushed a wrong key or because of a glitch in the program?) Attribution of authorship can be influenced by priming (e.g. Aarts, Custers and Marien, 2009; Aarts, Custers and Wegner, 2005); in a relevant experiment, participants who claimed belief in existence of God and were subliminally primed with the word 'God' were less likely to believe they caused changes in a computer-driven display than were non-primed believers or primed non-believers (Dijksterhuis *et al.*, 2008). If a shaman (or those a shaman served) were primed by expectations the shaman would provide a successful solution to a problem (e.g. curing an illness, finding a herd), then such an outcome would be attributed to the shaman regardless of whether or not that outcome was actually caused by the shaman's actions. Interestingly, similarity between an external event and one's behaviour increases attribution of self-authorship for that event (e.g. Knoblich *et al.*, 2002), and this is consistent with the law of similarity, representativeness heuristic, and thought-action fusion.

Supernaturalizing Social Life

Rossano (2007) suggested shamanism resulted from an extension of the human social world into the supernatural. Rossano uses Lohmann's (2003, p. 176) definition of the 'supernatural' as 'the extension of "volitional schema" to phenomena devoid of intention and will'. An extension of a volitional schema toward such phenomena can be seen as equivalent to adopting an intentional stance toward

those phenomena. As a consequence of extending the human social world into the supernatural, the gods, spirits, ancestors, and other entities inhabiting the supernatural become a watchful ‘eye’ that is ever vigilant and observing. Individuals are less likely to cheat or engage in negative or antisocial behaviours if they believe they are being watched (e.g. Burnham and Hare, 2007), and so suggestions of an omnipresent god (or ancestors) observing all of an individual’s actions (even those actions done in private) leads to more prosocial behaviour, better adherence to group norms of behaviour, and better social control. Gods, as well as ancestor, animal, or nature spirits, serve as extensions of the human social world, and in addition to influencing behaviour toward other humans, also influence how humans interact with non-human elements of their surroundings (e.g. how humans utilize natural resources — e.g. improper use of resources might anger the spirits, and so the resources would be taken away until appropriate apologies and changes in behaviour were made).

Part III: Implications for Mind and Causal Representation

The cognitive strategies discussed in Part I, and the social consequences of those strategies discussed in Part II, have implications for theories regarding the mind and for theories regarding causal representation. These implications involve use of metaphor and analogy, existence of a specialized module for social information, use of behaviour to infer mental states, distinguishing between physical causality and psychological causality, a role of property transmission in causal representation, and whether causal representation reflects general processes or state-specific processes.

Metaphor and Analogy

Within a shamanic framework, extension of intentionality (i.e. adoption of an intentional stance) toward non-human elements of the natural world imbues those elements with beliefs, desires, and mental states that are typical of humans. Similarly, attribution of properties of a non-human animal to humans in totemism imbues those humans with properties that are typical of that type of non-human animal. In each case, one type of entity is treated as if it were a different type of entity, and this provides useful analogies for understanding, predicting, or controlling (i.e. for problem-solving involving) non-human elements of the natural world or humans, respectively. Such analogies involve use of metaphor, and so causal representations involving actions of any such entities would reflect properties imbued by the

metaphor. Similarly, use of metaphor and analogy in extension of intentionality, totemism, and supernaturalizing the human social world, as well as increases in perceived relatedness of humans with non-human elements of the natural world that result from such metaphor and analogy, facilitates application of the representativeness heuristic and the law of similarity in causal representation. Such extensive use of metaphor and analogy in shamanic cognition is consistent with Lakoff and Johnson's (1980) suggestion that much of ordinary waking cognition is based on metaphor (also Gibbs, 2008; Ortony, 1993).

Not only is the use of metaphor and analogy common in shamanic cognition and in non-shamanic cognition, but the content of some metaphors and analogies are remarkably similar across shamanic cultures and scientific-technological (non-shamanic) cultures. One example is that the sky is a place of power and an individual who visits the sky becomes powerful (for discussion, Hubbard, 2008). Legends in shamanic cultures speak of bridges between Earth and sky, and individuals considered capable of crossing such bridges to 'journey the sky' (e.g. shamans) were viewed as possessing great power (Krupp, 1983). Similarly, during the Cold War of the 1960s, nations able to 'journey the sky' were seen as powerful (as control of space offered strategic advantages), and the race to land humans on the moon was a race for dominion of the political landscape of Earth as well as for dominion of the sky. International politics surrounding the docking of Apollo-Soyuz, presence of international crews on the Mir station, and construction of the international space station demonstrate that the sky continues to be a source of power and that those who journey the sky are still perceived as powerful (albeit in different ways). Such metaphors involve different vehicles (shamanic journey, spacecraft launch) but the same tenor (power); this suggests causal representations in shamanic consciousness and in ordinary waking consciousness involve the same mechanisms but can vary in the parameter values or content assigned to those causal representations.

Modularity of Mind

Theories of mind based on a consideration of the demands on an evolving brain suggest that human minds are more like a collection of highly specialized modules and less like a blank slate or general purpose computer; in other words, the mind is more analogous to a Swiss army knife with numerous different specialized blades and appliances and less analogous to a single generalized multipurpose blade (e.g.

Mithen, 1996). Having specialized modules could be adaptive, as modules dedicated to processing specific types of information could increase the speed and efficiency of problem-solving involving those types of information and lead to an increased probability of survival and reproduction (for discussions of modularity, Fodor, 1983; Garfield, 1991; Karmiloff-Smith, 1992). Accordingly, natural selection might be expected to favour development and application of modules in problem-solving situations, and such a modular approach characterizes much of ordinary waking cognition (e.g. Laws *et al.*, 2011). Although the number and specializations of different modules vary from theory to theory, many theorists postulate the existence of a module specialized for processing information related to social knowledge and social interaction (e.g. Mithen, 1996; Winkelman, 2010) or to biological or animate forms (e.g. Atran, 1995; but see Carey, 1995).⁴

Hubbard (2003) suggested that in problem-solving involving non-human elements of the natural world, an individual lacking appropriate physical information might utilize his or her most efficient cognitive module, and that if such a module was specialized for social information, then non-human elements of the natural world could be framed or conceptualized in social and intentional terms (e.g. Brother Wolf, Father Sky, etc.). Use of a cognitive module specialized for processing information related to social knowledge and social interaction could result in causal representation similar to that observed in shamanism, including extension of intentionality into the natural world and expansion of the social in-group to include non-human elements of the natural world. Use of a social module might also have been more likely if a characteristic of a non-human element of the natural world initially appeared similar to a characteristic of humans (e.g. appearing capricious). The existence of a cognitive module specialized for processing information related to social knowledge and social interaction has been postulated to have been present in early humans (Mithen, 1996), and this is consistent with archeological findings that the origins of shamanism occurred very early in human history (e.g. Clottes and Lewis-Williams, 1998; Lewis-Williams, 2002), and with observations that present-day analogues of primitive hunter-gatherers

[4] A similar idea is found in theories of 'multiple intelligences'. Although not 'modules' in a technical sense, the list of separate 'intelligences' often includes an intelligence that involves social interaction (e.g. an 'interpersonal intelligence' that involves processing of information regarding other people's moods, temperament, motivations, and intentions, and an 'intrapersonal intelligence' that involves understanding, using, and interpreting one's own emotions; Gardner, 1983).

(e.g. Australian aborigines) perceive their landscape in social terms (e.g. Cowan, 1992).

A different role of modularity in shamanism was proposed by Winkelman (2002), who suggested that characteristics of shamanism resulted from an integration of information from three distinct modules specialized for processing information related to social interaction, intentionality, or animal behaviour. However, if cognitive functioning regarding such information is actually modular, then integration of modules would not be possible, because a defining feature of a module is information encapsulation (i.e. processing within a module is not influenced by any other beliefs, knowledge, or expectations of that organism; Fodor, 1983). Such an integration of information might occur if different modules were combined into a single 'metamodule', but such a combination would seemingly defeat the purpose of having developed separate modules; instead, it might be more likely that any apparent integration would rely on outputs of multiple modular processes that could be further processed by a higher-level mechanism rather than on a merging of multiple modular processes into a single process (*cf.* a module of metarepresentation; Sperber, 1994). Alternatively, it might be that a social module was relatively more efficient and so was more likely to be evoked for processing of non-social information (in the absence of other appropriate modules or information).

Using Behaviour to Infer Intentionality

In shamanism, extension of intentionality to non-human elements of the natural world involves non-human animals, plants, rocks, sky, wind, and rain, and the behaviours of such non-human elements are explained in (intentional) terms of beliefs, desires, and mental states attributed to those elements. Interestingly, an extension of intentionality to a non-human stimulus in shamanism initially appears analogous to a similar extension of intentionality in artificial intelligence, in which some theorists argued that a computer running an appropriate program would experience the same mental states (presumably including intentionality) as a human (e.g. Newell and Simon, 1972; Schank and Abelson, 1977). Passing a Turing test⁵ has been proposed

[5] In the Turing test, three participants (two humans and one computer) are placed in different rooms, and the only communication between rooms is via typed text messages. One of the human participants must determine, based solely on responses from the other participants, which responder is the other human and which responder is the computer. This person engages the other participants in exchanges of typed text messages, and he or she can ask any question, make any statement, and attempt to engage in conversation on any topic.

as a criterion for attribution of intentional states to a computer; according to proponents of the Turing test, if behaviours (outputs) of a computer cannot be distinguished from behaviours (responses) of a human, then any intentional or mental states attributed to the human must also be attributed to the computer (for discussion, Dreyfus, 1992; Haugeland, 1985; Searle, 1980; Weizenbaum, 1976). In shamanism and in artificial intelligence, there is an extension of intentionality (i.e. attribution of mental states) to a non-human stimulus, and this extension is based on behaviour of the stimulus and not on the substrate, structure, or medium within which intentionality occurs and from which behaviour emerges (i.e. is not based on the 'body').

A strong form of artificial intelligence in which human-like mental states are attributed to a computer running an appropriate program might appear similar to a shamanic practice in which human-like mental states are attributed to a non-human element of the natural world. Although the general form of causal representation appears similar, the specific parameter values or content of the representation (i.e. whether intentionality is attributed to a human artefact or to an element of the natural world) varies. Computer models and simulations of cognitive processes are usually based on verbal protocols, priming, and other data collected from human participants engaged in various tasks, and so performance of many computer models and simulations on analogous tasks possesses at least a superficial similarity to human performance. Thus, an extension of intentionality to artificially constructed devices, or more specifically, an attribution of mental states to artificially intelligent systems, might involve the law of similarity. Similarity of behaviours (e.g. outputs, responses) of a computer and a human might lead to an assumption of similar causes (i.e. similar mental states). Framed in this way, an attribution of mental states to a computer could appear to be consistent with claims that magical thinking persists in the modern world but is disguised to fit the scientific paradigm (e.g. Subbotsky, 2010).

Physical Causality vs. Psychological Causality

The literature on causal representation contains a distinction between physical (mechanical) causality and psychological (social) causality (for review, Hubbard, 2012). The former is exemplified by the launching effect displays of Michotte (1963), in which a moving object

If this person cannot determine which responder is the other human and which responder is the computer, then the computer is said to have passed the Turing test.

contacts a stationary target and that stationary target then moves away (no intentionality), and the latter is exemplified by the displays of Heider and Simmel (1944), in which behaviour of a group of moving geometric shapes is spontaneously described in social (intentional) terms. The distinction between an intentional stance and either a design stance or a physical stance is similar to the distinction between psychological causality and physical causality. In general, explanation involving psychological causality is based on mental factors such as desires, beliefs, and knowledge, whereas explanation involving physical causality is based on mechanical factors such as mass, velocity, and chemical structure.⁶ Also, causal representation is influenced by whether stimuli are considered to be animate or inanimate (e.g. Dittrich and Lea, 1994; Falmier and Young, 2008), and given that intentionality is usually linked to animacy, this underscores the importance of intentionality. Interestingly, given that social influence does not require physical contact, causality based on mental factors such as desires, beliefs, and knowledge would appear to be consistent with the law of contagion.

Adopting an intentional stance toward an element of the natural world would increase attributions of psychological causality regarding behaviours of that element, and so the behaviour of that element within a shamanic framework should be more likely to be perceived or judged as resulting from psychological causes than as resulting from physical causes. Given that an intentionality heuristic might be more commonly used in causal representation in shamanic cognition than in causal representation in ordinary waking cognition, social biases might be more widely or more frequently demonstrated within shamanic cognition than within ordinary waking cognition, and there might be differences in the effects of different variables in different states of consciousness (consistent with calls for state-specific sciences, e.g. Tart, 2000; 2008). However, given similarities of heuristics, magical thinking, and social biases in shamanic cognition and in non-shamanic cognition, it does not appear that shamanic consciousness and ordinary waking consciousness use non-overlapping

[6] Wolff (2007) suggests that some physicalist models of causation can treat social influences as analogous to physical forces (e.g. 'efforts' and 'intentions' are construed as 'energies' and 'forces') and that both physical causality and psychological causality involve an origin, magnitude, and direction. Given this, elements of causal representation (e.g. representing origin, magnitude, and direction; representing pattern and position) might be the same across different states of consciousness, but specific parameter values used by those mechanisms of causal representation would differ across different states of consciousness. Such an approach is consistent with the idea that causal representation might involve general processes rather than state-specific processes.

varieties of causal representation; rather, the same types of causal representation appear available in shamanic consciousness and in ordinary waking consciousness. Even so, a specific state of consciousness might be biased in favour of specific parameters or content assigned to causal representation (e.g. psychological causality might be increased in shamanic cognition).

Property Transmission

White (2009) suggested perception of causality emerges because a cause object imposes (at least one of) its properties on an effect object (e.g. a moving object that strikes a stationary object results in movement of the stationary object, a finger pressed into clay creates a finger-shaped indentation, paint spilled on a fabric stains the fabric, etc.). The notion of property transmission, like the notion of an intentional stance, can be used as an heuristic. As with any heuristic, an heuristic based on property transmission would yield correct answers in most of the circumstances in which it is used, but would yield incorrect answers in some circumstances. White suggests magical thinking related to the law of contagion represents such an incorrect use. More generally, and as White noted, property transmission can be seen in extension of intentionality, magical thinking, and social attribution. Consideration of property transmission appears consistent with causal representation in shamanic consciousness (e.g. totemic relationships, an intentional stance) and with causal representation in ordinary waking consciousness. Also, as it might be easier to transfer a property to an effect object from a cause object if the effect resembled or was similar to the cause, application of a property transmission heuristic might involve the representativeness heuristic and the law of similarity.

State-Specific Processes vs. General Processes

Given that application of magical thinking, heuristics, and social biases occurs in causal representation in shamanic experience and in causal representation in ordinary waking experience, these appear to be general processes of causal representation that operate across different types of consciousness. Apparent differences between causal representation in shamanic experience and causal representation in ordinary waking experience that might indicate state-specific processes might instead reflect differences in degree rather than differences in kind. Causal representation appears to involve general mechanisms that operate across different states of consciousness, and

different parameter values (passed to those mechanisms) could reflect or be determined by state-specific information (e.g. greater emphasis on psychological or physical causes in shamanic or non-shamanic causal representation, respectively). Certain parameter values of causal representation might be relatively invariant across changes in the state of consciousness, whereas other parameter values of causal representation might be relatively unique to specific states of consciousness (e.g. creation of an object in shamanic states or in ordinary waking reality might involve the same formal cause — e.g. plan, intention — but different material causes). Such does not deny that highly specific state-specific processes might exist, but merely asserts that many observed properties of causal representation in shamanic cognition and causal representation in ordinary waking cognition appear to reflect general processes.

Part IV: Summary and Conclusions

Similarities in causal representation in shamanic consciousness and in ordinary waking consciousness were considered. Causal representation in shamanic experience and in ordinary waking experience can engage cognitive strategies that imbue non-human stimuli with intentionality (experience of beliefs, desires, and mental states similar to the beliefs, desires, and mental states experienced by humans), involve heuristics (representativeness, availability, intentionality, property transmission), and involve magical thinking (transmutation, similarity, thought-action fusion, contagion, illusion of control, tempting fate). These strategies influence social biases (fundamental attribution error, correspondence bias, in-group/out-group differences, totemism) toward non-human elements of the world, locus of control, attribution of authorship of actions, and supernaturalizing of elements of human social life. Causal representation in shamanic consciousness and in ordinary waking consciousness involves metaphor and analogy, modular processing of social information, and the use of behavioural criteria for attribution of mental states in non-human stimuli. Additionally, causal representation in shamanic experience does not as strongly differentiate between physical causality and psychological causality, involves sensitivity to property transmission, and involves at least some processes of causal representation that are general rather than state-specific.

Principles of causal representation in shamanic consciousness appear generally consistent with principles of causal representation in ordinary waking consciousness. This consistency suggests continuity

in cognitive processes and in principles of causal representation across different states of consciousness, and is consistent with previous suggestions of similarities across shamanic cognition and non-shamanic cognition (e.g. Hubbard, 2002; 2003; Rock and Krippner, 2007). Two caveats are in order, though. First, the consideration here addressed causal representations (i.e. perceived or judged causal relationships) rather than actual causal relationships. No claims regarding the correctness of causal representation relative to actual causality in shamanic experience or in ordinary waking experience were made. Second, the similarity of causal representation in shamanic experience and in ordinary waking experience does not rule out that important differences might exist between causal representation in ordinary consciousness and causal representation in other (non-shamanic) states of consciousness. Even so, similarities in causal representation in shamanic cognition and in ordinary waking cognition should not be surprising, as shamanic consciousness and ordinary waking consciousness can arise in the same human mind. Rather than separate and state-specific rules for causal representation, there appear to be more general mechanisms that are used for causal representation in different states of consciousness.

Acknowledgments

The author thanks Stanley Krippner, Kathleen McCulloch, and two anonymous reviewers for helpful comments on an earlier version of the manuscript.

References

- Aarts, H., Custers, R. & Marien, H. (2009) Priming and authorship ascription: When nonconscious goals turn into conscious experiences of self-agency, *Journal of Personality and Social Psychology*, **96**, pp. 967–979.
- Aarts, H., Custers, R. & Wegner, D.M. (2005) On the inference of personal authorship: Enhancing experienced agency by priming effect information, *Consciousness and Cognition*, **14**, pp. 439–458.
- Aeschleman, S.R., Rosen, C.C. & Williams, M.R. (2003) The effect of non-contingent negative and positive reinforcement operations on the acquisition of superstitious behaviors, *Behavioral Processes*, **61**, pp. 37–45.
- Atran, S. (1995) Causal constraints on categories and categorical constraints on biological reasoning across cultures, in Sperber, D., Premack, D. & Premack, A.J. (eds.) *Causal Cognition: A Multidisciplinary Debate*, New York: Oxford University Press.
- Berle, D. & Starcevic, V. (2005) Thought-action fusion: Review of the literature and future directions, *Clinical Psychology Review*, **25**, pp. 263–284.
- Berman, M. (1981) *The Reenchantment of the World*, Ithaca, NY: Cornell University Press.
- Berman, M. (2000) *Wandering God: A Study in Nomadic Spirituality*, Albany, NY: State University of New York Press.

- Burnham, T. & Hare, B. (2007) Engineering human cooperation: Does involuntary neural activation increase public goods contributions?, *Human Nature*, **18**, pp. 88–108.
- Carey, S. (1995) On the origin of causal understanding, in Sperber, D., Premack, D. & Premack, A.J. (eds.) *Causal Cognition: A Multidisciplinary Debate*, New York: Oxford University Press.
- Clottes, J. & Lewis-Williams, D. (1998) *The Shamans of Prehistory*, New York: Henry N. Adams, Inc.
- Cowan, J. (1992) *Mysteries of the Dream-Time: The Spiritual Life of the Australian Aborigines*, Dorset: Prism.
- Dennett, D.C. (1987) *The Intentional Stance*, Cambridge, MA: MIT Press.
- Dennett, D.C. (1988) Précis of The Intentional Stance, *Behavioral and Brain Sciences*, **11**, pp. 495–505.
- Dennett, D.C. (1997) True believers: The intentional strategy and why it works, in Haugeland, J. (ed.) *Mind Design II*, Cambridge, MA: MIT Press.
- Devereux, G. (1961) Shamans as neurotics, *American Anthropologist*, **63**, pp. 1088–1090.
- Dijksterhuis, A., Preston, J., Wegner, D.M. & Aarts, H. (2008) Effects of subliminal priming of self and God on self-attribution of authorship for events, *Journal of Experimental Social Psychology*, **44**, pp. 2–9.
- Dittrich, W.H. & Lea, S.E.G. (1994) Visual perception of intentional motion, *Perception*, **23**, pp. 253–268.
- Dreyfus, H.L. (1992) *What Computers Still Can't Do: A Critique of Artificial Reason*, Cambridge, MA: MIT Press.
- Eliade, M. (1964) *Shamanism: Archaic Techniques of Ecstasy*, Trask, W.R. (trans.), Princeton, NJ: Princeton University Press. Original work published 1951.
- Falmier, O. & Young, M.E. (2008) The impact of object animacy on the appraisal of causality, *American Journal of Psychology*, **121**, pp. 473–500.
- Fodor, J.A. (1974) Special sciences (or: The disunity of science as a working hypothesis), *Synthese*, **28**, pp. 97–115.
- Fodor, J.A. (1983) *The Modularity of Mind*, Cambridge, MA: MIT Press.
- Frazer, J.G. (1963) *The Golden Bough: A Study in Magic and Religion (abridged)*, New York: Macmillan Publishing Company. Original work published in 1922.
- Gallagher, H.L., Jack, A.I., Roepstorff, A. & Frith, C.D. (2002) Imaging the intentional stance in a competitive game, *Neuroimage*, **16**, pp. 814–821.
- Gardner, H. (1983) *Frames of Mind: The Theory of Multiple Intelligences*, New York: Basic Books.
- Garfield, J.L. (ed.) (1991) *Modularity in Knowledge Representation and Natural-Language Understanding*, Cambridge, MA: MIT Press.
- Gawronski, B. (2004) Theory-based bias correction in dispositional inference: The fundamental attribution error is dead, long live the correspondence bias, *European Review of Social Psychology*, **15**, pp. 183–217.
- Gell, A. (1975) *Metamorphosis of the Cassowaries*, London: Athlone.
- Genter, D. & Stevens, A.L. (eds.) (1983) *Mental models*, Hillsdale, NJ: Lawrence Erlbaum Associates.
- Gibbs, R.W. (ed.) (2008) *The Cambridge Handbook of Metaphor and Thought*, Cambridge: Cambridge University Press.
- Gigerenzer, G. & Todd, P.M. (eds.) (1999) *Simple Heuristics That Make Us Smart*, New York: Oxford University Press.
- Gilbert, D.T. & Malone, P.S. (1995) The correspondence bias, *Psychological Bulletin*, **117**, pp. 21–38.

- Gwilliam, P., Wells, A. & Cartwright-Hatton, S. (2004) Does metacognition or responsibility predict obsessive-compulsive symptoms: A test of the meta-cognitive model, *Clinical Psychology and Psychotherapy*, **11**, pp. 137–144.
- Hansen, G.P. (2001) *The Trickster and the Paranormal*, New York: Xlibris.
- Hardy, C. (1998) *Networks of Meaning*, Westport, CT: Praeger Publishers.
- Harner, M. (1990) *The Way of the Shaman*, 3rd ed., San Francisco, CA: Harper Collins Publishers.
- Haugeland, J. (1985) *Artificial Intelligence: The Very Idea*, Cambridge, MA: MIT Press.
- Heider, F. & Simmel, M. (1944) An experimental study of apparent behavior, *American Journal of Experimental Psychology*, **57**, pp. 243–259.
- Heinze, R.I. (1990) *Shamans of the 20th Century*, New York: Irvington.
- Hubbard, T.L. (2002) Some correspondences and similarities of shamanism and cognitive science: Interconnectedness, extension of meaning, and attribution of mental states, *Anthropology of Consciousness*, **13**, pp. 26–45.
- Hubbard, T.L. (2003) Further correspondences and similarities of shamanism and cognitive science: Mental representation, implicit processing, and cognitive structures, *Anthropology of Consciousness*, **14**, pp. 40–74.
- Hubbard, T.L. (2008) The inner meaning of outer space: Human nature and the celestial realm, *Advances in Latin American Psychology (Special Issue on Nurturing Human Nature)*, **26**, pp. 52–65.
- Hubbard, T.L. (2012) Phenomenal causality, *Manuscript submitted for publication*.
- Hultkrantz, A. (1973) A definition of shamanism, *Temenos*, **9**, pp. 25–37.
- Jones, E.E. & Harris, V.A. (1967) The attribution of attitudes, *Journal of Experimental Social Psychology*, **3**, pp. 1–24.
- Kahneman, D., Slovic, P. & Tversky, A. (eds.) (1982) *Judgment Under Uncertainty: Heuristics and Biases*, New York: Cambridge University Press.
- Kalweit, H. (1992) *Shamans, Healers, and Medicine Men*, Boston, MA: Shambala.
- Karmiloff-Smith, A. (1992) *Beyond Modularity: A Developmental Perspective on Cognitive Science*, Cambridge, MA: MIT Press.
- Knoblich, G., Seigerschmidt, E., Flach, R. & Prinz, W. (2002) Authorship effects in the prediction of handwriting strokes: Evidence for action simulation during action perception, *Quarterly Journal of Experimental Psychology*, **55A**, pp. 1027–1046.
- Krippner, S. (2000) The epistemology and technologies of shamanic states of consciousness, *Journal of Consciousness Studies*, **7** (11–12), pp. 93–118.
- Krippner, S. (2002) Conflicting perspectives and shamans and shamanism: Points and counterpoints, *American Psychologist*, **57**, pp. 962–978.
- Krippner, S. (2007) Humanity's first healers: Psychological and psychiatric stances on shamans and shamanism, *Revista de Psiquiatria Clinica*, **34**, pp. 16–22.
- Krull, D.S. (2001) On partitioning the fundamental attribution error: Dispositionalism and the correspondence bias, in Moskowitz, G.B. (ed.) *Cognitive Social Psychology*, Mahwah, NJ: Lawrence Erlbaum Associates.
- Krupp, E.C. (1983) *Echoes of the Ancient Skies: The Astronomy of Lost Civilizations*, New York: New American Library/Plume.
- Lakoff, G. & Johnson, M. (1980) *Metaphors We Live By*, Chicago, IL: University of Chicago Press.
- Langer, E.J. (1975) The illusion of control, *Journal of Personality of Social Psychology*, **32**, pp. 311–328.
- Laws, K.R., Adlington, R.L., Moreno-Martinez, F.J. & Gale, T.M. (2011) *Category-Specificity: Evidence for Modularity of Mind*, Hauppauge, NY: Nova Science Publishers.

- Lefcourt, H.M. (1982) *Locus of Control: Current Trends in Theory and Research*, 2nd ed., Hillsdale, NJ: Lawrence Erlbaum Associates.
- Levi-Strauss, C. (1966) *The Savage Mind*, London: Weidenfeld & Nicolson.
- Lewis-Williams, D. (2002) *The Mind in the Cave*, London: Thames and Hudson.
- Lohmann, R.I. (2003) The supernatural is everywhere: Defining qualities of religion in Melanesia and beyond, *Anthropological Forum*, **13**, pp. 175–185.
- Malinowski, B. (1954) *Magic, Science and Religion, and Other Essays*, Garden City, NY: Doubleday.
- Michotte, A. (1963) *The Perception of Causality*, Miles, T. & Miles, E. (trans.), New York: Basic Books. Original work published 1946.
- Millar, S. (1984) Reasons for the attribution of intent in 7- and 9-year-old children, *British Journal of Developmental Psychology*, **2**, pp. 51–61.
- Mithen, S. (1996) *The Prehistory of the Mind: The Cognitive Origins of Art and Science*, London: Thames and Hudson, Ltd.
- Narby, J. & Huxley, F. (eds.) (2001) *Shamans Through Time: 500 Years on the Path of Knowledge*, New York: Tarcher/Putnam.
- Nemeroff, C. (1995) Magical thinking about illness virulence: Conceptions of germs from 'safe' versus 'dangerous' others, *Health Psychology*, **14**, pp. 147–151.
- Nemeroff, C. & Rozin, P. (1994) The contagion concept in adult thinking in the United States: Transmission of germs and of interpersonal influences, *Ethos*, **22**, pp. 158–186.
- Newell, A. & Simon, H.A. (1972) *Human Problem Solving*, Englewood Cliffs, NJ: Prentice-Hall.
- Noll, R. (1983) Shamanism and schizophrenia: A state-specific approach to the 'schizophrenia metaphor' of shamanic states, *American Ethnologist*, **10**, pp. 443–459.
- Onwuegbuzie, A.J. & Daniel, L.G. (2002) Uses and misuses of the correlation coefficient, *Research in the Schools*, **9**, pp. 73–90.
- Ortony, A. (ed.) (1993) *Metaphor and Thought*, 2nd ed., New York: Cambridge University Press.
- Peat, D.F. (1994) *Lighting the Seventh Fire: The Spiritual Ways, Healing, and Science of the Native American*, New York: Birch Lane Press/Carol Publishing Group.
- Peters, L.G. & Price-Williams, D. (1980) Towards an experiential analysis of shamanism, *American Ethnologist*, **7**, pp. 397–418.
- Pollock, D. (1995) Masks and the semiotics of identity, *Journal of the Royal Anthropological Institute*, **1**, pp. 581–597.
- Pronin, E., Wegner, D.M., McCarthy, K. & Rodriguez, S. (2006) Everyday magical powers: The role of apparent mental causation in the overestimation of personal influence, *Journal of Personality and Social Psychology*, **91**, pp. 218–231.
- Radin, D. (2006) *Entangled Minds: Extrasensory Experiences in a Quantum Reality*, New York: Paraview Pocket Books.
- Ripinsky-Naxon, M. (1993) *The Nature of Shamanism: Substance and Function of a Religious Metaphor*, Albany, NY: State University of New York Press.
- Ray, R.A. (2001) *Secret of the Vajra World: The Tantric Buddhism of Tibet*, Boston, MA: Shambala.
- Risen, J.L. & Gilovich, T. (2008) Why people are reluctant to tempt fate, *Journal of Personality and Social Psychology*, **95**, pp. 293–307.
- Rock, A.J. & Krippner, S. (2007) Shamanism and the confusion of consciousness with phenomenological content, *North American Journal of Psychology*, **9**, pp. 485–500.
- Ross, L. (1977) The intuitive psychologist and his shortcomings: Distortions in the attribution process, *Advances in Experimental Social Psychology*, **10**, pp. 173–220.

- Rossano, M.J. (2007) Supernaturalizing social life: Religion and the evolution of human cooperation, *Human Nature*, **18**, pp. 272–294.
- Rosset, E. (2008) It's no accident: Our bias for intentional explanations, *Cognition*, **108**, pp. 771–780.
- Rotter, J.B. (1966) Generalized expectancies for internal versus external control of reinforcement, *Psychological Monographs*, **80**, pp. 1–28.
- 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**, pp. 703–712.
- Rozin, P., Nemeroff, C., Wane, M. & Sherrod, A. (1989) Operation of the sympathetic magical law of contagion in interpersonal attitudes among Americans, *Bulletin of the Psychonomic Society*, **27**, pp. 367–370.
- Schank, R.C. & Abelson, R. (1977) *Scripts, Plans, Goals, and Understanding*, Hillsdale, NJ: Lawrence Erlbaum Associates.
- Schlottmann, A., Ray, E., Mitchell, A. & Demetriou, N. (2006) Perceived social and physical causality in animated motion: Spontaneous reports and ratings, *Acta Psychologica*, **123**, pp. 112–143.
- Shafran, R. & Rachman, S. (2004) Thought-action fusion: A review, *Journal of Behavior Therapy and Experimental Psychiatry*, **35**, pp. 87–107.
- Searle, J.R. (1980) Minds, brains, and programs, *Behavioral and Brain Sciences*, **3**, pp. 417–456.
- Shweder, R.A. (1977) Likeness and likelihood in everyday thought: Magical thinking in judgments about personality, *Current Anthropology*, **18**, pp. 637–658.
- Silverman, J. (1967) Shamans and acute schizophrenia, *American Anthropologist*, **69**, pp. 21–31.
- Skinner, B.F. (1948) Superstition in the pigeon, *Journal of Experimental Psychology*, **38**, pp. 168–172.
- Sperber, D. (1994) The modularity of thought and the epidemiology of representations, in Hirschfeld, L.A. & Gelman, S.A. (eds.) *Mapping the Mind: Domain Specificity in Cognition and Culture*, New York: Cambridge University Press.
- Staddon, J.E. & Simmelhag, V.L. (1971) The 'superstition' experiment: A reexamination of its implications for the principles of adaptive behavior, *Psychological Review*, **78**, pp. 3–43.
- Stephan, W.G. (1985) Intergroup relations, in Lindzey, G. & Aronson, E. (eds.) *Handbook of Social Psychology*, vol. II, 3rd ed., New York: Random House.
- Subbotsky, E. (2010) *Magic and the Mind: Mechanisms, Functions, and Development of Magical Thinking and Behavior*, New York: Oxford University Press.
- Swanson, G. (1973) The search for a guardian spirit: A process of empowerment in simpler societies, *Ethnology*, **12**, pp. 359–378.
- Tart, C. (2000) Investigating altered states of consciousness on their own terms: A proposal of state specific sciences, *International Journal of Parapsychology*, **11**, pp. 7–41.
- Tart, C. (2008) Altered states of consciousness and the spiritual traditions: The proposal for the creation of state-specific sciences, in Rao, K.R., Paranjpe, A.C. & Dalal, A.K. (eds.) *Handbook of Indian Psychology*, New Delhi: Cambridge University Press India.
- Townsend, J.B. (1999) Shamanism, in Glazier, S.D. (ed.) *Anthropology of Religion*, Westport, CT: Praeger.
- Tylor, E.B. (1871) *Primitive Culture: Researches in the Development of Mythology, Philosophy, Religion, Art, and Custom*, London: John Murray.
- Walsh, R. (1990) *The Spirit of Shamanism*, New York: Tarcher/Putnam.

- Walsh, R. (2001) Shamanic experiences: A developmental analysis, *Journal of Humanistic Psychology*, **41**, pp. 31–52.
- Walsh, R. (2007) *The World of Shamanism: New Views of an Ancient Tradition*, Woodbury, MN: Llewellyn Publications.
- Warner, R. (1980) Deception and self-deception in shamanism and psychiatry, *International Journal of Social Psychiatry*, **26**, pp. 41–52.
- Wegner, D.M. (2002) *The Illusion of Conscious Will*, Cambridge, MA: MIT Press.
- Wegner, D.M. & Sparrow, B. (2004) Authorship processing, in Gazzaniga, M. (ed.) *The Cognitive Neurosciences*, 3rd ed., Cambridge, MA: MIT Press.
- Weizenbaum, J. (1976) *Computer Power and Human Reason*, New York: Freeman.
- White, P.A. (2009) Property transmission: An explanatory account of the role of similarity information in causal inference, *Psychological Bulletin*, **135**, pp. 774–793.
- Winkelman, M. (1992) Shamans, priests, and witches: A cross-cultural study of magico-religious practitioners, *Anthropological Research Papers #44*, Tempe, AZ: Arizona State University.
- Winkelman, M. (2002) Shamanism and cognitive evolution, *Cambridge Archaeological Journal*, **12**, pp. 71–101.
- Winkelman, M. (2004) Shamanism as the original neurotheology, *Zygon*, **39**, pp. 193–217.
- Winkelman, M. (2010) *Shamanism: The Biopsychosocial Paradigm of Consciousness and Healing*, 2nd ed., Santa Barbara, CA: Praeger.
- Wohl, M.J.A. & Enzle, M.E. (2002) The deployment of personal luck: Sympathetic magic and illusory control in games of pure chance, *Personality and Social Psychology Bulletin*, **28**, pp. 1388–1397.
- Wolff, P. (2007) Representing causation, *Journal of Experimental Psychology: General*, **136**, pp. 82–111.
- Zusne, L. & Jones, W.H. (1989) *Anomalistic Psychology: A Study of Magical Thinking*, 2nd ed., Hillsdale, NJ: Lawrence Erlbaum Associates.