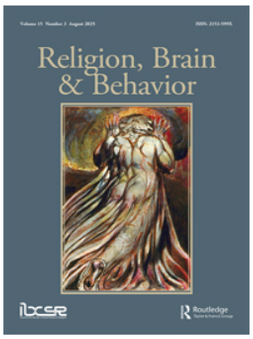

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Belief as explanation: a motivation-based theory of agency and anthropomorphism in religious belief

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ABSTRACT

Supernatural agent beliefs are ubiquitous across cultures, yet many theories aimed at explaining this fact have not held up to scrutiny. The most famous of these, the Hyperactive Agency Detection Device (HADD), has garnered several strong critiques and no supportive empirical evidence in almost 30 years. Yet, HADD is routinely cited as an explanation of why supernatural agent beliefs exist. We explore these problems and propose a new theoretical perspective to replace HADD. We suggest the tendency to create supernatural agents comes from the use of mental state reasoning to explain phenomenon beyond our current causal understanding. This is a non-automatic and cognitively effortful process. We review evidence that suggests we anthropomorphise when we are motivated to explain things we cannot explain using simpler causal mechanisms—like complex weather events or why good things happen to bad people. We argue this fits better than HADD with the evidence on how we use mental state reasoning to think about supernatural minds. This perspective allows us to account for two underspecified problems in the current literature: the shrinking domain of religion with the growth of science, and how to connect the origin of supernatural beliefs to the cultural evolution of religions.

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Humans are a species filled with curiosity. We explore new lands and indulge new possibilities with a desire to understand them. We seek out explanations for the unexplainable, and in doing so, discover new technologies, knowledge, and ways of being. Not only do we do this as an active process of knowledge formation, but recent theoretical advances have proposed that attempts to predict our environment is a fundamental principle of how our minds function (see Hohwy, 2013). We are prone to thinking in terms of causal processes and making spontaneous causal inferences, even with the weakest evidence to back those inferences up (Hassin et al., 2002; Weiner, 1985). Our sense of awe and wonder leads to a desire to explain the unknown and is likely central to our tendency to learn, explore, and discover new things about the world (De Cruz, 2024; Valdesolo et al., 2017). This curiosity has led us to solve complex technological and scientific problems, explore all corners of the earth and beyond, and create intricate social and political institutions.

Our impressive abilities to accumulate cultural knowledge have led to, among other things, the creation of complex religious systems that support our belief in ghosts, gods/goddesses, witches, spirits, fairies and a myriad of other supernatural agents (Gervais, 2013; Gervais et al., 2011). This process, too, has been found to be at least sometimes functional, with certain religious beliefs

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supporting social norms relevant to a population's need for cooperation (Lang et al., 2019; Norenzayan et al., 2016; Purzycki et al., 2016). The processes involved in building religions as norm enforcing institutions are likely not distinct from those used to build political and economic systems and other cultural institutions. By this we mean that development of both religious and non-religious institutions can be largely explained by the same selective social learning (Henrich & McElreath, 2003) and norm psychological (Chudek & Henrich, 2011) mechanisms that underlie cultural evolution and cumulative culture in humans (Henrich, 2017; Richerson & Boyd, 2005).

Whilst the emergence and evolution of our religious *institutions* may be explained by these cultural processes, what about the supernatural agents around which they typically arise? Though it is clearly the case that the specific culturally bound characteristics of a supernatural agent arise through cultural evolutionary processes (e.g., Lakshmi and The Cailleach are very different goddesses each developed in, and relevant to, very different cultural contexts), the question these cultural evolutionary processes have more difficulty answering is why do we create these supernatural agents so readily across all human cultures in the first place? Why do gods/goddesses, ghosts, or spirits, exist everywhere?

Answering the question of why supernatural agents are ubiquitous across human societies has been one of the core goals of the cognitive science of religion (Atran & Norenzayan, 2004; Barrett, 2004; Boyer, 2008). Despite several prominent theories, there is no consensus on why belief in supernatural agents is found everywhere (Willard et al., 2023). Most of these existing theories are based in heuristics or biases that arise from theory of mind (Willard & Norenzayan, 2013)—most simply defined as our ability to understand other people's minds. In basic terms, we use the abilities evolved to understand the goals, thoughts, intentions, and emotions of other humans to understand all sorts of things that are not human (Gervais, 2013). Though this appears true—the ability to understand a god's mind necessarily requires the ability to understand minds more generally—research on why we extend our ability to understand other people's minds to things that are not people has not come to a clear conclusion. The most popular explanation is based in our ability to detect that something is an agent (agency detection) from minimal cues. This theory suggests that the tendency to create supernatural agents comes from an automatic heuristic response that leads to the over-detection of agents based on proposed fitness benefits of assuming that everything might be an agent (Barrett, 2004; Guthrie, 1996). We challenge this view, as have others before us (Andersen, 2017; Lisdorf, 2007; Van Leeuwen & Van Elk, 2019). Where some critics have attempted to update agency detection theories (e.g., Andersen, 2017; Van Leeuwen & Van Elk, 2019), we put forward an altogether different explanation of how theory of mind may drive supernatural belief.

We are proposing that the tendency to use theory of mind on things that are not human minds arises from our curiosity and need for explanation rather than as a heuristic reaction to detect agents from perceptual cues. With this, we are essentially replacing a bias towards agency detection with a bias towards explanations, which sometimes engages mental states (and thus minds) as these explanations. We review the evidence for this in the pages that follow and suggest this evidence is much more robust than the evidence for the over-detection of agents from perceptual cues.

The idea that religion, and agency in religion, is used as explanation is in no way a new idea (e.g., Hume, 1779; Tylor, 1871), but there has been little psychological investigation of this as an account for why we believe in supernatural agents. We propose that when confronted with things that are important but difficult to understand (e.g., why there is a drought or why misfortune happens to some people at not others) we have a preference towards finding any explanation rather than leaving it unexplained (Keil, 2006). When other explanations are not obvious, we reach for something familiar to us (Lombrozo & Carey, 2006)—social explanations about other minds (Epley et al., 2007). We draw on a long standing literature which demonstrates that a bias towards making causal links, even when lacking proper evidence, is beneficial for associative learning (Abbott & Sherratt, 2011; Beck & Forstmeier, 2007; Daprati et al., 2019; Foster & Kokko, 2008; Skinner, 1948), but add that for this to be a complete explanation for religion (or other supernatural agent beliefs) we need to include some tendency towards mental state reasoning to fill in these causal links. We follow this

literature to suggest that our desire to explain the unexplainable can often be satisfied with assuming that complex causal systems have thoughts, emotions, desires etc. When other explanations are commonly available these mental state explanations can be replaced with more mechanistic ones, but mental state explanations are frequently used to fill in gaps when important things remain unexplained (Epley et al., 2007; Waytz, Morewedge, et al., 2010).

We borrow from Tanya Luhrmann (2012, 2020) in suggesting that this type of reasoning about supernatural minds is an effortful process, rather than one that is low cost and automatic (see Barrett, 2004; Guthrie, 1996). When people believe in supernatural agents, the ability to think about their minds is something that is cultivated and practiced to make the experience of, and confidence in, these types of explanations stronger. We suggest a similar slow and rationalized process is used create new supernatural agent beliefs in the first place. Further, people think about and elaborate on their explanations over time and generations, allowing for the cultural evolution of complex belief systems. The proposal that we create and use supernatural agent beliefs as explanations for difficult to explain phenomena fits better with patterns of belief decline in areas where more successful scientific explanations become available (e.g., explaining the weather, illness, etc) and better explains our tendency to culturally elaborate and innovate on these beliefs—a cultural evolutionary process necessary for creating religious institutions.

The unlikeliness of the Hyperactive Agency Detection Device (HADD)

Several theoretical perspectives have already been proposed to account for why we use mental states to explain things that are not human minds and how this might lead to supernatural beliefs. Before we can articulate our own theory, we need to review existing theories and explain the need for a new one.

Previous theories are largely predicated on Stuart Guthrie's (1993) pioneering work on anthropomorphism in religion. This research laid out the groundwork for the study of anthropomorphism in religion by showing how common anthropomorphism—or the tendency to see non-human things as having human-like traits—is in the everyday human experience, and how this might form the basis for religious beliefs. This is supported by findings that show individuals with higher tendencies towards anthropomorphism are more likely to believe in supernatural beings (Epley et al., 2007; Willard, Cingl, et al., 2020). This suggests that anthropomorphism might be relevant to explaining the human tendency towards religious belief, but there are some important differences in how this quantitative evidence and Guthrie's theory operationalize anthropomorphism.

In Guthrie's theory, anthropomorphism is a perceptual process—focussing on phenomena like seeing faces in the clouds or seeing a branch moving out of the corner of your eye as a person. In contrast to this, the quantitative studies have predominantly used measures that focus on giving human-like mental states to systems (like nature or the weather), non-human objects, and non-human agents. Mistakenly seeing human *forms* and human *minds* are distinct (though related) processes, and it is not clear that seeing something that looks like a person necessarily leads to, or is necessary for, reasoning about something as though it has a mind (Apperly et al., 2006; Gergely & Csibra, 2003). Even small children that understand having a face does not necessarily make something an agent (for example, children know dolls are not alive even when they look very human; Legerstee et al., 1987). Further, people readily give human-like agency to things, like the weather and nature, which have no physical characteristics of an agent (Epley, 2014; Waytz, Morewedge, et al., 2010). Guthrie (1993) too suggests that faces in the clouds are often dismissed as not real faces, suggesting some additional step is needed.

Among the most prominent theories of why we might so readily believe in supernatural agents is the theory of the hyperactive/hypersensitive agency detection device (HADD; Barrett, 2000, 2004). Theorizing around HADD also suggests that perceptual cues are the basis of how our anthropomorphic tendencies lead to supernatural beliefs, based in Guthrie's (1996) work. As the primary champion and architect of HADD, Justin Barrett (2000, 2004) has claimed that humans have an

agency detection system that is "hyperactive" or "hypersensitive" and is biased to detect agents from minimal cues. This makes us assume there are more agents in the world then there really are, which in turn leads us to believe that these are *supernatural* agents. Any small cue that something could be an agent, could lead to the assumption of agency.

HADD integrates principles from Error Management Theory (Haselton & Buss, 2000; Johnson et al., 2013) to support its plausibility. The central premise of error management theory is that some mistakes are more costly than others, and thus over evolutionary time our psychology will calibrate to minimize these costly mistakes even if this leads to a greater number of mistakes overall. For HADD, it is suggested that it is more costly to miss an agent when one is present than mistakenly see an agent when one is not present (Barrett, 2004; Guthrie, 1996). Not being sensitive enough and missing an agent could possibly be fatal, being oversensitive and getting spooked by something that isn't there will likely cause very little harm. HADD theorists have argued that this asymmetry in cost has resulted in us evolving a tendency to see agents everywhere, which in turn leads to the belief in invisible agents.

The intuitiveness of this theory led to its large scale adoption as a possible origin of religious belief in the cognitive science of religion (Atran & Norenzayan, 2004; Barrett, 2008; Boyer, 2003) and still makes appearances in newer literature on the topic (e.g., Luhrmann, 2020; Whitehouse, 2024). The error management reasoning for threat detection appears internally sound (though its logic has been questioned; see McKay & Efferson, 2010), and its application to agency detection might appear prima facie valid. At the same time, and despite it originating in the late 90s, allowing for plenty of time to do the research, there has never been any compelling empirical evidence for a tendency to hyperactively detect agents and a substantial number of null findings suggesting we have no bias towards preferentially detecting agents at all (for a good overview of this lack of evidence, see Van Leeuwen & Van Elk, 2019).

HADD theory relies heavily on agency detection from movement and other visual cues. This can be demonstrated in very young infants and is seen as one of the foundations for Theory of Mind in humans (Johnson, 2000; Leslie, 1994). The most common example of human over-detection of mental agents from movement cues used in support of HADD is a quite old study conducted by Heider and Simmel (1944). Heider and Simmel showed a group of participants a short animation of geometric shapes moving around a box and asked them what they saw. The explanations were almost universally human-like interactions full of anger or jealousy, but it is a stretch to say that this is an improper use of our ability to attribute mental states. Heider and Simmel intentionally created their animation to move like agents. Their experiment was designed to test if agent-like movement without facial expressions, body language, and other emotional cues was enough to infer complex motivations and behavior.

Though in the strictest sense people are aware these animated circles and triangles are not alive, they do exhibit all the behavior and interaction cues of agents. Nothing outside of living organisms (or things designed to mimic living organisms) behave in this way. Further research has demonstrated that changing or removing any one of these agent-like movement cues stops people from seeing these shapes as agents and makes interpretation of the "event" extremely difficult or impossible (Bassili, 1976; Scholl & Tremoulet, 2000). The stories of love, betrayal, and fear that the participants told (and which the experiment was designed to elicit) were also certainly used in a metaphorical sense. The participants did not believe the shapes on the screen were truly alive and in love. The mind they are detecting here is the mind of the experimenter, with participants describing the scene they thought the experimenters were trying to portray.

The idea humans can easily and quickly detect agents is not under dispute—as noted above, even infants possess such capabilities (Johnson, 2003). However, both the hyperactivity of such a system (the tendency to assume an agent when it is ambiguous), and its role in religiosity have not been demonstrated. If anything, research has shown a reluctance to detect agents; people are more prone to assume the absence of agents when cues are ambiguous rather than the other way around (Maij et al., 2019). Multiple cues of agency are necessary before an agent is detected (e.g., Biro & Leslie, 2007; Johnson, 2000). The tendency to see "faces in the clouds" or other inanimate objects

(pareidolia) is extremely well documented, but very quickly corrected (~250 ms; Wardle et al., 2020), and face detection in the absence of other cues does not lead to the belief that things are alive or have agency (Apperly et al., 2006; Legerstee et al., 1987). Where we do see evidence of bias in interpretation of faces is in the additional characteristics we might assign to these faces (such as age or gender or deciding the face seen in your toast looks like Jesus), and suggests these biases are learned cognitive ones, not perceptual ones (Wardle et al., 2022). In line with this, in research that has found links between agency detection and some forms of supernatural belief (Van Elk, 2013), further evidence has suggested that this relationship is driven by religious belief—people are detecting agents because they believe in them, rather than the other way around (Andersen et al., 2019; Szymanek et al., 2024; Van Elk et al., 2016).

A more recent review of HADD research has suggested that much of the dissent against HADD is based in a misunderstanding of how and where it applies rather than real problems with the theory (Atkinson, 2024). Atkinson (2024) suggests that HADD has been used in two different ways: (1) to explain the origin of religion, and (2) as maintenance of existing religious belief. Atkinson claims that this distinction has not been well established and has led to confusion in the literature. He suggests that researchers have mistakenly rejected HADD because they are thinking in terms of the second version and not the first. We read this differently. Researchers seem well aware of the perspective of HADD as the origin of religion, but have looked at HADD as a way of maintaining religion as an attempt to salvage the theory in light of a lack of evidence for any positive bias in agency detection (Andersen et al., 2019; Van Leeuwen & Van Elk, 2019). Barrett (2004) has used HADD in both ways. Atkinson (2024) concludes that HADD can be salvaged in both usages based on the error management principle. This is something we have already argued does not work here, as there is no evidence for a bias towards over detecting agency from perceptual cues.

Elsewhere, Barrett has pointed out that we quite obviously do not create a supernatural agent every time we witness a rustling in the trees (Barrett & Lanman, 2008). Rather, the detection of agency is often overridden or rejected and only occasionally elaborated on to create a supernatural agent. Even if we remove hyperactivity as a condition and just assume these extra agents come from the occasional error that sporadically gets elaborated on, then when, how, and why we engage in elaboration to create or support supernatural agent beliefs (rather than dismiss the mistake) becomes the interesting phenomenon to explain. Further, it is not clear the creation or maintenance of these beliefs requires the step of perceptual "detection" much of the time.

Detecting agents is unnecessary

One reason to be sceptical of the hyperactive agency account of religious belief is that supernatural agents often do not exhibit features that could be detected in this way. Though exceptions can be found, many supernatural agents don't have bodies, or physical presences at all, to be mistaken for perceptually cued agency (gods aren't frequently believed to be lurking in the bushes; see Willard et al., 2023). Even when exceptions are found—maybe we see agency in the actions of the wind in the leaves and this leads us to believe the wind is an agent—it is the attribution of thoughts and desires that is important to beliefs, not the detection of agency. When agency is detected through movement or other cues, assigning a mind full of thoughts and beliefs is not an automatic or costless process (Apperly et al., 2006).

You can see something as an agent with goals and behaviors that align with those goals without engaging your theory of mind. This process does not necessarily require an understanding of false belief and is commonly found in non-human animals (Gergely & Csibra, 2003; Tomasello et al., 2005). Apperly and Butterfill (2009) refer to this as "beliefs and belief-like states," with beliefs requiring much more cognitive resource than more heuristic and cue-based belief-like states. Thinking about intentions, beliefs, thoughts and desires of minds takes a lot more cognitive

effort than detecting something has agency. So much effort that thinking about other people's internal mental states is distracting and makes it harder to pay attention to other things (Apperly & Butterfill, 2009; Butterfill & Apperly, 2011).

This claim of cognitive effort might seem at odds with the level of fluency most of us bring to social interactions. For example, we can follow complex conversations with unspecified rules of turn taking and notice that our jokes are landing badly from the body language and facial expressions of others (see Levinson, 2016). This level of fluency is not costless and requires a large amount of learning (Levinson, 2016), and still these inferences are based on perceptual cues. When these cues lead to reasoning about mental states (what another person might be thinking) it becomes more costly still (Apperly & Butterfill, 2009). In a situation where you find yourself consumed with what a conversation partner is thinking about you, you will become distracted and have a harder time focusing on what else is going on around you or even the conversation you are engaged in.

Together, this means that even if an "agency detection device" is hyperactive (and the evidence suggests it is not), the over-detection of agents would only be a cost-effective mechanism if we don't elaborate on the mental states of those agents, and don't try to understand what the god or ghost we are interacting with thinks, feels, or desires. Further, if the reaction to these detected agents is a fight or flight type response, as the error management principle suggests, mental state attribution is an unnecessary step—you should just be fleeing.

On the other hand, representing and interacting with the mind of a supernatural agent does require mental state attribution, but not necessarily perceptual agency detection. The identification of a supernatural agent likely requires something entirely different: inference about cause in a more teleological sense (e.g., Kelemen, 2004). We tend to see the complex and important things in our life as having a purpose and can infer that some intentional agent designed them in a way that allows us to elaborate on what that purpose could be. This type of teleology is apparent from childhood (Kelemen, 1999) and present in adults unable to override the tendency due to distraction or impairment (Kelemen et al., 2013; Lombrozo et al., 2007).

More recent models have looked to modernize agency detection theories to better fit with these issues. For example, Van Leeuwen and Van Elk (2019) have proposed an Interactive Religious Experience Model, and Andersen (2017) a predictive coding account of agency detection of belief. Both models suggest that it is the expectation of seeing religious agents which leads to an over-detection of religious agents in the world. Szymanek et al. (2024) offer a clear demonstration of this in a study on the detection of voices. Though there were no general tendencies to over detect voices in noisy data, they found that when participants were given an expectation that the stimuli contained many voices, they were more likely to have false positives and over detect voices. When they were given the expectation that there would be very few voices, they were more likely to have false negatives and under detect voices. Their expectations changed how they experienced the stimuli. By making agency detection a consequence of belief, these authors remove agency detection as a causal factor in the origin of supernatural belief, once again leaving us with unanswered question about why supernatural agents are ubiquitous in religions, and why they arise in the first place (Willard, 2017).

Mentalising is not enough

If belief in supernatural agents comes from how we reason about minds rather than how we detect agency, then understanding how we reason about minds is important in understanding religious belief. Based on this, a straightforward relationship between our ability to use mental state reasoning, or mentalizing, and belief in God has been widely theorized (Atran & Norenzayan, 2004; Norenzayan et al., 2012). Yet, similarly to hyperactive agency detection, the intuitive tale here—that a universal mentalizing capacity drives religious belief through eliciting mental state reasoning about supernatural beings—stands on empirically shaky ground.

Research into the relationship between mentalizing and God beliefs has demonstrated an unreliable and weak link between increased mentalizing abilities and greater belief in supernatural agents (Lindeman et al., 2015; Willard & Norenzayan, 2013). However, it is not clear to us why we should expect strong effects. Whilst it is self-evident that representing the minds of supernatural beings requires some capacity to represent minds in general, it does not follow that greater mentalizing abilities should necessarily lead to increased belief in God, but rather to a greater capacity to represent God's mind, which may in turn have the downstream impact on belief in some cases. A *capacity* does not necessarily lead to a *tendency*. Work that hypothesizes greater mentalizing to predict increased belief in God makes the tacit assumption that there is a linear relationship between the two, despite no clear claims of such in theory.

Research around so-called deficits in mentalizing should make a clearer case—having trouble reasoning about minds should mean trouble reasoning about God's mind. Here too, the research is murky. It has been commonly argued that deficits in mentalizing abilities are present in individuals on the autistic spectrum (Baron-Cohen et al., 1985; but see Gernsbacher & Yergeau, 2019), and findings have suggested that these deficits explain why people with autism are less likely to believe in God (Norenzayan et al., 2012). However, more recent evidence has found no difference in belief in gods between those with autism and those who are not (Reddish et al., 2016). People with autism believe in a variety of supernatural agents, and have personal relationships with them, even when they don't follow a specific religion (Visuri, 2012, 2018). Indeed, in addition to belief in gods, people on the autistic spectrum have been observed to have high levels of anthropomorphism (Clutterbuck et al., 2022), a capacity which is also contingent to some degree on mentalizing abilities. These tendencies to reason about supernatural minds are not contingent on the ability to read emotions and other mental states in physical cues such as facial expressions and body language.

This is not the only place where we see diversity in how we represent minds impacting how we think about supernatural agents. Different cultures have different notions about the mind (Lillard, 1998; Weisman et al., 2016), and thus the supernatural minds they create to explain the world are likely to reflect the specific folk psychology of a particular cultural milieu (McNamara et al., 2021). When new types of supernatural minds are introduced, people can adjust their concepts of minds to include this new type of mind readily and can reason about human and supernatural minds differently. For example, the introduction of a Christian God who can know the content of your mind into a society that holds that the content of other minds is unknowable requires people to update their concept of minds, which they do (McNamara et al., 2021). This again suggest that thinking about minds, and supernatural minds specifically, is a careful rationalized process that requires learning rather than an automatic one.

The ability to think about minds differently across culture, and update them when new concepts are introduced, is necessarily a learned and practiced ability (Luhrmann, 2020). Like language development, even though basic mental state reasoning abilities comes easily to most at a young age, the development of these abilities requires input and learning (Lillard, 1998). Our ability to think about supernatural minds is something we refine through extensive practice. This practice is responsive to the cultural differences in how we represent minds more generally (Luhrmann et al., 2021), leading to the immense importance and diversity of supernatural minds we see in the world.

Motivated mentalising can evolve into complex cultural institutions

We have suggested that we create supernatural agents by applying human-like mental states to unexplained things as a way of explaining them. The best evidence for this claim comes from the mind perception literature (Waytz, Gray, et al., 2010; Waytz, Morewedge, et al., 2010). Three motivations are given for anthropomorphism as the tendency to see human-like minds in things not human: (1) the ease of explaining things as though they have familiar human thoughts and desires; (2) the need to understand the behavior of something and potentially feel like you can

influence it (effectance motivation; White, 1959); and (3) as a way to cope with loneliness and a lack of other human minds (Bartz et al., 2016; Epley et al., 2007, 2008). Though all of these may be potential motivators for creating and believing in supernatural agents, we suggest that the first two are the most relevant in accounting for most supernatural agent beliefs.

We can illustrate how these motivations for mental state reasoning would work through an example. If we look at something difficult to predict but important, like the weather, we find that supernatural explanations are common for it around the world (Jackson et al., 2023). We further suggest that people will be the most motivated to explain weather supernaturally, and specifically as having human-like thoughts beliefs or desires, when it behaves anomalously—such as suggesting a bad storm is caused by anger experienced by the weather or some agent that controls the weather. Beyond giving an explanation (which could be satisfied with other types of explanation), this motivation to see the weather as having mental states may additionally stem from the desire to be an effective and competent agent in the world (Waytz, Morewedge, et al., 2010). Minds are something we have influence over and our beliefs about them give us some indication of how to act. Creating minds not only potentially explains behavior in a general and predictable way by creating an intentional agent (see Kelemen, 2004; Lombrozo & Carey, 2006), but also helps us feel like we can effectively interact and influence things that might otherwise be beyond our control. If we believe the storm is caused by anger, then we can also believe that it may be possible to stop it, or prevent future storms, by making the agent behind it happy and keeping it happy. This, in turn, requires some elaboration on what makes this agent happy and not stormy.

Though these actions may not be effective, our engagement in them is plausible within an associative learning framework—trying something is more likely to have an effect than trying nothing (Beck & Forstmeier, 2007; Foster & Kokko, 2008). This is widely seen as the evolutionary basis of superstition in biology (Abbott & Sherratt, 2011; Skinner, 1948). At the same time, the ineffectiveness of these actions is extremely difficult to evidence outside of a scientific framework (a technology not present for much of human history), and random association between the proposed cause and effect may be enough to support beliefs and the effectiveness of their associated practices (Hong et al., 2023; Hong & Henrich, 2021).

This type of motivated mentalising fits better with how religious beliefs function for believers than agency detection accounts. Mentalised supernatural beliefs—or supernatural beliefs that employ thoughts, desires, and emotions—are frequently used to explain things like illness and misfortune, or generally why bad things happen to some people and good things to others. Further, a framework wherein the minds of supernatural agents are something we are motivated to create and think about, and which can dynamically evolve with cultural ideas, is parsimonious with socialization accounts of religion. Religion is learned as an explanation for the social and ecological worlds we live in. This helps to bridge the gap between a universal cognitive mechanism that might create supernatural beliefs in all societies and the complex cultural phenomena of religion that arises in any specific society—a universal tendency towards using mental states as explanations for all sorts of phenomena allows for culturally flexible and evolving specifics.

A simple agentic explanation for something unpredictable like anomalous weather can be elaborated and expanded through generations to create the complex belief systems we see in the world today. This can be applied to many domains where we see uncertainty. An unexplained disease might be attributed to a malevolent mind, which then becomes a "spirit," resulting in the further question as to why the "spirit" harms some people and not others. This belief can get attached to specific behaviors (or lack of behaviors) seen to anger the spirit, and these beliefs could lead to the enforcement of norms (Purzycki et al., 2021; Singh et al., 2020; Willard et al., 2025).

As well as being often difficult to disprove, iterations of spirit appeasing behaviors may sometimes lead to behaviors which are beneficial. Perhaps the spirit favors cleanliness and strikes those that do not keep their homes and selves clean, which reduces the instances of disease. The reduction in disease, in turn, is used as evidence that the spirits exist and prefer cleanliness. This belief can be sustained by its real benefits even if the belief is not mechanistically accurate. The

elaboration on beliefs like this can culturally evolve into functional belief systems and larger and larger religious institutions. Documented examples of this can be found in Lansing's (2012) work showing how Balinese religious beliefs are used to support effective rice farming techniques, and Singh et al.'s (2020) work on meat sharing to appease water spirits among the Mentawai, among others. This cultural evolutionary process has most popularly been used to explain why religions function to enforce prosocial behavior in believers (Norenzayan et al., 2016), but there are plausibly other domains in which these beliefs might function. Not all associations and norm enforcement practices have such obvious benefits. Willard and colleagues (2025) found that the belief that witchcraft can be caused by envy leads to the enforcement of norms aimed at preventing envy in others, such as hiding your own good fortune. In both cases, we suggest that this process starts in using mental states to explain otherwise difficult to explain phenomena in the world.

Belief as explanation

The idea that religious or supernatural beliefs are used as mentalistic explanations for otherwise hard to explain phenomena is in no way a new one. Even Barrett (2004) made some claim to this when talking about HADD. This idea has been circulating in philosophy and anthropology for quite some time (Horton, 1960; Hume, 1779; Tylor, 1871). A classic example of this is from the work of Evans-Pritchard (1937) on witchcraft beliefs among the Azande. Evans-Pritchard recalls a story where the Azande attributed a granary collapsing on some locals to witchcraft. He tried to explain that this collapse had been caused by termites, but the people already understood this and still claimed witchcraft. Termites were the natural cause of why the structure collapsed, but an additional cause was needed to explain why the granary fell at this specific time on these specific people. The answer to that question was witchcraft—it was used to explain an otherwise unexplainable part of the tragedy that the people still deemed important to explain.

Other relevant anthropological work can be found in the work of Malinowski (1954) on the Argonauts, wherein he suggests that religious rituals were a response to situations of uncertainty. He suggests that people engage more in ritual practices in situations of high uncertainty, such as deep-sea fishing where the probability of success is more up to chance and harder to understand, than other types of fishing (Malinowski, 1922). This suggests that the Argonauts use religious beliefs to account for the uncertainty of deep-sea fishing, but Malinowski also suggests that engaging with religious rituals before uncertain endeavors gives people a sense of control over the outcome of this activity. This in turn should make them more psychologically comfortable with engaging in the activity in the first place (Kay et al., 2009, 2010). Functionally, this follows the associative learning principle previously mentioned, that trying something is better than trying nothing when the stakes are high enough (Foster & Kokko, 2008). This type of behavior is phylogenetically deep, and first appeared in psychology with Skinner's (1948) pigeons, which developed superstitious-like behaviors associated with food drops while trying to work out what behaviors caused food to appear. This has been further described in biology as an inevitable outcome of an optimal associative learning strategy, which is a fundamental learning process for humans and other animals (Abbott & Sherratt, 2011; Beck & Forstmeier, 2007). This type of behavior is rooted in the tendency to confirm rather than falsify perceived associations (Vyse, 1997), a tendency that is also at least plausibly functional (Peters, 2022).

Examples of belief as explanation are commonly found in religions all over the world (Jackson et al., 2023). From the weather and illness to individual fortunes and misfortunes, there is a general sense that a god/goddess's thoughts, emotions, and desires, are the reason these otherwise hard to explain occurrences happen. Where the good and bad things that happen to people are not explained by supernatural agents, other non-agentic supernatural forces, such as karma, can be employed and elaborated upon to provide increasingly complex, and sometimes functional explanations over time (Obeyesekere, 2002; White et al., 2019), not dissimilarly to the cultural evolution of deity beliefs (Willard, Baimel, et al., 2020). Further, many of the previous explanations of religion

as employing primarily intuitive processes (e.g., Barrett, 2008; but see Gervais & Henrich, 2010) are hard to square with the intensely rational pursuit of knowledge that is often found within religions. Believers actively seek knowledge about the world in and outside of their religious beliefs.

Beyond this, viewing supernatural beliefs as explanations can help us understand why the domain of religious explanation is shrinking and being replaced by science and technology (Chaves, 1994; Yamane, 1997). For example, people around the world today see disease as primarily caused by germs not spirits, and the weather as mechanical not divine much of the time. This is not to say that supernatural beliefs are necessarily being disproven with evidence, but rather that they are being replaced with other widely accepted explanations (Hong & Henrich, 2021). Rainmaking rituals in China did not fall out of fashion because they were demonstrated as ineffective, but rather because people's perspective on what caused rain had changed to a more scientific one through exposure to different worldviews and social learning (Hong et al., 2023). These new perspectives and beliefs made the impact of ritual on rainfall seem implausible. Similar accounts can be found for the decline in astrology and alchemy in Europe (Clements, 2017; Kemp, 2003). We also see this type of thinking within science in such things as the replication crisis in psychology. Here, scientist's inability to really understand the probability of false positives, despite extensive training, hampers their ability to correctly interpret when their experiments fail to show evidence for the desired effect leading to the confirmation of effects that are not really there. At the same time, the cumulative knowledge from generations of scientific enterprise has vastly expanded the possible explanations for the world around us, so we are less reliant on mentalised explanations to feel like we understand and can act in the world.

Still, most people can find unexplainable things that motivate them to imbue the world with human like intention. Germ theory may have largely replaced the belief that diseases are caused by evil spirits, but it often can't make sense of the broader questions of why me, why this, why now? These questions are not necessarily less important to people in the contemporary west than they are to the Azande or the Argonauts, or people anywhere else in the world. These are different types of questions that require different sorts of evidence (Davoodi & Lombrozo, 2022; Metz et al., 2023), and questions that are not easily mechanistically answerable will likely remain the domain of supernatural belief for a long time. Religion as explanation does not suggest that religious beliefs will be replaced by scientific ones wholly and completely any time soon. By nature humans are explanatory pluralists (Lombrozo, 2010). We look for, and are willing to accept, multiple types of explanations, often at the same time.

Religion, agency, and anthropomorphism: a new perspective

Once we see the creation and belief in supernatural agents as rooted in the need to explain the unexplainable, we can start to build a connection between the origin of supernatural agent beliefs and their evolution into complex cultural systems. This "explanation explanation" offers a clear path from a newly created supernatural belief to religiosity—explanations can be socially transmitted and become subject to the cultural evolutionary pressures that can lead to the formation of a religion. We see unpredictable things in the world that we wish to explain, and when our other explanatory systems fail us, we apply mental states to satisfy this desire for an explanation, and to allow us some sense that we can affect the situation if needed (Waytz, Morewedge, et al., 2010).

The detection of goal directed behavior, or intentionality, likely still plays a role in our motivation to attribute minds to the world (see Lisdorf, 2007). Indeed, we do seem to be more likely to give minds to things that cue agency than things that don't. You are probably more likely to imbue your dog with human-like mental states than your car, though both are possible. But even when agency detection increases the chance of attributing mental states, the response is still a motivated one—there is something you want to explain. The detection of agency is neither necessary nor sufficient to explain supernatural agent beliefs even if a correlation exists. In order to cue gods or ghosts, an agency detection response to rustling grass would require either previous belief in

such agents (e.g., Andersen, 2017), or the motivation to find a novel explanation for that rustling beyond the obvious physical causes. In the latter case, supernatural minds are just one possibility among explanations. If the wind is not the obvious culprit, we could also predict it was another person, a fox, or any number of other creatures depending on the environment you find yourself in. If we do decide it is a supernatural agent (or even a human one), the necessary step to form a belief will be in thinking about why that agent is there rustling the leaves in the first place.

Conclusion

We have argued that, rather than automatic agency detection, a more likely path to widespread supernatural agent beliefs is through a motivation to explain the unexplainable paired with the tendency to explain things with human-like mental states. The human mind is a prediction machine, working to explain and predict the causal processes in our environment to facilitate effective navigation of it (Hohwy, 2013). However, explanatory pathways are often much too complex for our limited understanding of physical, biological, or even goal-directed reasoning. Even with the comprehensive scientific models of many phenomena that we have today, many causal explanations are not intuitively obvious. Social reasoning, however, comes intuitively to us, and when other possible explanations fail us, we turn to social causes and see things as being caused by the thoughts, desires, and intentions of other mindly beings. These causal structures work to satiate our need for an explanation but lead us to create, collectively and individually, supernatural agents to account for the additional minds required for these explanations.

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