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ARTICLE

Causes of cultural disparity: Switches, tuners, and the cognitive science of religion

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ABSTRACT

Cultural disparity – the variation across cultural traits such as knowledge, skill, and belief – is a complex phenomenon, studied by a number of researchers with an expanding empirical toolkit. While there is a growing consensus as to the processes that generate cultural variation and change, general explanatory frameworks require additional tools for identifying, organizing, and relating the complex causes that underpin the production of cultural disparity. Here I develop a case study in the cognitive science of religion and demonstrate how concepts and distinctions drawn from work on contrastive explanation and manipulationist accounts of causation provide such tools for distinguishing explanatory levels, organizing causal narratives, and accounting for cross-cultural patterns.

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1. Cultural diversity and cultural disparity

Genetically speaking, humans are not particularly variable. The human species contains less genetic diversity than the two hundred thousand chimpanzees that live in close proximity to one another in African forests (Bowden et al., 2012; Kaessmann & Pääbo, 2002; Kaessmann, Wiebe, & Pääbo, 1999). Usually, this situation would bode poorly for the long-term survival of a species. Since genetic variation supports possibilities for future adaptive change, low genetic diversity suggests that humans are ill-equipped to respond to changing circumstances. Yet as the paleoanthropological and historical record shows, this is clearly not the case. Low genetic diversity has not hindered human success. Indeed, cultural variability seems to compensate (and then some) for low genetic diversity: the ability to innovate and maintain large stocks of cultural traits has allowed humans to survive and thrive across an extraordinary range of environments (Henrich, 2016).

The manifest variability of human culture is striking, and almost hard to comprehend in its multiplicity. One can be helped in understanding this

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variation by borrowing the distinction between *diversity* and *disparity* (Gould, 1989; Maclaurin & Sterelny, 2008). Cultural diversity is a measure of the presence or absence of certain categories of traits in different cultures: whether or not particular skills, technologies, artifacts, or practices are found in this or that population.[1] Cultural disparity, on the other hand, is variation in the kind and qualities of these categories of cultural traits: why weaving takes this particular configuration *here*, using *these kinds* of patterns, while weaving takes a different configuration *there*, using *those kinds* of patterns.[2]

To give a different example of how this distinction works, consider music. Music demarcates an important domain of human activity – one that encompasses distinctive artifacts, physical skills, and modes of social coordination – that can vary from population to population. Musical instrumentation, rules for participation, and harmonic structures might mark out salient trait categories in this domain. With such categories at hand, one can determine the presence or absence of such traits across cultures, and thus arrive at a measurement of diversity.

Diversity is essentially a binary quality – either a culture possesses a particular trait category, or it does not. Disparity, by contrast, is a similarity-based measure. It compares traits along a number of key dimensions. For instance, while a number of cultures have melodic instruments, there is great variation among these melodic instruments in their timbre, their melodic range, and their means of acoustic production: digeridoos work and sound different from xylophones.

Though cultural diversity and disparity are related, and likely covary with one another, here my focus is on the latter. More specifically, my target is understanding some of the complex historical processes involved in generating cultural disparity. At the same time, I aim to identify how these processes might generate patterns in cultural evolutionary history, and to provide means of accounting for these patterns.

Though generally not articulated as an enterprise aimed at accounting for cross-cultural variation, the last four decades have seen a boom in work on the causes of cultural disparity. Researchers have developed sophisticated models and tools linking cultural change and variation to parameters like population size (Powell, Shennan, & Thomas, 2009), rates of conformity (Henrich, 2001), and cultural diffusion (Kolodny et al., 2015). These have been complemented by approaches that focus on the nitty-gritty of how culture is, and has been, transmitted in populations over time – for instance, using approximate Bayesian computation to understand historical data sets (Kandler et al., 2017) or anthropological and sociological tools to explain the persistence of cultural traditions (Morin, 2015). Emerging out of this interdisciplinary work is a pluralistic approach to understanding culture and cultural change.

Yet further work remains particularly in articulating the relative importance of the various causes of cultural disparity and understanding how they interrelate to generate cultural differentiation. Culture is a complex dynamic system, with individual, social, and environmental causes operating at multiple scales. The problem of understanding cultural disparity turns not merely on enumerating its causes, but also in organizing these causes and understanding their interrelationships.

It is at this point that further philosophical work is needed. Despite the growing consensus about the processes involved in cultural change, explanatory frameworks for cultural change (e.g., Richerson & Boyd, 2005; Sperber, 1996) lack a general account for how such processes relate to one another. As I see it, there is room for a more nuanced causal vocabulary to identify and hypothesize about how relevant causal processes combine and interact. The aim of this paper is to contribute to this project of organizing and relating causes of cultural change, achieved here by drawing on the manipulationist account of causation. Below, I demonstrate the applicability of these conceptual tools by way of a case study drawn from the cognitive science of religion. I conclude by suggesting how the tools developed here can be generalized to apply to cultural disparity more broadly.

2. The cognitive science of religion

The cognitive science of religion is a growing field, one that combines work from evolutionary psychology, economics, ethnography, and the history of religion. Like the example of music given above, the term "religion" outlines a fuzzy domain of human activity, with vague boundaries. Many cultures even lack a term that corresponds to the Western use of "religion". Yet the term is still useful as a means of describing salient domains of human activity, and different definitions of the term will pick out real, if partially overlapping subsets of, human behavior (Schilbrack, 2010). Commenting on this fact, Richard Sosis notes that "countless scholarly definitions of religion have been offered. None are universally accepted, although "belief in supernatural agents" might win a popular vote" (2009, p. 319).

Indeed, accounting for beliefs in supernatural agents characterizes much current work in the cognitive science of religion. Broadly, this work investigates how such beliefs factor into theories of the supernatural world, how they are used to rationalize and explain events, and how such beliefs motivate behavior and social coordination (Atran, 2002; Atran & Norenzayan, 2004; Boyer, 2001; Norenzayan, 2013; Pettazzoni, 1955). Though emphasizing the doxastic element plays down other important features associated with religion[3] – given the large cross-cultural

variability in beliefs about the nature, powers, and minds of supernatural agents, it serves as a useful case study in cultural disparity.

Below I examine two highly visible approaches within the cognitive science of religion that account for the variability in beliefs about supernatural agents: the *by-product* approach and the *socioecological* approach. The two approaches emphasize different sets of underlying causes, and predict different patterns in the cultural evolutionary history of religious belief. Speaking generally, the by-product account holds that variability in religious belief is the result of cultural evolution exploiting or extending the deep cognitive structures of human psychology (Atran, 1989, 2002; Barrett, 1999, 2000; Barrett & Nyhof, 2001; Boyer, 2001; Dawkins, 1976), while the socioecological account argues that it results from discovering (often, adaptive) solutions to the complex trade-offs between the economic, social, and environmental demands of human life (Rappaport, 1968, 1979; Sosis, 2005).

There are methodological and empirical criticisms of the by-product account from a socioecological perspective (e.g., Sosis, 2009; Purzycki & Willard, 2015; Sterelny, 2017), and vice versa (Elster, 1982; Sperber, D, 1996), yet here too there is a growing consensus concerning the processes involved. This can be seen in the way that key authors of both approaches co-write articles together (e.g., Atran & Henrich, 2010; Atran & Norenzayan, 2004; Purzycki et al., 2016) and espouse a methodological and explanatory pluralism (Shariff, Purzycki, & Sosis, 2014).

Yet like the broader cultural evolutionary enterprise, this congeniality and agreement around the processes of religious belief has not yielded a rich vocabulary for relating these causes, and general accounts of religious disparity remain underdeveloped. Though there is consensus on the kinds of causal processes implicated in religious differentiation and change – as well as cultural diversification and change more broadly – there is little theory dedicated to how such causes interact to produce cross-cultural variation.[4] While the emphasis on causal and explanatory pluralism is surely correct, this emphasis has allowed researchers to pursue their own research agendas and leave the hard work of organizing and relating the causes of cultural disparity to others. This has downstream problems. As Azim Shariff and colleagues (2014) argue, the success of the broad endeavor to explain cross-cultural variability in beliefs about supernatural agents is hampered by a lack of means for relating distinct kinds of causes and explanations of such variation. This is hard work that cannot be ignored.

3. The by-product approach

The core of the by-product account is the idea of mental catchiness. This idea – developed in complementary if competing ways by memeticists (Blackmore, 1999; Dawkins, 1976) and cultural epidemiologists (Sperber,

1985, 1996) – holds that humans are susceptible to some ideas or concepts more than others. This susceptibility is manifest in the way that some ideas spread more quickly, are more easily established, and are more stable in a population over time. What explains these differential susceptibilities are deep, evolved structures of human cognition.

These structures – possibly, though not necessarily, cognitive modules (Sperber, 1996; Sperber & Hirschfeld, 2004) – are taken by by-product theorists to provide constraints on the kind and propensity of inferences made by human beings. For these researchers, the deep structure of human cognition delimits a space of possible cognitive operations, as well as when and where these cognitive operations are put into play. Whatever their mechanistic implementation, by-product theorists hold both that these deep features of human cognition are invariant across human populations, and that they provide the core of an empirical account of cultural disparity (Barrett, 2004; Boyer, 2001; Sperber, 1996).

Sperber and Hirschfeld's (2004) work linking the face-recognition module to cultural variation provides a useful illustration. The face-recognition module is a brain region usually found around the fusiform gyrus that reliably responds to faces and face-like stimuli (Tong, Nakayama, Moscovitch, Weinrib, & Kanwisher, 2000). Patterns of responsiveness to these stimuli are seen extremely early in development; fMRI experiments find them in four-month old infants (Deen et al., 2017), and novel ultrasound experiments in third trimester fetuses (Reid et al., 2017). As Sperber and Hirschfeld argue, traits generated in cultural evolution can exploit this sensitivity: new cultural traits might activate this module, and in virtue of this activation, lead to the proliferation of the trait and its entrenchment in society. Pointing to practices like the making and wearing of masks, the use of cosmetics, and symbolic and artistic depictions of faces, Sperber and Hirschfeld argue both that face-recognition facilitates the generation of various cultural practices, and that the saliency of face-related cultural traits explains their downstream persistence.

Like Sperber and Hirschfeld, by-product explanations of religious disparity appeal to deep structures of human cognition to explain how religious beliefs arise and become established (Boyer, 2001). Yet despite sharing a general explanatory strategy, by-product researchers disagree as to the nature of human cognition, as well as the mechanisms that underpin and explain religious variation. As Purzycki, Haque, and Sosis (2014, p. 76) suggest, there seem to be at least four distinct by-product accounts in the literature, each of which appeals to a different mechanism of human cognition: either to theory of mind modules, emotional attachment systems, hazard precaution systems, or core conceptual templates. Keeping the focus on belief in supernatural agents, here I examine accounts that explain the possibility and persistence of such beliefs

by appeal to a distinctive capacity for identifying intentional agents in the world and employing mental state terms to explain these agents' behavior.

Justin L. Barrett (2004) is the most well-known exponent of the account that supernatural beliefs exploit theory of mind capacities – capacities for identifying agents and attributing them propositional attitudes like belief, desire, and the like. More specifically, Barrett argues that humans have a distinctive input bias that is extraordinarily sensitive to the presence of intentional agency. Impressionistic evidence for this bias is seen in our over-attribution of agency and agent-like features to worldly phenomena: for seeing faces in clouds, intentions in the weather, and agendas behind the growth of agricultural crops. As Barret suggests, humans are "quick to find agency in the environment [and this] survival-enhancing disposition encourages the production of superhuman agent concepts in many situations" (Barrett, 2004, p. 44). He labels this agency-detecting disposition the hypersensitive agent detection device. Barrett's account is contentious (see, for instance, Sterelny [2017] and responses), nonetheless, it is a paradigm example of how cultural disparity is taken to be explained by deep cognitive structure. The hypersensitive agent detection device provides part of this explanation by accounting for how supernatural beliefs are *possible*: they result from the hypersensitive disposition to identify agency in the world.

Yet there is a further step needed to explain religious disparity: why do specific religious beliefs and concepts persist over others? Why do spirits and gods have *these* particular features rather than *those*? Olivier Morin (2015) calls this the *flop problem*. Morin argues that the vast majority of cultural innovations fail for one reason or another. Perhaps concepts are hard to remember, tricky to learn, or difficult to act upon. Whatever the reason, most attempts to introduce cultural novelty fall flat. Boyer makes a similar point by appealing to the potential inferences that cultural variants factor into; unsuccessful ideas are "cognitive dead-ends." Though one can "imagine them [one] cannot produce many inferences about the situation described" (Boyer, 2001, p. 78).

One might be misled into thinking that the manifest fact of widespread cultural disparity demonstrates the triviality of the flop problem – that a large range of concepts have succeed in being established in human populations. But this objection mistakes process with product: though anthropologists and ethnographers have indeed documented a wide range of supernatural beliefs, these are only the *successful* beliefs, ones that have been built on the scrap-heap of numerous unsuccessful trials. The problem is not to explain why there are beliefs at all, but to account for why some beliefs have persisted through time while others did not. At

issue is explaining why, out of the many possible religious concepts, only some are rendered stable over time. As Boyer (2001, p. 32) writes:

> The religious concepts we observe are relatively successful ones selected among many other variants. Anthropologists explain the origins of many cultural phenomena, including religion, not by going from the One to the Many but by going from the Very Many to the Many Fewer, the many variants that our minds constantly produce and the many fewer variants that can be actually transmitted to other people and become stable in a human group.

What this suggests is that extant cross-cultural variation should be investigated not only by looking at mechanisms for transmitting various cultural novelties, but also at those that explain cultural *retention*.[5]

In Barrett's agency-driven account, two features explain the persistence of beliefs about supernatural agents: first, beliefs in supernatural agents like gods or spirits are beliefs about *intentional agents* whose activities in the world can be reasoned about in the same way that one reasons about the activities of other agents; second, the nature of these agents (their invisibility, omnipotence, etc.) violate intuitive beliefs about the nature of agents and the world, and these violations makes beliefs more memorable.[6] As Barrett (2004, p. 120) argues: "By virtue of being agents, gods enjoy tremendous inferential potential but also play into the hyperactivity of a particular mental tool, the hypersensitive agency detection device." It is because gods and spirits are taken to be agents whose actions can be observed and identified in many circumstances, and because the nature of these gods and spirits are counterintuitive enough to be memorable, that beliefs, concepts, and practices spring up that appeal to such entities.

In general, by-product accounts argue that religious disparity is explained by cultural exploitation of deep cognitive structure. This deep structure is taken to constrain the kinds of inferences that agents can make, as well as providing a sensitivity that can be exploited by cultural experimentation and evolution. This deep structure imposes "strong constraints on the diffusion and transmission of religious assumptions, thereby leading to the recurrence of ideas observed in the religious domain." (Boyer, 1992, p. 33) Ultimately, however, the specific ideas that occur are the result of stochastic processes of human cultural evolution. Diverse religious concepts are experiments in extending deep cognitive structures, and cross-cultural similarity is to be expected because of the universality of such structures.

4. The socioecological approach

By-product accounts deny or ignore the potential adaptive character of religion (Purzycki et al., 2014). Yet cultural evolution is known to generate

adaptations; in the paleoanthropological record, these are visible in the complex suites of knowledge involved in foraging and food preparation, modes of hunting game, and methods of producing tools (Henrich, 2016). To the extent that religion is also the result of cultural evolution, it is thus reasonable to assume it may have adaptive features. The socioecological account is premised on this idea. Modeling the complex coevolutionary links between culture and socioecological factors, this approach aims at explaining trends and patterns in religious disparity as adaptive responses to similar selection pressures (Cronk, 1991; Foley, 2004; Mace, 2000; Nettle, 2009).

The investigation of evolutionary ties between culture and local socioecology is a growing field in both cultural evolutionary studies and the cognitive science of religion. An excellent example of this research can be found in cultural phylogenetic studies that model how changes in local circumstances lead to downstream evolutionary changes in socioeconomic organization. Consider kinship. There are two broad strategies for organizing kinship. In matrilineal populations relatedness through female members of kin is more culturally significant than relatedness through males, manifesting itself in terms of parental investment, norms of property inheritance, and residency patterns. The reverse is true of patrilineal societies: here relationships through male members of kin are seen as more culturally significant. Might shifts in economic and environmental circumstance modulate a shift in kinship systems?

There are good reasons to think that shifts in subsistence strategy – such as a shift from horticultural or agricultural subsistence to pastoralism – should be linked to changes in kinship. Patchily-distributed valuable resources (like cattle) are often associated with monopolization by males and the creation of dominance hierarchies (Hartung et al., 1982). A shift to such subsistence might thus lead to the adoption of patrilineal or otherwise male-dominated kinship systems, where coalitions of males can hoard and dominate resources (Foley, 2004). When the opposite scenario holds – where resources are hard to monopolize or require collective stewardship – systems of matriliny may be more likely to arise. In the latter situation, women have access to sufficient resources and can thus have the power to pick and choose among potential mates (Durham, 1991).

Using a series of cultural phylogenetic models, Holden and Mace (2003, 2005) convincingly show that among sub-Saharan Bantu speakers, a shift in subsistence strategy toward pastoralism greatly increases the likelihood that a population will move from a matrilineal system to a patrilineal one.[7] Interestingly, shifts in subsistence strategy also bring about changes in patterns of marriage payments, with patrilineal systems often employing bridewealth payments (from grooms or the groom's family to the bride's family) as opposed to dowries (payments from the bride or bride's family

to the groom or groom's family) (Fortunato, Holden, & Mace, 2006; Holden & Mace, 2003).

These cultural phylogenetic models show how socioecological factors can drive the adoption of different strategies for resource acquisition and social organization. Building on such coevolutionary reasoning, the socioecological approach adopts a functional and adaptationist approach to explaining religious disparity.[8] Broadly speaking, this approach takes religious activities to be dynamic systems of which some components can be explained as designed solutions to problems.[9] Though earlier incarnations of anthropological functionalism were burdened with holism and "good-designism" (Lewens, 2009) – such that many (if not all) cultural activities were taken to be optimal solutions to problems – contemporary quantitative and statistical methods complement ethnography to generate a rigorous approach that mitigates these perils.

As an example of a sophisticated functionalist approach, consider the important work of J. Stephen Lansing. Combining ecological modeling and ethnographic work, Lansing has convincingly shown how Balinese water temples solve social and ecological coordination problems of local rice farmers (Lansing, 1987, 1991; Lansing & Kremer, 1993). Using several overlapping calendrical systems, large-scale rituals, and environmental cues, the water temples function as organizing structures to distribute irrigation waters equitably and to synchronize crop plantings. In doing so, the temples contribute to the reduction of crop pests and the maximization of plantings. Despite the complexity of the system, it functions in such a way so as to increase the net yield of food resources by rice farmers.

The adaptationist and functionalist bent of the socioecological approach is particularly well-suited for understanding puzzling features of religious behavior. Consider, for instance, costly rituals. In nearly all religions there are ritual behaviors and events that involve self-harm, the foregoing of food, or voluntary gifts of resources. How should such phenomena be accounted for? By-product accounts offer few resources to explain these phenomena. That such costly rituals are extensions of deep cognitive resources does not explain why costly rituals would persist relative to non-costly rituals. In fact, these costs would seem to make the beliefs that support costly rituals more likely to flop than to persist. A more promising solution to this puzzle points to the prosocial behavior of religious believers – both among members of the same religion and across religions (Norenzayan, 2013). If one putative function of religion is to facilitate cooperation (Irons, 2001; Bulbia, 2008; Norenzayan & Shariff, 2008; Norenzayan, 2013), then costly rituals may be signs of religious devotion that signal prosocial behavior and trustworthiness.[10]

Here I draw on the ethnographic and experimental work of Benjamin Purzycki, whose work has focused on the pastoral communities of the Tyva Republic and the costly rituals they engage in. The Tyva are one of a number of pastoral communities in inner Asia who engage in costly rituals around cairns. These cairns mark out pasture boundaries, regional borders, mountain passes, and mountaintops. Taken together, they represent a complex cartography that marks out boundaries and pathways, charting the routes households travel over the season of grazing (Purzycki & Arakchaa, 2013).

Tyvans continue to pay homage to local spirits at these cairns by offering food, tobacco, and money while engaging in ritualized behavior. Interestingly, the spirits they appeal to are not taken to be omniscient, and their domain of power is spatially constrained to a domain around particular cairns. Another compelling fact about these spirits is that their concerns predominantly revolve around resource usage and the respectful crossing of thresholds. The spirits care about littering, defacing nature, and the lack of proper respect paid to the spirits and one's family and ancestors (Purzycki, 2013). If anything, the limited powers and concerns of these spirits seem to raise further questions – why should one engage in such costly rituals to appease spirits who are interested in such localized affairs?

An illuminating example from Purzycki (2013) begins to sketch an answer:

> In one episode from my experience, my hosts' river water was sullied by a recent rain. We drove to our neighbors' *aal* to fill up large milk jugs with the water from a spring near the neighbors' yurts. Before extracting water, we tied prayer ties around the tree and threw coins near the spring's source to honor its spirit master. As we performed this ritual, the neighbors watched us from their yurts and waited until we were filling the jugs to come down to the spring to socialize. (p. S92)

As Purzycki argues, individuals may engage in costly rituals in order to signal trustworthiness and cooperation. By engaging in ritual behaviors, individuals are making public acknowledgements of their beholdenness to local traditions and norms.

Interviews and psychological studies support this supposition. Religious individuals who engage in costly rituals are seen as more trustworthy, cooperative, and more likely to return forgotten belongings (Purzycki & Arakchaa, 2013). This suggests that the appeasement of local spirits can mediate social behaviors by signaling prosocial behavior: when individuals observe others performing ritual displays this serves as a sign not only of the knowledge of local custom, but also an acknowledgement of crossing a boundary to use the resources of another household.

Of course, such solutions only make sense in small populations, where rituals are hard to fake and easy to monitor, and where there are repeated

interactions among groups. Pastoral populations, where households share contiguous patches of pasture, are just such populations. Yet as Ara Norenzayan (2013), Atran and Norenzayan (2004), and Shariff and Norenzayan (2007) argues, these kinds of religious organizations and practices cannot play a similar role in larger populations, where interactions largely take place between anonymous and non-repeating partners. According to Norenzayan, these latter conditions are those where so-called *moralizing high gods* culturally evolved – omniscient supernatural agents concerned with the moral status of individuals, and who mete out rewards and punishments. I do not have the space to engage with Norenzayan's account in much detail – particularly his contentious claims about the origin of moralizing high gods and the mechanisms by which they facilitate economic cooperation in an era of anonymous individuals (for some critical commentaries, see Martin, 2014; Schlieter, 2014; Thomassen, 2014) – nevertheless, as I have suggested above, there are good reasons to think that shifts in economic, environmental, and social circumstance will feed back into beliefs, skills, and modes of social coordination of human populations.

In short, the socioecological account provides coevolutionary explanations for patterns of religious belief, arguing that these beliefs are component parts of strategies for managing social and environmental circumstances. Generally speaking, the socioecological account treats culture as a dynamic system – and models that system as an adaptive solution to socioecological problems. Where there are repeat problems – for instance, a need to negotiate boundaries and resource-use – cultural evolution can generate patterns of behavior with design-like features. With the Tyva, for instance, religion may function as a social mediator for identifying trustworthy, cooperative individuals and dissuading individuals from free-riding.

5. Corralling cultural causes

5.1. *Contrastive explanation*

As I've said above, there is a general agreement about the various causes involved in explaining religious disparity. No one doubts that humans are evolved creatures, and that the evolved character of our cognitive system plays a role. Nor do researchers disagree about the substantive role played by cultural evolution in generating and establishing religious practices. Nonetheless, there are some sources of substantive disagreement, as we've seen: by-product theorists downplay or ignore adaptationist explanations, while the socioecological approach takes them to be research hypotheses that yield empirical dividends. Here I want to

suggest that this scenario does not just result from a division of labor, but that it represents a different understanding about the organization of causes underpinning religious disparity. Continuing to examine the cognitive science of religion is useful for understanding how similar strategies might work in accounting for cultural disparity more generally.

Explanations of phenomena, like religious disparity, have a contrastive character: why *this* kind of ritual rather than *that* kind? Why *this* musical instrument rather than *that* one? This contrastive character is often left implicit, yet it is important to emphasize, since the class of relevant contrasting explanations determines what counts as a relevant and satisfactory explanation of the target phenomenon (Dretske, 1972; Hitchcock, 1996; Van Fraassen, 1977; Woodward, 2003). Understanding and relating causes to one another is important, if only because it helps to zoom in on relevant explanatory contrasts to the questions at hand.

To take a simple example (drawn from Haslanger, 2016), consider a naïve social anthropologist who, after having arrived in the United Kingdom, observes an unusual behavior: citizens kneeling when the Queen enters the room. Attempting to answer why such behavior occurs, we find that the researcher can choose between (at least) two sets of contrasts:

(1.1) Why is it that British citizens **kneel** (rather than hoot and holler) when the Queen enters a room?
(1.2) Why is it that British citizens kneel when **the Queen** (rather than any nonagenarian) enters a room?

The difference between these two questions hinges on the relevant explanatory foci. In the first case, our naïve anthropologist is interested in explaining why a particular behavior (kneeling) is produced by the presence of the Queen, rather than some other kind of behavior. In the second case, our anthropologist is interested in explaining why it is that a particular kind of cause (the Queen entering a room), and not similar causes (the elderly) leads to a particular behavior.

In the contrastive approach adopted here, explanation consists in identifying and articulating the conditions under which patterns of counterfactual dependence hold, answering what Woodward (2003) calls "what-if-things-had-been-different" questions. That is, one could answer why-questions in counterfactual scenarios where the cause or background conditions have been manipulated. A minimal characterization of this manipulationist account of causation is the following:

> ***C*** causes ***E*** if and only if there are background circumstances ***B*** such that if some intervention that changes the state of ***C*** were to occur in ***B***, then ***E*** would change.

More generally, the idea is that some putative event causes another insofar as there is a range of conditions under which an intervention on C under those conditions leads to a change in event E. This formulation implicates what Woodward (2003) calls *invariance*, which he takes to be a key feature of causal claims.

The term "intervention" used above calls out for greater articulation. Interventions in the technical sense used here are conceivable experimental manipulations – that is, they need not be practical or even possible to carry out by human beings, given the constraints of the world. One can imagine interventions like flattening Nepal, tweaking universal constants, or replacing geological strata. The notion of intervention allows for surgical manipulations of events to determine whether there exists an invariant relationship under relevant conditions.

What is important here is how the relevant contrast classes are construed. In separating the two questions embedded in the research of our naïve social anthropologist, two relevant parameters were highlighted: what the individuals do, and the nature or status of the instigating cause. Likewise, when explaining religious disparity, one needs to articulate the dimensions that distinguish relevant contrast classes, articulate the causal relationships of such causes, and determine the way in which these causes might be related to one another.

5.2. *Historicity and temporal scale*

Building on the manipulationist account of causation provides useful tools for crafting a causal vocabulary useful for identifying salient causal levels, identifying contrast classes, and relating the causes of cultural disparity. Here I focus on the way in which temporality has been used to relate such causes, before moving on to problematize a simple relationship of temporal embeddedness in the final section. To begin to see how temporality is used to organize cross-cultural variation in religious beliefs, consider the following claims:

(2.1) Tyvans pay respect to local spirits at ritual cairns because concepts about such spirits are memorable and allow for rich inferences
(2.2) Tyvans pay respect to local spirits at ritual cairns because it signals trustworthiness and acknowledgement of local norms and mores

(2.1) and (2.2) appeal to distinct causes that account for Tyvan practices. (2.1) is grounded in the by-product account, suggesting that beliefs about

Tyvan spirits are memorable extensions to deep cognitive architecture. (2.2) is based on the ecological account, holding that Tyvan customs are shaped by concerns about resource management and reputation. In fact, (2.1) and (2.2) represent a small subset of the possible explanantia for Tyvan religious practices: as I've suggested, religion, and culture more broadly, are complex dynamic systems affected by a range of historically contingent causes.

The difficulties in providing explanations for complex historical phenomena has not gone unnoticed by philosophers and philosophically-minded researchers (Gould, 1989, 2002; Sober, 1991; Ben-Menahem, 1997; Beatty, 2006). The tools and concepts developed by these thinkers can aid in identifying and understanding the structure and downstream effects of the contingent causes of cultural disparity. One important dimension in historical explanation involves the way in which patterns of causation and change occur at different spatial and temporal scales (Inkpen & Turner, 2012).

The causes appealed to by the by-product account are tokened over vast time frames. To see this, consider again Boyer's appeal to mindreading capacities in the origin and stability of religious concepts. When we consider what kind of cultural disparity such an explanation provides, we must consider a contrast class at a similar temporal scale. The by-product account, for instance, does not explain why a culture has a religious concept like *this* rather than *that* – for instance, why one culture believes in eavesdropping trees while another believes in invisible animal spirits. Instead, their explanations appeal to why there is a panoply of concepts about intentional agents at all, rather than some alternate set of concepts. It does so because of antecedent assumptions about the capacities underwriting capacities for theory of mind – that one set of capacities evolved rather than some other set of capacities – and the way that our capacity for rationalizing and explaining the behavior of other agents has been extended and tinkered with by cultural evolution.

Contrast this with explanations provided by the ecological account. Here, the temporal scales can be quite short. Phylogenetic modeling from Watt et al. (2015) suggests that in Polynesian societies, belief in moralizing high gods coevolves with political complexity – and that such shifts have occurred several times since the second human expansion into Polynesia around six thousand years ago. The higher-resolution studies of Holden and Mace suggest that shifts can be even more rapid, with changes in costs and benefits of resource acquisition driving changes in social organization over a few generations.

So one way of making sense of the complexities of cultural disparity is to isolate contrast classes operating at distinct temporal scales, and restrict the target explanandum appropriately (more on this below). I think this is a wholly appropriate strategy, but one that does not satisfy the aims of

explaining how these distinct causes may be related to one another – how they structure the complex trajectories of cultural evolution, and together explain historical and contemporary cultural disparity. To see why, I suggest we need some further tools from the manipulationist account.

6. Causation big and small

6.1. *Proportionality and specificity*

Different descriptions of the same event can be more or less explanatory. To see this, consider again the research of our naïve anthropologist. Compare the following two claims:

(3.1) The entrance of a nonagenarian woman wearing a crown into the room caused all the British citizens therein to kneel
(3.2) The entrance of the Queen into the room caused all the British citizens therein to kneel

Even intuitively, claim (3.2) seems to be a better explanation – seems more correct – than (3.1). This is because (3.1) does not seem to articulate the correct structure of the dependency relationship, implying that all women of a certain age and fashion sense will cause British citizens to kneel. What is important is to recognize that similar descriptions of dependency relationships can be more or less acute, and in virtue of this, can be better or worse articulations of the causal structure actually at work. This is what Woodward (2010) calls *proportionality*.[11]

Proportionality is a normative notion. It provides an ideal standard for characterizing dependency relationships. Ideally, proportionate characterizations convey all and only that information about the conditions under which alternate effects (or effect-states) will be realized (Woodward, 2010, p. 298). Non-ideal characterizations will be those that include inaccurate or irrelevant information. To return to the example above, (3.1) contains irrelevant and perhaps misleading detail. Whether or not the Queen is in her nineties, and dresses in a certain way, is irrelevant to why she causes British citizens to kneel. More to the point, it does not accurately characterize the relevant feature that does cause such kneeling – namely, her royal status. By contrast, (3.2) does correctly characterize these features – that the crowned nonagenarian is the Queen.

Part of what is at stake in making causal claims is the perspicuity of the descriptions, and proportionality marks out this normative requirement. The accuracy and relevance of our causal descriptions are important. Often, however, we are interested not just in proportionality of claims, but in the influence that certain causes wield. This is Woodward's notion

of *specificity*. Here, specificity refers to causes whose manipulation leads to fine-grained influence on the state of some effect. Thus, if I have an effect that can take on a range of different states (e_1, …, e_n), a maximally influential cause is one where interventions on that cause can generate the full range of distinct effect states.

Take Woodward's example of an analog radio. Say we are interested in the sounds that the radio produces, represented by r. Thus the range of states that r can take is (r_1, …, r_n). These will include a wide variety of radio stations – each a unique value of r – as well as the lack of sound and static. With this in hand, consider what kinds of interventions on the radio will lead to specific, fine-grained influence on r. Though there are many relevant components of radios one might examine here, restrict attention to two standard features of such radios: (1) the electromagnetic receiver controlled by the tuner dial and (2) the switch determining whether the radio is "OFF", sensitive to frequency modulated "FM" signals, or amplitude modulated "AM" signals.

Specific fine-grained influence will characterize the relationship between interventions on the tuner dial (or, more specifically, the change in sensitivity of the radio receiver) and the values of r. What explains why I am listening to my local campus radio rather than the classic rock station is that the tuner dial is set to 90.9 MHz rather than 92.1 MHz. Note, however, that this fine-grained influence is not maximal: manipulations of the tuner dial will not suffice to bring about all the possible values of r. Given that the switch is set to (say) FM rather than AM, there will be a range of values of r that will require a distinct kind of intervention: intervention on the OFF–AM–FM switch.

Consider the kinds of effects moving this OFF–AM–FM switch can bring about. What determines whether I get a radio station – rather than static or nothing at all – is whether the tuner dial is set to receive a radio signal and that the radio is, in fact, turned on. While manipulations of the switch can determine what range of possible r values can be reached, it does not exert fine-grained influence on these states. Woodward (2010) calls such coarse-grained interventions "switch-like" – as opposed to what I will call the "tuner-like" fine-grained influence of the tuner dial. While switch-like manipulations are causally relevant to the state of some putative effect, they do not modulate or exert tuner-like fine-grained influence – say, whether I am listening to CJSW or CJAY.

6.2. *Embedding switches and tuners*

The problem of organizing and relating temporally diverse causal claims is an empirical issue, but a good guide in evaluating such claims is Woodward's proportionality – that the causal description includes all and

only the relevant information about the causes needed to determine the relevant state of the effect variable. Linked to this is the ability to answer "what-if-things-had-been-different" questions. Proportionate descriptions provide perspicacious answers to these questions.

Return to consider (2.1) and (2.2). If a researcher is concerned with explaining why Tyvans have spiritual and religious concepts *at all*, and why these religious beliefs involve spirits concerned with human activities, then a by-product approach seems proportionate: Tyvans have such beliefs in virtue of a cognitive capacity for explaining the world using mental state predicates. Yet if one is interested in why Tyvans have the particular religious organization that they do – why their spirits are concerned with resource management and the crossing of thresholds – then an ecological account seems to have a better grip on the causal facts of the matter. Yet the explanations are related – after all, Tyvans *do believe in spirits*.

Deploying the language of switch-like and tuner-like causation can help to identify one possible way that the claims of (2.1) and (2.2) can be related to one another despite the disparate temporal scales at which they operate. The by-product account provides *switch-like* explanation of such practices – why Tyvans (and, indeed, all populations) have religious beliefs in supernatural agents rather than some other set of religious beliefs (or perhaps, none at all). But, given that we have the cognitive architecture that we do, the ecological account provides a *tuner-like* explanation of practices: Tyvan religious beliefs have the form that they do because of the distribution of resources in Siberia and the subsistence strategies of those populations that find themselves there.

This way of relating the claims involves embedding the tuner-like ecological explanation in the switch-like by-product account. Just like Woodward's radio example, having a theory of mind module (rather than some other cognitive module) explains why individuals have beliefs about supernatural *agents* (rather than some other kind of belief). But the particular socioeconomic circumstances explain why religious beliefs might have the particular form that they do – and perhaps, why such a form might have aspects that seem designed to suit the particular local circumstance. A people encountering the same ecological circumstances with a different cognitive architecture would be unlikely to develop similar cultural appurtenances.

This claim of embeddedness is usually taken to be secured by temporal priority – that is, because the relevant cognitive evolution is assumed to have occurred *before* any cultural evolution (Boyer, 2001; Sperber, 1996). On this understanding, socioeconomic problem-solving represents a temporally downstream process from the earlier evolution of theory of mind capabilities. Yet this is a substantial and contentious empirical claim. It need not be the case that human cognitive architecture evolved

independently from culture, nor that it occurs at a time-scale incommensurate with cultural evolution. Gene-culture co-evolution, for instance, convincingly show that ecological and evolutionary causes can intersect and feedback in complicated ways.

Indeed, Cecilia Heyes' "cognitive gadget" account holds that many human cognitive capacities are culturally evolved cognitive tools – tools whose function and acquisition arose and were modified over many generations of tinkering and experimentation (Heyes, 2012a, 2012b, 2018). Her account of theory of mind capacities suggests that a minimal *implicit* theory of mind – an innate capacity to track bodily orientation and perspective (Heyes & Frith, 2014) – is bootstrapped by culturally evolved social scaffolding into the rich inferential capacities for reasoning and predicting the behavior of other agents, what she calls *explicit* mind reading. On Heyes' account, teaching, language, and other social scaffolds are required to develop the rich explicit theory of mind capabilities, and thus that variation (cross-cultural or otherwise) in the availability of these social scaffolds should translate into variation in development.[12]

Compelling support for this hypothesis can be found in empirical research on users of Nicaraguan sign language (NSL). The origin of NSL is a complex story (Polich, 2005), yet what is crucial for current concerns is that its protracted development from the 1970s to 1990s produced distinct cohorts of users with very different lexicons. Most notably, earlier adopters of NSL had a severely impoverished vocabulary of mental state terms as compared to later cohorts. As Pyers and Senghas (2009) show, this difference in cohort lexicon can be linked to performance on false-belief tasks, with the older cohort performing much worse than the younger cohort. Interestingly, when the researchers re-tested both cohorts after two years, the older cohort had both increased the number of mental state terms in their lexicon and demonstrated an increased capacity to correctly answer false-belief tasks.[13]

This research supports the idea that the development of explicit mind reading capabilities is supported by social scaffolds. These scaffolds involve teachers and parents guiding individuals (typically infants) in the use of mental state terms by providing labels, narratives, and sample explanations. This targeted transmission of explanatory vocabulary (Taumoepeau & Ruffman, 2006, 2008) provides symbolic labels for the organization and explanation of social behavior (Clark, 1997). Indeed, the development of explicit theory of mind capabilities can be predicted by the frequency of the mother's use of causal-explanatory statements and the subset of such statements which use mental state terms (Slaughter & Peterson, 2012). As infants continue to develop, these explicit capabilities are continually bootstrapped into general inferential

capabilities that can play out over a range of domains, including social navigation and religious belief.

On Heyes' account, culture and cultural evolution exerts a major influence on cultural disparity insofar as it produces cognitive tools. Rather than a picture where human cognition evolved *and then* cultural evolution took place, she argues that the two are more intimately linked. On the picture that Heyes motivates, theory of mind capabilities are not switch-like – occurring before downstream cultural differentiation – but together with cultural evolution jointly effect a tuner-like exploration of cultural disparity.

Yet while an intimate link between cultural evolution and cognition might problematize the picture of temporal embeddedness developed above, Heyes' account does not offer a knock-down argument. After all, it may turn out that the development of explicit theory of mind is tightly constrained by innate psychology – that explicit mind reading represents the only possible way in which implicit mind reading can be further developed. On this conservative reading, variation in social scaffolding represents the more or less reliable reassembly of developmental conditions needed to acquire a fully-fleshed theory of mind. Here, the evolution of a switch-like cognitive capacity occurs prior to the tuner-like exploration of social scaffolds and religious belief.

At the moment, it is unclear whether Heyes' cognitive gadgets account challenges this conservative reading. To do so, more evidence would be needed to demonstrate not only the effect of culture and cultural evolution on the *acquisition* of cognitive capabilities (as above) but also on the *kind* or *quality* of the cognitive capabilities thus acquired. Such evidence would convincingly show the role of cultural evolution in producing a range of distinct cognitive gadgets, and in doing so, opening up new domains of cultural differentiation. As things stand, it is hard to tell whether Heyes' account motivates this more radical possibility.

7. Conclusion

My aim in this paper has not been to solve issues in the cognitive science of religion, nor has it been to provide a full account of the causal processes involved in generating cultural disparity. Instead, the aim here has been relatively modest. First, I aimed to introduce the problem of cultural disparity as a distinct and important target for anthropological, social scientific, and philosophical work. At the same time, I hope to have pointed out that important work is already ongoing in the vicinity of this problem, with a number of researchers already employing models, carrying out experiments, and digesting data in order to identify, measure, and understand the processes involved in cultural change.

Yet I have also argued that accounting for cultural disparity requires further theoretical, and conceptual, language – language that can organize the various causes at work in generating cultural disparity and help to identify recurrent patterns. I have focused on a case study drawn from the cognitive science of religion because it provides a clear case study for understanding these organizational issues. More than this, it brings to the fore problems involved in temporally embedding processes of cultural evolution into broader narratives of cognitive evolution. As I've hinted, the links and relationships between cultural and cognitive evolution are likely to be more complex and intricate than a simple claim of embeddedness, though I have pointed out that radical alternatives require further empirical support.

In characterizing cultural disparity, I have also urged an understanding of culture as a complex and dynamic system – one whose components and overall state turn critically on the contingent paths taken over evolutionary and historical time. Furthermore, this complex system is likely to display indications of design in some places and times. As numerous researchers have argued, culture can be adaptive, and I hope that the case study developed here highlights a novel complement to those of subsistence strategies, food processing, and social navigation prevalent in the cultural evolutionary literature.

Notes

1. Here I assume along with a number of researchers that cultures can be individuated (see, e.g., Alesina, Devleeschauwer, Easterly, Kurlat, & Wacziarg, 2003; Fearon, 2003; Loh & Harmon, 2005; for some attempts at providing individuating criteria). Yet this supposition is contentious (Benhabib, 2002; Scheffler, 2007).
2. I note that this is not the only way of characterizing cultural diversity. In biology, the distinction between diversity and disparity marks a difference between counts of species number and sheer phenotypic variation (Maclaurin & Sterelny, 2008, p. 43). Along these lines, one might thus define cultural diversity as the number of distinct cultures in some relevant context. The use in this paper is different. Here I take diversity to count cultural trait categories. As I see it, both are legitimate construals of "diversity". Since nothing in the current paper hangs on the particular definition of "diversity" used, I opt for the latter as it hews closer to the colloquial usage of the term.
3. For instance, religious practices which do not advert to or relate to the activities or minds of supernatural agents (Bowen, 1998), or the role of religion in metaphysical, moral, and epistemological theorizing (e.g., Durkheim, 1912/1955; Winch, 1990).
4. Perhaps the exception that proves the rule is the study of gene-culture co-evolution (Boyd & Richerson, 1985; Durham, 1991; Laland, Kumm, & Feldman, 1995), which is unique in the study of cultural evolution in having well-developed causal models applied to a number of case studies (e.g., Durham, 1991; Holden & Mace, 1997).
5. Similar characterizations as to why some concepts are retained over others can be found in Boyd and Richerson (1985), Henrich and Boyd (2002), and Richerson and Boyd (2005). See Buskell (2017a, 2017b) for an account as to how the claims of Boyd

and Richerson can be related to those of Sperber, Morin, Boyer, and other by-product theorists.

6. This is what researchers call the minimally-counterintuitive bias (Boyer, 1999, 2001; Barrett, 2000, 2004), where minimally counterintuitive ideas are remembered more than normal or bizarre items (Norenzayan, Atran, Faulkner, & Schaller, 2006). This effect is central to Boyer and Barrett's by-product accounts, yet critics are skeptical that it can do the work required of it. The effect does not seem to be attributable to deep cognitive structures (Purzycki & Willard, 2015), nor does it seem plausible that all (or most) successful religious beliefs are best understood as minimally-counterintuitive (Sterelny, 2017).
7. The reverse trend was much weaker: while later returns to agricultural or horticultural modes of subsistence increased the likelihood of shifting back to a matrilineal system, it was not to the same extent that pastoralism increased the likelihood of patrilineal systems (Holden & Mace, 2003, 2005).
8. Indeed, they sometimes contrast the by-product approach with their "adaptationist" approach (i.e., Sosis, 2009).
9. For a review of anthropological functionalism, see Shariff et al. (2014).
10. An alternative account holds that costly rituals can be made sense of using rational choice theory, and that the downstream benefits of engaging in costly rituals may outweigh the upfront costs. This requires that individuals are able to recognize the putative costs and benefits of a range of actions and to make decisions accordingly – something that the socioecological approach need not assume. For an excellent review of the relationship between rational choice theory, costly behavior, and religion, see Pyysiäinen (2010).
11. Carl Craver describes a similar requirement when speaking about the relationship between explanatory texts and objective explanations. Objective explanations are the complex facts in the world that change over time, while explanatory texts are representations of such facts. Complete explanatory texts accurately represent the salient facts of the matter – they are complete insofar as they represent "all and only the relevant portions of the causal structure of the world" (Craver, 2007, p. 27).
12. For a similar account, see Sterelny (2003).
13. For similar claims about the relationship between theory of mind capabilities and late-signing deaf children, see Peterson, Wellman, and Liu (2005) and Peterson and Siegal (1999).

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