

Subjective selection, super-attractors, and the origins of the cultural manifold

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Short abstract

Human societies consistently develop complex, near-universal traditions that exhibit striking similarities. These “super-attractors” span magic and religion (e.g., shamanism, supernatural punishment beliefs), esthetics (e.g., heroic tales, dance songs), and social institutions (e.g., justice, corporate groups), and collectively constitute the “cultural manifold.” Here, I argue that the components of the cultural manifold develop primarily through “subjective selection,” or the production and selective retention of variants evaluated as useful for satisfying goals. Whereas previous explanations emphasize objective individual or group-level benefits, I highlight how subjective selection drives complex cultural convergences worldwide, attesting to the importance of subjective selection in shaping human culture.

Long abstract

Human societies reliably develop complex cultural traditions with striking similarities. These “super-attractors” span the domains of magic and religion (e.g., shamanism, supernatural punishment beliefs), esthetics (e.g., heroic tales, dance songs), and social institutions (e.g., justice, corporate groups) and collectively constitute what I call the “cultural manifold.” The cultural manifold represents a set of equilibrium states of social and cultural evolution: hypothetically cultureless humans placed in a novel and empty habitat will eventually produce most or all of these complex traditions. Although the study of the super-attractors has been characterized by explanatory pluralism, particularly an emphasis on processes that favor individual- or group-level benefits, I here argue that their development is primarily underlain by a process I call “subjective selection,” or the production and selective retention of variants that are evaluated as instrumentally useful for satisfying goals. Humans around the world are motivated toward similar ends, such as healing illness, explaining misfortune, calming infants, and inducing others to cooperate. As we shape, tweak, and preferentially adopt culture that appears most effective for achieving these ends, we drive the convergence of complex traditions worldwide. The predictable development of the cultural manifold reflects the capacity of humans to sculpt traditions that apparently provide them with what they want, attesting to the importance of subjective selection in shaping human culture.

1. The cultural manifold

Imagine that a new human society, free of any previous cultural influence, is established on a large, remote island. The humans successfully survive and breed for many generations, maintaining a stable population. Imagine also that anthropologists return a thousand years later and study this pristine society. What should they expect to find?

Fox (1971) envisioned such an “Experimental Eden” and argued the island would host a “recognizable human culture and society” (p. 284). It would have marriage, taboo, property, dancing, myths and legends, initiation rites, institutions for settling disputes, and supernatural practices and beliefs. “Without any exposure to cultural traditions our tribe would develop *very specific* and highly complex patterns of behavior, and probably very quickly – within a matter of a few generations, once they had developed a language” (p. 285; emphasis in the original).

Fox was far from the first person to speculate that human societies regularly develop suites of complex cultural traditions. Seventy-five years earlier, Boas (1896, p. 901) wrote about converging lines of evidence that “human society has grown and developed everywhere in such a manner that its forms, its opinions and its actions have many fundamental traits in common.” For him, this implied that “laws exist which govern the development of society” – laws that apply across time and throughout human history. “Many attempts have been made to discover the causes which have led to the formation of ideas ‘that develop with iron necessity wherever man lives,’” he wrote. “This is the most difficult problem of anthropology and we may expect that it will baffle our attempts for a long time to come” (p. 902).



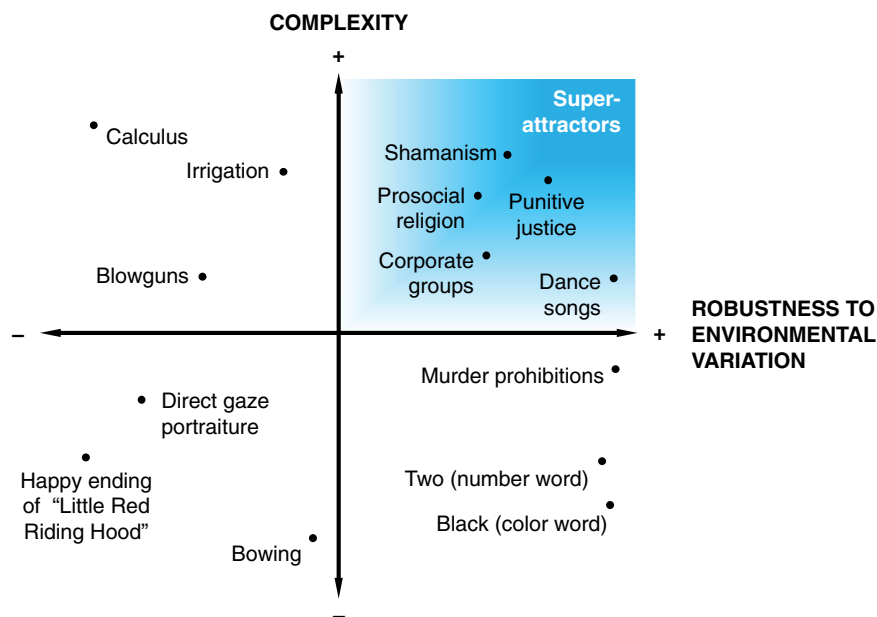


Figure 1. Cultural attractors are mapped along dimensions of complexity and robustness to environmental variation. Super-attractors are those that combine the highest complexity with the greatest reliability of emergence across diverse environments. The placement of examples is approximate and should be taken as illustrative rather than definitive.

In recent years, evolutionary and cognitive researchers have returned to Boas's most difficult problem. Researchers studying music have documented patterns of universality (Mehr et al., 2018, 2019; Savage et al., 2015; Singh & Mehr, 2023) and experimentally investigated the processes by which they might emerge (Ravignani et al., 2017; Verhoef & Ravignani, 2021). Other researchers have sought to identify similarities in legal institutions across societies, connecting them to underlying psychological foundations and cultural evolutionary processes (Fitouchi & Singh, 2023; Sznycer et al., 2021; Sznycer & Patrick, 2020). In line with growing research on witchcraft (Hutton, 2017; Singh, 2021a), divination (Boyer, 2020a; Hong & Henrich, 2021), and shamanism (Singh, 2018, 2025; Winkelman, 2004), Boyer (2020b) identified what he called "wild traditions" – beliefs and practices that are near-universal, consistently exhibit certain features, and reappear even when campaigns seek to destroy them. Aside from these domains, researchers have also worked to explain and identify patterns in narrative (Dubourg & Baumard, 2022; Hogan, 2003; Singh, 2021b), marriage (Boyer, 2018), and supernatural punishment beliefs (Bendixen, Apicella, et al., 2023; Fitouchi et al., 2025), among other ubiquitous traditions.

Here, I refer to such near-universal, complex sociocultural traditions as "super-attractors." This term builds on "cultural attractors," a term coined by Sperber (1996) and which scholars currently use to describe cultural possibilities favored during cultural transmission (Scott-Phillips et al., 2018). Sperber (2012) presented the happy ending of Little Red Riding Hood as an example of a cultural attractor; even if a person told the story with its happy ending cut off, others would be predisposed to

reconstruct it during encoding and retelling, ensuring its reappearance and subsequent stability. Both psychological factors and aspects of the physical environment help determine which cultural traits are attractors (Miton et al., 2020; Sperber & Hirschfeld, 2004).

Super-attractors qualify as Sperberian cultural attractors, yet they differ from most other attractors in two important ways (Figure 1). First, whereas many cultural attractors represent structurally simple variants, like the direction of stares in portraits (O. Morin, 2013), super-attractors are necessarily complex, comprising packages of functionally interrelated attractors. Consider shamanism, or the practice in which a specialist enters apparently non-ordinary states to engage with unseen agents, such as local spirits, and provide services like healing and divination (Singh, 2018, 2025). Across societies, shamanism tends to exhibit many reliably occurring, functionally related features, including (1) altered states (and techniques for inducing them), (2) claims of otherworldly contact, (3) goal-oriented services (such as healing and divination), and (4) dramatic initiation rituals. Likewise, the sympathetic plot – a recurrent narrative structure – includes a (1) goal-directed protagonist who (2) confronts obstacles, (3) eventually triumphs, and (4) reaps rewards (Singh, 2021b). In both cases, each component represents as a cultural attractor, although, through their co-occurrence and interaction, they give rise to a super-attractor. Importantly, the attractors composing a super-attractor are not merely a collection of discrete components; rather, they relate dynamically to produce new, emergent properties or functions that are not present in any individual attractor.

Second, whereas many examples of cultural attractors are environment-dependent (Scott-Phillips et al., 2018), super-attractors are much less so. For example, portraits that appear to gaze directly at the viewer may represent cultural attractors (O. Morin, 2013), but their existence relies on a tradition of portraiture and its many cultural and ecological precursors, including durable pigments, techniques that enable representational accuracy (proportions, shading, perspective), and enough resources to sustain artistic specialists. Marriage, dance songs, hero stories, and justice institutions, meanwhile, exist in human societies the world over, from hunting-gathering bands to industrial,

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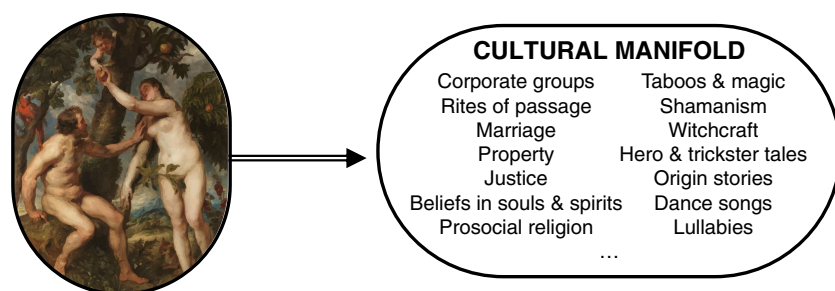


Figure 2. A new, pristine human society, or Experimental Eden, is expected to develop the set of all super-attractors, or the “cultural manifold.”

mega-urbanized states. To be sure, super-attractors are not immune to all environmental variation. Corporate groups, shamanism, and lullabies are vulnerable to disappearing when population size collapses (Singh & Hill, 2025; Walker et al., 2012); utopians have briefly eradicated marriage (Vickers, 2013). But super-attractors are, by definition, much more robust to ecological, social, and cultural differences than most other cultural attractors, developing around the world and in societies of diverse subsistence strategies and social organization (e.g., Boyer, 2020b).

I refer to the set of super-attractors as the “cultural manifold” (Figure 2). I use the word *manifold*, because, in everyday speech, it suggests multiplicity. There are at least two reasons to devote scholarly attention to the cultural manifold. The first is for the importance of its components. Costly, widespread, ancient, and uniquely elaborated among humans, super-attractors constitute central puzzles of the social sciences. As long as our aim is to understand human behavior, super-attractors are obvious targets. The second reason is the one that Boas pointed out more than a century ago: The existence of the cultural manifold suggests general processes underlying the development of culture and society – processes that presumably play out similarly across time and space. The cultural manifold thus serves as an empirical testing ground for researchers to generate and refine social scientific theory.

Why do humans so reliably build such strikingly similar packages of culture? Whence the cultural manifold? To date, answers to these questions have been characterized by an explanatory pluralism. Different super-attractors are explained with different explanatory frameworks. Some are understood as genetic adaptations (Bering, 2006; Gintis, 2007; Johnson & Krüger, 2004; Mehr & Krasnow, 2017); others, as cultural practices which develop to benefit the individual or the group (Leeson, 2014; Schimmelpennig & Muthukrishna, 2021; D. Smith et al., 2017; Winkelman, 2002); still others, as cultural variants that are most memorable or most easily reconstructed during cultural transmission (Boyer, 2001).

In this paper, I acknowledge that many processes likely contribute but argue that one process – what I have called *subjective (cultural) selection* – is the most important in driving the emergence of super-attractors and producing their regularities. Subjective selection occurs as people craft and selectively retain cultural variants evaluated as useful for attaining proximate, psychologically determined goals (Singh, 2022). Such goals, including changing the weather or soothing a fussy infant, are instrumental means to achieve higher-level, adaptive goals, such as securing food or caring for one’s offspring (Dubourg et al., 2025; Tomasello, 2022). Because humans reliably pursue similar goals and evaluate similar variants as compelling for achieving those goals, subjective selection produces comparable traditions, including super-attractors.

Many evolutionary psychologists have pushed back against mainstream cultural evolutionary theories for what they perceive to be a lack of appreciation for the sophistication of human cognition (Krasnow & Delton, 2016; Sperber, 2006; Tooby & Cosmides, 2016). The subjective selection framework addresses such critiques, demonstrating how processes of goal-directed cognition, when iterated, can drive the evolution of much complex culture. By using this framework to explain many components of the cultural manifold, I hope both to advance our understanding of these origins of these important human behaviors and to showcase the central role of subjective selection in constructing our cultural worlds.

2. Subjective selection

I propose that super-attractors, like much of culture, evolve as people craft and selectively retain cultural variants that best satisfy evaluations of goal-oriented, instrumental utility. I have referred to this process as “subjective selection” (Singh, 2022).

The conceptual foundations of subjective selection have a long history in the behavioral sciences. Goals as psychological constructs have been studied for more than a century in empirical psychology and continue to attract debate, refinement, and analysis (Ach, 1935; Austin & Vancouver, 1996; Chu et al., 2024; Heath et al., 1999; James, 1890; Lewin, 1951; Locke & Latham, 1990). The same goes for the processes by which individuals evaluate goal-directed behaviors, especially reinforcement learning (Ribas-Fernandes et al., 2011; Schultz et al., 1997; Sutton & Barto, 1998). Rather than attempting an exhaustive review of these topics, I focus here on synthesizing these concepts with ideas from cultural evolution, which explore how complexity can develop through the selective retention and recombination of functionally relevant modifications (R. Boyd & Richerson, 1985; Cavalli-Sforza & Feldman, 1981; Henrich, 2016; Richerson & Boyd, 2008). Viewed through this lens, psychological processes like goal pursuit and instrumental evaluation, though typically analyzed at the individual level, cumulatively give rise to population-level cultural evolutionary dynamics, including subjective selection.

2.1. Presenting subjective selection

Subjective selection can happen at different timescales. On the shortest timescales, it manifests as trial and error: A person has a goal, they invent a solution, they evaluate the extent to which that solution achieves the goal, and then they either modify or retain the solution (e.g., Allen et al., 2020). But subjective selection can also occur across generations as individuals manufacture, pass along, and preferentially adopt variants evaluated as useful for regular goals.

I refer to this process as “subjective” for two reasons. First, the ends people are motivated to achieve are psychologically determined. Because of how natural selection has shaped human motivation, we pursue higher-level outcomes, such as food, sex, status, and information, as well as lower-level goals that aid in their pursuit, such as killing animals or wooing potential mates (Kenrick et al., 2010). Second, we subjectively evaluate whether a cultural variant satisfies a goal. This evaluation often works – we might tell, for instance, that a variant of a spear is better at killing a deer – but it is not perfect. Humans historically have had difficulty recognizing the value of behaviors like handwashing or boiling water (Rogers, 2003), and we are predisposed to believe that ineffective techniques, or “superstitions,” are effective for influencing uncertain outcomes (Beck & Forstmeier, 2007; Burger & Lynn, 2005; Vyse, 2014). Evaluations of variants’ effectiveness are constrained and influenced by our psychology.

In the language of proximate and ultimate causation, then, the subjective selection framework considers the ultimate function of much of culture to be to satisfy our proximate psychology. Natural selection has produced a flexible psychology with proximate goals and mechanisms of evaluation. These, in turn, become ultimate-level cultural evolutionary pressures shaping which traditions emerge, persist, and fade.

Various researchers had earlier emphasized the importance of goals and subjective evaluation in the evolution of culture (Alexander, 1979; Boehm, 1978; R. Boyd & Richerson, 1985; Pulliam & Dunford, 1980; see also Malinowski, 1960). Moreover, subjective selection is broadly consistent with existing cultural evolutionary frameworks. As with much work by cultural attraction theorists, for example, it underscores the role of human psychology in shaping culture. In the context of dual inheritance theory, meanwhile, subjective selection often consists of a combination of “guided variation,” as people produce variants that they expect will be useful, and “content biases” that favor the adoption of variants that seem to best achieve goals. Yet despite its simplicity and compatibility, the idea of subjective selection has remained under-developed in the contemporary cultural evolution literature. It thus differs in important ways from oft-invoked cultural evolutionary processes.

The main features distinguishing subjective selection from other hypothesized processes are the two sources of subjectivity: proximate goals and the psychology of evaluation. Unlike most work by cultural attraction theorists until recently (e.g., Atran, 1998; Boyer, 2001; O. Morin, 2013; Sperber & Hirschfeld, 2004), subjective selection focuses on goal-directed behavior. Unlike cultural group selection or cultural evolution through cue-biased transmission (e.g., imitating the healthy, successful, or prestigious), meanwhile, subjective selection emphasizes subjective

appeal over objective benefits. Of course, subjective appraisals of instrumental value can, and often do, correspond with objective benefits: A spear that works well for hunting can both be subjectively evaluated as useful for a goal and produce objective benefits. But this need not to be the case. People can evaluate magical practices to be effective for healing illness or divining the future, even when they have no causal impact (Hong, 2022a; Hong & Henrich, 2021); people might believe that endorsing particular narratives will make their groupmates more cooperative, regardless of those narratives’ efficacy (Fitouchi et al., 2025). Through its emphasis on goals and the psychology of evaluation, subjective selection stresses features of individual-level psychology that, until recently, have been underemphasized in the study of cultural evolution (although see André et al., 2023; Baumard et al., n.d.; Hong & Henrich, 2021; Hong & Zinin, 2023; Mercier & Boyer, 2020 for indications of a scholarly shift).

2.2. The psychology of goals and evaluation

According to a subjective selection framework, people’s goals and evaluative processes interact to shape and constrain the design of culture. Understanding the psychology of goals and evaluation is thus critical to recognizing how subjective selection acts.

2.2.1. What are goals?

Goals are ends toward which individuals are motivated (see Table 1 for definitions). They can be represented cognitively and include both internal states (e.g., experiencing pleasure, controlling one’s body temperature) and external outcomes (e.g., spearing a deer, starting a successful company). Vertebrates appear to organize their behavior in the pursuit of goals (Del Giudice, 2023; Kenrick et al., 2010; Tomasello, 2022); as a result, goals profoundly shape cognition, such as in how states of the world are mapped, how actions are judged and selected, and how rewards are computed (De Martino & Cortese, 2023; Molinaro & Collins, 2023). Decades of research on goal pursuit show that people are often not consciously aware of their goals and how those goals guide their behavior (Bargh et al., 2001; Custers & Aarts, 2010).

Goals appear to be structured hierarchically (Figure 3) (Austin & Vancouver, 1996; Botvinick, 2008, 2012; Dubourg et al., 2025). At the apex of the hierarchy are superordinate goals, also termed “core biological goals” (Del Giudice, 2023), such as sex, status, security, food, and information (Kenrick et al., 2010). That these goals ultimately guide our behavior reflects their adaptive value: Natural selection seems to have shaped human psychology to secure outcomes that reliably increased fitness in ancestral environments (Barrett, 2015; Pinker, 1997; Schaller et al., 2017; Tomasello, 2022; Tooby & Cosmides, 1990).

Table 1. Some definitions of “goal”

Source	Definition ^a
Locke and Latham (1990, p. 2)	Idea of a future, desired end state.
Austin and Vancouver (1996, p. 338)	Internal representation of a desired state.
Kruglanski (1996, p. 600)	Desirable future state of affairs one intends to attain through action.
Fishbach and Ferguson (2007, p. 491)	Cognitive representation of a desired endpoint that impacts evaluations, emotions, and behaviors.
Custers and Aarts (2010, p. 47)	A desired outcome.
(VandenBos 2007/2018	End state toward which a human or nonhuman animal is striving: the purpose of an activity of endeavor.

^aDefinitions originally referring to “goals” (plural) have been modified to refer to a “goal” (singular) for consistency.

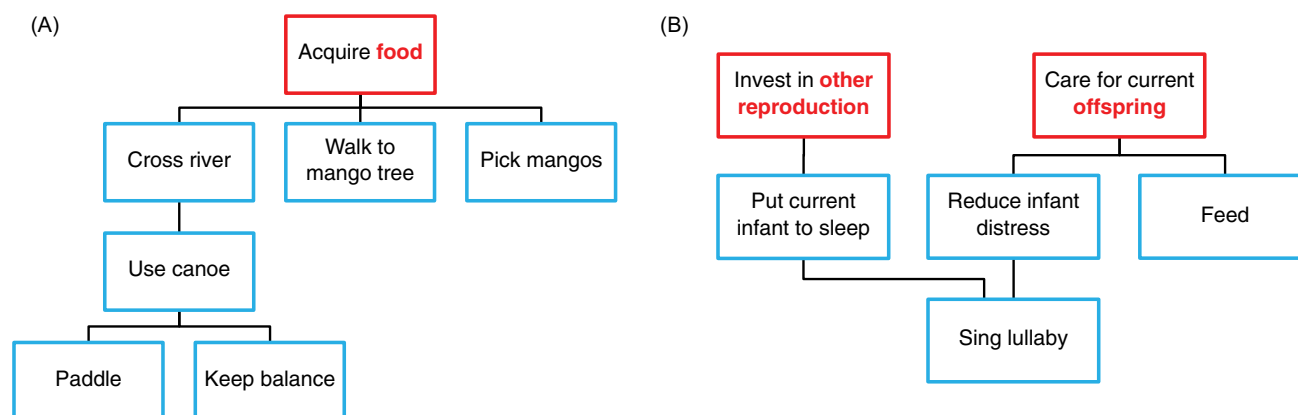


Figure 3. Goal-directed behavior is hierarchical. Superordinate or core biological goals (red) ultimately guide behavior; natural selection has shaped human motivation to pursue these ends, which reliably increased fitness in ancestral conditions. Hierarchically structured under superordinate goals are subordinate or instrumental goals (blue); these have not been defined by natural selection but are flexibly and strategically selected to advance superordinate goals. Cultural behaviors, such as using a canoe (A) or singing a lullaby (B), are adopted and evaluated in the same way as other goal-directed behaviors. Some behaviors, such as singing lullabies, may be deployed in service of several superordinate goals.

Hierarchically structured under superordinate goals is the second set: subordinate goals, also called “instrumental goals” (Del Giudice, 2023). To acquire food, for example, we might execute the following sequence of subordinate goals: *Find stick; leave camp; walk to mango tree; knock down mangos with stick; collect mangos*. Importantly, subordinate goals are themselves composed of a hierarchy of subordinate goals (Botvinick, 2008). A goal like *walk to mango tree* itself comprises complicated sub-routines, like *Step over log* and *Swat away mosquitoes*. Because of the hierarchical nature of goal pursuit, a subordinate goal (like typing the word “goal”) and its ultimate, superordinate outcome (like acquiring status or material resources) can be linked through an elaborate set of nested links (Dubourg et al., 2025). In line with the hierarchical nature of goal pursuit, experimental research suggests that humans experience simultaneous reward signals corresponding to different levels of a goal hierarchy (Diuk et al., 2013; Ribas-Fernandes et al., 2011).

2.2.2. Humans select behaviors, including cultural ones, using goal-directed evaluation

A basic premise of subjective selection is that the cognitive processes involved in evaluating and adopting cultural behaviors are the same as those involved in selecting any goal-directed behavior. Researchers, particularly those working within a reinforcement learning framework, generally distinguish between two evaluative processes – *habit* and *planning* – involved in the selection of goal-directed behavior (Gershman, 2015; Kool et al., 2018). Both can occur outside of conscious awareness. *Habit*, known also as model-free learning, occurs when the individual selects behaviors based on their previously computed rewards. It is referred to as “model-free” because the individual does not use a causal model of the environment to select a behavior, but rather tracks its expected reward, updating it based on deviations from predicted values. For example, a person may head to a tree (let’s call it *tree X*) to collect mangos only to find fewer mangos there, thus updating the value of the subordinate goal *Find mangos at tree X*.

In *planning*, known also as model-based learning, an individual uses a causal model to calculate the expected value of a behavior, selecting it based on this simulation (Kool et al., 2018). For example, an individual may see a new kind of fruit tree and use their familiarity with mango trees to simulate a novel routine to acquire the trees’ fruits. Our causal models can be shaped by culturally

transmitted beliefs, creating pathways by which cultural variants can affect each other’s selective environments. Given tradeoffs between habit and planning – habit is frugal but inflexible; planning is the opposite – organisms benefit from integrating them (Cushman & Morris, 2015; Keramati et al., 2016; Kool et al., 2018).

At first, social learning may seem a distinct process by which individuals adopt behaviors. Nevertheless, converging lines of evidence – including theoretical work (Aoki, 2010; Enquist et al., 2007), studies on learning in non-human animals (Heyes, 2012), and research on the neuroscience of social cognition (Olsson et al., 2020) – demonstrate that cultural learning is constrained by individual evaluations. For example, systems involved in social learning show substantial neural and computational overlap with the systems involved in self-experienced, value-based learning, including computing prediction errors that are used to update the value of learned actions (Olsson et al., 2020). Individuals not only observe others’ behaviors but engage in what is called “vicarious reinforcement learning,” evaluating actions by attending to others’ costs and rewards (Olsson et al., 2020). Instrumental evaluation also appears early in development: Young children, including infants, are attentive to others’ goals (Baillargeon et al., 2016; Woodward, 2009) and preferentially reproduce goal-directed behaviors compared to behaviors with no clear intended outcome (Elsner, 2007).

The importance of individual evaluation in social learning is corroborated by sociological research. Rogers (2003), for example, reviewed an extensive body of literature on the diffusion of innovations, ultimately concluding that five characteristics – perceived relative advantage, compatibility, complexity, trialability, and observability – are most predictive of whether an innovation spreads. Critically, all relate to individual evaluation. Cultural behaviors, as with all behaviors, are more likely to be adopted when they are evaluated as effectively satisfying goals.

2.3. Selective schemes and cultural “technologies”

Because people’s goals vary, trajectories of cultural evolution driven by subjective selection should vary, too. Spears might evolve as people selectively retain implements that appear best for killing. Chocolate chip cookies might evolve as they selectively retain recipes that produce the most gustatory pleasure. Rain magic

might evolve as they selectively retain esoteric practices that seem best at changing weather.

I refer to these as different “selective schemes”; each selective scheme can be reconceptualized as a cultural selection for a given trait. The evolution of spears, then, would be guided by one selective scheme: a cultural selection for effective seeming killing implements. The evolution of chocolate chip cookies would be shaped by another: a cultural selection for delicious foods. Rain magic, finally, would be shaped by a third: a selection for weather-changing techniques that seem to work best.

The design features favored under a given selective scheme depend on many factors. Some of these apply across human populations, such as the laws of physics or genetically encoded features of the human taste system. Others can vary considerably. For example, cultural beliefs about how illness works or where rain comes from (which may have themselves developed through subjective selection) can affect evaluations of healing or weather rituals – and thus the variants that are favored. In that vein, rain magic that involved lizards became popular during Song dynasty China because of their resemblance to dragons, creatures long associated with rain in China (Hong et al., 2024). We would expect much less reliance on this “lizard rainmaking method” in cultures that do not connect dragons to weather.

Selective schemes can interact. Consider, for example, narratives about witches and sorcerers. These appear partly to be shaped by a selection for compelling explanations of misfortune: People seek to understand why they suffer calamities and, particularly in ecologies that promote paranoid or conspiratorial thinking, they find compelling explanations that attribute that suffering to distrusted parties (Singh, 2021a). However, witchcraft narratives also appear to be affected by a selection for demonizing narratives: Under certain conditions, people iteratively craft stories about rivals that justify violence or spur others to attack them (Cohen, 1972; Cohn, 1976; Goode & Ben-Yehuda, 1994); in cultural ecologies in which witchcraft and sorcery narratives also serve as plausible explanations of misfortune, those can be leveraged to demonize targets, who are accused not only of using dark powers for harm but of posing existential threats and engaging in morally abhorrent acts (Hutton, 2017). A cultural tradition – the belief in heinous witches – is thus plausibly shaped by several interacting cultural selective schemes.

An implication of subjective selection and the existence of selective schemes is that many traditions can be considered “technologies” (see also Hong & Henrich, 2021; Horton, 1967). Arthur (2009) defined a “technology” most basically as a “means to fulfill a human purpose.” Oil refining, a diesel engine, an electrical generator, a speech recognition algorithm – all are means to carry out human purposes. If, as I have argued, much of culture evolves to satisfy psychologically determined goals, then those cultural traditions qualify as technologies by Arthur’s definition. Not only is, say, a hammer a technology to hammer in nails or a spear a technology for killing animals, but voodoo magic is a compelling but erroneous technology for making rivals sick. Divination is an effective-seeming technology to acquire hard-to-access information. Chocolate chip cookies are technologies to induce gustatory pleasure.

Researchers studying culture have long drawn fundamental distinctions between domains of culture, separating, for example, material from symbolic culture or adaptive from non-adaptive culture. Such distinctions have invited a sense that different cultural domains develop through distinct processes which parallel contrasting theoretical approaches: songs and folktales emerge through one set of processes in which psychology is paramount;

food-processing techniques and bows and arrows evolve through another set of processes that optimize individual- and group-level benefits (Sterelny, 2017). A subjective selection framework invites a different view of culture, however. Rather than reifying distinctions, it suggests that many traditions in our diverse cultural repertoires – from stories to cheesecake to spears to igloos – evolve as compelling solutions for instrumental ends.

2.4. Explaining culture: A subjective approach

The subjective selection framework generates hypotheses for the origins, function, and persistence of cultural traditions, including super-attractors (Box 1). Partly because people around the world pursue shared goals and evaluate cultural variants in similar ways, subjective selection drives the convergent evolution of many traditions, resulting in the regularities of the cultural manifold. It is outside of the scope of this paper to enumerate and provide explanations of all super-attractors. Instead, I will go through three domains – religion, esthetics, and social institutions – addressing, in each domain, two super-attractors and reviewing evidence of their regular development through subjective selection. With the exception of corporate group structure, these super-attractors have been selected, because each has been the subject of comparative research and has been analyzed within the framework of subjective selection.

Box 1. Deriving and testing hypotheses within a subjective selection framework

Explaining design through subjective selection may seem to invite circular reasoning. If we hypothesize that traditions develop and persist because people perceive them to be effective for achieving goals, this may seem to imply that any cultural behavior must have emerged for that reason. However, this concern is misplaced. The explanatory power of any ultimate-level framework comes not from assuming that traits exist because they were selected for but from identifying the pressures that shape their emergence and persistence. Just as explaining a trait’s evolution through natural selection or cultural group selection often involves clarifying its adaptive function, proposing that a tradition develops through subjective selection is most informative when the account specifies the proximate goal the tradition seems to fulfill (and, ideally, the ultimate-level reasons humans pursue that goal), as well as the factors that make it a compelling solution for achieving that goal. Such factors might include physical constraints imposed by the natural world, genetically encoded features of the human brain, and complementary cultural variants, such as beliefs that enhance the perceived efficacy of the tradition.

The predictions generated by a subjective selection hypothesis will vary depending on the specifics of that hypothesis. In sections 3 through 5, for example, I review seven hypotheses for how super-attractors develop through subjective selection, each of which makes predictions about a cultural domain. In addition to these, any subjective selection hypothesis that specifies the relevant goal will yield at least five additional, basic predictions (see also Singh, 2022, pp. 276–277):

1. People pursuing that goal will adopt the tradition more frequently than people not pursuing that goal.
2. Providing an alternative tradition evaluated as better satisfying the goal will reduce people’s reliance on the tradition of interest.
3. Manipulating the perceived efficacy of the tradition for satisfying the goal will affect people’s reliance on it, even when holding the actual efficacy constant.
4. Manipulating the perceived efficacy of the tradition for satisfying the goal will elicit activity in brain regions associated with reward prediction error for goal-directed activities.
5. Manipulating the perceived efficacy of the tradition for satisfying the goal will affect participants’ use of the tradition when pursuing that goal more than when pursuing other goals.

The main alternatives to these accounts are cultural evolutionary theories that point to objective individual- or group-level benefits – often, benefits of which individuals are unaware. For example, theorists have emphasized the importance of processes such as cultural group selection and cultural evolution driven by success-biased imitation (R. Boyd & Richerson, 1985; Henrich, 2004a, 2016; Richerson & Boyd, 2008). These processes have been hypothesized to produce adaptive, functional cultural design without individual agency or planning and without individuals aware of the traits' benefits. In other words, magic, myths, dance songs, and justice institutions – to name a few – are often said to culturally evolve not because individuals instrumentally craft and retain similar solutions for universally occurring goals but rather because they generate objective benefits and are favored by blind cultural evolutionary processes.

I contend that such accounts are limited in their ability to explain many super-attractors, as are approaches that frame various super-attractors as cognitive by-products. A basic reason is that they often fail to explain why humans, so attentive to costs and benefits, should care to adopt, endorse, transmit, and invest in various cultural traditions (see also André et al., 2023). Culture relies on people to keep it alive. Stories survive only as long as they are told; music endures only as long it is performed; justice institutions last only as long people employ them. A subjective selection framework not only spotlights people's instrumental reasons for investing in culture; it demonstrates the powerful explanatory power that comes from centering such motivations when analyzing the recurrent features of cultural practices.

3. Religion explained

If super-attractors are testing grounds for developing and evaluating social scientific theory, religion has been the paradigmatic case study. Few if any cultural domains have attracted as much scholarly attention within the evolutionary and cognitive literature as religion (Atran, 2002; Bloom, 2007; Boyer, 2001; Guthrie, 1995; Henrich, 2020; Norenzayan, 2013). Paralleling larger debates in the naturalistic study of culture (Richerson, 2017; Sterelny, 2017), research on religion has been marked by a tension between by-product approaches and adaptationist accounts (Boyer, 2001; Johnson & Bering, 2006; Pyysiäinen & Hauser, 2010; D. S. Wilson, 2002). An influential synthesis has sought to reconcile these approaches, proposing that cultural group selection favors variants of cognitively sticky beliefs that best promote group-level cooperation (Norenzayan et al., 2016).

In recent years, however, a subset of researchers has contributed to what might be considered a third approach – one that focuses on people's instrumental goals and the psychology of evaluation in explaining the emergence, stabilization, and design features of magico-religious traditions (Boyer, 2020a; Fitouchi et al., 2025; Fitouchi & Singh, 2022; Hong, 2022b; Hong et al., 2024; Hong & Henrich, 2021, 2024; Hong & Zinin, 2023; Mercier & Boyer, 2020; Miton et al., 2015; Singh, 2018, 2025). This research overcomes limitations of by-product and adaptationist accounts while demonstrating that complex, ubiquitous religious traditions plausibly develop as people convergently build them to satisfy everyday ends.

3.1. Shamanism as a compelling technology to control uncertain outcomes

Around the world, human societies have shamans, defined here as specialists who, in non-ordinary states, engage with unseen

realities and provide services like healing and divination (Hultkrantz, 1993; Singh, 2025). Shamanism appears to be a super-attractor. Winkelman (1984, 1986) coded a subsample of 47 cultures in the Standard Cross-Cultural Sample and found shamans in more than 90% of the cultures examined, while a review of hunter-gatherer religions reported shamanism in 29 of 33 societies (Peoples et al., 2016; see Singh, 2018a for details). Of the remaining four, the members of one, the Mbuti, visited the “local witch doctor” of nearby farmers (Putnam, 1948, p. 340); for another, the Tiwi, anthropologists referred to “clever” men who could foretell the future (Pilling, 1958, p. 115); a third, the Sirionó, seemed to have lost shamanism in recent centuries following demographic collapse (Walker et al., 2012). Centralized states and religious authorities have attempted to destroy shamanic traditions numerous times throughout history, yet their efforts usually either fail or are successful only briefly before it reappears (Bell, 2005; Boyer, 2020b; Meeks, 2011). Aside from their defining features, shamanic traditions frequently exhibit other common features, including dramatic initiations, practices of deprivation, and claims of superhuman powers (Singh, 2018, 2025).

Researchers have put forward numerous hypotheses to explain shamanism. Many outline some mechanism by which shamanism helps clients or boosts group-level success (Achterberg, 1985; Blackwell & Purzycki, 2018; McClenon, 2001; Watson-Jones & Legare, 2018). Winkelman's theory of shamanism, for example, posits that shamanic traditions worldwide induce a cross-culturally consistent trance state that has an “integrative” effect on cognition, enhancing capacities such as social intelligence and familiarity with natural history (Winkelman, 2002). Such an account suffers from important shortcomings, however, including a lack of evidence for the benefits proposed (Singh, 2018). Furthermore, whereas Winkelman's theory predicts similar trance states and cognitive effects (particularly in terms of “integration”) across societies, research on non-ordinary states has documented very little overlap and much more diversity (Vaitl et al., 2005), even when restricting comparisons to psychoactive substances used by shamans in the Americas (Singh, 2025).

Despite many claims of objective benefits of shamanic practices, most evidence indicates a *perception* of benefits; people clearly often think that shamanic ceremonies work (see, e.g., van der Watt et al., 2018). A subjective selection account thus focuses on the *ostensible* efficacy of shamanism (Singh, 2018, 2025). Humans are predisposed to adopt ineffective interventions, or “superstitions,” to sway important, unpredictable outcomes such as illness and the weather (Vyse, 2014) – a bet-hedging tendency plausibly explained by cognitive mechanisms that have evolved to minimize costly errors (Johnson et al., 2013; see also the smoke detector principle: Nesse, 2019). As specialists compete to provide magical services and clients preferentially choose the services that subjectively seem most effective, shamanism develops. What makes shamanic traditions compelling is that the specialist uses various practices to “xenize,” or apparently become distinct from normal humans, bolstering their claim that they can engage with the gods, spirits, and other agents believed to oversee uncertain outcomes (Singh, 2025).

A subjective selection account of shamanism attributes its existence and design features to (a) clients' goals in seeking out shamanic services (namely, controlling uncertain, fitness-relevant events such as illness) and (b) the features of specialists that clients use to evaluate their ability to provide services (often, otherness as a sign of special powers). It therefore makes clear predictions about the design features of shamanism. It predicts, for example, that,

despite variation in their activities, shamans will act foremost to help clients control uncertain outcomes, an expectation borne out by cross-cultural analysis (Singh, 2018). It also predicts that the various practices so often associated with shamanism should promote perceptions of otherness and special powers. I have elsewhere reviewed ethnographic evidence that altered states and dramatic initiations have these effects (Singh, 2018) and, in field experiments, demonstrated that, as predicted, Mentawai participants (Indonesia) infer fundamental difference and supernatural power from shamanic self-denial (Singh & Henrich, 2020). In shamanism, we find a super-attractive tradition that develops everywhere because it assures clients they have some control over uncertain events.

3.2. Supernatural punishment beliefs as technologies for mutual policing

Across societies, people claim that antisocial acts are punished by supernatural forces such as gods, spirits, or karmic forces. Although such prosocial religious beliefs were long assumed to be limited to large-scale societies (Baumard & Boyer, 2013; Roes & Raymond, 2003; Tylor, 1920a), this conclusion seems partly an artifact of datasets biased against detecting moralistic punishment in smaller-scale societies (Lightner et al., 2023; Purzycki et al., 2023). Recent research, including coding of the ethnographic record (Boehm, 2008), detailed ethnographic studies (Purzycki, 2016; Singh et al., 2021; Townsend et al., 2020), and cross-cultural surveys (Bendixen, Lightner, et al., 2023; Purzycki et al., 2022), shows that moralistic supernatural punishment is much more widespread.

According to the leading theory in the evolutionary and cognitive literature, supernatural punishment beliefs have culturally evolved to promote cooperation (Norenzayan, 2013; Norenzayan et al., 2016; Norenzayan & Shariff, 2008). Such an approach permits that religious beliefs emerge as by-products of cognitive biases but adds that competition among groups selects for those religious packages with group-level benefits (Norenzayan et al., 2016). Nonetheless, the central assumption that moralistic punishment beliefs make people more cooperative has become increasingly debated in recent years (Bendixen, Lightner, et al., 2023; Jacquet et al., 2021; Kavanagh et al., 2020). Moreover, group-adaptive accounts overlook the critical fact that people endorse supernatural beliefs for strategic purposes, using threats of mystical sanctions to motivate self-serving behavior (Fitouchi & Singh, 2022; Moon, 2021; Singh et al., 2017).

A subjective selection account overcomes these limitations and shows that focusing on a critical and common goal – controlling others' cooperation – can explain much of supernatural punishment (Fitouchi et al., 2025). Whatever the effects of religious beliefs on cooperation, a less contested claim is that people *believe* that holding supernatural punishment beliefs makes others more cooperative (Gervais et al., 2017, 2024). Prosocial religions thus plausibly develop from people crafting and selectively endorsing beliefs that they intuit, based on their folk psychology, will encourage others to cooperate (Fitouchi & Singh, 2022). When each individual, lacking full confidence in others' cooperation, strategically pushes supernatural punishment beliefs, their micro-level interactions can give rise to a dynamic of collective, mutual policing, such that everyone pays trivial costs to maintain shared moralistic beliefs (Fitouchi et al., 2025). As people preferentially adopt and endorse those variants they subjectively believe will best achieve the goal of encouraging others' cooperation, the beliefs should evolve into their most subjectively appealing forms.

Fitouchi et al. (2025) derived, and found support for, nine predictions of such a subjective selection account of supernatural punishment beliefs. These include, for example, that individuals who desire higher levels of social control are more likely to endorse punitive religious beliefs (Atkinson & Bourrat, 2011; Jackson et al., 2021), that lower social trust is associated with greater endorsement of such beliefs (Berggren & Bjørnskov, 2011; Jacquet et al., 2021), and that punitive religious beliefs are not only prosocial but, under some circumstances, extractive and self-serving, as well (Bentzen & Gokmen, 2023; Singh et al., 2017; Strassmann, 1992; Strassmann et al., 2012). Moralistic supernatural punishment beliefs also target behaviors that people are motivated to control in everyday life (Bendixen, Apicella, et al., 2023) and that are difficult to police by secular means; see, for example, that the Mentawai water spirit Sikameinan oversees food-sharing, one of the few domains of cooperation unregulated by secular justice (Singh et al., 2021; Singh & Garfield, 2022). Although some of these predictions are shared by group-adaptationist theories, the subjective selection account critically predicts that changes should be driven not by any proposed process of cultural group selection (e.g., interdemographic selection, payoff-biased migration) but by shifts in individual-level motivations to control others' behavior, an expectation supported by survey data (Houtman & Aupers, 2007; Houtman & Mascini, 2002; Tamir et al., 2020).

4. Esthetic behaviors explained

Esthetic behaviors, including music, storytelling, and visual adornment, are not only longstanding topics of anthropological interest (Boas, 1928; Lévi-Strauss, 1955; Malinowski, 1948; Merriam, 1964; Tylor, 1920b) but also common, costly, and puzzling enough to have attracted considerable evolutionary theorizing (B. Boyd, 2009; Carroll, 2012; Dutton, 2009; Mehr et al., 2021; Savage et al., 2021; Tooby & Cosmides, 2001). These ubiquitous behaviors plausibly develop through subjective selection as people fashion sound and word (and image, although not covered here) to fit universal goals.

4.1. Dance songs and lullabies as behavioral technologies

Music has appeared in every society where researchers have looked (Mehr et al., 2019; Savage et al., 2015). Moreover, several domains of music exhibit remarkable internal consistency. Across diverse populations – including among young children (Hilton, Thierry, et al., 2022), in smaller-scale societies (Yurdum et al., 2023), in massive online experiments with English speakers (Hilton, Moser, et al., 2022; Mehr et al., 2018, 2019), and in experiments with speakers of 29 languages across 48 countries (Yurdum et al., 2023) – naïve listeners can identify the function of foreign dance songs and lullabies from audio recordings alone (Singh & Mehr, 2023). Moreover, analyses of recordings have identified acoustic features that tend to characterize these song domains and which distinguish them not just from each other but from other musical and non-musical vocalizations, as well (Hilton, Moser, et al., 2022; Mehr et al., 2018, 2019). Given their complex forms, universality, and similarity worldwide, dance songs and lullabies seem clear examples of super-attractors.

What accounts for these musical super-attractors? One explanation is biological adaptation, which posits that humans have been shaped by natural selection to produce and respond to dance songs and lullabies. Universal patterns would thus reflect dance- and lullaby-specific adaptations. In line with such an explanation, some researchers argue that human musicality has

been shaped by natural selection (at least in part), with dance songs and lullabies serving as credible signals or a mechanisms for social bonding (Mehr et al., 2021; Savage et al., 2021).

A biological-adaptation explanation of musical super-attractors runs into at least three limitations, however. First, observations of the lack of dancing and lullabies among the Northern Aché, whose ancestors experienced a series of population bottlenecks in recent centuries and lost much of their complex culture, suggest that dance songs and lullabies require cultural transmission to be maintained (Singh & Hill, 2025.; see also Aubinet, 2024). Second, although dance songs and lullabies are highly stereotyped across societies, other song types also are widespread and exhibit regular features cross-culturally (Bertolo et al., 2025). Naïve listeners can identify foreign healing songs; people in different societies have similar conceptions of what a healing song should like; and analyses of acoustic features have identified some features that tend to distinguish healing songs from other song domains (Hilton, Thierry, et al., 2022; Mehr et al., 2018, 2019; Yurdum et al., 2023). Despite these similarities, there is little reason currently to expect that humans have genetically evolved to produce healing songs. When it comes to musical domains, ubiquity and regularity of structure are not necessarily indications of specialized, biological adaptation.

A final limitation of biological-adaptation explanations of musical super-attractors is the absence of evidence of adaptation. Psychological research on the universality, domain-specificity, and ontogeny of behavioral responses to music has struggled to identify signatures of adaptation (Singh & Mehr, 2023). For instance, many lines of evidence suggest that our capacity to respond to dance songs – that is, our capacity to perceive beat and spontaneously entrain to it – is a by-product of vocal learning. The only other animals that spontaneously entrain to beats are parrots (also sophisticated vocal learners), while recent research has shown substantial overlap between the genetic and neural mechanisms involved in vocal learning and those involved in beat perception and entrainment (Cahill et al., 2021; Niarchou et al., 2022; Patel et al., 2009; Rouse et al., 2021; Schachner et al., 2009). Although some researchers posit that gene-culture coevolution has subsequently shaped rhythmic perception and response (e.g., Patel, 2021), there is currently no indication that the psychological mechanisms involved in beat perception and entrainment are music-specific adaptations as opposed to features of our psychology that exist for non-musical ends (Singh & Mehr, 2023).

The framework of subjective selection provides alternatives to biological-adaptation explanations of musical super-attractors. Consider dance songs. Dance songs plausibly develop because, like pornography or chocolate chip cookies, they are technologies for feeling good (see Box 2). Action synchronized to music is pleasurable (Foster Vander Elst et al., 2021; Witek et al., 2014), seemingly as an incidental consequence of vocal learning mechanisms, which entail intrinsic rewards for accurately predicting and reproducing the temporal structures of auditory sequences (Patel, 2021). As people shape songs into forms that best facilitate enjoyable vocal and motor entrainment, they produce convergent structures in dance songs (Singh & Mehr 2023). Of course, people can then build on this common, super-attractive structure for other ends, such as signaling coalitional formidability, inducing altered states, feeling bonded, or promoting cooperation, as often proposed (B. Campbell, 2023; Hagen & Bryant, 2003; Mogan et al., 2017; Tarr et al., 2014). But these other ends do not explain why music is pleasurable in the first place, and the ubiquity and structural commonalities of dance songs seem to reflect this common aim of experiencing the rewards of temporal prediction.

Box 2. Technologies of pleasure

I argue in the main text that traditions such as dance songs and hero stories are technologies of pleasure, engineered to deliver psychological reward. However, the claim raises a basic question: Should pleasure be considered analogous to the other goals discussed, such as restoring cooperation or putting an infant to sleep? In one sense, no. Hedonic reward is often experienced when achieving superordinate, fitness-relevant goals, such as eating, having sex, and interacting with friends and loved ones (Berridge & Kringelbach, 2015; Bloom, 2010; Kringelbach & Berridge, 2009). Contrasts between pleasure and other goals, whether superordinate or subordinate, may thus seem like comparisons at different levels of analysis and thus dubious. Yet pleasure can also become decoupled from the adaptive outcomes it was meant to motivate, and its pursuit can interfere with other goal-directed behavior (Hofmann & Van Dillen, 2012; Stroebe, 2022). Eating cheesecake and watching pornography are pleasurable because the activities provide cues of states that tended to advance fitness in ancestral environments – yet consuming cheesecake often harms nutritional status while viewing pornography bypasses the actual behaviors and relationships that would normally increase reproductive success. Conceptualizing these and other traditions as technologies for inducing pleasure captures this decoupling, further highlighting that many traditions develop and persist because they satisfy a subjective end in the absence of adaptive benefits.

Lullabies, too, plausibly develop through subjective selection as parents experiment with and preferentially retain songs effective for soothing infants. Although humans seem to respond most to lullabies during infancy (suggesting specialized cognitive mechanisms expressed during relevant developmental stages), adults also rely on lullaby-like music to fall asleep. Studies of Canadians and Finns find that substantial numbers of people – up to 56% of respondents, in one study (Brown et al., 2017) – report using music to fall asleep (C. M. Morin et al., 2006; Urponen et al., 1988). Furthermore, a recent analysis of sleep playlists on the streaming platform Spotify found that the soporific songs that adults rely on share features with lullabies, such as softness and a slow tempo (Scarratt, Heggli, Vuust, & Jespersen, 2023). These findings question the conclusion that responses to lullabies are infant-specific adaptations, instead raising the possibility of a pan-human predisposition to be calmed by soft, slow music (see also Scarratt, Heggli, Vuust, & Sadakata, 2023). Parents attempting to calm fussy infants try a variety of techniques, learning their infants' preferences and repeatedly using what seems to work. Such a process conceivably fuels the development of calming songs, especially as people learn effective songs from others, resulting in global convergences in the acoustic structure of lullabies.

4.2. The sympathetic plot as a technology of entertainment

Storytelling is a human universal. Even supposed cultural exceptions, such as the Sirionó of Bolivia and the Pirahã of Brazil, tell stories, including particular variants over and over (Everett, 2005; Holmberg, 1969). Aside from their universality, stories include super-attractive variants. Scholars of the world's literature have long provided evidence that certain complex narrative structures recur across diverse contexts (Raglan, 1936; Rank, 1914; Scheub, 2007). Many of their projects converge on the "hero's story" or the "sympathetic plot" (Booker, 2004; J. Campbell, 1949; Hogan, 2003, 2011; Raglan, 1936; Rank, 1914; Singh, 2021b; von Hahn, 1876). The sympathetic plot features a goal-directed protagonist who confronts obstacles, overcomes them, and wins rewards (Singh, 2021b). Stories with such a structure tend to exhibit other common features: protagonists are often appealing (e.g., strong, caring); they

start out alone and suffer early misfortunes (e.g., they are orphaned or abandoned); they are high-status or at least tied to high-status individuals (e.g., they are adopted by royalty or the offspring of a deity); their opponents are repulsive and formidable; and their opponents eventually suffer or are reformed. Such features appear not only in many (or most) popular Western stories but also in the myths, folktales, and legends of peoples around the world (Booker, 2004; Hogan, 2003, 2011; Thompson, 1946).

The sympathetic plot exhibits features suggesting that it is the product of subjective selection – and, in particular, a cultural selection for entertainment (Singh, 2021b; see also Dubourg & Baumard, 2022). Humans are motivated to feel pleasure (Box 2), and storytellers benefit from providing entertainment, such as through greater status. As audiences demand their favorite stories, and storytellers preferentially tell them, they jointly drive a cultural selection for entertaining stories – that is, for those that best capture human attention and eventually provide pleasure. Scheub (1975) observed the selective retention of entertaining material working with *ntsomi* storytellers among the Xhosa. He wrote that “an artist includes and emphasizes those elements that she delighted in during *ntsomi* performances that she witnessed, and she does not fail to recall those details that particularly delighted her audiences during her own productions” (p. 90). He saw this subjective selection as important for the tradition’s evolution: “Considering that this process of borrowing, influencing, innovating, and combining has been going on for decades, there should be no surprise that such an involved form has developed” (p. 81).

The sympathetic plot seems to entertain through two pathways (Singh, 2021b). First, by presenting a protagonist who has a goal but difficulty achieving it, it triggers psychological mechanisms for learning about obstacles. Several lines of experimental evidence demonstrate that humans are intrigued and attentive when hearing about obstacles that others confront (Delatorre et al., 2018; Fine & White, 2002; Gerrig, 1989; Iran-Nejad, 1987; Jose, 1988) – a response that likely reflects psychological adaptations for vicarious learning (Thouzeau, 2023).

Second, the sympathetic plot is exquisitely designed to evoke sympathetic joy, or the pleasure experienced when a cooperative beneficiary succeeds. It presents the kinds of individuals we would want to befriend: warm, competent, attractive, in-group members who are in-need (Gottschall, 2005; Jobling, 2001; Kimball, 1999; Mattix, 2012). Audiences often engage in parasocial relationships with these individuals, representing them as people they know (Giles, 2010; Hoffner & Cantor, 1991; Klimmt et al., 2006) and feeling positive affect – sympathetic joy – when those characters ultimately succeed (Trabasso & Chung, 2004; Zillmann, 1995; Zillmann & Cantor, 1977).

Viewing the sympathetic plot from the perspective of these psychological responses reveals its ubiquitous features to be sensitively assembled to attract attention, induce sympathy, and produce pleasure. The overlapping aims of storytellers to entertain and audiences to be entertained creates a selective scheme for pleasure-inducing stories that results in the heroic archetype.

5. Social institutions explained

Subjective selection can also explain the evolution of social institutions. Social institutions differ from the other domains discussed in at least two important ways. First, more than religious or esthetic traditions, social institutions are shaped by how individuals negotiate conflicts of interest (Molho et al., 2024). Because their existence hinges on many individuals adhering to them, the

evolution and stability of social institutions depends not only on whether people evaluate them as instrumentally useful but also on variables such as the degree of overlapping interests among parties and the relative power differentials among them (Singh et al., 2017). Second, whereas the perceived utility for religious and esthetic traditions was often illusory (in the case of shamanism) or targeted at producing pleasure (in the case of dancing and the sympathetic plot), social institutions represent a domain of culture where subjective benefits and objective group-functional benefits seem often to align. In the examples considered here, people design social institutions to restore or mobilize cooperation, and the capacity for different institutions to produce these outcomes is likely critical for their long-term maintenance.

5.1. Justice institutions as technologies to satisfy retribution and restore cooperation

Human societies regularly develop institutions of justice for dealing with social transgressions. Rather than taking any form, however, those institutions tend to exhibit four common features: (1) They impose costs on transgressors; (2) they transfer benefits to victims; (3) they involve a sense of proportionality between the severity of the transgression and the magnitude of costs imposed or benefits transferred; and (4) the imposition of costs or transfer of benefits follows institutionalized procedures, sometimes accompanied by ritualized ceremonies (Black, 2000; Fitouchi & Singh, 2023; Hoebel, 1954; Strathern & Stewart, 2012).

A common explanation for such responses to wrongdoing, particularly the imposition of costs, is that they serve to enforce cooperative norms. According to a popular view, punishment generally – and thus punitive justice, in particular – functions to increase the cost of free-riding and thereby incentivize group-beneficial, cooperative behaviors (R. Boyd, 2018). Such a norm-enforcement hypothesis explains some punitive institutions, such as those used to protect common-pool resources (Ostrom, 1990), yet it fails to describe punitive justice in many societies, particularly those with dense kin networks in which people have long time horizons and interdependent obligations (Baumard, 2010; Black, 2000; Wiessner, 2020).

According to the alternative relation-restoration hypothesis, many justice systems develop through subjective selection as people design procedures to restore cooperation between transgressors and victims following violations of reciprocal obligations (Fitouchi & Singh, 2023). The logic is simple: Victims are less willing to cooperate with transgressors until they pay costs (Ohtsubo & Watanabe, 2009), a desire that likely evolved to deter future exploitation from the transgressor and other onlookers (McCullough et al., 2013). Although victims can satisfy this urge by directly attacking the aggressor, doing so risks cycles of feuding (Glowacki, 2024). Furthermore, victims prefer to be compensated following transgressions, with experimental work demonstrating that compensatory payments encourage forgiveness (Komiya et al., 2018). The relation-restoration hypothesis thus proposes that justice systems evolve through subjective selection as interacting partners create and preferentially employ procedures that repair dyadic cooperation in ways that satisfy both parties while constraining rash retaliation (Fitouchi & Singh, 2023).

The relation-restoration hypothesis generates at least seven predictions. These include that third parties should care more about reconciliation than imposing costs on offenders, that victims should prefer transfers of benefits over brute cost-infliction, and that punitive institutions should be accompanied by practices that

constrain retaliation and facilitate reconciliation. These predictions were tested, and supported, using observations of justice systems in three-small societies: the Kiowa of the American Great Plains, Mentawai horticulturalists on Siberut Island, Indonesia, and the Nuer of South Sudan (Fitouchi & Singh, 2023; see also Wiessner, 2020). The relation-restoration hypothesis also explains a quirk of punitive justice: Contrary to the predictions of a norm enforcement account, some societies create systems to pay victims that end up barely imposing costs on transgressors and thus have little deterrence value. In northern Somalia, for instance, people formed groups with as many as several thousand members to pay blood-money following a killing. In these cases, observed Lewis (1961, p. 174), “the amounts paid by individual members may be infinitesimal. Thus, while exchange of blood-price removes immediate enmity between lineages it often provides little economic deterrent to continued bloodshed.” A system was constructed to appease victims’ desire for payment but with little apparent effect on enforcing norms.

Unlike most of the other super-attractors considered here, there has been less systematic, cross-cultural research on how justice systems compare worldwide. It is thus possible that the relation-restoration hypothesis explains a subset of justice institutions with, perhaps, a substantial proportion of punitive justice systems developing as people construct, through subjective selection, systems to generally deter wrongdoing (e.g., Leeson, 2007; McDowell, 2004; Ostrom, 1990). Future investigations will better clarify patterns in the world’s justice systems and the processes by which they develop.

5.2. Corporate groups as technologies to mobilize cooperation

Humans are often organized into corporate groups, which are defined by at least five features: (1) They exist in perpetuity; (2) they have clear, restrictive membership; (3) they are cooperative units in which membership carries duties (e.g., helping defend a territory) and privileges (e.g., hunting on it); (4) they have mutually exclusive membership (e.g., an individual typically cannot be a member of two clans); and (5) they recruit members through qualifications that usually build on existing connections, such as kinship or residence (Befu & Plotnicov, 1962; Hayden & Cannon, 1982). These features define rule-created social groupings as diverse as clans, guilds, lineages, and age sets – even the gangs of lobster fishermen working in the harbors of coastal Maine (Acheson, 1988; Glowacki, 2020).

Corporate groups are widespread. When Murdock and Wilson (1972) surveyed the 186 societies of the Standard Cross-Cultural Sample, they found that 117 had clans or similar kinship-based corporate groups. Although a comprehensive examination of the societies in the SCCS purportedly lacking such groups has yet to be conducted, ethnographic reports of several, such as the Pawnee and Torajans, reveal them to have residence-based corporate groups (Beierle & Malone, 1997; Dorsey et al., 1940). Others – such as the Eastern Pomo, Copper Inuit, and !Kung – had kin-based corporate groups in recent memory but lost them by the time that anthropologists described them (Singh & Glowacki, 2022, p. 420; see also the Ifugao (Beyer & Barton, 1911)). In fact, cultural phylogenetics suggest that the cultural ancestors of various South American nomadic hunter-gatherer societies, including the Aché and Sirionó, lost corporate group structure recently in history, likely in the wake of demographic collapse (Walker et al., 2012).

Although corporate groups may not be a cultural universal, they are more widespread than the SCCS suggests.

The features of corporate groups seem well-designed to mobilize cooperation. By specifying mutual obligations among a closed group of individuals, they prune competing loyalties and assure fellow group members of each other’s future cooperation. According to a subjective selection framework, then, they can emerge as individuals deliberately create closed groups to promote mutual benefits, further tweaking them in ways that best mobilize cooperation. After one such group appears in a social landscape, other people hoping to compete would then borrow the initial structure, refining it in ways that seem to further encourage cooperation.

Such a subjective selection account is consistent with perhaps the best documented instance of a newly emerged system of corporate groups: the rise of prison gangs in the United States. According to Skarbek (2014), before the 1950s, inmates in the United States grouped together in “tips” or “cliques,” informal groups held together by preprison acquaintances. These were not corporate groups: They lacked membership requirements or a clear group identity, and people could be members of multiple, overlapping cliques.

Starting in the late 1950s, however, the social organization transitioned (Morrill, 2013; Skarbek, 2014). In 1957, young Mexican American inmates in the Deuel Vocational Institution (DVI) in California formed a new kind of social unit to defend themselves against black and white inmates. Rather than being fluid, membership in the gang was official, exclusive, and a lifetime commitment; recruits had to give up street gang affiliations and pledge their allegiance to the new group. They eventually called themselves the Mexican Mafia and, later, La Eme. As the new group refined its rules and organizational structure, it came to dominate the DVI, robbing non-gang members of their possessions and eventually metastasizing into prisons throughout California. To contend, other inmates established similar corporate groups, such as La Nuestra Familia, the Black Guerilla Family, the Blue Bird Gang, the Aryan Brotherhood, and the Texas Syndicate, which likewise recruited based on race and geography. Gang membership subsequently became so crucial and commonplace in U.S. prisons that, prior to a Supreme Court ruling in 2005, reception forms asked new inmates to check a box indicating gang affiliation (Goodman, 2008).

The rise and spread of American prison gangs illustrates two key points about the role of subjective selection in producing corporate groups specifically and social institutions more broadly. First is the role of instrumentality: The first such group, the Mexican Mafia, seems to have been deliberately created with the goal of mobilizing cooperation, specifically for mutual defense. As the innovation spread, other people assembled into similar groups for the same end. Second is the fact that subjective selection seems to have fueled a process of cultural group selection (at least if “group” is defined at the level of the prison gang): People designed and adopted those cultural traits that served their individual goals (e.g., safety) but, because of their overlapping interests, ended up honing institutions that encouraged groupwide cooperation.

6. Addressing potential criticisms

6.1. Addressing the possibility of deep, shared cultural ancestry

I have argued that much of the cultural manifold develops through subjective selection; as people worldwide selectively produce and

retain cultural variants evaluated as useful for instrumental ends, they produce similarities in complex culture. An alternative perspective, however, emphasizes shared cultural ancestry. By this perspective, global similarities in complex traditions stem not from convergent subjective selection but from a cultural “African Eve” to which each super-attractor might be traced (see, e.g., Witzel, 2012). Although complex cultural packages can certainly diffuse over large expanses (e.g., Stépanoff, 2021), there are at least three reasons to suspect that shared cultural ancestry cannot by itself account for the cultural manifold.

First is what Morin (2016) called the Wear-and-Tear Problem. Humans adopt and pass on traditions but rarely, if ever, with 100% transmission fidelity. Such errors and modifications mean that neutral cultural variation evolves alarmingly quickly and that, without other stabilizing mechanisms, traditions quickly transform beyond recognizability. Language, for example, evolves fast enough that many linguists consider it futile to reconstruct phylogenetic relationships beyond about six to ten thousand years. The Wear-and-Tear problem does not necessarily mean that super-attractors have evolved numerous times. But, at the least, it suggests that stabilizing mechanisms have maintained core features of each domain as humans spread around the world. The evidence reviewed above indicates that their subjective appeal – and, specifically, their apparent usefulness for regular instrumental ends – qualifies as a powerful stabilizing mechanism. Even if humans worldwide did inherit the cultural manifold from a common cultural ancestor many millennia ago, the Wear-and-Tear Problem nevertheless suggests that subjective selection has maintained them.

Second is the diversity exhibited within each type of super-attractor. Justice institutions function in a variety of ways, from transferring pigs and durian trees to victims (Singh & Garfield, 2022) to spearing the legs of offenders and their kin (Warner, 1958). Supernatural punishment beliefs may often target uncooperative behavior, although the nature of the supposed punishers and the behaviors targeted exhibit substantial variation (Bendixen, Apicella et al., 2023; Boehm, 2008; Singh et al., 2021; Townsend et al., 2020). Likewise, although shamanic traditions all involve altered states, those states are understood in many ways, from consulting spirits in dreams (Radcliffe-Brown, 1922) to spirit possession (Kendall, 1985) to boiling energy (Katz, 1982). This variation suggests analogy rather than homology – that super-attractors do not trace to single ancestral origin points but rather are convergently reconstructed across human societies.

Finally, human populations have frequently experienced bottlenecks dramatic enough that they have lost substantial complex culture, including many super-attractors (Henrich, 2004b; Holmberg, 1969; Singh & Hill, 2025; Walker et al., 2012). It's plausible that, following such bottlenecks, most human populations re-established connections with other societies, allowing lost traditions to diffuse back in. However, one set of populations represents a possible, albeit speculative, instance in which such connections seem not to have been re-established: the Andaman Islanders. Despite likely undergoing a bottleneck small enough to destroy much of their cultural complexity, the Andaman Islanders exhibited most or all of the cultural manifold, including rites of passage, dance music, shamanism, origin myths, and marriage (Radcliffe-Brown, 1922). Genetic analyses are consistent with the Andamanese have remained genetically isolated since arriving in the islands many millennia ago (Mondal et al., 2016; Mondal, personal communication). Although the British had set up a penal colony before concerted ethnographic description began, and

Malay, Burmese, and European pirates had long raided the islands for slaves, it is unlikely that these interactions transmitted the super-attractors studied here, especially as Radcliffe-Brown (1922) noted that the British presence had the effect of destroying indigenous institutions. All of this suggests that Andamanese culture may be as close to a societal rebirth – Fox's Experimental Eden, essentially – as researchers might discover, potentially confirming that super-attractors develop anew under near-pristine conditions.

6.2. Addressing assumptions of adaptiveness

The subjective selection framework is agnostic to individual- or group-level benefits. What matters instead is that individuals perceive a cultural variant to be useful. This agnosticism clashes with a widespread and enduring assumption in the analysis of culture, according to which, “any expensive and long-lasting cultural trait (such as traditions passed down within a lineage for thousands of years) should be presumed to be adaptive” (Heying & Weinstein, 2021). By subscribing to this assumption, many researchers implicitly treat processes such as cultural group selection as decisive sieves for preserving and filtering adaptive cultural variation.

Such prioritization is unjustified for at least two reasons, however. The first is that processes such as cultural group selection require variation (R. Boyd & Richerson, 1985, 2010). Imagine, for instance, that groups with witchcraft beliefs are less competitive than groups without them. Will cultural group selection select against witchcraft beliefs, or at least the non-adaptive versions? Not necessarily, in part because the subjective appeal of witchcraft beliefs may compel people in all groups to adopt and endorse them, removing the variation necessary for selection. Even if groups without witchcraft beliefs somehow emerge and spread at the expense of other groups, it is not clear that they can necessarily keep witchcraft beliefs out. The reliable development of some traditions can weaken the capacity for blind, adaptive cultural evolutionary processes to act.

Another reason to be skeptical of the key role sometimes ascribed to adaptive cultural evolutionary processes is that it remains unresolved how important they are in naturalistic settings. Using group extinction rates in New Guinea, Soltis et al. (1995) concluded “that a minimum of 500 to 1,000 years would be required for the spread of a single group-beneficial trait under the influence of [cultural group selection by interdemographic selection].” As this is the minimum, it presumably requires a very strong selection coefficient; insofar as any super-attractors have negative or neutral fitness effects, those would be expected to be relatively small and so cultural group selection by natural selection would be expected to be much slower. Faster mechanisms of cultural group selection have since been proposed and modeled. Selective migration, for example, has been posited as a mechanism by which cultural group selection might occur (R. Boyd & Richerson, 2009), although empirical research has yet to demonstrate its importance in shaping culture. Boyd and Richerson (2002) also showed that cultural group selection might occur via selective imitation, yet adding psychological richness, such as by considering people's instrumental aims in adopting variants and the constraints of the psychology of evaluation, would turn such a process into subjective selection.

Whereas the role of such blind adaptive cultural evolutionary processes remains unclear, the centrality of individual evaluations of usefulness is well demonstrated. As pointed out earlier,

sociological research has concluded that the most important factors determining whether an innovation spreads through a population – including trialability, compatibility, and, most importantly, perceived relative advantage – reflect individual evaluation (Rogers, 2003). Indeed, cultural transmission experiments corroborate the central role of individual evaluation in the development of complex culture (Miton & Charbonneau, 2018). In a common paradigm, participants are given an objective, such as building a plane to throw as far as possible or assembling a basket to hold rice (e.g., Caldwell & Millen, 2009; Zwirner & Thornton, 2015). Over generations, as individuals iteratively tinker with and pass on their attempts, it is the repeated evaluation of success that acts as the primary selective mechanism. The reason that planes evolve to fly farther or that baskets evolve to hold more rice is, simply, that people introduce variations, judge the extent to which they work, and retain the variants judged to be the best. In fact, even Derex et al.'s (2019) experiment showing that people can improve technologies while lacking a causal understanding nevertheless relies on iterative, instrumental evaluation: Individuals judged the efficacy of innovations for achieving a goal (minimizing the time for a wheel to go down a track) and decided whether to retain them on the basis of the evaluation. Although factors like group size and connectedness are clearly pivotal in affecting cultural evolutionary dynamics (Derex et al., 2018; Derex & Boyd, 2016; Henrich, 2004b; Muthukrishna & Henrich, 2016), the diverse experimental literature suggests that instrumental evaluation is the filter through which most variants must pass. Culture evolves foremost as people keep what seems to best satisfy their ends.

7. Discussion

7.1. Subjective selection beyond the cultural manifold

I have demonstrated the power of a subjective selection framework by focusing on super-attractors across religion, esthetics, and social institutions. Nevertheless, viewing culture as shaped by subjective selection generates proposals for how other super-attractors may be crafted to achieve people's instrumental ends. Rites of passage may be constructed through several interacting selective schemes, such as a selection for practices that establish common knowledge about shifting social roles (Thomas et al., 2014), a selection for hazing-like practices that increase trust in newcomers (Cimino, 2011), and a selection for practices that seem to change the essence of a person. Marriage plausibly develops as partners and their families establish shared contractual expectations, such as about sex and property, and other unions borrow and build on such arrangements (see the evolution of pirate ship constitutions for an analogy: E. T. Fox, 2013). Although ownership is sometimes considered a genetically evolved strategy or inclination (e.g., Gintis, 2007; Tibble & Carvalho, 2018), studies of the emergence and evolution of property regimes among people of roughly similar power show them iteratively designing and negotiating over property rules, apparently in an effort to design standards that are both fair and efficient (Ellickson, 1989, 1993, 2006; Kimbrough et al., 2010; B. J. Wilson et al., 2012). Future research will develop more precise accounts for how a broader set of super-attractors might develop through subjective selection which can then be tested against existing alternative theories.

Of course, there is no reason that subjective selection should be limited to the development of super-attractors. As with many existing frameworks, subjective selection plausibly explains the

development of much adaptive technology. Assuming people accurately evaluate whether modifications better serve to satisfy their goals, they should adopt those variants, driving culture towards evermore useful forms (see, e.g., Allen et al., 2020; Caldwell & Millen, 2009; Zwirner & Thornton, 2015). A subjective selection framework also explains cultural inefficiencies (Singh, 2022). First, it helps explain why effective practices are sometimes suboptimal. As long as people's evaluations include faulty cues – such as baseball managers looking to footspeed rather than to a player's ability to withstand bad pitches when judging their performance (Thaler & Sunstein, 2004) – we should expect systematic inefficiencies in otherwise effective cultural traits. Second, a subjective selection framework explains why adaptive behaviors such as boiling water or handwashing (even with ash or water) often fail to emerge or spread. Despite these behaviors producing substantial benefits (Hoque & Briend, 1991; Luby et al., 2011), their effects are noisy and time-lagged, making them difficult to evaluate and thus less likely to be retained. Finally, as illustrated with the example of shamanism, a subjective selection framework explains why some ineffective cultural practices spread. Specifically, cognitive biases can lead us to infer efficacy when there is none, maintaining practices that have no effect on their stated outcome, such as superstitions.

I focused on near-universals here, but subjective selection should also drive the development of variable cultural practices. There exist numerous contributors to cultural variety, including diverse ecological conditions (Diamond, 1997; E. A. Smith & Coddington, 2021), variable exposure to neighboring societies (Diamond & Bellwood, 2003), and historical contingency (such as the outsized impact of the Catholic Church in Europe: Henrich, 2020). As a result of these and other factors, people in different environments will have different goals, different means of satisfying those goals, and different evaluation criteria for what constitutes a solution. Indeed, Arthur (2009) noted that technological innovation is self-reinforcing because of how new technologies breed new “human needs”: in seventeenth century Europe, for example, mining led to water seepage, creating a need for drainage and, in turn, a primitive version of the steam engine. Our goals engender both universality and variety in our cultural repertoires.

7.2. Subjective functionalism and the *emic* as *etic*

Analyses of culture in anthropology have long centered on the question of function. Traditions appear functional, and, although theorists have debated over what exactly their functions are, a common approach has been to view function in the context of objective benefits, usually at the group level. Whether we consider the structural-functionalism of scholars like Radcliffe-Brown and Durkheim (Pope, 1975; Radcliffe-Brown, 1935), the functionalism of ecological anthropologists and cultural materialists (Harris, 1974; Orlove, 1980; Ross et al., 1978; Vayda, 1974), or the functionalism implied by cultural group selection (R. Boyd & Richerson, 2010; D. S. Wilson, 2002), diverse approaches convergently frame cultural traits as adaptations critical for the survival and reproduction of the social group.

The framework of subjective selection, in contrast, suggests what might be called “subjective functionalism.” The subjective function of many traditions is, as established, to be perceived as useful for achieving proximate goals. The subjective function of dance music is to incite dancing, that of shamanism is to appear to

control uncertain outcomes, that of a spear is to kill, that of a hammer is to hammer nails, that of corporate groups is to mobilize cooperation, and that of cheesecake is to evoke gustatory pleasure.

Because of the emphasis here on goals and individual evaluation, an important difference between subjective functionalism and other forms of functionalism is the degree to which it treats the emic as a causal force behind the etic. In the behavioral sciences, an emic explanation of a behavior is produced by a cultural insider, while an etic account examines the behavior from outside the cultural context. Functional accounts have often entailed large disparities between the emic and the etic, reflecting a sense that people are unaware of the reasons various cultural traditions persist. Classic examples are witchcraft beliefs: Emically, people often cite them to explain misfortune (e.g., Evans-Pritchard, 1937), yet, in seeking to explain them, researchers have often turned to supposed group-level benefits, such as their alleged role in promoting cooperation (Faulkingham, 1971; P. Leeson, 2021; Schimmelpennig & Muthukrishna, 2021).

As with any behavior they engage in, of course, people may often be unaware of, or unwilling to share, the instrumental ends for which they are evaluating and maintaining cultural variants. Nevertheless, the framework presented here – perhaps to a greater extent than any other functional approach in the history of the study of culture – sees great value in people's reported reasons for why they rely on a tradition or what its function is. Our traditions are mirrors of our deepest goals and the problems we confront in their pursuit. If we want to understand why people engage in some practice, a useful starting place is to ask them.

8. Summary

Since 1896, when Franz Boas proposed that the ubiquity of some traditions attests to universal laws of cultural development, the study of human behavior has undergone an efflorescence. Psychologists have probed the mechanics of the human mind. Anthropologists have traveled the world and systematically documented the richness and myriad manifestations of human culture. Evolutionary theorists have mapped the population-level processes shaping our and other species' phenotypes. This paper attempts to synthesize these threads, proposing that the cultural manifold – the set of reliably developing, complex cultural practices – emerges not from blind cultural evolutionary processes but from subjective selection, wherein people build, evaluate, and retain cultural traits that appear to best serve their goals. This account is surely incomplete. But, like the traditions it seeks to explain, it is one iteration in a longer arc of refinement – fated to be judged, modified, and eventually replaced by something that seems to better achieve its stated aims.

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Open Peer Commentary

Western jurisprudence and criminal justice systems as superstitious belief

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Abstract

Western punitive justice systems persist despite weak evidence that they reduce crime. We argue that they function as WEIRD cultural superstitions: punishment intuitively feels effective even when it fails. Drawing on Singh's framework, historical evidence of punishment's dominance origins, and our own experiments, we show how subjective selection sustains maladaptive punitive institutions – ultimately raising the question, *intuitively effective to whom?*

It might seem obvious to a secular person raised in a WEIRD culture (Henrich et al., 2010) that a Mentawai water spirit does not actually punish people for failing to share food (Singh, target article). Singh argues these beliefs and practices culturally evolve within groups because they make intuitive sense to individuals, regardless of causal relations or objective outcomes. Yet, the article would benefit from turning this subjective selection lens on itself: What are examples of WEIRD practices that do not accomplish their purported goals but nevertheless persist because they are intuitive? Where do these intuitions come from? And which group members have them?

Western punitive justice systems offer such an example. Many scholars argue that third-party punishment – the imposition of

costs on selfish actors by unaffected, often institutionalized, parties – is essential to the emergence and stability of large-scale human cooperation (Boyd, Gintis, & Bowles, 2010; Fehr & Gächter, 2002, 2004; Henrich et al., 2006; Mathew & Boyd, 2011). However, outside of theoretical models and laboratory experiments, evidence for this claim is weak. Meta-analyses consistently find that harsher penalties, such as “three strikes” laws, or even the death penalty, do not reliably reduce crime (Chalfin & McCrary, 2017; National Research Council, Nagin, & Pepper, 2012; Nagin, 2013), and in the United States, 82% of people released from prison are rearrested within a decade (Antenangeli & Durose, 2021). Nonpunitive approaches such as restorative justice conferences – structured dialogues among offenders, victims, and community members – reduce recidivism relative to conventional criminal-justice processing (Sherman et al., 2015; Strang et al., 2013), yet do not receive the same level of support in WEIRD countries.

How do we reconcile the widespread emergence and persistence of harsh punitive institutions in WEIRD societies with their limited efficacy? Singh’s framework provides an answer: punishment *feels* like it ought to improve cooperation to WEIRD people, which is consistent with our own data. In our experiments, we document economic game conditions under which the inclusion of punishment is actively detrimental to cooperation (Alam & Rai, 2025). These games were designed to mimic real-world conditions in which punishment can sometimes be profitable for punishers – for example, by extracting fines or resources from those they sanction (Sheth, 2016). Critically, we also find that people will choose to play in economic game conditions that incentivize severe punishment even as it reduces their own payouts (Alam & Rai, 2025). When asked about their expectations, most believed that the presence of punishers would increase cooperation, and that paying punishers to engage in severe punishment would be most effective (Figure 1).

Why do WEIRD participants subjectively feel like punishment should increase cooperation? According to Singh, subjective selection operates by targeting proximate psychological goals. In the context of punishment, retribution may be the proximate goal of punishment rather than deterrence (Carlsmith, 2006). Yet, it is unclear whether these proximate retributive sentiments culturally evolved for the ultimate goal of inducing cooperation, or whether Western punishment practices may have culturally evolved for

exploitation and domination. The earliest written legal codes, such as the laws of Ur-Nammu and Hammurabi in Mesopotamia, reserve the harshest penalties for women and slaves who harmed free men (Dunbar, 2018). In the antebellum South, slave patrols maintained racial hierarchies by violently punishing enslaved people who attempted to escape or resist (Potter, 2013). After abolition, these practices were transformed into convict leasing, in which Black Americans were criminalized en masse and forced into labor camps (Muhammad, 2022). Echoes of this dominance function persist: for example, Black defendants are significantly more likely to receive a death penalty, especially if they are convicted of murdering a White victim (Sidanius & Pratto, 1999).

Thus, the modern belief in punishment as necessary for cooperation may reflect a process of subjective selection even as punishment itself culturally evolved for hierarchical purposes. This would suggest that explaining subjective selection in terms of intuition is incomplete without also taking into account the socio-historical conditions that make different explanations more cognitively accessible and socially motivated. In the context of western punishment, one possible explanation is that once Enlightenment ideals of liberty and equality became the preferred social-relational model for organizing legal relations in WEIRD societies, explaining that punishment served hierarchy became less cognitively accessible and carried reputational costs (Rai & Fiske, 2011; Singh & Hoffman, 2025).

Singh’s framework also invites a deeper question that remains unaddressed: *intuitive to whom?* The intuitive appeal of punitive justice is unevenly distributed (Johnson, 2008), and this may be due to poor perspective-taking. In one experiment, we asked participants to imagine themselves in different roles in a dictator game (Alam & Rai, 2025). Those who imagined themselves as dictators, who might be subject to punishment, were more skeptical of punishers and their motives than players who were not subject to punishment. Dictators were also more likely to believe in the importance of never punishing fair behavior, while other players focused on the importance of always punishing selfish behavior. The same punitive system thus felt different depending on where people imagined themselves within it – either as potential targets or bystanders beyond its reach. This perspective gap may help explain why White voters often support “tough on crime” policies (Johnson, 2008) without considering what

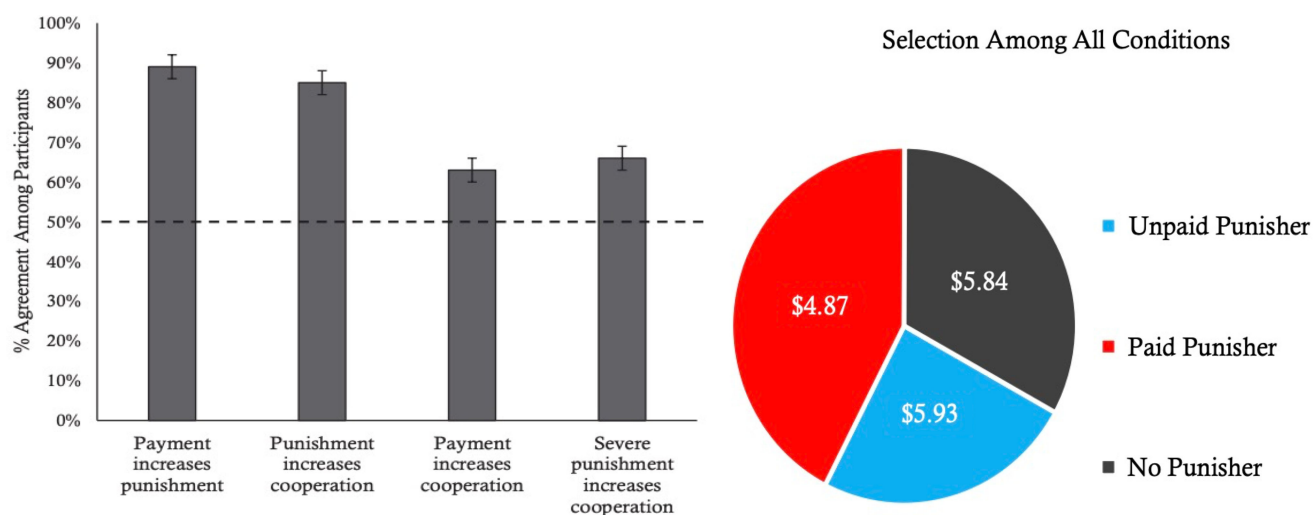


Figure 1 (Alam and Rai). The left panel shows lay intuitions about incentives and punishment, while the right panel shows the proportion of participants who choose to play in different game conditions and the expected values of their choices. From Alam and Rai (2025).

those policies signal to the minority communities they disproportionately target, where trust in law enforcement is low. Crucially, the people for whom it feels intuitive that punishment fosters cooperative are also those with disproportionate cultural and political influence – allowing the intuition to shape institutions and endure despite its empirical weakness. Singh's account, therefore, could be strengthened by clarifying whose intuitions shape which cultural practices persist. However, doing so might force the theory to integrate subjective selection with the kinds of prestige, dominance, and conformity-based cultural transmission pathways that Singh seeks to distinguish subjective selection from (Henrich & Gil-White, 2001).

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Healing rituals and dietary practices as cultural super-attractors

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Abstract

Singh's account explains cultural super-attractors via subjective selection. I extend it to healing rituals and dietary practices, including fasting calendars, sacred or taboo foods, detox narratives, probiotic beliefs, and ceremonial eating. I map these packages to complexity and robustness, specify control-seeking and hedonic mechanisms, derive testable predictions, and outline cross-cultural studies that distinguish satisfaction from objective efficacy for public health.

Singh argues that many cultural forms converge across societies because individuals iteratively evaluate and retain variants that seem to help them achieve salient goals. This commentary extends that account to healing rituals and dietary practices. I highlight why such practices are strong candidates for cultural super-attractors, propose mechanisms that make them persist and recur, and offer testable predictions and a research program to discriminate perceived goal satisfaction from objective benefit (Henrich, 2015; Mesoudi, 2011).

First, consider the criteria of complexity and robustness. Health-related cultural packages are complex because they combine rules and schedules, roles for specialists, narratives of meaning, material affordances, and embodied actions (Boyd & Richerson, 1985; Mesoudi, 2011). A fasting cycle is not merely abstention; it has a calendar anchored in moral time, exceptions, and compensations; shared meals at dawn or dusk; and socially

recognized guardians of correctness. Ritual healing likewise stitches together settings, music, movement, invocations, preparations, and expectations, features that are well documented in ethnographic and experimental work on ritual (Xygalatas, 2022). These packages are robust: they persist through ecological variation, migration, and technological change, often re-emerging after suppression. Such complexity and robustness are hallmarks of cultural super-attractors.

Second, think about selection pressures under uncertainty. Where causal structure is opaque and the stakes are high, people prefer variants that provide a credible sense of control (Sperber, 1996). Regular timing, repetition, sanctification, and specialist authority help produce that sense. Narratives that link purity with health, or moral renewal with bodily renewal, increase the perceived instrumentality of a practice even when causal links are thin. Placebo-compatible scripts such as preparation phases, escalating commitment, and communal witnessing further raise expected benefit by shaping expectation and learning (Wager & Atlas, 2015). Subjective selection favors variants that deliver this felt control quickly and reliably.

Third, a complementary mechanism is hedonic and affective reinforcement. Comfort foods, communal feasting, rhythmic music, synchronized movement, and identity-affirming stories provide immediate experiential rewards that stabilize adherence (Xygalatas, 2022). When a practice couples perceived instrumentality with felt reward, its retention becomes resilient. This synergy helps explain why analogs recur cross-culturally: fasting as purification and discipline; sacred or taboo foods that mark group boundaries; seasonal ceremonies that mix healing intentions with song and dance; and dietary codes that link everyday actions with larger cosmologies.

The subjective selection framework also clarifies when cultural packages align with objective benefits and when they diverge. In domains with rich feedback signals, repeated practice can channel selection toward truth-tracking design (Henrich, 2015; Mesoudi, 2011). Infant-soothing routines, for example, may converge on features that actually regulate arousal. By contrast, when feedback is sparse, delayed, or confounded, selection may privilege cues of control and meaning rather than causal leverage. Fad diets and detox narratives illustrate this divergence. They can satisfy goals of purity, control, and identity while having little physiological efficacy.

The view yields five predictions. First, experimentally increasing the perceived efficacy of a ritual or dietary variant by endorsement from respected experts, by elevating perceived precision, or by adding solemn framing should increase reliance more when participants pursue health goals than when they pursue unrelated goals. Second, the presence of alternatives that are evaluated as better for the same goal, such as trustworthy clinical care, clear guidance, and higher health literacy, should reduce adherence to ritual and dietary super-attractors. Third, measures of attention, memory, and reward learning should mediate appeal and retention: practices that capture attention and are easily remembered and rehearsed should show higher cultural stability (Wager & Atlas, 2015). Fourth, platform-level amplification should accelerate convergence: algorithmic promotion of vivid ritual diets, for instance, should compress variation around a small set of recurring templates (Vosoughi, Roy, & Aral, 2018). Fifth, ecological shocks that shrink population size or institutional complexity should threaten maintenance, because transmission

chains shorten and evaluative diversity declines (Boyd & Richerson, 1985).

Each prediction suggests concrete measurements. Field experiments with ritual specialists and with lay participants can manipulate features that raise perceived control, such as regularity or sanctification, and track adherence over weeks (Sperber, 1996). Cross-cultural coding projects can catalog the components of healing and dietary packages, assessing complexity, redundancy, and the presence of affective features (Mesoudi, 2011). Longitudinal analyses of digital traces can quantify diffusion, retention, and convergence of ritual diets and healing narratives, linking engagement metrics with the adoption and stabilization of practices (Vosoughi et al., 2018).

Public health practice can benefit from this framework. Rather than opposing widespread practices solely on the basis of efficacy, interventions can be designed to redirect goal satisfaction. If purity and control are dominant goals, design elements that provide clean narratives and visible progress markers can be embedded within evidence-based nutrition programs. If social bonding and identity are central, then structured communal meals that follow dietary guidance, with roles and scripts that are meaningful to participants, may improve adherence without importing misleading causal stories.

Finally, the approach clarifies where group-functional explanations retain value. In settings that coordinate shared resources and enforce norms with credible signals and sanctions, group-level properties can stabilize packages that would otherwise drift (Boyd & Richerson, 1985). The subjective selection lens identifies how individuals evaluate and retain variants, while group-functional dynamics identify how institutions shape and constrain the evaluative landscape. Bringing these levels together can explain why some practices become common knowledge with enforcement, while others survive as optional traditions or commercial offerings.

In sum, healing rituals and dietary practices meet the criteria for cultural super-attractors and are well explained by subjective selection (Singh). They deliver convincing cues of control and meaning under uncertainty while providing immediate experiential rewards. The framework generates testable predictions and an interdisciplinary program suitable for field settings and for large-scale digital observation. It also distinguishes situations where cultural attractors align with objective benefit from those where they systematically diverge, an empirical boundary that matters for health policy and cultural theory alike.

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From attractors to ecological strategies: Embedding subjective selection in an evolutionary-ecological framework

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Abstract

This commentary welcomes Singh's shift from dual inheritance to individual psychology but argues that his model remains incomplete without evolutionary foundations. Cultural variants are not adopted merely because they appear useful – they appeal to evolved motivational systems shaped by natural selection. Integrating adaptive goals, producer–consumer dynamics, and ecological variation transforms subjective selection into a genuinely evolutionary-ecological framework.

After three decades in which debates on cultural evolution were dominated by models emphasizing social learning, cultural group selection, and niche construction, Singh pushes the discussion in a different direction: culture as the product of individual psychology. This re-centering on individual preferences and evaluations is refreshing, and it opens the way for more productive dialogue between cultural evolutionists and psychologists, especially evolutionary psychologists, whose perspectives have often been marginalized.

Yet the article deprives itself of the full resources of evolutionary theory. Singh demonstrates how people adopt cultural variants they perceive as useful, but he stops short of asking why humans find certain variants compelling in the first place. The preferences guiding these evaluations are not arbitrary. They are the product of natural selection, shaped to motivate humans toward actions that historically enhanced survival and reproduction (e.g., securing food, attracting mates, caring for offspring, building alliances, managing uncertainty) (Tooby & Cosmides, 1992).

In each domain, Singh identifies the proximate goals that cultural forms appear to satisfy, but he stops halfway: the crucial

step is to explain why and how these goals are valued, which requires linking them to the evolved reward systems that make them subjectively compelling (Dubourg et al., 2025). Shamanic rituals persist not only because they seem to manage uncertainty but also because threat-detection systems reward any practice that promises agency under risk. Lullabies converge not only because they calm infants but also because the parental care system delivers intrinsic rewards when distress signals are reduced.

The strength of an evolutionary framework is not only that it explains why certain goals feel compelling but also that it allows us to predict what cultural forms will emerge and under which conditions they will vary. Take judicial institutions, one example beautifully studied by Singh. Human cooperation is structured by reciprocity and proportionality. As a result, punitive practices in small-scale societies serve primarily to restore reciprocal cooperation: sanctions are calibrated to the severity of the offense, often combine punishment with compensation, and include procedures to prevent escalation (Baumard et al., 2023; Fitouchi & Singh, 2023).

The evolutionary perspective explains not only the recurrence of cultural “super-attractors”

across societies but also systematic divergences. Motivational systems are universal, yet their expression shifts with adaptive trade-offs across age, sex, and life-history stage and with ecological conditions that alter costs and benefits (Boon-Falleur et al., 2025; Ko & Neuberg, 2025; Sng et al., 2018). Romantic love ideals vary historically as mating strategies respond to demographic and institutional change; lullabies adapt to caregiving ecologies, and judicial practices evolve with group size and kinship structures (Baumard et al., 2022). Evolutionary reasoning thus makes both stability and variability intelligible, as two sides of the same adaptive logic.

Consider also stories, another example discussed by Singh. Imaginary worlds in fiction recruit exploration-based curiosity (Dubourg et al., 2023). These systems evolved because they motivate individuals to seek information, expand social knowledge, and prepare for novel situations. Because imaginary stories are most appealing to people who are psychologically oriented toward exploration, their cultural prominence varies with ecology: in safe and resource-rich environments, where the costs of exploration are low and innovation is rewarded, exploratory drive increases and audiences demand more speculative fiction; in harsher, riskier ecologies, where exploratory behaviors are more costly, cultural production shifts toward familiar, realistic, and morally didactic narratives (Dubourg & Baumard, 2022; Dubourg et al., 2025). In the end, cultural products are best understood as emergent phenotypes: cultural forms generated by evolved motivational systems and modulated by ecological conditions and historical legacies (Baumard et al., 2023).

Importantly, the evolutionary approach helps explain not only why cultural products are adopted (because they are useful to consumers) but also why they are created (because they serve the interests of producers) (André et al., 2023; see also Nettle & Heinz, 2025). Ritual specialists, storytellers, or artists invest in costly cultural productions because these productions bring them prestige, allies, resources, or mating opportunities. From this perspective, super-attractors are not only emergent phenotypes shaped by evolved motivations and ecological conditions – they are also joint phenotypes, stabilized because they benefit both sides of the cultural exchange, albeit in different ways.

Integrating the producer's standpoint into Singh's framework helps explain why some traditions persist even when their direct

utility to consumers is ambiguous. Costly rituals, for instance, may endure less because of their benefits to participants than because they reliably channel status and resources to ritual specialists (which would explain why their knowledge is specialized and secretive; see Lightner et al., 2021). Here again, subjective selection plays a role, but only as part of a broader ecology of motivations and interests.

Seen in this light, subjective selection is best understood not as a freestanding mechanism but as the proximal face of an ecological-evolutionary process. People evaluate cultural variants as useful because they are guided by evolved motivations; those motivations are reliable because they historically tracked fitness-relevant outcomes, and cultural forms persist because they also align with the strategic interests of producers within specific ecologies (Baumard & André, 2025).

This perspective has at least three advantages. First, by specifying which evolved goal is engaged, and whose interests are at stake (producers, consumers, or both), we can generate sharper predictions about cultural forms. Not all domains of culture should converge equally; only those anchored in strong, universal motivations will produce super-attractors. Second, linking subjective selection to adaptive goals and strategic asymmetries prevents circularity (Scott-Phillips, 2018). We do not merely say that people keep what they find useful; we explain why they find it useful, and why others invest in producing it, in terms of evolved design and ecological payoffs. Finally, with this ecological layer, subjective selection becomes more than a descriptive label. It becomes a bridge between psychology, ecology, and cultural evolution, unifying findings across domains and perspectives (Baumard & André, 2025).

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Subjective selection is a mechanistic and behaviorally integrative account of group-level selection, not a replacement

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Abstract

We praise many aspects of this paper that bring forward previously underemphasized content. We would caution against presenting it as an alternative group-level selection. Indeed, subjective selection may serve to generate a mechanistic understanding of the underlying system upon which group selection operates. Such an approach would address the circularity in the supposition that subjective selection explains cultural patterns.

The outstanding diversity among cultures might be exactly what leads so many scientists to seek common processes that might account for both variation and surprising similarities. Singh proposes that many recurrent cultural forms (attractors) evolve convergently via a process of subjective selection in which individuals and communities retain and transmit a perceptual bias by which they subjectively value key outcomes and judge certain actions as efficacious in achieving them, even when such actions lack objective efficacy. Such purported processes may help account for the fact that some problematic practices persist despite their deleterious impact on the well-being of individuals and/or communities. We wish to praise this paper for bringing forward previously underemphasized content on this topic. First, subjective selection acknowledges and emphasizes a much-needed heavy role in cultural evolution for perceptual bias, instrumentally generated behavior, instrumental superstitious behavior, and (more generally) individual behavioral/biobehavioral processes. It also implies (but perhaps does not specify) that those individual

processes involve not only reinforcement learning via “objective goals” but also reinforcement learning via socially mediated feedback (since subjective preference as described here can lead to differential social feedback/social learning). We also appreciate the inclusion of concrete variables in purported tests of the proposal; indeed, goals and perceptual biases may be understood (to avoid circular reasoning or unverifiable phenomenal reference) as a specification of which environmental events are functioning as effective learning signals; both neurobiological and behavioral tools could be used to test those suppositions in constituent individuals.

While recognizing those contributions, we also caution against presenting subjective selection as alternative, competitive, or antithetical to group-level selection. Indeed, subjective selection may serve to generate a mechanistic understanding of the underlying system upon which group selection operates. An integrative approach would still provide all the advantages that the author suggested, while also addressing the circularity endemic in the supposition that subjective selection explains cultural patterns rather than constituting something to be explained about those patterns. If subjective valuation and perceptual biases develop for any heritable reason – e.g., consistent development and transmission by social learning processes or phylogenetically selected canalization of perceptual regularities – it may increase not only individual goal attainment but also fitness for coordinating groups of individuals. If so, the tendency together with its mode of social transmission and expression may all thereby be selected as an interactor on the group level (Hull, 1980). We would like to note that this point is equally applicable to “group selection” in the sense of multilevel natural selection (Traulsen & Nowak, 2006) as well as “group selection” in the sense of group-level cultural selection (Couto & Sandaker, 2016; Glenn, 2004). In fact, without group-level selection, it is difficult to account for why such perceptual biases would stabilize common misattributions (such as supernatural elements) that appear to compete with true goal attainment. These may be epiphenomenal, but they may also be indirectly adaptive on the group level. In a similar manner, mate preference for disadvantageous traits in the context of phylogenetic sexual selection requires (and has often received) explanation in terms of how the preference should adaptively evolve in the choosy mate (e.g.), (Henshaw, Fromhage, & Jones, 2022). Such choosiness may evolve because genes associated with the preferred trait convey fitness for some other reason, and the analogous possibility here would be that subjective selection develops because it produces adaptive group outcomes that overcome disadvantages. In short, subjective preferences need to be accounted for in terms of why they are preferred, and group-level selection can offer at least heuristic or even testable explanations in service to this question.

Integration also brings this work into harmony with previous literature that describes typical patterns in social behavior – both socially learned and socially coordinated – as replicated and maintained over time by virtue of increasing the fitness and/or capability for survival and provision of outcomes for the group (Baum, 1995; Glenn et al., 2016; Harris, 2001; Rachlin, 2019; Skinner, 1981; Skinner, 1953/2024; Wilson, Ostrom, & Cox, 2013). This group selection might account for the development of practices that decrease immediate individual benefits or survival but also convey group-level benefits. If sets of practices or interactive patterns all arise from a single subjective preference, and if

group interaction is necessary to maintain and express the cultural impact of those subjective preferences, then we would expect that both deleterious and (net) adaptive outcomes would result from the selection of a wholistic unit interactor (Hull, 1980).

Group selection notwithstanding, it's interesting to highlight that “groups don't behave” (Skinner, 1953/2024, p. 298); in other words, group-level selection must operate in parallel with individual-level selection. This is another advantage of integrating the subjective selection proposal with other aspects of cultural group selection. Culturally transmitted behavior that does not produce immediate benefit (or that produces aversive consequences) for the individual must still develop according to individual behavioral principles, and subjective selection posits a plausible mechanistic processes that could be important for group selection; the development of perceptual biases leading to subjective selection may create the learning environment that channels individual behavior toward group-level outcomes. One might, for example, obey ethical rules even at a cost because they are perceived as subjectively effective in procuring supernatural benefits or avoiding supernatural punishment (a perception partly supported by related social reinforcement and verbal patterns maintained via the subjective preferences of others). Overall, these perceived efficacies could lead to improved positive prosociality, cooperation, and cohesion in the group, thus increasing its chances of survival (Rachlin, 2019; Wilson, Ostrom, & Cox, 2013). It's interesting to note that, if asked, a particular individual might never describe these ultimate contingencies supporting their behavior or their group's (Harris, 2001).

In summary, group-cultural or multilevel phylogenetic selection may provide an ultimate explanation for the content of subjective selection as a proximate mechanism for cultural development. In other words, integrating the cultural group and individual-level processes may produce a more effective paradigm than either can do independently, as either phylogenetic and/or cultural group-level “objective” selection can account for maintaining the perceptual biases by which cultural attractors are subjectively selected.

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Subjective selection as an outcome of natural selection

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Abstract

A merit of the subjective selection framework is to focus on individuals' motivations in shaping cultural trends. To gain explanatory strength, the model should be completed with a proper assessment of the role of natural selection. In contrast to some formulations in the target article, natural selection shapes not just organisms' overall goals in "selecting" cultural materials but also the detailed mechanisms whereby they assess and produce cultural material.

Manvir Singh must be commended for contributing to an evolutionary perspective that gives pride of place to individuals' interests and motivations in adopting or modifying "cultural" representations. This stands in contrast to traditional descriptions of cultural evolution processes in terms of consumption (André, Baumard, & Boyer, 2023). Explaining the "cultural manifold" in terms of "subjective selection," however, comes with various difficulties.

A first point is that Singh describes the main process involved in shaping cultures in terms of "selection" among alternatives proposed. But most cultural materials are not selected in that sense, as they are re-constructed by individuals on the basis of fragmentary cues taken from other individuals' public representations (Sperber & Hirschfeld, 2004).

More important is a central ambiguity as concerns the role of natural selection. Singh of course assumes that the cognitive equipment relevant to cultural transmission is an outcome of natural selection, but also suggests that fitness has no specific impact on the "subjective selection" process itself.

That is clear in passages where Singh contrasts his "subjective selection" account of cultural traits with what he calls "biological" explanations, which he describes as based on the assumption that a cultural practice occurs because it maximizes fitness. For instance, discussing aesthetics (sect. 4.1, para. 2), Singh criticizes a "biological" interpretation "which posits that humans have been shaped by natural selection to produce [...] songs and lullabies." In a similar manner, Singh contrasts his own account of the formation of groups with a "biological" one, following which forming groups brings increased fitness (sect. 5.2, p. 11). In these two domains, then, what Singh calls "biological" explanations would proceed along the lines of a [natural selection → behaviors] explanatory frame.

But that is not how current evolutionary accounts of behavior work. Indeed, the whole enterprise of evolutionary psychology started from rejecting the assumption that organisms behave in ways that directly maximize fitness (Cosmides & Tooby, 1987). Rather, the major assumption of that research program is that organisms behave in ways that minimize the distance between their current state and some goal states defined by evolved cognitive systems – which themselves were selected because they motivate behaviors that increased fitness, on average, in ancestral environments. So the explanatory frame is [natural selection → cognitive adaptations → behaviors].

That is why section 2.1, for instance, is (at best) too concise and possibly misleading, in stating that natural selection makes us "pursue higher-level outcomes, such as food, sex, status, and information, as well as lower-level goals that aid in their pursuit." Crucially, natural selection does not just result in organisms that follow these goals and sub-goals, but in organisms that *pursue them in extremely specific ways*, and that is crucial to understanding culture.

For instance, it is insufficient to state that humans are motivated for a desire to "woo potential mates" (2.1). Human females for example do much more than that. They try to find and retain mates that maximize proximity to a target along multiple dimensions that include stable personality, disposition to provide, willingness to protect, as well as intelligence, formidability, and many other equally precise, naturally and sexually selected traits (Buss & Schmitt, 2019; Conroy-Beam, Walter, & Duarte, 2022; Conroy-Beam, 2024). Women's behavior is optimized, not toward some general goal, but towards a number of very specific ones.

The same point applies to the formation of social groups (section 5.2). It is at least incomplete to describe people's goal as "deliberately creat[ing] closed groups to promote mutual benefits." Our coalitional psychology does much more than that. It orchestrates a whole series of capacities and motivations to monitor people's commitment, to evaluate different individuals' contributions, to assess their contributions against their resources, to evaluate the size and cohesiveness of one's own and of other coalitions, and much more (Tooby, Cosmides, & Price, 2006; Tooby & Cosmides, 2010). Here, again, natural selection provides not a generic goal (create groups) but very specific targets.

Because of this problem – glossing over the details of the evolved, domain-specific psychological adaptations activated – Singh's description of the "selective" process in various domains relies mostly on commonsense criteria that do not provide a solid basis for fundamental assumptions about human psychology.

For instance, it is perhaps true that some aspects of musical capacities evolved from interactions with infants (section 4.1.). The subjective selection account posits that the happened because parents had the goal to pacify their infants. But, why do we assume

that they have that goal? Mostly because the parents themselves tell us so, and because our folk-psychology tells us that it must be their motivation. But that is not an explanation of their behavior, let alone an evolutionary explanation.

In a similar way, one may agree that shamans behave the way they do because that behavior provides others with cues of exceptional and essential qualities (Singh, 2018). But it seems at least incomplete to suggest that shamanism is subjectively selected because shamans convince their audience that “they have some control over uncertain events” (sect. 3.1, para. 4). Why would people want their shamans, or indeed anyone, to control uncertain events? How do we know that they have that goal? Again, this alleged goal is inferred from people’s own reports and from our interpretation of their behavior. But people’s own reasons for their behavior, like our inferences to their best reasons, are not the same as a psychological explanation of that behavior.

A more complete “subjective selection” perspective would, first, leave aside the misleading language of selection, to take into account the fact that cultural transmission implies inferences from fragmentary cues rather than inheritance and selection; second, it would include a description of people’s motivations that is anchored in independent psychological evidence and explains the relevant cognitive processes themselves in terms of fitness.

Addressing these problems would help preserve the essential merit of Singh’s proposal – to encourage us to focus on the production of cultural materials and on individual motivations engaged in their production.

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Cultural evolution by revealed preferences – from status signals to alien porn

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Abstract

Singh convincingly argues that understanding culture requires understanding *subjective selection*. Here, I (1) suggest an extension to Singh’s cultural manifold, namely *status signaling systems* and (2) argue that Singh’s approach might unfold its greatest impact on the study of *modern* culture and economics. Indeed, *subjective selection* seems to readily predict numerous modern phenomena such as highly addictive digital interfaces.

The target article opens with a hypothetical scenario “*Imagine that a new human society, free of any previous cultural influence, is established on a large, remote island.*” Singh convincingly argues that a range of recognizable complex cultural practices, such as marriage or shamanism, would reliably arise in such a society due to “subjective selection.” He terms such practices “super-attractors,” and their set the “cultural manifold.” Miller (2007) imagines an equivalent scenario for technologically advanced species on an interplanetary scale. He surmises that any intelligent species should evolve practices “to shape their subjective reality to provide the cues of survival and reproductive success.”

Both perspectives share two insights: (i) cultural practices depend on *subjective choices*, and (ii) what *subjectively appeals* depends on evolved psychology and is not necessarily *biologically adaptive*. This aligns with a growing recognition that “adaptationism” is insufficient to explain either cultural or biological evolution (Acerbi & de Courson, 2025; Bartlett et al., 2017; McCoy & Haig, 2020; Prum, 2012, 2017). We must also consider subjective goals and neuro-psychological proxies of value.

A particularly relevant phenomenon in this context is “proxy failure” (John et al., 2024), where for instance psychological decision proxies such as sweetness or salience elicit behavior that undermines the underlying goals (e.g., fitness or utility). The upshot is that subjective selection may not only explain the cultural manifold but also why modern culture is creating ever more addictive goods (Sacco, 2024; van Tulleken, 2023) or digital interfaces (Miller, 2007).

This commentary contributes in two ways: (1) It proposes *status signaling systems* as a super-attractor, hopefully extending the “*empirical testing ground for [. . .] social scientific theory*” in

Singh's spirit. (2) It suggests that Singh's framework, pursued in a dispassionate and non-ideological manner, could unfold its most profound impact in the study of modern culture.

Status signaling systems as a super-attractor

A cultural status signaling system is a "social institution" (target article, sect. 5, para. 1), which provides members of a society (or societal group) a means to rank each other in terms of status or prestige (both terms used synonymously here, in the sense of Henrich & Gil-White, 2001). Imagine the entire set of cultural cues, including material displays (clothes, ornaments, beards; Gray et al., 2020), behavioral cues (generosity, posture, followership; Anderson & Kilduff, 2009; Egozi & Ram, 2024), and linguistic or symbolic markers (speech patterns), which together underlie status judgments. We can specifically define a status signaling system as the set of cultural cues that allow independent members of a society to infer the same ranking for a random sample of peers (Yu, Kilduff, & West, 2023).

Of course, cultural status cues will build upon and complexly interact with non-cultural, that is, innate, mechanisms of status signaling. Yet the interpretation of many cues (e.g., skin tone and assertiveness) is strongly culturally contingent (Kim & Pettit, 2019). The appeal of understanding status signaling systems as a super-attractor, rather than just an amalgam of cues, is that it explicates what exactly underlies the concept of status (or prestige) in a given society.

A cultural status signaling system is characterized by at least four features: (i) perpetuity – that is, transmission across generations; (ii) a culturally defined set of evaluation criteria – for example, which skin tones or clothes are deemed superior; (iii) an abstract value proposition – signals are understood to imply some sense of worth; and (iv) resource allocation – signals materially manifest in, and justify, privilege.

Status signaling systems are clearly shaped by psychological needs and goals, such as the need for legibility (or clarity, Nguyen, 2021). Perceivers require legible means to infer status with reasonable effort (John et al., 2024). Successful status signals are thus often readily visible and, more generally, tailored to the perception and psychology of perceivers.

Established status signaling systems can offer clear "adaptive" benefits. Accurate (or "honest") signals can improve individual choices and guide social learning (Henrich & Gil-White, 2001). Inaccurate but commonly accepted signals can facilitate peaceful resource allocation and collective action (Yu et al., 2023). But status signaling systems also risk "runaway" dynamics, becoming self-referential and wasteful (Frank, 2011; Schubert & Cordes, 2013), perhaps due to fundamental informational dynamics (Braganza, 2022; John et al., 2024).

Status signaling systems thus seem a strong candidate for Singh's framework.

Cultural evolution by revealed preferences

Singh's "large island" scenario offers a useful empirical testbed for subjective selection theory, shielding researchers from too many political distractions. Yet the framework may be most impactful when applied to the more contentious realm of modern culture. For instance, a growing meta-scientific literature is built precisely on the insight that cultural selection based on (subjective) proxies of scientific value is shaping academia in a variety of predictable and consequential ways (Braganza, 2020; Browning & Veit, 2024;

Higgins et al., 2024; Peters, Krauss, & Braganza, 2022; Smaldino & McElreath, 2016).

But the most important domain of application is arguably what we might call "cultural evolution by revealed preferences." How do subjective consumer choices (revealed preferences) lead to the continuous evolution of new goods and services? *Evolutionary economics* explores both the origins and evolution of preferences (Chai, 2017; Cordes, 2019; Veblen, 1899; Witt, 2001, 2021) and how consumer choices shape goods and services (Alchian, 1950; Braganza, 2025). A better understanding of such processes seems of overwhelming importance to address current societal challenges concerning, for example, sustainability (Braganza & Kapeller, 2025).

One critical advantage of Singh's framework is that it allows for cognitive biases and idiosyncrasies to affect selection, leading to the prediction that firms should evolve "consumption nudging" (Braganza, 2025; Braganza & Kapeller, 2025). This has profound implications. Does cultural evolution by revealed preferences naturally lead to "a carnival of addictively fitness-faking entertainment products" (Miller, 2007), super-addictive foods (van Tulleken, 2023), or perpetual consumption growth (Braganza, 2025)? These questions raise a range of thorny philosophical issues concerning individual autonomy and societal well-being (Braganza et al., 2024; Braganza & Kapeller, 2025; Rizzo & Whitman, 2019). But the significant ethical implications arguably speak for, not against, a dispassionate investigation into the role of subjective selection in modern cultural evolution.

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Cultural super-attractors in critical care: The intensive care unit as a living manifold of meaning

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Abstract

Extending Singh's theory of cultural "super-attractors," this commentary examines the Intensive Care Unit as a living model of the cultural manifold. In this high-acuity clinical environment, patients, families, and clinicians unconsciously reconstruct cultural super-attractors through ritual, cooperation, and shared humanitarian goals. Integrating psychiatric consultation reveals how these attractors transform unconscious adaptation into structured healing and recovery.

Singh's "*Subjective Selection, Super-Attractors, and the Origins of the Cultural Manifold*" proposes that human culture evolves through recurrent psychological "super-attractors," or deep motivational and cognitive patterns that reliably shape how humans construct meaning, ritual, and cooperation through the pursuit of shared humanitarian goals. Even in the absence of prior cultural scaffolds, Singh argues that these attractors generate convergent structures of behavior and belief, writing, "*hypothetically cultureless humans placed in a novel and empty habitat will eventually produce most or all of these complex traditions.*" This commentary extends that framework into the Intensive Care Unit (ICU), a unique clinical environment in which patients, families, and clinicians unconsciously rebuild culture under extreme conditions of uncertainty and death. The ICU exemplifies how subjective selection and cultural adaptation produce new, yet universally familiar cultural patterns including rituals of hope, solidarity, and transcendence that are critical for ICU survivorship.

The ICU is an archetype of the "empty habitat," Singh envisions. As an environment that is at once barren and sterile, while also overwhelming the senses through a constant barrage of light,

sound, and data, the critical care environment puts the body's "fight or flight" response into overdrive. The intensity of the environment overwhelms higher-order cognition, leaving patients, families, and uninitiated staff struggling to reconstruct meaning in the midst of radical dislocation. Yet within days or even hours, recognizable cultural structures emerge. Families arrange photographs and talismans at the bedside. Staff embody ritualized behaviors such as daily rounds and the use of subspecialized language. These endeavors stabilize collective emotion and affirm a shared set of goals for all those who pass through.

This emergent culture becomes especially apparent when viewed through the eyes of a critical care psychiatrist. A relatively new sub-specialty of Consultation-Liaison Psychiatry, embedded psychiatric consultants in the ICU setting have demonstrated numerous positive benefits across multiple systems of care, fulfilling all 5 of the IHI's Quintuple Aim framework. (Dragonetti et al., 2024; Nundy, Cooper, & Mate, 2022) Given that 1 in 3 patients admitted to the ICU will have a pre-existing psychiatric illness, and another 1 in 4 patients will carry a substance use diagnosis, embedded psychiatric consultants have no shortage of patients to support. (Pilowsky, Elliott, & Roche, 2023; Westerhausen et al., 2020) Furthermore, given the high prevalence of delirium, agitation, pain, anxiety, and demoralization in the ICU, the vast majority of critically ill patients will have at least one psychiatric target of intervention. (Devlin et al., 2018) Early evidence strongly supports the value of integrating psychiatric consultants into the ICU, not only as a means of improving patient outcomes and reducing bloated healthcare costs, but also with the hope of mitigating the long shadow of suffering that ICU survivors are forced to endure. (Bui et al., 2019; Bui, 2025)

It is with a unique lens, then, that the critical care psychiatrist may not only facilitate early neuropsychiatric engagement and recovery, but also act as an observer of larger humanitarian trends as so clearly distilled by Singh's paradigm of the cultural manifold. In the ICU, attractors such as spirituality, healing, and symbolic projection reappear spontaneously, organizing individual behavior around the universal task of preserving life. This process is neither fully deliberate nor random, but rather is shaped by unconscious cognitive biases that favor attachment, stability, and coherence. Human groups consistently rebuild meaning through these emergent recurrent forms.

A paradoxical case example helps to further illustrate Singh's argument. When critical illness has run its course and depleted the body's extensive reserves, patients may find themselves beyond the reach of ICU medicine's ability to save them. In these cases, the team may encourage a "comfort-focused" approach, which emphasizes optimizing the quality of any remaining time over pursuing futile, life-extending measures. However, it is not uncommon for patients to exhibit denial and to refuse to discuss end-of-life matters, instead maintaining hope for a miraculous recovery. Families will sometimes maintain the same steadfast stance, stating, "we don't use that word" when the conversation turns to death. Seen as a natural stage of grief, denial is an understandable coping response in the face of insurmountable distress. But seen through the lens of Chaos theory, this psychological distortion becomes an attractor in and of itself, a local point of stability which permits the patient and their loved ones to

artificially extend the selective retention of variants that demonstrate utility for satisfying goals, to paraphrase Singh's own writing.

The ICU offers a living laboratory for Singh's model to come to life. The ICU constitutes a bounded, data-rich environment for examining how unconscious and conscious processes interdigitate in real time. Physiological synchrony among families or team members, linguistic markers of self-preservation, and the evolution of bedside rituals all offer measurable indices of how shared meaning emerges under stress. Studying these dynamics could advance not only medical anthropology but also cognitive science, illuminating how the recurrent creation of cultural super-attractors can optimize patient care by providing evidence-based scaffolding to support a meaningful recovery. In this view, recovery from critical illness becomes a process of cultural as well as biological regulation: an emergent alignment between unconscious attractors and conscious intentionality. By deliberately harnessing these attractors, ICU teams can transform emergent coping strategies into structured healing rituals, amplifying these critical interventions to align individual- and group-behaviors in the midst of uncertainty and overwhelming distress. In uniting Singh's theoretical vision with the neuroscientific burdens of critical care medicine, the ICU invites us to reimagine healing itself as a cultural act, a convergence of biology, cognition, and meaning that reaffirms what it means to be human, even at the very edge of life.

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Subjective selection needs context: Culture shapes goal selection, evaluations of usefulness, and “actual” effectiveness

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Abstract

Singh compellingly describes some psychological factors that shape selection of cultural variants, but his approach gives insufficient attention to how culture shapes psychology. We argue the subjective selection account needs to pay greater attention to the psychological nuances of goal pursuit, cultural shaping of both perceived and “actual” effectiveness, and importance of social consensus cues.

As cultural-clinical psychologists, we are enthusiastic about Singh’s proposed psychological approach to how universals are selected and see applicability to our field. Healing traditions for psychological distress share universal features, such as fostering cognitive flexibility and centering the sufferer-healer relationship (Hinton & Kirmayer, 2017; Wampold, 2015). Singh’s theory of super-attractors can help us think carefully about how such universal features emerge, pointing toward more specific mechanisms.

Healing practices for mental illness likely emerge from the tendency to socially signal distress. Singh convincingly describes some psychological mechanisms that shape selection of cultural-historical variants. It makes sense that a sufferer would select healing practices appraised as useful. His approach, however, gives insufficient attention to the reverse influence: how cultural-historical context shapes psychology. Evaluations of usefulness within a cultural context are not independent of said context. Healing practices are maintained by shared beliefs about causes of and effective interventions for distress (Chentsova-Dutton & Ryder,

2020). Humans innovate – but also strongly rely on existing practices.

Singh’s account of subjective selection is well-suited to domains with concrete, easily observable, nonsocial outcomes, with clear cause-outcome relations. Yet, he describes socially embedded super-attractors with multi-determined outcomes and non-obvious links between cause and outcome. Many outcomes he discusses depend on expectancies and social norms; evaluations of these outcomes are themselves culturally shaped. In his example of mango picking, the mangos are unaware of expectancies and are not shaped by their history of watching other mangos being harvested. In contrast, babies listening to lullabies, participants in shamanic rituals – and sufferers consulting healers – are attuned to social context. Although lullabies may have universal benefits “in a cultural vacuum,” actual benefits are shaped by the infants’ learning histories and exposure to different calming techniques. Similarly, a milieu that supports a given healing practice shapes this practice’s effectiveness.

Psychological models of goal pursuit are evolving (some studies cited by Singh have failed to replicate). Recent models point to processes underlying selection and maintenance of super-attractors that are more complex than acknowledged in the target article. These approaches move beyond agentic cost-benefit models to models that highlight dynamic co-creation and co-maintenance of goal pursuit. Humans are sensitive to costs and benefits of their actions from an early age, but over time develop epistemic concern with maintaining a shared reality (Higgins, 2016). Accordingly, adults pursue goals for reasons that are not only instrumental but also socially normative (Ajzen & Kruglanski, 2019). Singing a lullaby that fails to soothe remains an opportunity to show oneself as a dedicated parent; participating in a treatment that fails to heal still reassures family and friends about one’s commitment to getting better.

Selection of goals, and ways to achieve these goals, depends on more than effectiveness beliefs and also involves goal commitment, relevant values, expectancies for the chosen strategy, and capacity to control the problem, all of which are dynamically modulated by prior experiences of goal pursuit (Ajzen & Kruglanski, 2019). Different behaviors allow people to meet the same goal (equifinality); the same behaviors can serve different goals (multifinality). Goals are pursued within ecologies of other – potentially conflicting – goals. Consider a potentially effective new healing practice introduced to a community by visitors from abroad. Some people might include this practice as they seek healing because of prior positive experiences with other cultural practices from the same origin; others might use it exclusively in order to show that they are modern; still others might reject it because they place a higher value on goals of maintaining tradition and resisting outside influence.

Like goal selection, usefulness in the service of subjective selection is not evaluated in a cultural vacuum and is partially shaped by one’s history with, and local beliefs about, a given practice. In interpersonal domains especially, effectiveness is not independent of what is culturally understood as effective; for example, is assertiveness or humility a better way to fulfill social goals? Healers build efficacy beliefs by delivering something objectively effective and also by capitalizing on joint expectations and the quality of the relationship. Effective healers share a

common “illness myth,” a cultural model of illness and its treatment, with sufferers – one that includes beliefs about the healer’s effectiveness (Frank, Frank, & Wampold, 2025).

A sufferer participating in a healing practice for the first time likely has some familiarity with how it unfolds. Broad cultural assumptions inform the approach: belief in the power of spirits supports shamanic healing; belief in the power of emotional release supports many psychotherapies. Beyond perceptions of effectiveness, such beliefs are central to “actual” effectiveness. There is now considerable evidence that the placebo effect is better conceived as a “meaning effect,” reflecting the influence of effectiveness beliefs even at a biological level (Benedetti, 2021; Moerman, 2002). Most contemporary psychotherapies are at least moderately effective, an observation explained by so-called “common factors,” such as rapport with the healer and the shared illness myth. A similar rationale may explain the effectiveness of traditional healing practices for at least some presentations of mental illness (Nortje et al., 2016). Certain interventions do offer additional advantages, but neither sufferers nor practitioners are well-attuned to this valuable cost-benefit information, raising further questions about the limitations of effectiveness evaluations (Lilienfeld et al., 2013).

From this vantage point, we find it hard to believe that people across a wide range of cultural-historical settings would continually make similar subjective judgments about effectiveness in domains with multi-determined outcomes. A more psychologically realistic account would propose that super-attractors emerge universally in part because they are evaluated as effective regardless of consensus, but also because they facilitate consensus that they are meaningful – and hence, effective. Selection of super-attractors is not purely subjective, but fundamentally cultural, with feedback loops ensuring stability. Super-attractors stand out not only for their capacity to be selected, but also for their capacity to fit in with broader sets of psychological intuitions, generating shared reality and positive expectancies. The advantages of super attractors lie not only in their perceived effectiveness and propensity to be selected in many different contexts, but in their remarkable stability once chosen.

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Whose subjectivity? Power and inequality in cultural selection

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Abstract

Singh’s framework of subjective selection compellingly links individual cognition to cultural convergence. My commentary emphasizes that subjective selection is hierarchically mediated: not all individuals have equal capacity to shape or transmit their evaluations. Hierarchies of influence, authority, and interdependence determine whose perceptions are amplified into cultural traditions. Accounting for inequality and social power clarifies how the cultural manifold reflects both shared psychology and the unequal distribution of influence within human societies.

Introduction

Singh offers a compelling account of how cultural universals and convergent traditions – what he calls super-attractors – emerge from psychological processes of subjective selection, or the crafting and retention of cultural variants that people evaluate as useful for satisfying proximate goals. His framework links individual cognition with population-level cultural evolution, offering a theoretical synthesis of models grounded in group selection and adaptive functional design. It provides a foundation for generating new hypotheses about cultural evolution and psychology. I aim to extend this framework, emphasizing that subjective selection is not evenly distributed across individuals. The capacity to contribute subjective perceptions to the cultural manifold depends on hierarchy, power, and interdependence.

Unequal capacities for subjective selection

Singh rightly observes that individuals evaluate cultural variants through the same cognitive processes that guide goal-directed

behavior. Yet not all individuals have equal power to shape which variants persist. Some possess greater power, communicative reach, or credibility (Cialdini & Goldstein, 2004; French & Raven, 1959). Their preferences are more likely to become institutionalized. Subjective selection is thus filtered through social asymmetries that determine whose evaluations are promoted and retained.

This raises a question about the nature of subjectivity. The motivation to affiliate with influential others may be part of the subjective selection Singh describes. Yet is subjectivity necessarily endogenous, rooted in internal evaluation, or can it be exogenously shaped? If my sense of appeal is overridden by others' approval or cues from the powerful, is my preference still "subjective"? If so, the boundary between subjective and social selection blurs. Subjective selection is often mediated by social feedback, as perceptions of utility are continually recalibrated by others' reactions and expectations (Bénabou & Tirole, 2006; Fehr & Schmidt, 1999). People's evaluations are socially contingent: what seems valuable depends on others' success, available alternatives, and hierarchies. Individuals attend to the behavior and outcomes of high-status models when judging what is desirable (Henrich & Gil-White, 2001). Consequently, subjective appeal is never purely subjective but relational and conditional. This tendency may itself reflect evolved adaptations for recognizing and deferring to individuals with greater knowledge or expertise (Hagen, Garfield, & Lightner, 2025).

The social filtering of cultural variation

If subjective appeal is socially structured, then so is the persistence of cultural variants. Storytellers, ritual specialists, and leaders often control the channels through which variation is introduced and reproduced (Garfield & Lew-Levy, 2024; Henrich & Gil-White, 2001). Cultural convergence thus depends not only on shared psychology but also on the opportunity to innovate and the platform to communicate. In oral traditions, stories persist only as long as they are told, and the ability to tell them depends on social position, memory, and audience. Many community members may hold different versions of a tale, each reflecting idiosyncratic goals, yet only a subset – often the skilled, charismatic, or institutionally sanctioned – shape the canonical form that enters collective memory.

Linguistic change offers another example. Innovations are rarely distributed evenly through a population but emerge and stabilize through the speech of socially influential individuals. Classic studies by Labov (1973) and Milroy (1980), and computational models of lexical diffusion on social media (Eisenstein et al., 2014), show that people with prestige or wide bridging ties disproportionately shape language change. This process of prestige borrowing demonstrates how subjective evaluations and perceived utility are filtered through social hierarchy, as others adopt the speech patterns of the influential to signal affiliation or upward mobility.

Perception, transmission, and hierarchy

In discussing adaptiveness, Singh argues that what matters is whether people perceive a tradition to be useful – a challenge to adaptationist reasoning. Still, I suspect perception alone cannot sustain traditions. For subjective selection to influence the cultural manifold, perceptions must be communicated and accepted. Individuals without access to social information or institutional support may perceive a variant as useful but remain unable to

translate that perception into collective behavior. Conversely, powerful actors can diffuse individually maladaptive values through their control of communication and enforcement (Paige & Paige, 1981). The emergence of super-attractors reflects both convergence in psychological goals and unequal capacities for expression and retention.

Singh briefly acknowledges that power differentials shape the evolution and stability of institutions. I see this as a starting point for broadening the framework. Hierarchy is an essential feature of human social life (Boehm, 1993; Redhead, 2024; von Rueden, Durkee, & Garfield, 2025). Our species' dependence on cooperative networks means that individuals rarely act as isolated actors (Syme & Balliet, 2025). Instead, goal pursuit and evaluation occur within webs of obligation and deference. Many individuals adopt variants not because they find them compelling but because influential others define them as such. Leaders, elders, or religious specialists may shape what counts as instrumentally valuable, aligning followers' evaluations with institutional norms (Garfield, Hubbard, & Hagen, 2018; Hagen et al., 2025). Even when followers internalize those evaluations, the process begins with asymmetrical power.

Emphasizing that subjectivity is socially conditional strengthens Singh's argument. It situates subjective selection within an unequal social ecology of influence. Cultural traditions converge not only because humans share motivational architectures but because some individuals consistently occupy positions from which their preferences become disproportionately influential. Accounting for these asymmetries connects subjective selection with findings in leadership, prestige bias, and cumulative culture. In small-scale societies, leaders and skilled specialists routinely guide communal decisions (Garfield, von Rueden, & Hagen, 2019; von Rueden & van Vugt, 2015). Their evaluations, filtered through reputation, reciprocity, and institutions, become focal points around which collective traditions stabilize. Similarly, in large-scale societies, elites, media figures, and corporations structure collective attention, shaping which cultural variants are amplified and ultimately attain super-attractor status (al-Gharbi, 2024).

Conclusion

Singh's concept of subjective selection offers an elegant unifying framework for understanding cultural convergence. I hope my comments extend this framework by emphasizing that the process is hierarchically mediated: the ability to influence which cultural variants persist is unevenly distributed across individuals and institutions. By incorporating inequality, power, and interdependence into models of subjective selection, we can better explain not only why certain cultural forms arise repeatedly but also whose subjectivities shape the enduring structure of the cultural manifold.

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Abstract

We are sympathetic to Singh's argument for ascribing a central role to agency within cultural evolution. In our opinion, however, his account oversimplifies the relation between agents and their environments, treating goals merely as internal cognitive states. Work in cognitive ethnography reveals that goals emerge in interaction with, and are constrained by, physical and social features of the environment.

Singh argues for subjective selection as a key driver in cultural evolution. We applaud the target article's rejection of purely adaptationist accounts of cultural evolution and its acknowledgment of the role of human agency. In these respects, Singh's argument is consistent with a trend in the philosophy of biology for recognizing the agency of the organism in giving direction to phylogenetic change (Walsh, 2014). We disagree, however, with the assumption that acknowledging the role of agency implies that the mechanism of cultural evolution is primarily subjective. Rather than seeing agency as something located in the individual subject and expressed outward, we would argue that agency is better understood as an emergent feature of agent–environment dynamics (Malafouris, 2013; Stewart, 2019). By describing agency as merely “subjective,” the target article, in our view, oversimplifies the cultural evolution story.

At the heart of Singh's account is the claim that subjective selection retains those behaviors that are “evaluated as instrumentally useful for satisfying goals” (our emphasis). This implies a linear story: first, people formulate a goal, then they engage in trial-and-error behaviors aimed at fulfilling the goal, then the results are evaluated, and the behavior is either retained or rejected. This is an intuitively plausible story. There is, however, a rich tradition of studying human behavior that acknowledges a more interactive and substantive role for the environment in shaping goal states (e.g., Dewey, 1896). Singh's organism-centered and static view of subjectivity, we believe, leads him to overlook several ways that the environment enables and constrains goals.

(1) *The environment plays a role in constraining goal states.* Cognitive ethnographers working in the distributed cognition tradition have described how goals are pursued within real-world tasks (Hutchins, 1995, 2014). For example, in maritime navigation, navigators must reliably be able to reach land and return to their starting point (Fernandez-Velasco & Spiers, 2024). Those systems of navigation that fail this test will not reach the goal evaluation phase. They will be selected against not by the subjective evaluation of the navigators but by the objective constraints of the environment. To give an account of the evolution of navigation systems, then, one must give an account of the objective constraints at play. The same argument can be extended to goal-directed behavior in general: goals are typically not prior cognitive states but arise through moment-to-moment coupling with an environment that “breathes back” possibilities, resistances, and attractors (Stewart, 2019).

Subjective selection requires objective constraints

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(2) *The physical environment plays a role in discovering goal states.* The target article portrays artistic practices as “technologies for pleasure,” that is, as instruments for fulfilling the hedonistic goals of agents. In research on creativity, however, goals and intentions are typically found to emerge, to a large degree, *within* the creative process. Bernini (2014) suggests, for instance, that producing a literary text involves “material agency”: the paper and pen, and the material aspects of language and imagination interact with and change the intentions of the writer. Pearlman, McKay, and Sutton (2018) discuss the historical case of Elizaveta Svilova, the editor and wife of Russian film director Dziga Vertov. As Svilova works with the material, cutting and splicing the film, she surrounds herself with the different reels, carefully categorizing and organizing them in her workspace. This manipulation of the material should not be seen as merely “technical” but as an integral part of the creative process: “[E]ditors don’t think first and then act, they think through acting.” In other words, Svilova’s creative goals emerge through interaction with the material. Her creative agency is also deeply entwined with Vertov’s since the two worked closely together in the editing process, making it difficult to assign epistemic credit for the creative output to one or the other. This blending of Svilova’s intentions and goals with the “material agency” of the film and the agency of her partner is hard to square with a linear story of creativity as the fulfillment of pre-existing goals. The creative process is inherently interactive. Similar conclusions can be found in studies of many other creative practices, including architecture, music, or making comics (Haraldsen & Trasmundi, 2025; Rietveld & Brouwers, 2017; Wheeler, 2018).

(3) *Subjective goals are socially contested.* The target article focuses on interesting “erroneous” systems of behavior, such as shamanism and witchcraft, and suggests that these, like spears and igloos, are “compelling solutions to instrumental ends.” This, however, overlooks an important question: compelling to whom? What Singh describes as “subjective benefits” can often be better understood as objective benefits to some powerful members of the social group. Singh’s lack of attention to social hierarchy leads him to disregard its shaping role for the goals of individual agents. In an ethnographic study of an emergency ward, Trasmundi and Steffensen (2016) show how medical goals can emerge in social interaction. In their case study, a doctor and nurse jointly make a medical decision that departs from standard procedure. Crucially, the nurse’s initial goal is to follow procedure, but she ends up deferring to the doctor’s initial doubt. Such cases show that goal states can be affected by hierarchical social structures. In general, cultural patterns often emerge as stabilized power asymmetries (Stewart, 2019). Cultural selection, then, is not simply subjective endorsement, but the institutionalization of certain social trajectories over others. What we are suggesting is that cultural institutions survive over time not because they seem like the best system to everyone in the population, but because it is in the objective interests of certain members of the group to retain them, and that the power asymmetries inherent in them can have powerful effects on the goals of agents.

Taken together, these points reveal a blind spot in Singh’s account of subjective selection, which assumes a linear trajectory: goal → action → evaluation. In reality, the discovery, pursuit, and social contestation of goals is more complicated and interactive (Trasmundi et al., 2024). A more complete account of cultural evolution will recognize the interplay between subjective states of

the agent and objective constraints provided by material, social, and cultural features of the environment.

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Language is a super-attractor: Does it evolve through subjective selection?

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Abstract

Language exemplifies Singh's super-attractor concept while testing the explanatory limits of subjective selection, which is just one of the processes of cultural evolution. Subjective selection explains many linguistic features through speakers' instrumental goals. However, other types of processes also shape language evolution: some, related to learning and perception, for instance, will not involve intentions or conscious selection. Others involve intentionally creating and transforming linguistic constructions rather than merely selecting them from random mutations.

Languages are cultural traditions that combine great complexity with universal emergence across diverse environments. Singh defines super-attractors as sociocultural phenomena representing packages of functionally interrelated attractors. Languages fit this characterization precisely. They are packages of words and constructions, each itself an attractor maintained through cultural transmission. The word "cat," for instance, is an attractor comprising token sounds similar to /kat/ associated with mental representations similar to [CAT]. Languages emerge reliably in every known culture. In fact, language may be the paradigmatic super-attractor even though Singh makes no mention of it.

Can language evolution be explained by subjective selection and subjective selection alone? Subjective selection refers to the production and selective retention of cultural variants evaluated as instrumentally useful for satisfying goals. Studying subjective selection means privileging explanations that treat agents as goal-directed and endowed with psychological mechanisms making them effective at achieving these goals. We find this approach promising and useful because it applies methodological individualism to explain social phenomena and also their evolution over time.

Languages are culturally evolved technologies for satisfying speakers' informative intentions. Singh characterizes cultural traditions whose function is achieving goals as technologies. This works well for language: speakers craft utterances to achieve communicative goals, primarily to affect their audience's mind by conveying intended meanings. Thus, many linguistic features indeed result from subjective selection.

The terms a language develops are precisely terms about things people want to discuss – terms helping them achieve informative goals. Kinship terminology provides a compelling example. Rather than simply tracking genetic relatedness, kinship systems reflect social relationships that matter for predicting behavior, cooperation, and resource allocation. People develop kinship terms representing information about genealogical distance, social rank, gender, and group membership – precisely the information having predictive validity for understanding how individuals will behave toward one another. This likely represents subjective selection as speakers retain linguistic distinctions serving their instrumental goals to shape and refer to social relations (Jones, 2003; Nettle & Heintz, 2025).

Differential case marking provides another example: it refers to the fact that nouns are marked for their grammatical role only if this information cannot be derived from world knowledge. This also likely results from speakers choosing to minimize effort while maximizing communicative success. When ambiguity threatens communication, speakers add marking; when meaning is

recoverable from context, they omit it. Smith and Culbertson (2025) demonstrate that these efficient patterns emerge specifically during communicative interaction (rather than at the learning stage), supporting a subjective selection account.

However, subjective selection has limits. Singh's framework privileges conscious, goal-directed behavior, so its explanations are limited to behavior resulting from individual motivations. This leaves out the many unintended effects of behavior, which contribute to shaping cultural phenomena. Additionally, intentions and motivations themselves need explanation. Understanding why people have the goals they have contributes to explaining cultural evolution and falls outside subjective selection's explanatory reach. It falls in the domain of evolutionary psychology, and thus, subjective selection must be coupled with accounts of the evolved architecture of the mind.

Sperber's (1997) analysis of the factors that shape cultural evolution emphasize the necessity to include "sub-personal" factors: mental processes not always reducible to belief-desire psychology; they include mental capacities and their properties, whether related to learning, motivation, memory, or attention. Cultural evolution studies require attention to cognitive processes operating below conscious intention, leading social scientists to better integrate findings from cognitive psychology. Sperber thus advocates for "infra-individualism" as going beyond methodological individualism.

Vowel spacing provides an example for infra-individualism. Languages tend to preserve maximal phonetic dispersion in their vowels: that is, the centroids of the distinction vowels are as distant from one another as possible given the number of vowels and available acoustic space (Liljencrants & Linblom, 1972). Yet, no speaker decides to have nicely spaced vowels. Rather, the regularity is a consequence of a low-level mechanism called peak shift. Tokens of a vowel X that fall closer to the centroid of vowel Y are usually misclassified by learners as tokens of Y. Thus, the centroid of X that they learn is biased relative to the actual production distribution by other speakers, in the direction of being further from the centroid of Y (Labov, 1994). The emergent effect of this in populations of learners is the gradual repulsion of vowels in acoustic space (or, their merger). Subjective goals play no direct role in the explanation. Learning biases shape language evolution in ways that cannot be reduced to speakers' conscious intentions. Weak biases, which can operate below conscious awareness in individual learners, can nonetheless have strong effects on socially learned systems' structure (Kirby, Griffiths, & Smith, 2014).

Finally, the term "subjective selection" may be misleading. It evokes natural or artificial selection, implying that random mutation creates options and choosers simply favor one over another. Processes of cultural evolution, however, involve agents creating and transforming variants in either goal-directed or unconscious ways, not merely selecting among random mutations. Consider the evolution of slang. New slang terms are often deliberately invented to achieve specific social goals – signaling group membership, establishing social identity, and preventing outgroups – the bourgeois – to understand what is said. The inventions involve computations of what kinds of substitutions will be funny, obscure, humiliating, apt, etc., and so the innovations are far from random.

A complete understanding of language as a super-attractor is a rich research field, which – under the name of "language evolution" research – has made many advances in recent years. The field recognizes that subjective selection plays a role, but also identified many factors that drive systematic transformation and non-

intentional processes related to mental processes such as learning, remembering, and perceiving. Singh's target article provides a useful reminder that analyzing human behavior as goal-directed has great explanatory power. Still, infra-individualism adds tools from cognitive psychology to the social scientist's toolkit.

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Will cultural evolution regain its sight?

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Abstract

The field of cultural evolution has long emphasized forms of social learning where learners are “blind” to payoffs of cultural traits, while neglecting “sighted” processes like guided variation. We review new insights that could inform psychologically enriched models of social learning. These insights reveal new ways that blindness creeps into selection, even when agents appraise the payoffs of cultural traits.

Science requires exploration, yet sometimes this exploration leads us back to the familiar. Farmers were breeding plants and animals

centuries before Darwin published *Origin of Species* (Gould, 1992). Likewise, cultural evolutionists have always known that people have subjective preferences, but now they may be ready to discover it. Singh frames this discovery with the idea of “subjective selection”: that “super-attractors” of culture (e.g., dance songs, shamanism) are selected through explicit preferences.

Although subjective selection is intuitive, and has been foreshadowed by theories of guided variation, the origin story and development of cultural evolutionary science make Singh's argument valuable. His argument is also timely, as new insights from psychology could also enrich how we understand cultural evolution. Although these insights could be framed as giving cultural evolution its sight, they also point to new forms of blindness within subjective selection.

How cultural evolution went blind

Cultural evolution was developed by population geneticists and biologists (Boyd & Richerson, 1988; Cavalli-Sforza & Feldman, 1981), and it has always been modeled closely after biological evolution. In biological evolution, inheritance alone does not cause systematic evolutionary change, except in rare cases like meiotic drive (Mesoudi, 2016). Similarly, animals do not change their genes through conscious will. These principles, translated to cultural evolution, imply that people should not systematically select cultural traits during the transmission process, nor should they re-engineer traits after inheritance. Instead, cultural traits should change through processes that are “blind” to their function, just like genetic mutation is blind to the function of the mutated genes. A classic case of “blind” cultural evolution is prestige-based transmission, in which people copy all traits of prestigious people without knowing which traits have made them prestigious (Henrich & Gil-White, 2001; Richerson & Boyd, 2008).

No cultural evolutionist has claimed that cultural evolution unfurls solely through blind processes. In *Culture and the Evolutionary Process*, Boyd and Richerson (1988) introduced the process of “guided variation,” in which an individual acquires a cultural trait, intentionally modifies it, and then passes it on. In our own work, we have applied guided variation to model the cultural evolution of language (Jackson et al., 2022), religion (Caluori et al., 2020; Jackson et al., 2021), and emotion (Lindquist et al., 2022).

Nevertheless, blind processes are undoubtedly more popular and more synonymous with cultural evolutionary thinking than “sighted” processes like guided variation. Perhaps blind processes became popular because they were not already well-established in the social sciences. Perhaps it is just more counterintuitive to think of cases where people copy and preserve a cultural trait without understanding its function than to think of cases where people copy a trait they perceive as valuable.

The mind in the cultural machine

Despite the value of blind processes, they clearly do not explain all forms of cultural change (Pinker, 2012), and Singh's target article is right to observe their limits. We agree with Singh that it is a good time for cultural evolution science to regain its sight. Fortunately, there is also no need to build models of subjective selection from scratch, as psychologists have been studying subjective selection for many decades.

Reviewing three insights from these studies shows how humans go beyond classic blind processes like prestige-based learning, but

also reveals curious new forms of blindness. The first insight, for example, is that people do not always know what will benefit them (Kahneman, Knetsch, & Thaler, 1991). Humans are Bayesian, which means that we would rather stick with what we know rather than learn new tricks (Lieder & Griffiths, 2020). This tendency can produce cultural regularities that we would not expect if humans simply selected cultural traits with the highest payoff (Kirby, Dowman, & Griffiths, 2007). Cultural systems can amplify this inertia, especially when strong norms raise the coordination costs of cultural change (Gelfand, Harrington, & Jackson, 2017). When norms are strong, people may opt for conformist transmission, even when they recognize there are non-conformist alternatives.

Second, even when people try to do what benefits them, they may focus on the wrong time horizon. Temporal discounting – choosing strategies with high payoffs in the short run but lower payoffs in the long run – is the classic example of this error (Samuelson, 1937). But problems with the time horizon can be more insidious. For example, people can learn to prioritize strategies that work well in few-shot dilemmas (“disengage after people are hostile”) but ultimately lead to inaccurate beliefs (“hostility is common”) because they prevent learning (you never find out that hostile people can also be nice) (Denrell, 2005). Similarly, people show little ability to learn from short-term failure, showing poorer memory for failures than successes (Eskreis-Winkler & Fishbach, 2019). Even “sighted” subjective selection can thus be blind to ultimate function.

Third, people do not always know *how* something will benefit them. Learning can be “model-free” (using immediate memory of reward) or model-based (involving a causal model of how behaviors yield reward) (Daw et al., 2011). Psychological studies show that low-volatility environments select for model-free learning, meaning that people learn and inherit cultural traits without a causal model of how they work (Roberts-Gaal & Cushman, 2023; Roberts-Gaal, Bolic, & Cushman, 2025). Through the same process of reinforcement learning, people may even subjectively select social learning strategies (e.g., conformist versus prestige-based learning) without knowing why (Schultner, Molleman, & Lindström, 2025).

The benefits of blindness

Many other insights should be listed here, but reviewing them comprehensively would require another target-length article. However, even this brief review reveals a common theme: Even in cases of “subjective selection,” people may be blinder to ultimate cultural payoffs than we might intuitively think (Gigerenzer & Selten, 2002).

Singh’s article may foreshadow a new wave of cultural evolutionary science that models “sighted” processes, but sight is not everything. Blind processes – either the classic learning biases of cultural evolution or the modes of bounded rationality that have been described by psychologists – show good evidence, and they undoubtedly contribute to both “super” and “minor” cultural attractors. Just because cultural evolutionists have discovered the value of sight, they need not forget the benefits of blindness.

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Beyond usefulness: Symbolic super-attractors in the cultural manifold

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Abstract

Singh sees cultural convergence as people choosing traditions that seem to work well in practice. I build on this by looking at symbolic super attractors, like ancestor worship or cosmic diagrams. These can last for a long time since they fit human ways of thinking and give people a sense of deeper grounding. Unlike practical choices, which are judged by how effective they are, symbolic ones are valued for how well they make sense and hold together. Recognizing both sides gives a clearer picture of how cultures form and endure.

Singh argues that many cultural universals emerge through *subjective selection*, whereby cultural variants are created, adopted, and retained because people evaluate them as instrumentally useful for achieving recurrent goals such as healing illness, calming infants, or resolving disputes. In this account, traditions such as shamanic rituals, lullabies, and justice systems spread because they appear to “work” for those who practice them, leading to convergence across societies despite historical and ecological variation.

Singh also notes that the cultural manifold includes traditions whose persistence cannot be explained solely by immediate causal efficacy, including religious beliefs, ritual systems, and symbolic practices that address existential concerns rather than practical problems. Building on this observation, I suggest that Singh’s framework can be extended to distinguish cases in which cultural variants are evaluated primarily for instrumental success from cases in which they are evaluated for symbolic coherence and meaning. This distinction is not explicitly articulated by Singh, but it follows naturally from his emphasis on goal-directed evaluation as the driver of cultural convergence.

Practices such as ancestor worship provide a useful illustration of this extension. Cross-cultural research indicates that some form of ancestor veneration occurs in a large majority of documented societies (Norenzayan, 2013). These practices persist even though their effects are not directly measurable in instrumental terms, suggesting that their selective appeal lies elsewhere. Prior work in the cognitive and anthropological literature points to several contributing factors: kinship psychology that extends social obligations beyond death (Boyer, 2001), prestige-biased transmission that reinforces respect for admired ancestors (Henrich, 2016), emotionally salient rituals that enhance memory and cultural transmission (Whitehouse, 2004), and the provision of ontological

coherence by situating the dead within a broader cosmological framework (Geertz, 1973). Interpreted through Singh’s model, ancestor worship can be understood as a case in which subjective selection favors practices that satisfy symbolic and existential goals rather than instrumental ones.

A similar pattern can be observed in the widespread recurrence of cosmological diagrams such as mandalas, yantras, and labyrinths. These symbolic forms appear across diverse cultural contexts despite lacking direct practical function (Boyer, 2001; Lévi-Strauss, 1963). Their persistence can be explained by their symbolic appeal: they align with esthetic preferences for symmetry and order, render abstract cosmological ideas perceptually accessible, and support shared cultural identities through collective ritual engagement (Geertz, 1973; Sperber, 1996). Here, again, Singh’s framework accommodates these cases if subjective evaluation is understood to include symbolic satisfaction alongside instrumental success.

Recognizing this distinction clarifies how subjective selection can account for convergence in both practical and symbolic traditions. Instrumentally evaluated practices, such as healing rituals or legal institutions, spread because they appear causally effective, while symbolically evaluated practices persist because they provide meaning, coherence, and emotional grounding (Sperber, 1996). This extension strengthens Singh’s account by showing how the cultural manifold includes universals shaped by both problem-solving and meaning-making processes.

More broadly, incorporating symbolic evaluation into subjective selection enhances cultural evolutionary theory by explaining why non-instrumental traditions recur cross-culturally without treating them as anomalies or vestiges of pre-rational thought (Boyer, 2001; Geertz, 1973). Future research could further investigate how different cultural domains weigh instrumental versus symbolic evaluation, and whether biases toward coherence, beauty, or symbolic fit predict long-term cultural stability (Sperber, 1996; Whitehouse, 2004). Without this broader view, accounts of cultural evolution risk explaining only half of the observed universals, overlooking the role of meaning-based evaluation in shaping the cultural manifold.

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Moral progress as a counter-attractor

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Abstract

Singh's model accounts for cultural convergence but not moral progress. Historical expansions in moral status and the decline of cruel punishment constitute principled departures from parochial utility optimization. Empathy, reflective override, and institutional scaffolding support such breakthroughs. Moral progress therefore functions as a counter-attractor dynamic that enables systematic divergence from utility-based equilibria and requires explanatory resources beyond subjective selection alone.

Singh's model of super-attractors, grounded in "subjective selection" as the unifying principle of cultural convergence, is persuasive in explaining why practices and beliefs stabilize through their perceived psychological utility. Yet some of the most consequential cultural achievements in human history emerged not from stabilization, but from disruption. Cultural evolution is not only a story of attractors, but it is also a story of breakthroughs. These shifts appear difficult to reduce to subjective utility alone.

It remains unclear how Singh's framework can account for instances of genuine moral progress: the transition from irrational to rational beliefs, from retributive to consequentialist models of justice, or from common-sense intuitions to counterintuitive scientific commitments. If culture is conceived primarily as a technology of subjective satisfaction, we risk overlooking the processes that enable not only the preservation but also the emancipatory transformation of norms and convictions.

Many salient instances of moral progress involve the expansion of moral status – namely, the inclusion and protection of subjects previously excluded from full membership in the moral and political community. Historical examples include formerly enslaved people, marginalized racial groups, women, sexual minorities, children, and individuals with disabilities, with recent debates extending to non-human animals and potentially future artificial agents. Broader commitments to equality, personal autonomy, and democratic rule likewise reflect this expansion (Bina, 2024).

Moral progress is undeniably a specific and theoretically demanding concept and phenomenon, whose genealogical and descriptive articulation is not straightforward, insofar as it incorporates a significant normative component. Implicit in moral progress is, on one hand, a dimension of subjective selection: individuals or groups excluded from the benefits granted to those enjoying the most advantageous social conditions aim to obtain such benefits and pursue this aim with the means at their disposal. On the other hand, moral progress also contains a dimension of

recognition, or "granting," on the part of those already advantaged, extended toward those who are less advantaged.

This latter aspect of moral progress remains a challenge for many explanatory models. This dynamic underlies core modern institutions such as human rights (e.g., the Universal Declaration of Human Rights) and is therefore crucial to explain, if we aim to sustain and extend it. On this basis, understanding how what we call moral progress (here, for simplicity, the motivated expansion of the moral circle; Singer, 2011) could emerge is also instrumental to its further advancement and preservation.

Empirical work on cooperative cognition (Tomasello, 2016), dual-process dynamics in moral judgment (Greene, 2014), and institutional "ratchet effects" in norm stabilization (Boyd & Richerson, 2005) suggests that moral expansion is supported not simply by subjective utility but also by capacities for reflective override, empathic projection beyond parochial boundaries, and the scaffolding effects of legal and cultural institutions. These mechanisms indicate a mixed architecture in which attraction dynamics coexist with counter-attractor forces enabling normative innovation.

One may concede that cognitive aspects play a relevant role, and that therefore, even within the framework of the super-attractors hypothesis, one can account for a shift – one not to be judged for now through the normative lens of values – toward solutions that are more "rational" in the sense of being more effective in achieving our aims. Cognitive factors may fit within Singh's model: magical thinking can be displaced by empirically grounded reasoning when it yields superior results, although intuitive beliefs continually re-emerge at the individual level.

In this sense, one can plausibly trace a trajectory, compatible with the super-attractors and subjective selection framework, whereby primitive forms of punishment – now considered cruel and unacceptable – are gradually replaced by sanctions oriented toward the rehabilitation of the offender rather than their affliction, because these constitute more efficient solutions in economic and social terms. Yet the cognitive component of moral progress is only one aspect of it. Even in the case of punishment practices, there is a recognition that inflicting suffering on a convicted individual – for example, through torture – is not morally right or acceptable, even if vengeful feelings continue to simmer as an evolutionary remnant (cf. Lavazza et al., 2025).

If Singh's proposal does not claim to be exhaustive, it nonetheless seems reasonable and significant to suggest modifying it so as not to leave moral progress unexplained or forced into categories that deny or diminish a phenomenon so central to human life, even while acknowledging scholarly disagreement concerning how to describe moral progress or even whether it exists.

Morality can be analyzed as a biological-cultural element independently of judgments of praise or blame. However, accounts in terms of functionalist reasoning or secondary adaptation appear insufficient to explain how certain ideas come to be established – ideas that subsequently acquire the status of normative guides, often considered *ex post* to be self-evident – for our action and for the regulation of societies. In naturalistic terms, a plausible proposal might appeal to environmental conditions that make it less costly and more feasible – also cognitively more accessible – for the empathic and altruistic tendencies we have incorporated through evolution to unfold.

If moral progress hinges on environments that reduce the cost of altruistic commitments and increase opportunities for reflective cognition, then we should observe broader moral

circle expansion under conditions of reduced ecological stress, inclusive institutions, and increased exposure to cross-group perspective-taking. In this sense, moral progress may not be an anomaly to be folded into subjective selection, but a systematic counter-dynamic, a “moral innovation engine” triggered when cognition, institutions, and social ecology align in specific ways.

This goes in a direction opposite to that suggested by super-attractors, as if, under certain conditions, the centripetal force of subjective selection were overcome by the centrifugal force of intrinsic individual motivations (Lavazza & Leone, 2025) that counter evolutionary pressures understood as the selection of the best available solutions given the environment. In other words, if super-attractors explain cultural stabilization under structural constraints, moral progress marks the operation of counter-attractor dynamics through which emotions and reflective reasoning generate trajectories that break away from purely utility-based equilibria. Future work should model moral progress as systematic normative divergence enabled by cognitive, social, and institutional conditions.

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Reasons to be fussy about subjective selection and super-attractors

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Abstract

Singh's notion of subjective selection is ambiguous between (i) the subjective selections of individual agents, and (ii) a form of cultural selection that ranges across populations. His notion of super-attraction is also ambiguous: it spells out a target for explanation, but also suggests a hypothesis for how these phenomena should be explained.

This commentary (whose title follows Morin, 2016) focuses on definitional issues raised by the two more basic neologisms among the three Singh introduces. He claims that *subjective selection* is the most important process in producing the *cultural manifold*. The cultural manifold comprises the complete set of *super-attractors*. I begin with “subjective selection” and move on to “super-attractor.”

The term “subjective selection” invites two quite different readings in the context of an article on cultural evolution. First, one might think it refers to any evaluation made by an individual agent based on their subjective desiderata. Second, one might think it picks out a specific form of cultural selection, where cultural selection is understood as a population-level process analogous to natural selection. Singh's comments indicate he is comfortable with both readings. In line with the first interpretation, he suggests that subjective selection can take place on the shortest of timescales when “a person has a goal, they invent a solution, they evaluate the extent to which that solution achieves the goal.” In line with the second interpretation, he suggests psychological processes “cumulatively give rise to population-level cultural evolutionary dynamics, including subjective selection.” The two interpretations come apart, however, in various ways (Lewens, 2004; Walsh, Lewens, & Ariew, 2002). For example, according to standard conceptions, natural selection relies on token entities having differential reproductive success. In other words, natural selection, along with forms of cultural selection that are meant to be analogous to it, requires parent-offspring relations between the entities undergoing selection. Singh, however, mentions “shared cultural ancestry” as an *alternative* to his own cultural selectionist explanation of shared similarities across cultures. It is clear enough that here he is thinking of “shared cultural ancestry” in very broad-sweep terms, which might trace all the way back to a kind of cultural “African Eve.” But, on most standard views, unless some more local shared ancestry is in play – unless, that is, there are cultural lineages to be traced – it makes no sense to think of cultural selection at work. This is where the ambiguity in the two notions of “subjective selection” becomes significant: one does not show that *subjective (cultural) selection* is at work solely by showing the importance of individual agents' *subjective selections*.

This brings me to super-attraction. Singh's primary goal is to explain cultural phenomena that are robust, in the sense that they develop “around the world and in societies of diverse subsistence strategies and social organization,” and also complex, in the sense that they “are not merely a collection of discrete components; rather, they relate dynamically to produce new, emergent properties or functions.”

By labelling these robust and complex cultural phenomena “super-attractors,” Singh does not merely draw attention to their existence as worthwhile explanatory targets. A super-attractor is a scaled-up cultural attractor in Sperber's (1996) sense. “Attraction,”

so understood, is a notion that earns its keep because it points – via more precisely-specified “factors of attraction” – towards an understanding of the reliable recurrence of resembling cultural representations without bit-by-bit copying (Sperber, 2000). Imagine two agents, *a* and *b*, who are confronted with the same type of situation and who need to respond to it in some way. Suppose *a* produces a solution of type *S*; *b* notices *a* and also produces a solution of just the same type *S*. This could be because *b* carefully copies each element of *a*’s solution bit-by-bit. But Sperber points out that it could also be because *a* and *b* share cognitive biases in how they approach problems, or because they face similar constraints in terms of raw materials they can use, or because the problem itself has just one very obvious functional solution, or because of many such “factors of attraction” acting individually or in concert (Buskell, 2017; Scott-Phillips, Blanke, & Heintz, 2018). In using the term “super-attractor,” Singh implicitly conveys – although he does not explicitly argue for it – that whatever explains the prevalence of robust and complex cultural phenomena, it is *not* bit-by-bit copying.

There is no contradiction in combining cultural selection and (super-)attraction in just the manner Singh alludes to. Imagine one is trying to explain the prevalence of a solution *S* in a population. It could be that a single individual initially discovers *S* alone. A few others casually observe that individual – who becomes, because of this, a cultural “parent” – and their observation inspires them to produce similar solutions through the action of commonly-held cognitive processes coming into contact with similarly-constrained resources. They, too, are then observed by others, and the process iterates until *S* is dominant. Here, there are reproductive cultural lineages without bit-by-bit copying, and forms of cultural selection and cultural attraction consequently work hand-in-hand (Lewens, 2024). But although this might be how things work sometimes, one can also imagine circumstances where there are no easily identifiable cultural “parents”; instead, *S* may spread through far more diffuse transmission pathways, perhaps because agents, once again with similar cognitive and material constraints, are repeatedly exposed to a whole series of different models who have developed *S*. At the limit, one might even imagine an exogenous environmental change that leads many different individuals’ subjective “selections,” again informed by their shared constraints, to favour *S* across a population. Here, there may be no form of cultural transmission – or cultural selection – at work at all.

Singh’s evidence points squarely towards the importance of subjective goals and preferences in the explanation of cultural phenomena, and in this respect his paper is a success. However, to secure the importance of subjective (cultural) selection, one needs to show that the best way to understand the repeated re-occurrence of resembling cultural phenomena must appeal to proliferating lineages of reproducing cultural items. This requires ruling out an alternative, namely, that widely-held subjective goals and preferences give rise to the repeated re-constitution of resembling cultural representations without any clear lineage formation. I take this to be one of the lessons of cultural attraction theory: if it holds for basic attractors, it holds for super-attractors also.

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On the originality of subjective selection and the importance of payoff-biased diffusion and migration in shaping the cultural manifold

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Abstract

I suggest that, first, the broad framework of subjective selection proposed by Singh is not as different from existing research in cultural evolution as is made out, and second, that an under-discussed but important cause of cross-cultural regularities (the “cultural manifold”) is payoff-biased diffusion or migration between societies.

I appreciate Singh’s focus on the proximate psychological goals that people employ when evaluating and adopting different cultural traits. However, I would like to make two points regarding Singh’s target article, one related to the broad theory of subjective (cultural) selection and one related to the claims regarding cross-cultural universals (the “cultural manifold”).

First, while commendable, I do not see Singh’s broad framework of subjective selection as so different to many existing strands of cultural evolution research. Singh claims that “[u]nlike cultural group selection or cultural evolution through cue-biased transmission (e.g., imitating the healthy, successful, or prestigious) . . . subjective selection emphasizes subjective appeal over objective benefits.” Yet prominent theories regarding cue-biased transmission mechanisms already assume that the cues people use to adopt cultural traits are subjective. Take prestige bias, for example. In Henrich and Gil-White’s (2001) formulation, prestige bias

occurs when people copy others whom they *perceive* as being prestigious. These prestigious people may often possess adaptive (objectively or ultimately beneficial) knowledge or skills, but not necessarily. Rather, prestige is a subjective shortcut to acquiring adaptive cultural traits. Earlier models of prestige-like dynamics (Boyd & Richerson, 1985) showed that while prestige (aka “indirect”) bias is broadly adaptive, it can misfire precisely because subjective prestige does not always correlate with objective success. This leads people to copy irrelevant or maladaptive traits exhibited by prestigious individuals. Experiments confirm that people are sensitive to this correlation, moderating their use of subjective prestige cues based on whether they correlate with objective success (Brand et al., 2020) and whether that success was attained in a relevant domain to the trait being copied (Brand, Mesoudi, & Morgan, 2021).

Elsewhere, transmission chain experiments show that information that is subjectively appealing, e.g., that evokes disgust (Eriksson & Coultas, 2014), has negative valence (Bebbington et al., 2017) or concerns social interactions (Mesoudi, Whiten, & Dunbar, 2006), is preferentially recalled and transmitted. This is not necessarily the “objectively” correct or true information. In my study, made-up social information about fictional characters was transmitted better than factual but non-social information about climate change (Mesoudi et al., 2006). Models (Tanaka, Kendal, & Laland, 2009) and real-world data (de Barra, Eriksson, & Strimling, 2014) show how objectively ineffective, or even harmful, medical treatments can spread due to the biased subjective perception of their efficacy. And as Singh acknowledges (in Section 6.2. “Addressing assumptions of adaptiveness”), even in experiments which show that cultural evolution can occur without causal understanding of why a trait works (e.g. Derex et al., 2019), there is still the subjective evaluation of alternatives and selection of the best-performing cultural variant.

It is unclear to me how cultural selection could be anything other than “subjective,” except perhaps when driven by blind genetic algorithms or machine learning. The real question is when and why proximate, subjective psychological mechanisms converge or diverge from what would enhance individual inclusive fitness (or perhaps group fitness, under specific circumstances). This brings to mind Durham’s (1991) the distinction between “primary value selection,” where traits are selected based on goals derived from genetic evolution (e.g., the pursuit of food, shelter, or sex), and “secondary value selection,” where the goals are themselves derived from social learning (e.g., the pursuit of money, stamps, or video game points). I suspect Singh’s focus on subjective selection will be most useful in focusing attention on explaining where these latter, secondary, socially learned goals come from, how they themselves culturally evolve over time, and in some cases diverge from primary values.

Second, Singh argues that complex cross-cultural regularities – the “cultural manifold” – typically arise via independent convergence due to universal aspects of human psychology, which act to generate similar subjective selection pressures. While this may well be true for many of the examples he gives, especially shamanism and musical commonalities, other potential explanations for the cultural manifold should also be considered. While Singh dismisses deep/common ancestry as an alternative to independent convergence, he does not fully consider another more likely alternative: payoff-biased diffusion or migration across societies. (As an aside, this is perhaps ironic given the many quotations from Franz Boas in the

target article, who was a prominent advocate for diffusionism within anthropology, e.g. Boas, 1937) Formal models have shown that both convergence and diffusion can generate identical patterns of cross-cultural regularity (Mesoudi, 2021), while historical data show that many traits spread across societal borders via payoff-biased diffusion or migration, from agriculture (Fort, 2015) to glass-making (Macfarlane & Martin, 2002) to musical instruments (Nia et al., 2015). Payoff-biased diffusion or migration is also a key factor in the spread of complex social institutions, as seen for example in post-feudal Japan’s adoption of Western institutions related to the police force, post office, and print media (Westney, 1987) or the spread through history of institutional religions often due to their consequences for cooperation (Schulz et al., 2019; Stark, 1996). Indeed, the more complex and therefore unintuitive or difficult to learn the cultural trait, the less likely it is to be independently reconstructed (Mesoudi, 2021). So while studying the psychological mechanisms driving independent convergence is important, we should not be blind to the equally important study of cultural diffusion and migration as drivers and shapers of the complex cultural manifold.

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Cultural affordances

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Abstract

Singh emphasizes how individual-level processes, including motivation, shape cultural evolution. I suggest this approach can be enriched by considering cultural affordances – the goal-relevant opportunities and threats that a cultural variant might provide to an individual. This framework might be useful for explaining not only cultural universals but also nuances in variation between and within cultures.

Why do humans develop some cultural elements, such as religion, music, and stories, so reliably? In the target article, Singh provides an important answer: these packages of complex culture become common precisely because they appeal to humans – people might perceive them as instrumental in achieving some of their goals, or simply as enjoyable or interesting. This emphasis on individual motivations adds to previous approaches, which have typically focused on heuristics such as conformity or prestige biases.

Here, I suggest that Singh's approach resonates with the concept of *affordances* and that this approach can be useful not only for understanding cross-culturally common phenomena but also for understanding nuances in cultural variation.

Gibson (1979) proposed that the perceptual system is organized around affordances – opportunities offered by the environment to a perceiver. A chair, for example, is not seen merely as an elevated flat surface, but as something that “invites” or “affords” the

opportunity to sit. However, for someone desperate to defend himself from an intruder, a chair might instead pose the affordance of “weapon” (Ko & Neuberg, *in press*). Thus, what matters is not simply what an object *is*, but what it enables the perceiver to do.

This concept has been productively extended beyond the perception of the physical world. In social perception, people are highly attuned to characteristics in others that cue potential threats and opportunities (McArthur & Baron, 1983; Neuberg, Kenrick, & Schaller, 2010). Likewise, different environments afford distinct opportunities and threats for different individuals (Ko & Neuberg, *in press*).

Subjective selection could also be thought of as operating through the perception of *cultural affordances* – the opportunities and threats that participation in or endorsement of a cultural element afford. (Note that others have used “cultural affordances” in slightly different ways, such as to refer to the types of behavior or expression that one's culture allows.)

Singh focuses primarily on explaining cross-cultural similarities. Because people share many universal motivations, there is substantial overlap in which cultural elements are perceived as useful. However, this approach may similarly be valuable for understanding variation, both between and within cultures. Just as the perceived affordance of a chair might vary with the perceiver's goals and abilities, the same cultural variant might offer tangible benefits to some individuals but might significantly inhibit the goals of others.

By considering how goals and problems differ between societies and between individuals, we can consider how and why they might vary in the cultural affordances they perceive. To demonstrate how this approach might apply to variation, consider the example of religion.

The perception of cultural affordances likely varies as a function of features of the cultural variant as well as the goals, abilities, and vulnerabilities of the individual. By considering these factors, one might make several predictions about the cultural affordances people will perceive in religion. As reviewed in the target article, prosocial religions include strong norms that favor cooperation. Accordingly, individuals tend to promote punitive religious beliefs to the extent that they are motivated to police others' behavior and believe that religious norms effectively promote cooperation (Fitouchi et al., 2025).

Religious involvement can provide other affordances, too. In much of the world, religious commitment is more strongly correlated with attitudes towards family and sexuality than with endorsement of cooperative values (Moon, 2021). Given that many world religions emphasize sexual morality, one possibility is that those who benefit from such norms will find religious beliefs to be more plausible or meaningful. This might explain patterns in religiosity across the lifespan: young adults often become somewhat less religious, while becoming a parent tends to increase religiosity (Blekesaune & Skirbekk, 2023). In such cases, it is not that religious beliefs change, but that religion provides different affordances for people at different life stages.

One implication of this approach is that the underpinnings of a given cultural variant might differ across time and place. The perception of cultural affordances likely relies not only on properties of the cultural variant but also on the ability of the perceiver to gain benefits from it. Thus, it is not necessarily the case that the

same cognitive biases or motivations will facilitate religious belief in every case. This might explain why some common patterns in religiousness vary across cultures. Whereas religious belief is typically negatively correlated with socioeconomic status and women tend to be more religious than men, there are instances where religion is more of a tool of the elite (Seabright, 2024) and where men are more religious than women (Irons, 2001; Moon, Tratner, & McDonald, 2022). This might suggest that previous findings do not reflect some inherent propensity for certain groups to be religious, but rather that, *in the societies where these findings were produced*, these groups were more likely to perceive religion as affording important opportunities. Considering how people perceive cultural affordances may provide a useful framework for understanding such nuances.

Culture is an emergent property of the decisions of individuals (Baumard & André, 2025), and Singh provides a valuable framework for understanding what makes individuals choose certain cultural variants. My hope is that this perspective can help understand not only super-attractors that recur across cultures, but also nuanced patterns of variation that arise when different individuals and societies perceive culture as providing distinct opportunities and constraints.

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Spandrels in the cathedral of the mind

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Abstract

Reviving Gould and Lewontin's critique of adaptationism, Singh's subjective selection favors truth over useful simplification. Nonetheless, while psychologically plausible, its explanatory power remains limited. Moreover, by treating evolved psychology as fixed, it neglects gene-culture coevolution. The result is a vision of cultural evolution whose expansiveness risks outpacing its scientific utility.

Gould and Lewontin famously used an architectural metaphor to critique the adaptationist program in biology (Gould & Lewontin, 1979). So overconfident were biologists in the omnipotence of selection that many of the fancied adaptations they documented were, in reality, mere byproducts of other true adaptations.

Gould and Lewontin were also motivated by another concern: the veracity of models (Ullica Segerstråle, 2000). “All models are wrong, but some are useful” is an adage usually attributed to the British statistician George Box (Box, 1976). Nonetheless, for Gould and Lewontin, such an attitude forgot that the utility of a theory was intrinsically linked to its accuracy. As such, rather than seeking productive simplifications, such as assuming adaptation, Gould and Lewontin felt that evolutionary theories had to grapple with the full complexity of biological processes.

Did these critiques land? Certainly, they are well remembered. Nonetheless, they did not fundamentally change the way biologists go about their work. Everyone accepts the dangers of naïve adaptationism, but no one owns up to it! Moreover, few agree with the proposed relationship between accuracy and utility. Thus, the importance of Gould and Lewontin's argument is perhaps more rhetorical than scientific.

Turning to Singh's article, both of these concerns – excess adaptationism and the balance between truth and utility – re-emerge as motivating factors for subjective selection. Assessing it in this light raises the question of whether Singh's proposal will succeed where Gould and Lewontin's did not. I suggest that, as presented, it faces the same challenges: an impressive exposition of a broad worldview, but ultimately of limited scientific impact.

The essence of subjective selection is that individuals perform actions that they believe will help them achieve their goals. This can be contrasted with other broad theories of human behavior that emphasize payoffs, utility, or evolutionary fitness (Laland & Brown, 2011). Such an emphasis is, of course, a simplifying assumption; evolutionary fitness may only rarely be a factor that individuals explicitly consider. Subjective selection, by contrast, is undoubtedly closer to reality. It acknowledges that when individuals evaluate their options, they do so in terms of what

perceived benefits they bring the decider and whether this satisfies them.

But what value does this truthiness bring us? At best, it accounts for a range of recurrent cultural phenomena that other theories cannot. At worst, it is just a middleman; selection shapes our appetites such that by doing what feels good, we end up maximizing our fitness anyway. This is the first challenge to which Singh rises, documenting cases where traits are maintained by subjective preferences in the face of fitness costs. Such an account is far from complete, and fitness costs are hard to pin down, but the manuscript makes a good start.

A second challenge is to distinguish subjective selection from other theories of cultural attractors, which similarly explain recurrent patterns in cultural variation by virtue of biases in cognition (Buskell, 2017; Sperber and Hirschfeld, 2004). Here, the differences are in the details. Subjective selection pins its aspirations on the specific claim that it is subjective evaluations that create these patterns. However, it is not surprising that individuals seek to do what they think will benefit them. So, what exactly is the benefit of subjective selection? To prove utility beyond mere truth, it should provide novel predictions. Singh does provide a number of predictions in Box 1; however, these all test whether people make choices in line with their goals, which is not inconsistent with other theories. What is needed instead are predictions of specific cultural phenomena that other theories would not anticipate. What kinds of traits, as yet unexplored, are costly yet meet subjective needs and so can be predicted to be widespread? If subjective selection can pull this off, it will deservedly displace other similar theories, but until then, its utility is unclear.

Singh's cautiousness to assume cultural traits are adaptive is laudable given the ease of adaptationist storytelling. However, there is an important complication. For biological evolution, the constraints on adaptation are often immutable physical constraints. It is the physical requirements of domes that necessitate the spandrel. For cultural evolution, variation exists in a mental, not physical, world, and the constraints or biases the mind imposes are themselves products of evolution and so subject to additional evolutionary change. Such a view challenges the possibility of cultural spandrels maintained by subjective selection because for any sufficiently costly cultural side effect, biological evolution can, in theory, rework our subjective appetites to remove it.

Singh's solution to this is to question the possibility of such a biological change. Thus, the mind becomes a fixed landscape on which the evolution of cultural variants under subjective selection plays out. Such a position is akin to the meme's-eye-view of earlier decades. Nonetheless, I find it hard to accept, as it neglects the coevolution of mind and culture, a process that is central to contemporary thinking on the evolution of human cognition. A softer stance might be to suggest that the different pace of genetic and cultural change (Perreault, 2012) means that there will be an extensive period in which subjective selection can maintain cultural spandrels before genetic change removes them. However, there is evidence that gene-culture coevolution can dramatically accelerate genetic change, rendering such effects short-lived (Morgan & Feldman, 2024). Additional processes, such as cultural group selection, will further accelerate the removal of costly cultural practices (Zefferman & Mathew, 2015). As such, the only long-lasting cultural spandrels will be those that do not harm fitness, implying that subjective selection alone cannot be a complete ultimate explanation as Singh intends.

In sum, while I appreciate the anti-adaptationist and psychological leaning of subjective selection, it does not yet offer a novel and comprehensive account for human cultural phenomena. It may be accurate, but unless it can make insightful predictions, it will not surpass other existing theories. It is right to caution against naïve adaptationism, but the diminishment of gene-culture coevolution and cultural-group selection risks the baby being thrown out with the bathwater.

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The pros and cons of reverting to methodological individualism

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Abstract

I read Singh's stimulating proposal as a comeback to methodological individualism: social and cultural phenomena are driven by individual motivations, given by individuals' subjective

reasons for action. Singh's version of this classic doctrine is useful when it leads him to question cultural group selection. But contrary to methodological individualism, the cognitive mechanisms shaping culture are not necessarily conscious, coherent, or causal.

Manvir Singh's target paper contains much new material and some that is less new. Unusually, this comment focuses on what is less new, not to diminish Singh's own contribution but to provide some historical context that partly explains why the path he proposes for cultural evolution has not been taken so far.

A hundred years ago, Max Weber laid out an ambitious program for the social sciences (e.g., Weber & Tribe, 1921/2019). To simplify, Weber's program rested on one assumption and one goal. The goal was a comparative study of political, legal, and religious institutions across cultures. The assumption was that social change is chiefly a consequence of people's subjective motivations. A widely successful example of the Weberian approach is, of course, his analysis of capitalism. In the beginning, capitalistic accumulation had to be chosen by individuals who, by devoting their time and energy to the storing of wealth, went against their society's values. They selected a capitalist lifeway for reasons that made subjective sense to them. Understanding those reasons was, Weber argued, the core of the social scientist's job. This general theoretical orientation, methodological individualism, had a considerable posterity far beyond Weber (Heath, 2024). All major theoretical schools in the social sciences had to take a stance towards it.

Cultural evolution's relationship with methodological individualism is complicated. The two approaches have much in common, starting with an atomistic view of social phenomena (built into the discipline by the routine use of agent-based models) and a wariness of holistic approaches. Yet, the core tenet of methodological individualism, the centrality of individuals' subjective reasons for action, is not exactly a cornerstone of the discipline. Why? The answer differs from one school to the next.

Cultural group selection is a heterogeneous family of models and theories (Morin, 2016; Richerson et al., 2016). Some of its proponents are staunch supporters of methodological individualism (e.g., Gintis, 2007). Yet, as Singh rightly notes, the most famous and impactful group-selectionist models tend to be those where a cultural practice becomes widespread even though it runs counter to the immediate interests of those adopting it, like « strong reciprocity » (e.g., Gintis et al., 2003). Relatedly, proponents of cultural group selection have emphasized the possibility that cultural practices (like food-processing technologies) may spread even though the individuals adopting them do not know why the practices are useful or even that they are useful at all (Dereck et al., 2019; Henrich, 2016; see Lewens, 2024, and Osiurak & Reynaud, 2019). If these models are accurate, cultural change can happen even if it goes against the grain of clear individual preferences or if its effects are not even registered by individual minds. In other words, cultural evolution can be blind to individual motivations. I agree with Singh that there are too few clear examples where cultural evolution acts like a « blind watchmaker », short-circuiting cognition. If Singh's framework can serve as an antidote to cognition-blind cultural evolution, so much the better.

Cultural attraction's lack of fit with methodological individualism has other roots. That theory stresses the importance of individual cognition for cultural change. The psychological factors that shape culture include goal-directed action and what accompanies it: subjectively available beliefs, desires, and reasons for acting. But the list does not stop at this level. One important

motivation for cultural attraction as a research program is to draw the consequences, for social science, of psychological discoveries that were not available when social science's main theoretical frameworks were formed. The founders of methodological individualism, like early theorists of *Homo Economicus*, built their frameworks on a view of human behavior in which action is driven by beliefs and desires that are conscious, coherent, and have causal power. They did not know about the cognitive unconscious, the modularity of mind, or bounded rationality. Since then, much has been learnt about psychological mechanisms that may not be conscious, or coherent, or causally efficient. Much of our cognitive life is but poorly integrated within the set of conscious beliefs and desires that form our subjective sense of self; for that reason, Sperber (1997) made a plea to replace methodological individualism with an « infra-individualism ».

Cognitive mechanisms are not necessarily consciously accessible – hence, they are not always subjectively assessed. Most languages have a harmonic word order, where numeral adjectives occupy the same position as other adjectives (as in “two chairs”/ “blue chairs”) (Culbertson et al., 2020). This is an easier syntactic structure to learn, even for speakers who grew up learning a non-harmonic language. Yet, speakers have little insight, if any, into the mechanisms that makes an harmonic order more learnable. Here, cognition impacts culture without conscious selection.

Contrary to another central tenet of methodological individualism, the individual judgments that shape culture may not form a coherent set of beliefs; alternatively, they may be coherent but not causally efficacious – that is, post hoc rationalizations that do not drive behavior. This has been well studied in the case of “theological correctness” – the mismatch between official religious dogmas and the beliefs, often implicitly held, that drive behavior even in rigorously trained religious specialists (Barrett, 1999). For instance, believers in Christianity or Hinduism explicitly endorse the view that God(s) are not located in space, yet routinely act and speak as if the opposite were true. The contradictory nature of these beliefs is no obstacle to their adoption: on the contrary, the possibility of switching between two contradictory interpretations of the same concept, one more intuitive than the other, can make religious concepts easier to manipulate and memorize (Boyer, 2007). Here, a cultural trait spreads, but for reasons that agents subjectively reject.

The point here is not to dispute the fact that people have irreplaceable insight into what drives them. Not all beliefs or desires are conscious, coherent, and causally efficient, but some are all three, and they matter for cultural change. The point is to adopt a finer-grained and more accurate view of cognition, and in so doing to illuminate some blind spots of standard social science.

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Functionalism versus the structuralist tradition

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Abstract

I contrast Singh's subjective functionalism with structuralist-related approaches in anthropology, where “attractors” are not isolated packages of beliefs and practices but robust relationships between such packages within cultural systems. While impressive in its synthesis, Singh's account falls short of explaining a defining feature of human culture: its holistic nature. I use shamanism as an illustrative example.

In *A Scientific Theory of Culture* (1944), Malinowski suggested that cultural institutions develop to satisfy psychobiological needs. Singh's own scientific theory of culture draws on an impressively broad range of research to make a similar functionalist point: culture develops to satisfy psychobiological “goals.” However, functionalism in anthropology has largely been abandoned since Malinowski's time due to a string of criticisms that paved the way to structuralism and related approaches. Structuralism's central insight is that we cannot explain a cultural element in isolation but only in terms of the *relationships* it forms with other elements in the system. For the structuralist, it is the structures of such relationships, when emerging in robust patterns, that form the key components of the cultural manifold. Lest we risk intellectual history going around in circles, it is useful to rehearse a few structuralist-inspired criticisms of functionalism and see how Singh responds to the challenge. I will keep my focus on shamanism, which for Singh functions primarily as a technology to control uncertain outcomes (see also his well-received recent book, Singh).

One of the earliest criticisms of functionalism targeted its apparent circularity: functionalism explains cultural institutions by the functions they fulfill, which are seemingly inferred from the institutions themselves (Jarvie, 1964). To counter circularity, functionalists need independent criteria for these functions, but the recourse to “subjective” selection seems to pre-empt that very move. To what degree is Singh's theory of shamanism open to the same critique?

Beyond this, structuralists would argue that functionalist analyses of individual “super-attractors” fall short of explaining the holistic nature of culture: the fact that cultures can constitute structured wholes in which disparate domains can share the same set of organizing principles (Descola, 2014; Lévi-Strauss, 1966; Otto & Bubandt, 2010; Sahlin, 1978). Consider, for instance, Stépanoff's (2025) recent analysis of Siberian shamanism, which distinguishes between the “heterarchical shamanism” of groups like the Chukchi or Koryak and the “hierarchal shamanism” common among the Tuvans and neighboring groups. In heterarchical shamanism, so-called “dark tent” rituals occur in sensory-deprivation settings with minimal imagery, where the shaman simply facilitates the participants' active engagement with spirits. In hierarchal or “light tent” shamanism, participants passively watch a dramatic, imagery-rich performance, in which the shaman claims exclusive power of mediation with spirits.

These institutions are not simply packages of practices and beliefs for dealing with the unknown. The packages are much broader. Stépanoff was able to show that to these rival forms of shamanism correspond different forms of marriage (an institution that, on the surface, seems unrelated to shamanism). In societies with hierarchal shamanism, the groom's family pays bridewealth, just as the community collectively supports the shaman. In heterarchical shamanism contexts, the son-in-law works for the bride's family, just as the shaman serves individuals rather than the community. These two forms reflect contrasting understandings of autonomy – one allows delegation of responsibility, the other emphasizes individual obligation – that act as an organizing principle for the culture in question as a whole.

In anthropology, the term “attractor” has been used to refer to such structural relationships among cultural practices (Mosko & Damon, 2005; pace Sperber, 1996), which compels us to analyze these practices only as parts of larger cultural systems. Intuitively, a theory aiming to explain the near-universality of cultural institutions should also explain why they almost invariably form part of

larger wholes underpinned by shared organizing principles. How, in short, can subjective functionalism explain the holistic dimension of culture?

A further issue with functionalism is its neglect of power relations within and between societies, as well as between genders, which can also manifest in robust structural patterns. Why, for example, does shamanism tend to lose its ecstatic elements as a society becomes more hierarchical and centralized? Why is spirit possession predominantly a female phenomenon in societies with high gender inequality? Why do shamans in societies where shamanism is the mainstream religion typically hold hereditary or elite status with roles tied to public morality, while in peripheral cults, shamanism attracts the downtrodden, and spirits are often amoral? (Lewis, 2002). It seems impossible to explain these near-universal patterns without taking into account power relations.

Singh might argue that while power relations may – albeit in significantly robust ways – shape the local *expressions* of shamanism, the latter remains the true super-attractor that must be explained in terms of its perceived function of controlling the unknown. However, anthropologists have also noted that power relations shape the *motivation* for, and the *perceived utility* (to use Singh's terms) of, shamanism, depending on context. Lewis (2002) has shown that shamanism and spirit possession in peripheral cults function primarily as a means of empowerment, allowing marginalized women to engage in otherwise unacceptable behaviors while attributing their actions to spirits. These are “thinly disguised protest movements directed against the dominant sex” (2002, p. 26), rather than means of controlling uncertain outcomes. Power seems to be an inextricable element in the patterning of the cultural manifold.

It is also debatable whether shamanism should be conceived as a technology to control uncertain outcomes, more generally. Stépanoff (2025) instead defines it as a “technology of the imagination,” insofar as it cultivates a dissociative capacity for mental imagery that develops universally from childhood. This capacity is neither “non-ordinary” nor primarily focused on controlling uncertain outcomes (Harris, 2000). There is a “close relationship between shamans who travel to the moon and dreamers with their heads in the clouds” (Stépanoff, 2025, p. 27). From this perspective, shamanism does not *primarily* arise from “goals” but is instead an integral part of the basic human capacity for the imagination, one that certain societies nurture and certain societies repress (see Bloch, 2008 for a related argument about “religion”).

A final point on Fox's “Experimental Eden” thought experiment: imagining a new human society, free of any previous cultural influence, established on a remote island, is an impossible thought experiment because culture is path-dependent and inseparable from ontogeny. We still have little understanding of our phenotypic plasticity. We simply cannot predict what the cultural manifold could evolve into under radically different ontogenetic conditions.

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Basic emotions underlie both proximal and distal behaviors, resulting in social institutions that are either adaptive, vestigial, or a little of both

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Abstract

The concept of super-attractors downplays the impact of basic emotions upon decision-making. The complexity of emotions belies the instinctual nature of such emotional systems, which are ultimately established by genetics and evolutionary processes. Examples of super-attractants may perhaps be better framed as evolutionary adaptiveness versus vestigial/byproduct behaviors.

Singh introduces the concept of cultural super-attractors, which are complex and robust cultural institutions whose stability is borne from collective subjective appeal and not necessarily objective benefits or evolutionary history. This system supposedly leads to the existence of non-adaptive cultural institutions such as dance, lullabies, and shamanism. Singh overlooks notable genetic links to both primary aesthetic emotions and complex behaviors (Plomin et al., 2016; Vukasovic & Bratko, 2015). The concept of “subjective selection” appears rooted in basic emotional drives, and such instincts are mostly dictated by a long phylogenetic history.

Cultural activities will often have a viable path to our evolutionary past even though such behaviors may sometimes seem disconnected from survival. One idea, so often ignored in

evolutionary studies, is that an adaptive trait need not be adaptive in every situation. Not every expression of anger is evolutionarily adaptive; however, the sum total of all expressions of anger throughout history must have ultimately been adaptive for mammalian organisms. In a similar vein, not every sexual impulse enhances survival (e.g., masturbation and pornography). These apparent contradictions do not nullify our general belief that aggression or sexual desire are evolutionarily adaptive. Such vestigial or byproduct behaviors are “tolerated” by evolutionary processes.

Let’s examine lullabies (and music), one of the flagship examples of a non-adaptive super-attractor. Whether it be songbirds or alarm calls, vocalizations in the animal kingdom are typically considered evolutionarily adaptive. Music appears to be the outcome of a dedicated neurocognitive system (Szyfter & Witt, 2020) that triggers a variety of pleasurable emotional states that can be simultaneously communicated to every conspecific in the group. Many traditional societies produce music during important tribal rituals, including war dances, but not every musical institution needs to be evolutionarily adaptive. Rock bands and orchestras may be no more adaptive than lullabies in traditional societies. I would argue that music is a *vestigial* phenomenon (no longer particularly helpful for survival), while rock bands and lullabies are *byproducts* akin to masturbation and pornography. These byproduct behaviors each have their own idiosyncratic history and do not necessarily follow a universal theme like super-attractants.

In a similar vein, Singh suggests shamanism is a conscious strategy to control uncertain outcomes; however, shamanism appears to occur at a much more unconscious level. Although the idea has received little traction among psychiatrists, shamanism and schizophrenia appear to share a similar phylogenetic history. A detailed explanation of the shamanistic theory of schizophrenia is beyond the scope of a brief commentary (Polimeni, 2012; Polimeni, 2022); but put simply, where schizophrenia is common, shamanism is not, and where shamanism is practiced, hallucinations and delusions are interpreted as magico-religious communication. Shamanism is not precisely schizophrenia because schizophrenia represents the biological experience of magico-religious thoughts (i.e., hallucinations and delusions), while shamanism is a social role, well-suited for those on the schizotypal spectrum – similar to how tall people are well-suited to be basketball players.

Every religion whose beginnings are known has originated from the mind of one individual (Labarre, 1972). This shaman or prophet almost always experiences some form of magico-religious communication with the gods in the form of hallucinations and delusions. Shamans are the creators of traditional religious folklore, and the rest of us have the capacity to receive the signal. Spirituality may be evolutionarily advantageous because it facilitates a number of prosocial activities, such as bolstering morality, enhancing fighting morale, and prompting divination. Incidentally, there is little evidence that distrustful environments beget paranoid psychosis, as Singh suggests. The prevalence of paranoid psychosis is fairly uniform throughout the world, and accordingly, paranoid thinking (e.g., schizophrenia) is rooted in genetics and biology.

One key point about the schizophrenia-shaman connection is that so many behaviors occur at an unconscious level. While most

people readily identify emotions that cause physiological changes, such as anger and sexual attraction, many other supposed emotions are not so easily felt. Investigating these amorphous emotions is often the basis of psychodynamic interpretations around such complex emotions as narcissism, obsessiveness, or latent hostility, to name a few. Therefore, emotions appear to be complex instinctual responses that have the capacity to be evolutionarily advantageous in key situations. In the case of shamanism, I have proposed that religiosity is not rational but based on very subtle spiritual emotions (i.e., the feeling that something greater out there could conceivably influence the tangible world). This emotion appears to be present in almost all humans to varying degrees.

That the invisible hand of evolution can produce a distinct phenotype within a species (i.e., shamans) can be theoretically (and jointly) supported by such evolutionary mechanisms as group selection, frequency-dependent selection, heterozygote advantage, and perhaps antagonistic pleiotropy (Hunt & Jaeggi, 2022).

Under Singh’s hypothesis, it would seem that sports should be considered a super-attractor. Almost every traditional society and contemporary culture engages in some form of sanctioned games (Lombardo, 2012); and such games are usually imbued with the necessary emotions to war with others. Sports (and war) seem to universally trigger three pleasurable emotions: glory, excitement, and camaraderie – perhaps to counterbalance fear. Sports may be an evolutionarily adaptive behavior when used directly as practice for war, but it may be a vestigial or byproduct behavior in other circumstances, such as online video games or a football match.

In summary, Singh’s idea of super attractants is thoughtful and interesting but does not seem to replace plainer concepts that simply invoke the constructs of evolutionary adaptiveness versus vestigial/byproduct behaviors.

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From selection to surgery: Aesthetic chills bridge subjective functionalism and cognitive calibration

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Abstract

In this commentary, we argue that aesthetic chills provide empirical evidence for Singh's subjective functionalism. These pleasurable and measurable somatic events mark dopaminergic-mediated validation when cultural artifacts resonate with cognitive architecture. Research demonstrates chills can be predicted, induced, and therapeutically deployed for depression. This transforms aesthetics from ornamental to functional, revealing how feeling drives cultural transmission while enabling interventions.

Why do all cultures, despite no direct contact, converge on remarkably similar aesthetic practices that consume substantial resources without overt adaptive value? Singh's "subjective functionalism" offers a compelling answer: cultural forms persist and converge because they feel good to individuals across our shared humanity, with positive epistemic emotions serving as a universal compass to navigate and shape the cultural manifold. Here, we review a decade of empirical research across affective neuroscience, psychology, and neurotechnology, providing direct evidence for this subjective functionalism: aesthetic pleasure acts as a reinforcement signal for culturally learned meaning.

Aesthetic chills (hereafter, chills) – the involuntary shivers or goosebumps that accompany moments of awe or transcendence in response to cultural devices such as art, science, and religious rituals – offer a precise model of how feeling encodes meaning with clear neurobiological correlates. Chills are discrete, measurable bodily events that occur when perception and cognition resonate along the cortical hierarchy (Schoeller & Perlovsky, 2016). Oftentimes, the experiences resulting in chills satisfy an inherent "knowledge instinct" (Schoeller et al., 2018) that drives humans to seek meaning through non-propositional pathways when conventional epistemic channels exhaust themselves, triggering somatic validation that confirms deep structural resonance between cultural artifact and cognitive architecture. Neuroimaging links chills to dopaminergic circuits of the ventral tegmental area, nucleus accumbens, and orbitofrontal cortex (Blood & Zatorre, 2001; Salimpoor et al., 2011) as well as synchronized theta and beta oscillations across prefrontal and limbic networks (Chabin et al., 2020). Dopamine release during chills signals not mere hedonic

pleasure but the validation of high-level layers in a hierarchical world model (Schoeller et al., 2024a). The dopaminergic system whispers: "This fragment of the cultural manifold illuminates your position within it; integrate accordingly."

In machine learning, grokking occurs when an overfitted model suddenly achieves generalization after extended training with no visible progress, mirroring the cognitive leap from rote memorization to comprehension. Physiologically, chills correspond to such a "grok" event, the moment when prediction error collapses, and learning saturates (Schoeller, Eskinazi, & Garreau, 2018). Subjectively, chills co-occur with insight, unity, meaning, and self-transcendence (Christov-Moore et al., 2024; Schoeller et al., 2024a). Interoceptive awareness mediates this relationship: individuals more attuned to bodily signals report stronger insight and positive affect (Christov-Moore et al., 2025). Together, these data demonstrate that aesthetic pleasure is a precision signal guiding model calibration – the mechanism by which Singh's "felt usefulness" shapes cultural transmission.

The same principles that explain how art transmits knowledge also enable its deliberate modulation. Once societies learn to evoke chills reliably, they gain leverage over the mechanisms of epistemic validation. Modern media already exploit this through music, film scores, and viral videos; we have compiled a validated database of such chill-eliciting stimuli: ChillsDB (Schoeller et al., 2023). Importantly, no stimulus universally evokes chills, with susceptibility systematically varying as a function of demographic, personality, and state factors (Schoeller et al., 2024b). Such resonance profiles define micro-cultures of aesthetic preference that may serve as the empirical substrate of Singh's cultural attractors.

In therapeutic settings, we have begun to recognize the potential for these aesthetic super-attractors to serve as precision technologies for recalibrating maladaptive beliefs. In a trial of patients diagnosed with major depressive disorder, conceptualized as disorientation within the cultural manifold, exposure to ChillsDB stimuli decreased shame and increased self-acceptance, mimicking key phenomenological aspects of psychedelic therapy (Schoeller et al., 2024c). Similar work showed improved reward learning in anhedonic depression (Jain et al., 2025). These findings suggest that chills re-engage mesolimbic reward circuits, offering a non-pharmacological path to belief revision and motivational restoration. Building on this, we developed "schema surgery," a generative-AI framework that produces personalized variants of ChillsDB stimuli to deactivate specific maladaptive schemas in depression (Schoeller et al., 2024). This system effectively engineers micro-cultural experiences that restore coherence and meaning – an applied realization of Singh's cultural functionalism within precision psychiatry.

If chills index the interoceptive signature of epistemic alignment, their mechanism can be targeted directly through neurotechnology. Indeed, it has been shown that a device that generates cold and vibrotactile sensations along the spine of participants at specific chill-inducing moments from ChillsDB stimuli, the occurrence rate and intensity of chills significantly increase (Haar et al., 2020). With such success, it becomes sensible to consider augmenting chills using neuromodulation (e.g., transcranial focused ultrasound (tFUS; Dell'Italia et al., 2022)) to modulate mesolimbic and insular networks, amplifying the bodily shiver and corresponding dopaminergic activation (Schoeller et al., 2024c). Alternatively, neurofeedback offers an interesting avenue to permit a shift from chills as a surprising event to a volitionally induced

state; by displaying real-time indices of the neural signatures and the distance between current and expected (chills) neural states, individuals could learn to voluntarily control the onset of chills.

The ability to engineer chills carries profound ethical implications. Cultural technologies that harness chills can align or distort belief systems with equal power – a neurophysiological substrate for what Singh warns could become directed cultural evolution. Indeed, terrorist recruitment videos that emphasize shared humanity through martyrdom demonstrate how chills can be co-opted for ideological control. Yet, when used transparently and therapeutically, precision aesthetics can restore alignment in individuals “lost” in the manifold – those suffering from depression, anhedonia, or meaning crises (Jain et al., 2025; Schoeller et al., 2024a). In this sense, chills are both probes and promoters of meaning (as workouts are for fitness): they reveal and repair the coupling between world and self.

In line with a long tradition in aesthetics dating back to its foundation, aesthetics, as Singh proposes, is the interface where feeling meets cognition. Our findings extend this claim: aesthetic emotions are not decorative by-products but core cognitive calibration mechanisms that can now be measured, modeled, and modulated. The chills response bridges subjective conviction and objective neurobiology, transforming art from ornament into instrument. With neurotechnologies that allow humans to self-induce the very feelings art once evoked, culture may outgrow its artifacts. In the words of Konrad Lorenz (1974), humanity may “direct its own evolution” – not biologically but cognitively – by mastering the aesthetic mechanisms that once guided it “blindly.”

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If lullabies and hero stories are super-attractors, what are music and language? Absolute universals imply genetic mechanisms

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Abstract

I praise the synthesis and expansion of attractor theory to explain statistical universals, but critique its failure to explain absolute universals. I agree that lullabies, hero stories, and shamanism are good candidates for primarily cultural evolutionary explanations, but argue that the larger, most universal categories they are sub-

phenomena of – music, language, religion – require gene-culture coevolutionary explanations.

Singh's explanation of near-universal "super-attractors" is the most persuasive case I've read yet, generalising cultural attractor theory to phenomena widespread across cultures. Singh frames his approach as addressing what he calls "laws that apply across time and throughout human history" in order to solve what Boas (1896) called "the most difficult problem of anthropology." This makes it sound like Singh will address what are known as "absolute universals" found in all societies without exception. But in fact, Singh focuses on "near-universal" traditions (also known as "statistical universals"; Bickel, 2011; Brown, 1991; Savage, 2019).

At the top of most lists of absolute universals is the uniquely human capacity for language, which has been described as "what makes us human" (Fitch, 2010). Arguably, next on the list might be music (for which Singh has helped provide some of the strongest evidence for absolute universality; Mehr et al., 2019), along with things like religion, tool use, and control of fire (Brown, 1991).

The examples of super-attractors Singh provides include multiple examples that can be seen as restricted cases of broader absolute universals such as music (e.g., lullabies, dance songs), language (e.g., hero stories, happy endings), or religion (e.g., shamanism, prosocial religions). Yet the broader, most universal domains of music, language, and religion themselves are curiously absent from the target article (Fig. 1).

Super-attractor theory is proposed as a phenomenon relying purely on cultural evolutionary mechanisms, without requiring any genetic component. This contrasts with alternative theories that invoke gene-culture coevolutionary mechanisms (e.g., Patel, 2018, 2023; Savage et al., 2021; Savage, *In press*). Singh argues that the existence of societies such as the Northern Aché without lullabies (Aubinet, 2024; Singh & Hill, 2025) is a key challenge to gene-culture coevolutionary theories of the evolution of musicality. Yet this conflates the broader, universal category of music with the narrower, less universal sub-phenomenon of lullabies. Even the Northern Aché still sing other, non-lullaby songs (Singh & Hill, 2025), as do every other known human society throughout history (Brown, 1991; Mehr et al., 2019; Savage, *In press*).

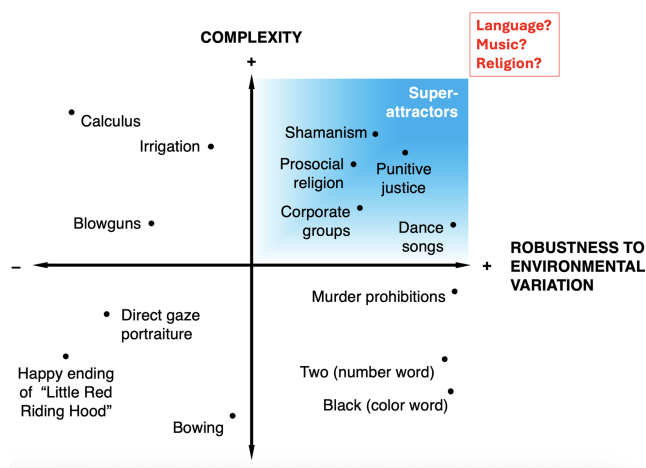


Figure 1 (Savage). An adapted version of Figure 1 from Singh's target article with an added red box containing some of the most complex and universal cultural domains. These "absolute universals" found in all known human societies without exception (e.g., language, music, religion) appear beyond the explanatory framework of super-attractor theory, and instead imply at least some genetic component.

The analogy of "cheesecake" recurs repeatedly to explain super-attractor theory. Pinker (1997) famously used the cheesecake metaphor to argue that music ("auditory cheesecake") and other aspects of arts and culture were non-adaptive byproducts of other adaptations, such as the capacity for language. But even Pinker acknowledges that the language instinct, at least, suggests biological adaptive explanations beyond a purely cultural evolutionary one (although cf. Kirby, 2017, for potential cultural evolutionary mechanisms in language evolution). Further, I have argued that this "cheesecake" metaphor is fundamentally flawed because it again conflates a non-universal sub-phenomenon (cheesecake) with the universal category it is a part of (food; Savage, *In press*).

It is true that our capacity for synchronised dancing to a beat may have originated as a byproduct of learning, as it appears to have done in other vocal learners such as cockatoos (Patel, 2024; Patel et al., 2009; Schachner et al., 2009). But among those non-human animals that have the capacity to synchronise to a beat, they do not universally employ this capacity. Humans do, which I have argued was a result of a gene-culture coevolutionary selection following its initial origins as a byproduct of vocal learning (Savage, *In press*).

Singh correctly notes that one of the major challenges for biological explanations of music (and other cultural universals) is the "absence of evidence of adaptation." But there is relatively strong evidence for the adaptive value of language, at least (Patel, 2008), and the absence of evidence for music is not necessarily the same as evidence of absence. Global experiments reveal strong and cross-culturally consistent acoustic differences between singing and speaking (Albouy et al., 2024; Anikin et al., 2023; Ozaki et al., 2024), and follow-ups are underway to directly test the potentially adaptive social bonding functions of singing vs. speaking (Savage et al., *In Principle Accepted*).

Studies of the genetic bases of musicality and language are still in their infancy, but already a number of potential candidates have begun to emerge, such as the FOXP2 gene that could be implicated in either song and/or speech evolution (Enard et al., 2002; Fisher, 2019; Haesler et al., 2007). Genome-wide association studies have started identifying dozens of other genetic variants associated with musicality and language (Alagöz et al., 2025; Niarchou et al., 2022; Wesseldijk, Ullén, & Mosing, 2023). More will likely come as the quantity and quality of data and methods continue to improve.

Such new data will provide an important opportunity to test Singh's cultural evolutionary predictions against predictions of alternative hypotheses that invoke genetic mechanisms. However, as currently framed, Singh's predictions do not mention genetics. Future studies should aim to formulate testable hypotheses, making specific predictions for purely cultural evolutionary theories vs. those that include genetic components. I will admit, however, that this is easier said than done. We did make some genetic predictions for our gene-culture coevolution hypothesis (e.g., "genetic differences (e.g., in DRD2) may predict variation in bonding experienced through musical activities."; Savage et al., 2021). However, it is not immediately clear how to conclusively test such predictions against alternative predictions of a purely cultural evolutionary theory, such as Singh's.

On that note, I'd like to emphasise that it is much easier to criticise than to propose constructive new theories, and my criticisms of Singh's proposal should not detract from the value he has provided by proposing an impressive and broad new theory. I look forward to future tests of his and competing theories to help us understand the complex cultural and biological bases of human evolution.

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Core knowledge shapes what actions are considered and how others will perceive them

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Abstract

We propose an extension in which core knowledge – innate, skeletal, and abstract cognitive representations – shape “super attractors.” They shape our cognition and our communication with others. People choose actions based not only on what they feel is right but also on whether they think others will agree. We propose that universal priors shape the space of shared intuitions.

Singh’s article focuses on “super attractors” – complex cultural inventions that appear in nearly all cultures. He argues that they result in part from *subjective* selection pressures. That is, people choose to do things that they judge as useful (either implicitly or explicitly). Because people across cultures share high-level goals, such as caring for offspring or acquiring food, and because of similarities across environments, they tend to select similar actions to achieve them.

In this commentary, we offer an extension to Singh’s model, informed by research and theories on infant cognitive development, as well as an idea first put forth by computational cognitive science, *the blessing of abstraction* (Goodman, Ullman, & Tenenbaum, 2011). We suggest that considering domain-specific core knowledge systems – for objects, agents, numbers, space, and social relations – may help explain which cultural variants become super-attractors.

Core knowledge is theorized to be the set of innate (or very easily learned), abstract cognitive representations that humans possess. It is theorized to be domain-specific and ancient: a large body of work suggests that infants have knowledge about objects, number, space, agency (Carey, 2009; Spelke, 2022), and potentially social relationships, social interactions, and communication (Kaufmann & Clément, 2014; Tatone, 2017; Thomas, 2025; Thomsen & Carey, 2013; Samani & Thomas, under review).

Aspects of core knowledge that apply to Singh’s proposal. Core knowledge is theorized to be *abstract*. Adopting a term first proposed in computational cognitive science, Spelke has argued that core knowledge can be thought of as the *primordial blessing of abstraction*, allowing infants to make sense of entities the first time they encounter them, while also retaining flexibility to adapt to diverse cultures and environments (Spelke, 2022). While core knowledge is theorized to be both skeletal and a learning mechanism that enables infants to constrain what they attend to, it is also theorized to persist throughout life. Thus, there may be universal priors that lead to overlapping intuitions of adults, making some solutions more likely to be considered and easier to

learn. This argument builds off many previous similar arguments about how innate mechanisms may shape cultural attractors (Sperber & Hirschfeld, 2004).

Second, these innate priors may also create *shared knowledge*, thereby shaping our intuitions about other people’s minds. This could mean that when people are choosing between actions, they may consider not only what is the best way to achieve a goal, but also whether others will agree. Intuitions about what falls in the domain of shared knowledge will, of course, also be shaped by culture. However, innate priors and our ability to reason about others’ knowledge may shape which practices become super attractors. In other words, while Singh’s article focuses on people across cultures judging actions similarly, people may also reason similarly about others’ interpretations of such actions.

This reasoning about shared knowledge may explain why many super attractors – like those Singh emphasizes – are public. Super attractors are not simply the outcome of private beliefs about utility; they also need to be learned. Thus, innate priors may shape which practices are intuitive to understand and therefore easy to learn, and which practices people intuit are effective; however, they may also shape intuitions about what other people will find intuitive and effective. When a shaman claims to intercede with spirits, she does so believing not just in her own efficacy, but also that others will share her intuitions about agency and causality, etc., both of which are rooted in core knowledge. Or, a shaman may believe that she can punish spirits, but also that others will share her intuition, which is why shamanism, religion, and institutions that facilitate punishment are public rather than private. Or take another example: while someone may believe that a particular social structure is the best way for their society to be structured, if they know that only a handful of others agree with them, they may not choose to devote their lives to a political revolution. Likewise, people may accept and justify practices that work against their own interests if they believe that a large proportion of the population endorses those practices (e.g., meritocracy beliefs in the United States; e.g., Benabou & Tirole, 2006; Kogelmann, 2024).

Consider the case of thinking about others’ minds – naive psychology. Naive psychology has been formalized in computational models, in which people assume others act rationally, maximizing benefits and minimizing costs (Jara-Ettinger et al., 2016; Liu et al., 2017). This way of thinking about others’ actions aligns even with the expectations of young infants, suggesting it is part of core knowledge (Liu et al., 2017; Liu, Brooks, & Spelke, 2019). People may use these intuitions not just to understand other people’s behavior but also to plan their own actions, knowing that other people make sense of actions in a similar way (Ho, Saxe, & Cushman, 2022). That is, if I call attention to how hard I worked on something, then I will intuit that others will intuit that I care about it. This can be expanded to include intuitions about other domains as well – people may have an understanding of how others think about agency, physics, etc.

All this being said, one question that applies to both our proposal and Singh’s is why we should expect this type of reasoning, which may be cognitively resource-intensive, rather than the sort of “model-free” learning he discusses (Boyd & Richerson, 1988; Lake et al., 2017). Singh proposes that individual evaluation, not blind copying, is central to cultural evolution. However, take the example of shamans, who might make different claims, and those whose intuitions resonate with others could gain prominence; the next generation of shamans could simply imitate the “celebrity” shaman without any intuitions about why they are doing so (Chudek et al., 2012). In this model, there need not be any

knowledge, either explicit or implicit, about either the “best course of action” or what others may think about them. One answer is that, just as core knowledge helps infants constrain the vast amount of information to which they have access and their hypothesis space, universal priors and the intuitions about shared knowledge that may arise from them constrain which actions are considered when people engage in model-based learning. Our proposal fits naturally into this framework: core knowledge systems provide a foundation for the structured “models” that make model-based reasoning computationally tractable and worthwhile in some cases. Studying infant cognition can help shed light on these starting states, while developmental cross-cultural studies can help us understand how cultural input shapes the processes by which these super attractors come to be (e.g., Astuti, Solomon, & Carey, 2004).

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Subjective selection needs socially transmitted goals and culturally evolving problems

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Abstract

Our commentary aims to enrich Singh’s subjective selection framework in two fundamental ways. First, language is necessary for coordinating on shared instrumental goals. Without it, the explanatory burden rests largely on evolved psychology. Second, goals themselves are culturally constructed, socially transmitted, and cumulatively evolving over time. This co-evolutionary dynamic between problems and solutions exceeds what fixed psychological hierarchies can explain.

We applaud Singh’s effort to reorient cultural evolutionary theory towards a richer, deeper psychology (Sperber, 1996), providing more agency to individual cognition while still retaining the specifically populational, evolutionary patterns and processes that shape human culture. Singh’s framework is grounded on two key features of human cognition: a psychologically determined hierarchy of goals and the psychology we deploy to evaluate which means to select to satisfy these goals. Higher-order goals are essentially fixed and universal. Subsumed under these are instrumental goals, the solutions to which are evaluated through preferences that are themselves reflections of these higher-order goals. This allows Singh to explain cultural near-universals in a finer-grained and more charitable way than processes of cultural group-selection or plain old natural selection. In the following commentary, we argue that explaining the emergence, evolution and convergence of complex cultural traditions requires (i) incorporating the role of language for coordinating on shared instrumental goals, and (ii) recognising that goals themselves can be culturally constructed, socially transmitted, and cumulatively modified over time.

To explain cross-cultural convergence in traditions, Singh’s account relies on groups pursuing shared instrumental goals and

evaluating cultural variants in similar ways. However, even if we grant that evolved psychology helps humans coordinate on higher-level goals, we still need to explain how groups coordinate on the specific instrumental formulations that afford the evolution of convergent cultural solutions. Language, as a communication system capable of conveying richly structured propositional content (Pinker & Bloom, 1990), is a uniquely powerful means by which humans can coordinate on these shared instrumental goals (Clark, 2020). Through language, groups can explicitly and implicitly share information about goals, collaboratively develop and evaluate solutions, and negotiate which instrumental goals warrant collective investment. Without language or some additional mechanism(s) for coordination, the solution space is dauntingly vast, making it difficult to explain why populations repeatedly adopt and converge on similar cultural traditions like shamanism or sympathetic plot narratives. Indeed, the latter somewhat supports this dynamic: the narrative structure, featuring a goal-directed protagonist who confronts obstacles, overcomes them, and wins rewards, partly serves as a mechanism for culturally transmitting information about instrumental goals as well as schemas for how to structure goals, identify obstacles and conceive of solutions. In this respect, language acts as an amplifying factor for turning weakly biasing higher-level goals into strongly constraining instrumental ones through repeated episodes of social transmission and collective deliberation.

Not all goals we pursue, however, are best explained through a relatively fixed set of universal motivations and preferences. On the contrary, humans are extremely proficient at generating new, often imagined or self-imposed goals – which we prefer to call “constructed problems,” with many solutions far removed from adaptive concerns of survival and reproduction. It is this combination of flexible problem construction *and* linguistic capabilities that offers a powerful framework for understanding goals as culturally evolving entities. We propose that there are two key benefits of adopting such a framework. First, constructed problems shape the search space of possible and satisfactory solutions, and when constructed problems are transmitted across generations, so too are their search spaces (Winters & Charbonneau, 2025). Importantly, this allows problems and solutions to enter into reciprocally causal relationships: solutions to constructed problems often result in the emergence of new problems, which, in turn, affords the discovery of novel solutions (Arthur, 2009; Charbonneau, Strachan & Winters, 2023; Charbonneau, 2025; Winters, 2019). Second, constructed problems rarely if ever emerge fully formed, in that early problematization or goal-setting is generally vague, what cognitive psychologists refer to as ill-structured problems (Simon, 1973). Constructed problems can increase in clarity and structure as individuals engage in problem solving, with tentative solutions helping refine the problem space one is engaged in exploring (Simon, 1995). We argue this process can be distributed over multiple generations and across groups, leading populations to cumulatively improve the structure of their problem traditions.

Consider, for instance, the challenge faced by Old Kingdom architects in Ancient Egypt. Egyptian pyramids may satisfy evolved psychological goals falling within Singh’s framework (e.g., being related to beliefs about the afterlife), but many of their aspects are best explained by the arbitrariness of wanting to build pyramidal monuments (e.g., why a building rather than an underground tomb, why pyramidal rather than rectangular, etc). Moreover, when documenting the long-term evolution of pyramids, we see clear instances where co-evolutionary dynamics are in play. After

realising that mudbricks are unable to support the weight of these monuments, architects used this deeper appreciation of the underlying problem to switch solutions and opt for stone bricks instead (Romer, 2007). This subsequently led to a demand for a new class of stone workers, capable of cutting blocks with precise specifications, which, in turn, required new measuring and stonecutting techniques. Over successive generations, architects refined their understanding of pyramid building through trial-and-error (as illustrated by Seneferu’s many failed pyramids) and were able to formulate increasingly well-structured problems, culminating in the realisation that a lower-angled slope was necessary to avoid having the building crumble under its own weight (ibid).

The cultural evolution of Egyptian pyramids is indicative of what is arguably a more general and pervasive phenomenon in human history. When populations inherit both problems and solutions as co-evolving bundles, and when they cumulatively refine problem formulations over generations, cultural traditions exhibit open-ended dynamics that exceed what fixed psychological hierarchies can explain. These additional factors – the social transmission of constructed problems, their co-evolution with solutions, and their cumulative refinement – seem essential to capture the variety of problems we pursue and the nature of the solutions we select. Evolved cognition, with a fixed set of hierarchically structured goals, is limited in its ability to account for such dynamics.

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The nature of goals in subjective selection: Origins, shaping forces, and salience

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Abstract

This commentary enriches Singh's subjective selection framework by focusing on the nature of goals. It considers their origins (biology, ecology, culture) and varying salience, allowing the model to account for both highly instrumental actions and seemingly goal-demoted behaviors like ritual, thus broadening its applicability.

In the target article, Singh advances a framework of *subjective selection* to explain the emergence of cultural “super-attractors.” By highlighting the ways in which individuals actively evaluate cultural variants as instrumentally useful, Singh offers a refreshing alternative to accounts that focus primarily on cultural group selection, cognitive by-products, or blind transmission biases. I am sympathetic to this proposal, as my own work emphasizes the perceived instrumentality of practices lacking objective efficacy (Hong, 2022a, 2022b, 2022c; Hong, Slingerland, & Henrich, 2024; Hong & Henrich, 2024).

At the same time, Singh's framework rests on a foundational assumption that warrants closer scrutiny: the nature of the goals that direct and guide subjective evaluations. If cultural practices are retained because they are judged to help achieve goals, then a complete theory must also account for the goals themselves. This prompts two related questions: first, how are goals constructed through the interplay of biology, ecology, and culture? Second, under what conditions do goals become instrumentally salient versus demoted in favor of conventional conformity?

Origins of goals and factors shaping their expression

Singh is correct to treat goals as proximate drivers of subjective evaluation, but their origins and plasticity merit deeper consideration. Many goals central to his examples – obtaining food and ensuring cooperation – plausibly trace to evolved biological imperatives. These “superordinate goals” reflect recurrent adaptive challenges and are the ultimate foundation of our motivational architecture (Kenrick et al., 2010; Tomasello, 2022).

Yet, human goals are not reducible to biology alone. Ecological conditions, for example, amplify the salience of certain goals while suppressing others. In drought-prone agricultural societies, the goal of weather control becomes an urgent collective priority, giving rise to elaborate ritual technologies designed to secure rain. In more climatically stable contexts, this goal may recede entirely. Similarly, pathogen-rich environments can heighten the cultural emphasis on purity and avoidance, reinforcing goals related to

hygiene, dietary restrictions, and ritual cleanliness. Goals are adaptively calibrated to local ecological pressures.

Singh notes that goals are hierarchically structured, and it is within this hierarchy that the role of transmitted culture becomes most apparent. While natural selection may have defined the superordinate ends, culture excels at constructing the vast, branching network of subordinate goals that connect them to action. Crucially, as Singh points out, the selection of these subordinate goals is often a function of an individual's causal models, which are themselves shaped by culturally transmitted beliefs. This creates different “selective schemes” and opens up a rich space for theoretical and empirical exploration.

Recent work has begun to systematically examine how these culturally evolved goals emerge. Some models formally explore how our causal beliefs and their resulting “payoffs” coevolve genetically and culturally (Hong & Henrich, 2024), while others conceptualize culturally evolved “incentives” within a reinforcement learning framework (Rigoli & Lennon, 2025). This process can lead to evolutionary puzzles that challenge a simple functionalist view. For example, in many modern societies, it may be said that a selective scheme has emerged for discovering the most effective contraceptive methods (Jain & Muralidhar, 2011) – a culturally evolved goal that runs in direct opposition to maximizing genetic fitness. The potential for subjective selection to favor goals that are decoupled from, or even hostile to, biological adaptation is one of the most intriguing and underexplored aspects of the framework.

Salience and demotion of goals

Singh's framework productively emphasizes the emic, cost-benefit perspective that individuals often bring to their choices. However, a significant challenge arises from the vast domain of human behaviors where instrumental ends are opaque or absent. This tension is not new; it resonates with a long-standing distinction in the social sciences, dating back to Max Weber (1922/1978), between instrumentally rational action and actions guided by tradition or value for their own sake.

This classic sociological insight finds modern expression in the cognitive science of religion. Here, rituals are frequently defined by their “goal-demoted” nature, meaning their performance is detached from any obvious practical outcome (Kapitány & Nielsen, 2019; Legare & Herrmann, 2013). Such conventional, non-instrumental actions are considered vital for reinforcing social norms (Rossano, 2012) and scaffolding cumulative cultural evolution (Nielsen, 2018). More recently, the “bifocal stance theory” proposes that humans flexibly switch between an instrumental stance and a ritual stance when observing actions, depending on contextual cues (Jagiello, Heyes, & Whitehouse, 2022).

How can Singh's goal-based framework accommodate these seemingly goal-demoted actions? A productive path forward is not necessarily to posit separate psychological systems but to conceptualize a continuum of *instrumental salience*. The analytical utility of a framework like the bifocal stance is that it helps us recognize that the perceived purpose of an action is context-dependent and variable. Some cultural practices have high, explicit instrumental salience, while for others, it is low or opaque. The technological innovations central to Rogers's (2003) work, which Singh references, exist at the high-salience end of this spectrum. They are often introduced with clear instrumental descriptions (“this seed variant increases yield”), making their adoption

amenable to a straightforward subjective selection model based on perceived utility.

In contrast, many traditional cultural practices occupy a different position on this continuum. While some have clear, articulated goals (e.g., performing a ritual to make rain), many others are transmitted with only a vague sense that they are “doing something important.” Often, this is expressed as a precautionary belief: if the practice is not performed in the “right way,” some unspecified misfortune will occur (Hong, 2024). Here, it may be said that the operative goal for the individual is not an explicit external outcome, but rather the subordinate goal of *correct performance* itself. Furthermore, this instrumental salience is not uniform even for a single practice. Within any population, individuals likely vary in the degree to which they perceive a goal, from those who see an action as purely conventional to others who have developed folk theories about its instrumental purpose. A more comprehensive model of subjective selection would therefore be one that incorporates this variation in the salience and nature of goals, both across different cultural practices and among the individuals who perform them.

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Silent forces: How normative ecologies reshape super-attractors

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Abstract

Singh explains how cultural convergence is driven by super-attractors through subjective selection, but this account underestimates how social norms shape which psychological goals are maintained or suppressed. We clarify that social norms filter subjective selection by guiding what individuals regard as effective or desirable behaviors and by redefining their goals, thereby embedding subjective selection within the multilevel normative ecosystem.

Singh presents a compelling framework for understanding how humans develop super-attractors through goal-directed subjective selection and how universal psychological goals drive convergence across societies. By emphasizing the central role of subjective selection in the cognitive mechanisms through which super-attractors emerge and persist, this framework offers a systematic explanation of cultural evolution. However, this framework overstates bottom-up cognitive processes while underestimating top-down forces embedded within normative ecologies, which

shape which goals are maintained or suppressed across social contexts.

Across societies, individual evaluations of what is effective or desirable are embedded within the multilevel normative system that spans from individual-level processes in norm psychology (e.g., beliefs and expectations) to broader ecological and historical contexts that shape the emergence of norms (Gelfand, Gavrilets, & Nunn, 2024; Mu & Gelfand, 2020). Social norms influence behaviors by establishing prescriptive standards that define what is acceptable or desirable, enforcing compliance through social sanctions, and redirecting normative expectations that subtly guide individuals toward forming super-attractors.

While universal psychological goals may give rise to certain outcomes (e.g., cooperation), the ways in which people select and pursue these goals are shaped by social norms operating at the family, community, organizational, and societal levels. For example, cooperation often depends on perceived compliance with shared norms – conditional cooperators are willing to cooperate only when others do (Fehr & Schurtenberger, 2018). This raises an important question: to what extent does the interplay between subjective selection and the multilevel normative system determine which super-attractors persist and change?

Individual subjective evaluations and selection are bounded and directed by social norms, which shape not only what behaviors are acceptable but also how individuals interpret their goals. Social norms operate through prescriptive guidance and enforcement in a given context and may become internalized so that the norm is pursued as an end in itself rather than merely as a means to achieve goals or avoid sanctions (Gelfand et al., 2024; Henrich & Ensminger, 2014). Confucian traditions represent societal-level normative expectations about respect and relational obligations that have permeated East Asian countries for centuries. These norms are internalized into individual evaluative judgments and behavioral selections, such as hierarchical practices and maintaining interpersonal harmony (Kim & Hamilton-Hart, 2022; Rozman, 2014). Hierarchical honorific speech in East Asian countries (e.g., Korea and Japan) reflects deeply Confucian expectations, demonstrating that even individual linguistic choices are subject to their norms (Kim & Hamilton-Hart, 2022; Pizziconi, 2011). Adherence to these norms reinforces the persistence of valued behaviors, while deviant behaviors are often corrected through social feedback (Patterson, 2014), showing that the maintenance of super-attractors (e.g., filial piety and respect for hierarchy) emerges from the interaction between norm enforcement and subjective selection. In other words, subjective selection does not occur in a vacuum but is socially scaffolded.

Super-attractors emerge and evolve through goal-directed subjective selection, in which the multilevel normative system shapes how individuals evaluate and retain behaviors serving these goals. *Across communities and organizations, diverse norms produce divergent subjective selection even when underlying psychological goals are similar.* For example, the universal psychological goal of fostering interpersonal bonds manifests through distinct selection – gratitude involves expressions of indebtedness in Korea but emphasizes interpersonal closeness in the USA, depending on prevailing norms (Vishkin et al., 2025). Organizational and community norms guide which behaviors are prioritized, tolerated, and discouraged (Legros & Cislighi, 2020), effectively establishing expectations and guiding individual subjective selection and subtly reshaping goals

themselves. In tight societies or communities, norms dictate not only acceptable forms of cooperation or reciprocity but also signal which achievements are valued and how individuals should invest their efforts (Elster & Ron, 2025; Gelfand et al., 2024). Importantly, even when universal psychological goals, such as social cohesion or family bonding, are shared, the normative contexts produce variations in how super-attractors are shaped. This demonstrates that while super-attractors exhibit robustness to environmental variation as proposed by Singh, their manifestations take multiple culturally specific forms, reflecting the interplay between universal human motivations and locally enacted social norms.

Beyond differences in how super-attractors are expressed, normative systems are also dynamic, continuously reshaped by broader societal forces and historical transitions at the macro level. *Subjective selection is further influenced by large-scale societal changes that disrupt ecological and historical conditions, redirecting long-standing norms and leading to normative shifts.* Rapid economic development and urbanization in China have reshaped social values and collective behaviors by modifying normative expectations of success, effort, and social bonding (e.g., Chen, Wang, & Liu, 2012; Ding et al., 2025). These shifts in normative systems influence the expression of super-attractors such as governmental control and religious practices (e.g., Chua, Huang, & Jin, 2019). Likewise, global events such as the COVID-19 pandemic have altered everyday life worldwide, creating ecological pressures such as health threats and social distancing that have triggered shifts in norms (Lu, Jin, & English, 2021; Szekely et al., 2025). These normative shifts required people to reevaluate their behavioral choices. Also, perceived pandemic threat and uncertainty have undermined trust and cooperation (Liu et al., 2025; Van Lange & Rand, 2022), showing how ecological disruptions influence the psychological foundations of super-attractors, such as cooperative coordination. Large-scale societal shifts like the worldwide epidemic or urbanization alter normative expectations, which further influence individual subjective selection. These processes produce specific trajectories of super-attractors that are both robust and diverse in their forms. Even when universal goals like safety, cooperation, and well-being are widely shared, the specific selection adopted to realize these goals illustrates the inseparable influence of social structure on cultural evolution.

While Singh's article posits that super-attractors emerge primarily from universal psychological goals and individual subjective selection, this perspective may not fully discuss the processes involved. By incorporating a multilevel normative ecosystem perspective, social norms filter subjective selection by constraining certain behaviors and amplifying others, thereby producing diverse trajectories of super-attractors across societies and ecological and historical contexts. Extending Singh's model in this way would highlight that super-attractors emerge not only from innate psychological goals but also from the interplay between subjective selection and the multilevel normative system that constrains and guides individuals across different social contexts.

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Author's Response

Goals, power, and selection: Foundational issues in the naturalistic study of culture

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Abstract

The commentators mostly endorsed the value of attending to goals and evaluations in explanations of cultural patterns, including super-attractors. They also voiced concerns about subjective selection, enumerated other factors influencing goals and evaluation, proposed additional super-attractors and processes that might shape them, and demanded greater engagement with power and influence. Many issues signal larger disagreements in the naturalistic study of culture. Here, I respond.

Homo sapiens is a paragon of behavioral diversity. Despite exhibiting some of the lowest levels of genetic diversity among primates (Osada, 2015), our species has rapidly colonized most of the world's terrestrial habitats (Ellis et al., 2021), from Arctic Greenland to lonely Pacific islands. This global expansion was enabled by exceptional behavioral flexibility and capacity for cultural learning (Boyd, Richerson, & Henrich, 2011; Henrich, 2016), as our species not only perfected toolkits specific to each environment but also underwent social reconfigurations, reworking hierarchy, family structure, and residence patterns in response to shifting ecologies (e.g., Holden & Mace, 2003; Singh & Glowacki, 2022; Smith & Coddington, 2021).

And yet, just as striking as our differences are our commonalities. Humans everywhere construct a bevy of complex traditions with near-fated predictability. Ranging from dance songs to shamanism, hero stories to institutions of punitive justice, these super-attractors represent an empirical gauntlet to develop and test theories about culture and human behavior. In the target article, I argued that subjective selection, comprising the production, modification, and selective retention of cultural variants evaluated as satisfying goals, is the primary process responsible for the development of super-attractors. My goal was to help elucidate the origins of these ubiquitous behaviors while showcasing the explanatory power of subjective selection, which, I maintain, is a central but mostly overlooked engine of cultural evolution.

Across twenty-seven commentaries, an impressive and varied group of thinkers responded. Some sought clarification. Others were more explicitly critical. Still others extended and nuanced the

frameworks I had put forward. Many of their comments exposed deeper debates about the social, psychological, and evolutionary origins of cultural behaviors, from whether cultural evolution involves selection to whether maladaptive practices can persist over long time scales. I am grateful for such thoughtful responses, which have sharpened my own thinking on subjective selection and super-attractors. I hope my responses contribute to clarifying not just these topics but also deeper conceptual disagreements in the naturalistic study of culture.

R1. Conceptual clarification about subjective selection

Subjective selection, presented as the major driver of super-attractors, naturally attracted critique and discussion. The commentators' concerns map onto seven conceptual questions.

R1.1. What is subjective (and new) about subjective selection?

Morin and Jackson and Cao agree that cultural evolution has devoted little attention to individuals' instrumental motivations and mention many potential reasons for the oversight, including the field's basis in population genetic models and the historical novelty of "blind" processes. Other commentators find the "recentering of individual preferences and evaluations" to be "refreshing" (Baumard, Dubourg, and André [Baumard et al.]) and commend my giving "pride of place to individuals' interests and motivations in adopting or modifying 'cultural' representations" (Boyer; see also Borba and Becker; Hong; Moon; Winters and Charbonneau).

Mesoudi, however, disagrees. He does not see my approach as "so different to existing strands of cultural evolution research" and mentions many mechanisms of cultural transmission in which subjective appeal determines the spread of cultural variants. For example, "people copy others whom they *perceive* as being prestigious," they preferentially transmit and recall information that is disgusting, and they are attentive to news about other people.

I agree that many sources of subjectivity are either implicit in cultural evolutionary research or have been well-explored (Sperber & Hirschfeld, 2004; Stubbersfield, 2022). But subjective selection does not encompass any cultural evolutionary process in which cognitively engaging variants are favored. Stories about people eating their dogs or selling maggot-infested cakes might spread because they are more memorable (Eriksson & Coultas, 2014), but that is not, *prima facie*, an example of subjective selection.

Subjective selection means something narrower and more demanding. It is, as I define in the target article, the process by which "people craft and selectively retain cultural variants that best satisfy evaluations of goal-oriented, instrumental utility" (see also Singh, 2022a; see R1.4 for further conceptual clarification). The sources of subjectivity are people's goals (which Mesoudi likewise sees as a promising focus) and the processes by which they evaluate goal-oriented value. As stated, the framework of subjective selection is consistent with dominant paradigms (section 2.1). Nevertheless, as Morin and Jackson and Cao observe, cultural evolutionary research has largely sidelined the roles of goals and

instrumental evaluations in favor of other, often counterintuitive, mechanisms and processes.

R1.2. Does subjective selection involve "selection"?

Subjective selection, as I wrote, can occur at different scales. At one end is individual trial-and-error, as when a person generates solutions, assesses how well they serve a goal, and preferentially retains some as templates for future attempts. At the other end is a population-level process involving the differential retention of variants transmitted across individuals.

Lewens advances several places in which these two interpretations presumably clash (or "come apart"). First, he notes that selection requires parent-offspring relations between the variants undergoing selection, with the implication, it seems, that individual trial-and-error does not involve such relations.

But the implication does not follow. A person composing a melody or crafting a tool generates successive versions connected to each other in clear ancestor-descendant relations. It's true that, in natural selection, ancestor-descendant relations between genetic variants usually span generations, but this is because genetic reproduction is tied to organismal reproduction (with well-known exceptions, like somatic selection in cancer). This is not the case for technological evolution, where the production and preferential retention of increasingly functional variants can operate within individuals (e.g., Allen, Smith, & Tenenbaum, 2020; Derex, Godelle, & Raymond, 2012, 2019; Zwirner & Thornton, 2015).

A second issue, according to Lewens, is my contrasting of convergent subjective selection with deep ancestry as explanations of super-attractors. He reasons that the distinction is incoherent, because selection always involves ancestry; without it, "it makes no sense to think of cultural selection at work."

Again, I agree that proper selection requires inheritance relations, but Lewens's critique seems to blur microevolutionary and macroevolutionary processes when it's necessary to distinguish them. An analogy from genetic evolution might be helpful. Consider tool use, which has been observed in clades as varied as primates, corvids, and cetaceans (Mann et al., 2005; Rutz & Clair, 2012; Whiten et al., 1999). We might argue that the behavior exists in such diverse taxa because of convergent evolution rather than because primates, corvids, and cetaceans all inherited tool use from a common ancestor – just as we might argue that the near-universality of shamanism, lullabies, and hero stories reflects convergent subjective selection more than inheritance from a common ancestor. The convergent evolution hypothesis does not deny that selection acts, nor does it deny that, on a microevolutionary scale, traits are transmitted and stand in ancestral chains; in fact, it assumes both. It only maintains that deep, shared ancestry fails to explain large-scale similarities.

R1.3. Is subjective selection driven by conscious decision-making?

Heintz and Nettle write that my "framework privileges conscious, goal-directed behaviors," while Morin spends much of his commentary showing that decision-making is not driven by desires that are consciously available or coherent. In fact, he writes, the desires people report are often post-hoc rationalizations rather than "causally efficacious."

To clarify, the subjective selection framework makes no commitments about conscious awareness. My use of “subjective” is meant to highlight the roles of goals and evaluations, not to describe how those are mentally represented. If anything, I assume people are oblivious to many of their goals (sect. 2.1.1, para. 1: “Decades of research on goal pursuit show that people are often not conscious of their goals and how those goals guide their behavior”) and to how they evaluate goal-directed behavior (sect. 2.2.2, para. 1: “Both [evaluative processes] can occur outside of conscious awareness”).

Morin’s analysis of post-hoc rationalization and incoherent motivations is consistent with a subjective selection framework. As Jackson and Cao show, people often engage in model-free learning, evaluating and adopting behaviors purely using expected reward and thus without “know[ing] how something will benefit them.” Lacking insight into why they adopt the behaviors they do, people should be expected to confabulate motivations. And the inconsistency he emphasizes is exactly the kind of psychological detail that a subjective selection framework can leverage to explain cultural peculiarities.

R1.4. Should production count as selection?

Heintz and Nettle ask whether “subjective selection” is an appropriate label. Their critique mixes two related concerns:

1. Unlike genetic mutations, innovations in cultural evolution are not random.
2. Goal-directed creation or transformation is distinct from selection.

The first concern, although true, does not invalidate that selective retention occurs and can accelerate the development of complex cultural design. The process by which variation is introduced appears to have little bearing on whether selection occurs.

The second is more serious. Here, and in previous work (Singh, 2022a), I have used “subjective selection” broadly to encompass the combined processes of production, modification, and retention of variants evaluated as satisfying goals. This is partly because subjective evaluations of instrumental utility occur at every stage, from individuals simulating effects of actions before executing them (Allen et al., 2020) to people assessing products produced and shared by others (Rogers, 2003). I agree that we gain analytical precision, however, by disaggregating instrumental generation (which I’ve characterized using terms like “craft” and “tweak”) from the selective retention of variants after they have been produced and evaluated. For clarity, throughout this response, I continue to use “subjective selection” to refer to the broader framework and set of processes of goal-directed cultural evolution, while reserving “selection proper” for the narrower process of differential retention conditional on evaluations.

R1.5. What about reconstruction?

Resuscitating a decades-old debate (Claidiere, Scott-Phillips, & Sperber, 2014; Claidière & Sperber, 2007; Henrich & Boyd, 2002; Nettle, 2020), Boyer rejects the role of selection, declaring, “Most cultural materials are not selected in that sense, as they are reconstructed by individuals on the basis of fragmentary cues taken from other individuals’ public representations.”

But selection and reconstruction are not mutually exclusive. The requirements of reconstruction can bias cultural form and

stabilize the transmission of some cultural variants (Morin 2016); those variants, in turn, can undergo selection. For example, both narratives and supernatural content are canalized by cognitive mechanisms (e.g., Barrett, 1998; Barrett & Keil, 1996; Black & Bower, 1980; Mandler et al., 1980), yet storytellers and shamans have also been observed attending to and adopting elements that better entertain audiences (Scheub, 1975) or convince clients they can successfully extract illness (Boas, 1930). Likewise, whereas the potential design space of material technologies is certainly delimited by anatomical and cognitive constraints of reconstruction, an enormous literature demonstrates that participants selectively retain tweaks that more effectively achieve desired aims (Caldwell, Atkinson, & Renner, 2016). Reconstruction casts much of the landscape that selection proper then prunes.

R1.6. What value does the truthiness of subjective selection bring?

Morgan writes that subjective selection is “undoubted closer to reality” than many alternative theories of behavior and culture. But he’s skeptical about the payoffs of inching closer. Comparing my article to Gould and Lewontin’s (1979) critique of adaptationism, he asks, “What value does truthiness bring us?”

This isn’t the place to litigate Gould and Lewontin’s contribution, which I perceive to have been more impactful than Morgan does. Still, despite our shared distrust of excess adaptationism, the analogy seems overstated. My argument is not merely a critique but a shift in explanatory framework. The thesis is not just that, as a field, we have been overeager to search for objective, functional benefits; nor is it just that more attention should be paid to goals and evaluation. Rather, my main contention is that, by attending to goals and evaluation, a powerful but simple model of cultural evolution becomes apparent – one capable of explaining the adaptive traits explained by blind processes, as well as much more of cultural design, from shamanism (Singh, 2025) to addictive digital interfaces (Braganza) to punitive institutions that fail to deter crime (Alam and Rai). Where we might usually rely on cultural group selection or other blind processes, a more parsimonious evolutionary process suffices – and explains more of cultural design.

Morgan partly concedes this, writing that “the manuscript makes a good start” at explaining “a range of recurrent cultural phenomena that other theories cannot.” He asserts, fairly, that proving utility requires that subjective selection “provide novel predictions . . . of specific cultural phenomena that other theories would not anticipate.” I strove to enumerate such predictions in sections 3 through 5 and in previous work. These have included:

1. Predictions about the form of shamanism across cultures, including shamans’ jurisdictions, features of trance performances, people’s perceptions of them, people’s intuitions about self-denial, how competition should mediate features of shamanism, and the conditions favoring the loss of shamanism (Singh, 2018a, 2018b)
2. Five testable predictions about the sympathetic plot (Singh, 2021a)
3. Nine predictions about prosocial religions (Fitouchi et al., 2025)
4. Seven predictions about punitive justice (Fitouchi & Singh, 2023)
5. Ten predictions about how conceptions of witches and sorcerers will vary with social conditions (Singh, 2021b)

Many of these predictions contrast with those of adaptationist accounts.

In short, the truthiness of subjective selection buys it explanatory reach. It combines the psychological richness of traditional cultural attractor perspectives with the functionalism often assumed under approaches like cultural group selection, at once explaining elegant utility, kludgy inefficiency, and the ever-growing carnival of hyper-addictive technologies (Braganza).

R1.7. Do the old critiques of functionalism still apply?

Ongaro compares my framework to the functionalism endorsed by Malinowski (1960), asking whether the criticisms that applied to earlier brands of functionalism apply to my framework. It's a fair concern to raise, especially given my arguments for "subjective functionalism" (sect. 7.2, para. 2). But the classic objections do not easily carry over.

First, Ongaro asks whether my approach is circular. I addressed this concern in Box 1. My response was that functional approaches structure hypotheses, which, in turn, generate testable predictions. The hypothesis that lullabies developed to soothe fussy infants makes many predictions, including about the design features of lullabies, the contexts in which people should use them, and the practices that should crowd lullabies out. To the degree that these predictions are supported, especially compared to predictions derived from alternative approaches, they lend credence to the proposed function.

I presented several broadly applicable predictions in Box 1 (see Arslan's first and second predictions for domain-specific examples). Borba and Becker note that any hypothesis about an instrumental cultural behavior also generates predictions about the environmental events that should function as "effective learning signals." If we hypothesize that lullabies are for soothing infants, then a relaxed infant should serve as a positive learning signal for reinforcing the use of a lullaby – exactly the kind of independent criterion Ongaro requests. As Morgan states, the more interesting, and perhaps approach-exclusive, predictions are those about specific cultural phenomena; for examples, see the previous subsection.

Second, Ongaro declares that the approach fails to explain the holistic nature of culture, such as correspondences between bride-price institutions and forms of shamanism in Siberia. Here, I partly agree and partly disagree.

To start with the disagreement, subjective selection does help illuminate dependencies and correspondences between aspects of culture. For example, a single cultural practice, which develops to satisfy a goal, can produce a cultural ecosystem. Consider traditions of malicious sorcery, which I have argued evolve partly as people fashion compelling practices to harm others from afar (Singh, 2021b). Once such practices are established, they reinforce beliefs that misfortune is sometimes caused through mystical means. These beliefs, in turn, create new goals (detering harmful magic, determining who caused illness, and curing witchcraft-caused illness) and thus new practices (counter-magic, divination, and healing) (Figure R1). In a case like this, a subjective selection framework helps clarify how one cultural practice can beget an array of related traditions.

Several commentators show how a subjective selection framework can further elucidate cultural correspondences. Hong notes that culturally inherited causal beliefs, such as about where

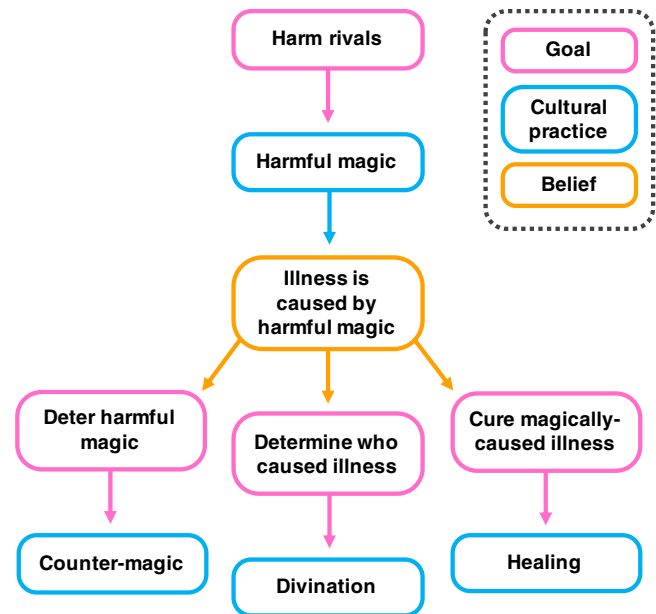


Figure R1. An example of how a single goal – harming rivals, in this case – can give rise first to a corresponding practice (harmful magic) and subsequently to new beliefs, new goals, and other cultural practices. Reproduced from Singh (2022a).

rain comes from, shape other cultural practices, such as rain-making rituals, by influencing how people evaluate usefulness. Zhang, Ding, and Mu [Zhang et al.] describe in detail how subjective selection interacts with norms and other attitudes. Using Old Kingdom pyramid-building as an example, Winters and Charbonneau discuss how goals can generate technologies, which spawn new problems, solutions, and even techniques for exploring the problem space (see R2.2.2).

Still, I also partly agree with Ongaro. Subjective selection is not a theory of everything. It is a hypothesized process (or set of interacting processes) of cultural evolution. I am convinced that it occurs and that it explains a lot, but it is far from a complete framework. To explain the totality of culture, we also need to consider subjective selection alongside distributions of power (section R4), ecological conditions (section R2.2.1), the broader historical context (Chentsova-Dutton and Ryder), norms and attitudes (Zhang et al.), other aspects of psychology (Heintz and Nettle; Kumaar; Jackson & Cao; Morin; Thomas & Samani), and other hypothesized processes of cultural evolution. Indeed, many of the questions Ongaro raises about shamanism are ones I address in my book, often by looking beyond instrumental function, including to power relations (see, e.g., Singh, 2025, Ch. 7). Malinowski-style functionalism may have faltered by treating its analyses as exhaustive, but that weakness doesn't apply here.

R2. Sharpening goals and evaluation

I argued that much of cultural design can be explained by considering people's goals and the psychological processes involved in evaluating goal fulfillment. Some commentators used their responses to refine, critique, and expand the discussion of these psychological forces. Many described factors that I overlooked. Incorporating their comments deepens the psychological foundations of subjective selection, improves the framework's

predictive power, and bolsters its ability to explain similarities and differences in cultural form.

R2.1. Further incorporating evolved psychology

Baumard et al. and Boyer both call for more evolutionary psychology. In broad terms, we all agree that proximate goals trace to evolved goal states and that we gain explanatory power by better identifying the evolutionary foundations and cognitive structure of human motivation. Against this background, some of their critiques rest on a misreading of my claims. For example, Baumard et al. write that I identify “proximate goals that cultural forms appear to satisfy” and then supposedly stop. Crucial, they write, is linking proximate goals to “evolved reward systems that make them subjectively compelling.” Yet I proposed something similar in the target article (sect. 2.2.1, p. 4); indeed, I cited a short comment co-authored by two of the commentators to support this point (Dubourg, Chambon, & Baumard, 2025).

In a similar vein, Boyer writes that I rely “mostly on commonsense criteria that do not provide a solid basis for fundamental assumptions about human psychology.” He uses the example of why parents aim to pacify infants. He reports that my view is something like, “Mostly because parents themselves tell us, and because our folk-psychology tells us that it must be their motivation,” critiquing that this “is not an explanation of their behavior, let alone an evolutionary explanation.” But this wasn’t my claim. In Figure 3B, I speculated that reducing infant distress is an instrumental goal in service of evolved goal states such as caring for current offspring (insofar as one is using fussiness as a cue of costly distress) and investing in other offspring. This might be inaccurate; it is certainly incomplete. But it is more evolutionarily informed than appealing to folk psychology.

Still, Baumard et al. and Boyer identify a genuine difference in emphasis. Both commentators rightly sensed that my account invoked fewer “evolved, domain-specific psychological adaptations” (Boyer) than many evolutionary psychologists would have liked. For example, whereas I hazarded that the reduction of infant fussiness may function instrumentally in the pursuit of other evolved goal states, Baumard et al. proposed that offspring distress-reduction is, itself, the superordinate goal. Likewise, whereas my explanation of corporate groups invoked the goal of best mobilizing cooperation, Boyer argued that humans evaluate numerous, more specific targets, including cohesiveness, commitment, and contributions.

Their proposals are reasonable, and the point is well-taken. The accounts I presented are first approximations and will benefit from much more psychological richness. To the extent that empirically attested motivations can replace the provisional ones I put forward, I am eager to incorporate them.

R2.2. Explaining variation in goals

Because one of my primary aims was to explain super-attractors, I focused on universal goals. But several commentators highlighted how humans’ motivations also vary tremendously, laying out different sources of such variation.

R2.2.1. Environmental variation creates new goals

Some commentators note that goals change with shifting environments. For example, people in drought-prone societies turn more often to weather control (Hong). Those in wealthier societies apparently place greater emphasis on mutual attraction and long-term commitment when choosing mates (Baumard et al.). Massive

disruptions, like the COVID-19 pandemic, can increase the salience of some goals, such as protecting against disease, while also creating new goals, like social distancing (Zhang et al.).

These examples suggest different mechanisms by which changing ecologies might shift people’s goals. In some cases, environmental variation tunes the expression of evolved motivational systems, just as higher population density induces gregariousness in locusts (Simpson, Caffery, & Hägele, 1999). In other cases, people acquire new intermediate goals through learning and problem-solving, devising novel strategies to pursue core biological goals in unfamiliar ecologies.

Whatever the mechanism, I agree that considering how environments produce new goals will be critical to explaining cultural variation, including, as Hong points out, puzzling behaviors apparently decoupled from fitness interests, such as contraception use.

R2.2.2. The dynamic emergence of goals

Two sets of commentators discuss dynamic processes of goal emergence. According to Haraldsen et al., new goals can arise during the creative process. As writers produce literary text or film editors cut and splice physical reels, they interact with their material, developing new intentions in response to their creative output.

Haraldsen et al. present such goals in opposition to the broader goal of evoking pleasure, but two points are worth making. First, evoking pleasure is not meant to describe all esthetic activity; rather, it is a common and important goal that seems responsible for the emergence of dance songs and the sympathetic plot. A creator can have many other goals, including signaling virtuosity, sharing personal stories, and transmitting information, each of which will imprint on the forms of their creations. Second, the shifting micro-intentions described by Haraldsen et al. are organized within larger goal hierarchies. In their study of the Norwegian comic artist Anders Kvammen, for instance, Haraldsen and Trasmundi (2025, p. 4) describe a hierarchy of intentions in which “the higher levels set more general action goals that are used by the lower levels to bias the choice of the next affordance.” Kvammen, the artist, starts with an overall idea for a narrative, works on individual scenes, and eventually makes creative decisions in response to single pen strokes, yet even on that smallest scale, overarching goals, like producing forms that are visually appealing, still dictate which intentions are pursued.

Winters and Charbonneau also describe a dynamic process of goal setting, although on a different scale. They write about “constructed problems,” defined as self-imposed goals whose solutions are “far removed from adaptive concerns of survival and reproduction.” They use the example of pyramid construction in Old Kingdom Egypt and show how a goal (building pyramids) can generate new problems (finding materials that support the weight of the monuments), thereby selecting for new solutions (stone bricks and a corresponding industry for working with them). They also observe that people must refine problem spaces or learn how to structure problems. Pyramid builders who found their monuments crumbling had to determine the issue that needed addressing, whether related to building materials or the slopes of the sides.

These examples testify to the complex processes by which goals emerge. They demonstrate that issues that I only briefly touched upon – such as how technologies can spawn new goals or how smaller decisions can be organized within larger goals – can be studied rigorously. Given the importance I ascribe to goals in

directing cultural evolution, I agree that better characterizing such processes is valuable.

R2.3. Addressing supposedly non-instrumental behavior

Several authors push back against my emphasis on instrumental behavior. Hong, for instance, mentions the “vast domain of human behaviors where instrumental ends are opaque or absent.” I concede that subjective selection would be less relevant to such behaviors, but I wonder whether non-instrumentality is being muddled or overstated. Hong writes:

Often, this is expressed as a precautionary belief: if the practice is not performed in the “right way,” some unspecified misfortune will occur (Hong, 2024). Here, it may be said that the operative goal for the individual is not an explicit external outcome, but rather the subordinate goal of *correct performance* itself.

In Hong’s own words, then, there is an explicit external outcome at play here: avoiding “some unspecified misfortune.” In fact, the paper cited here is about taboos (Hong, 2024), and it seems that a useful starting point when explaining the design of taboos is to think about the misfortune they are supposed to discourage. For example, in many societies, pregnant women are tabooed from tying knots – a rule that’s hard to understand without appreciating its connection to fears of umbilical cord strangulation (Frazer, 1922).

Similar concerns apply to the literature on goal-demotion more broadly, where behaviors, despite being goal-oriented, are often described as non-instrumental. Take the ritual stance, which Hong discusses. As Jagiello, Heyes, and Whitehouse (2022, p. 3) explain:

In a ritual stance, we do not necessarily expect observed behavior to be directed towards the accomplishment of specifiable end goals and, even if we do, we assume (implicitly or explicitly) that at least some of the actions required to perform the behavior correctly do not contribute to those end goals in ways that are potentially knowable.

Yet, the same authors, on the same page, link the ritual stance to goal-directed motivations. A learner adopting the ritual stance is “oriented to social and affiliative outcomes” (p. 3). Participants in collective rituals are “at least partly motivated by the rewards of belonging” (p. 3). A Christian congregant learning to cross herself upon entering a church is “driven by the motivation of simply wanting to fit in with the other church goers” (p. 3).

Scholars of ritual are not alone in treating behavior as non-instrumental when the goals are social. Describing how people might try to show that they are good parents or committed to getting better, Chentsova-Dutton and Ryder write that “adults pursue goals for reasons that are not only instrumental, but also socially normative.” Likewise, Kumaar argues that some cultural forms may develop through symbolic, rather than instrumental, evaluation. While I agree that cultural variants may be appealing because of non-instrumental factors, some of the examples presented – such as “support[ing] shared cultural identities through collective ritual engagement” – seemed difficult to distinguish from instrumental social goals.

To clarify, then, my usage of “instrumental” and “goal-oriented” encompasses social motivations. These include goals like identity signaling and social belonging, as well as normative behaviors that have become ends themselves (Zhang et al.). For example, if people are sanctioned for being disrespectful, they will strive to show respect and adopt behaviors that help satisfy that

goal. For my purposes, such behavior is as instrumental as healing illness, soothing a baby, experiencing pleasure, or killing an animal.

This is crucial because we should expect social motivations to matter for cultural evolution, including processes of subjective selection. Rituals or taboos will manifest differently depending on whether participants seek to avert misfortune, signal commitment, display competence, experience aesthetic pleasure, or forge bonds. Treating these as non-instrumental obscures how they, like all goals, mold culture.

R2.4. Elaborating models of evaluation

Several authors built on my provisional model of evaluation, putting forward additional constraints that limit the evolution of adaptive culture (Jackson and Cao) and detailing how factors such as norms, attitudes, cultural beliefs, and history might guide how people evaluate cultural traits (Chentsova-Dutton and Ryder; see also Zhang et al.).

R2.4.1. “Blindness” during evaluation and the maintenance of cultural inefficiencies

By focusing on how people’s goals and evaluations ultimately guide cultural evolution, a subjective selection framework can explain various cultural inefficiencies, including suboptimal or even maladaptive practices. I outlined several ways in which cognitive limitations might interfere with the identification of useful practices, and Jackson and Cao helpfully added to this list. They explain that cultural practices can persist even when people know of better alternatives, because of, for example, the costs of coordination, and that temporal discounting can lead people to adopt culture that seems appealing or beneficial on an immediate timescale but can be costly in the long run. Both are important to emphasize and help explain further cultural inefficiencies. Table R1 lists these two “forms of blindness” along with three biases and constraints I discussed in the target article.

These factors can interact. Braganza discusses the trend in modern culture favoring “ever more addictive goods.” This dynamic seems to emerge from the interaction of factors 1 and 5 in Table R1: When psychological rewards are dissociated from adaptive benefit (an example of “proxy failure”: John et al., 2024), and when they are immediate and powerful relative to delayed costs, subjective selection can drive the evolution of technologies that induce progressively more intense responses. In a similar vein, Reggente and Schoeler suggest that the pleasure of aesthetic chills often indexes something adaptive – a generative model achieving a sudden leap in explanatory power – but that it can also be induced through neuromodulation and technologies that generate sensations along the spine. In both cases, the elaboration of technologies of pleasure will be accelerated when producers are incentivized to proffer such goods to consumers – whether through market forces (Braganza) or opportunities for manipulation (Reggente and Schoeler) – with potentially damaging consequences for consumers’ health, autonomy, or psychological well-being.

R2.4.2. Norms, culture, and the power of placebo

Chentsova-Dutton and Ryder nuance what they see as an overly simplistic model of evaluation. They make at least three points:

Table R1. Biases or constraints of goal-oriented evaluations and corresponding cultural inefficiencies

Bias/constraint	Conditions	Examples of cultural inefficiencies
1 Proximate goals decoupled from ultimate currencies	When psychological reward becomes dissociated from adaptive benefit	Technologies of pleasure (e.g., cheesecake, pornography, hero stories)
2 Erroneous evaluation of ineffective practices (false positives)	When seeking to influence high-stakes outcomes that resolve stochastically	Magic and superstition (e.g., rainmaking, divination, malicious sorcery)
3 Failure to detect useful practices (false negatives)	When gains are noisy and lagged	Failures to discover and adopt sanitation practices (e.g., handwashing)
4 Suboptimal practices stabilized by coordination costs*	When unilateral change is costly or impossible	Imperial system of measurement; QWERTY keyboard
5 Temporal discounting in evaluation*	When rewards are immediate and salient and costs are lagged and uncertain	Cigarettes; high-sugar foods in environments of caloric abundance

*Described by Jackson and Cao

1. People's judgments about efficacy are shaped by both their personal history with a practice and local beliefs.
2. Norms and cultural attitudes affect which solutions are preferred or seen as effective (see also Zhang et al.).
3. Expectations of efficacy can lead to objective effects, exemplified in work on placebos and the "common factors" shared across psychotherapeutic modalities.

I agree with all three points. I touched upon the first in the target article (see the brief discussion of lizard rainmaking in section 2.2) but recognize that there is much more work to be done on how cultural beliefs interact with personal experience and other factors to influence evaluation. The third, although largely left out of the target article, is something I have explored in detail elsewhere (Singh, 2025, Ch. 5).

Despite points of overlap, I am less certain of their conclusion. Chentsova-Dutton and Ryder write, "From this vantage point, we find it hard to believe that people across a wide range of cultural-historical settings would continually make similar subjective judgments about effectiveness in domains with multi-determined outcomes." But the inference doesn't follow. Even if, for example, people's judgments about lullabies are shaped by cultural attitudes about which styles are most effective, or part of the motivation for singing lullabies is to signal that one is a good parent, convergent features of lullabies across societies can still emerge from parents creating and retaining features that seem best at putting their infants to sleep. Myriad motivations and cultural inputs into evaluation do not preclude universal goals and comparable ways of achieving those goals from generating cultural similarities.

R3. Revisiting super-attractors and the cultural manifold

A major thrust of the target article was that societies near-universally develop complex sociocultural traditions, termed "super-attractors," and that these collectively constitute the "cultural manifold." Commentators sought conceptual clarification about super-attractors, contested my de-emphasizing of processes other than subjective selection, proposed other super-attractors and contexts in which they might be observed, and outlined additional psychological capacities or processes that might be involved in the development of super-attractors.

R3.1. Super-attractors, by-products, and the need for group selection

Polimeni argues that the concept of super-attractors should not replace or distract from concepts such as byproducts or adaptations. I agree, but I would emphasize that they refer to distinct levels of analysis. "Super-attractor" is a descriptive term; it describes sociocultural traditions that exhibit features such as ubiquity and internal complexity. Terms like "adaptation" and "by-product," meanwhile, are functional; they describe the ultimate reasons a behavior exists.

The two classes of terms do not compete. If anything, comprehensive explanations of super-attractors necessarily invoke functional concepts. For example, in seeking to explain the sympathetic plot, I argued that people represent characters as other people, often feeling sympathy for them and sympathetic joy when they succeed (Singh 2021a). Such emotional responses seem to be by-products of psychological mechanisms that evolved for interacting with flesh-and-blood humans, not with made-up protagonists. Other by-products implicit in the accounts in the target article included superstitions as by-products of systems for selecting useful behaviors under uncertainty (D. D. P. Johnson et al., 2013; Singh, 2022b) and rhythmic entrainment as a by-product of vocal learning (Patel, 2021; Singh & Mehr, 2023; although see Savage; Rajendran et al., 2025). Once humans find pleasure in the antics of made-up characters, enjoy synchronized movement, or adopt superstitions to stop rain, subjective selection can drive the elaboration of technologies that most compellingly achieve the relevant ends.

Appreciating the role of by-products addresses other issues raised by commentators. Borba and Becker claimed that, "without group-level selection, it is difficult to account for why such perceptual biases would stabilize common misattributions (such as supernatural elements) that appear to compete with true goal attainment." Yet a success of the cognitive and evolutionary science of religion has been to demonstrate how maladaptive or erroneous attributions could have emerged as by-products of individually adaptive cognitive capacities (Atran & Norenzayan, 2004; Bloom, 2007; Boyer, 2001; Guthrie, 1995; Willard & Norenzayan, 2013).

In a similar vein, Morgan argues against the possibility that subjective selection might maintain maladaptive behaviors, because, as he writes, "for any sufficiently costly cultural side-effect,

biological evolution can, in theory, rework our subjective appetites to remove it.” Yet, as he acknowledges, there are constraints on the pace and evolvability of such compensatory adaptations.

Consider malicious sorcery again. Historically, humans around the world used spells, charms, and amulets to try to harm each other (Singh, 2021b). These practices can sometimes become very intricate. In southern Siberut, Indonesia, a Mentawai person intending to harm someone must abstain from sex and beverages, gather dangerous objects (e.g., snake teeth, bee stingers, and poisoned arrows), and summon a spirit to capture the victim’s soul, which is enclosed in a container. With the soul in hand, the sorcerer is believed capable of causing illness and death.

Practices like this seem maladaptive. Aside from expending time and other resources, such rituals contribute to suspicions that death and illness are caused by mystical harm, which can sow distrust and paranoia even among close family members (e.g., Talayesva & Simmons, 1942). Yet the superstitious tendency underlying evil sorcery does not seem like something that biological evolution can easily rework. It appears to be a by-product of cognitive systems that are otherwise beneficial, particularly our capacity to discover useful, goal-directed behaviors under conditions of uncertainty (Foster & Kokko, 2009; D. D. P. Johnson et al., 2013; Singh, 2022b). It’s plausible that, given enough time, natural selection could theoretically rejigger human psychology to somehow sever costly superstitions from a general competence at extracting instrumental regularities from noisy observations. But given that the best-attested examples of gene-cultural coevolution postdating the emergence of *Homo sapiens* involve traits with simple genetic architectures (e.g., Stock & Wells, 2023), I would expect it to take much longer.

Morgan also proposes that cultural group selection can filter out costly cultural practices. But here I would repeat the issues raised in section 6.2 in the target article:

1. Cultural group selection requires variation, and it is unclear how this can be produced or maintained when some practices are compelling and easily reconstructed.
2. Even if cultural group selection occurs and costly practices are filtered out, it is unclear what would prevent them from again appearing, evolving, and spreading.
3. It remains unclear how important cultural group selection is in naturalistic settings.

Until these are resolved, it is premature to conclude that “the only long-lasting cultural spandrels will be those that do not harm fitness” (Morgan). Indeed, anthropologists have documented numerous apparently costly practices that have not only persisted but also appeared around the world (Edgerton, 1992), bloodletting being a paradigmatic example (Miton, Claidière, & Mercier, 2015).

R3.2. Considering additional super-attractors

The list of super-attractors I proposed in the target article was necessarily incomplete. I hoped that researchers would add to the list, and, to my delight, several commentators proposed candidates worth discussing. Here, I consider those additions as well as the defining criteria of super-attractors.

R3.2.1. Shamanism and dance songs are super-attractors, while music and religion are (probably) not

Observing that I treat shamanism, dance songs, and hero stories as super-attractors, Savage asks why I do not include broader domains, such as religion, music, and language. He is right that these comprise behaviors that are ubiquitous and complex (Evans & Levinson, 2009; Jackson et al., 2023; Mehr et al., 2019; Peoples, Duda, & Marlowe, 2016; Pinker, 1994; Savage et al., 2015). But, putting aside language, which I discuss below, religion and music do not strike me as super-attractors, because they do not seem to exhibit the degree of functional integration characteristic of clearer classes. I wrote:

Importantly, the attractors composing a super-attractor are not merely a collection of discrete components; rather, they relate dynamically to produce new, emergent properties or functions that are not present in any individual attractor. (Section 1)

Super-attractors are roughly analogous to organs like the heart or lungs. Each is complex; each has components that reliably co-occur and that work together to sustain emergent functions. In contrast, “music” is a label for a family of super-attractors, much like “organ” is a label for a family of systems. “Music” encompasses traditions like dance songs, lullabies, and healing songs, but these are not functionally integrated. There is, for example, no necessary reason why lullabies require dance songs, nor a patterned way in which lullabies and dance songs interact to yield larger functions.

The components of religion may be better integrated. For example, shamans are believed to interact with supernatural agents, and such interactions might feature in myths. Yet the integration across such components seems much weaker than within-component integration. Shamanism always includes trance and services like healing and divination, often alongside dramatic initiations and self-denial. Yet, the connection between shamanism and myth seems more tenuous, less cross-culturally predictable, and less critical for the form or the function of either shamanism or mythology. “Religion,” at least broadly defined, seems more like an ecology of super-attractors and related traditions than a single super-attractor. Despite the qualms I’m expressing here, it’s possible that future investigations will identify higher-order super-attractors composed of traditions that I currently treat as distinct.

None of this contradicts Savage’s separate point that music and religion may each arise, in part, from specialized genetically evolved adaptations. The concept of super-attractors does not imply a lack of a genetic component. Rather, a “super-attractor” is a sociocultural tradition that is ubiquitous, robust to environmental variation, internally complex, and functionally integrated (Table R2). I argued that subjective selection “is the most important [process] in driving the emergence of super-attractors and producing their regularities” (section 1), but this doesn’t deny the contribution of processes like genetic adaptation. I am open to the hypothesis that the complexity exhibited by lullabies is partly a product of natural selection; I take seriously the possibility that humans possess evolved capacities for music.

So, do they? Savage reviews findings from comparative, cross-cultural, and genetic research but seems to agree that nothing is definitive and that the question of whether human musicality involves evolved specialized adaptations remains unresolved.

A final point of clarification: Savage writes that I regard the absence of lullabies among the Northern Aché as evidence against an evolved basis of music. This is a misunderstanding. Given that lullabies, along with dance songs, appear to have been lost during larger cultural declines (Singh & Hill, 2025), their absence indicates that cultural transmission is partly required for the maintenance of these musical domains. The implication is less about the genetic basis of music than about the necessary role of cultural transmission in sustaining dance and lullabies, in particular.

R3.2.2. Language

Savage and Heintz and Nettle argue that language is a super-attractor. “In fact,” write Heintz and Nettle, “language may be the paradigmatic super-attractor even though Singh makes no mention of it.”

They make a compelling case, citing its universality, complexity, constituent attractors, and overall function for communication. Although, as Savage reviews, natural selection likely favored linguistic abilities in humans, many structural regularities across languages apparently emerge as cultural evolution adapts to human psychology (Christiansen & Chater, 2008), including through subjective selection. Heintz and Nettle provide several plausible examples. Kinship terminology, for example, likely develops as people use and preferentially “retain linguistic distinctions serving their instrumental goals to shape and refer to social relations,” producing both global commonalities and local idiosyncrasies in how languages carve up relations.

Still, insist Heintz and Nettle, “subjective selection has limits.” Along with Morin, they argue that cognitive biases unrelated to instrumental decision-making and evaluation also contribute to cultural design. Yet the example they use – vowel spacing – is contestable. Languages appear to optimize their inventories of vowels such that vowels are maximally distinct from each other acoustically and opportunities for misclassification are minimized. Heintz and Nettle attribute the pattern to biases during learning, concluding that “subjective goals play no direct role in the explanation.” However, the goal of effective communication seems to feature here, as well. Increased vowel spacing improves listener comprehension, and speakers frequently employ it to increase intelligibility (Ferguson & Kewley-Port, 2007; Picheny, Durlach, & Braid, 1986; Smiljanić & Bradlow, 2009). Two meta-analyses confirm that vowel space expansion is also a common feature of infant-directed speech across languages (Cox et al., 2023; Lovčević et al., 2025). It is thus plausible that vowel spacing partly results from attempts to communicate clearly, including when speaking to young language learners.

As vowel spacing demonstrates, finding instances in which instrumental behavior does not play a role in shaping culture may be more difficult than it seems. Nevertheless, I agree with Heintz and Nettle and Morin: subjective goals and evaluations, while important, are not the exclusive psychological pressures shaping culture, and complete explanations of cultural patterns require looking beyond them.

R3.2.3. Identifying other potential super-attractors

Several commentators put forward other super-attractors, including sports (Polimeni), dietary practices (Arslan), healing rituals (Arslan; see also Bui; Chentsova-Dutton and Ryder), and status signaling systems (Braganza). The proposals, although intriguing, mostly lacked the evidence necessary for establishing that these are super-attractors – a reasonable limitation given that most of the relevant work has yet to be conducted. To help clarify what such demonstrations would require and to spur future research, Table R2 summarizes how core criteria of super-attractors might be tested or demonstrated.

R3.3. Experimental edens

Following Fox (1971), I speculated that hypothetically cultureless humans placed on an island and capable of generating society anew would produce the cultural manifold. Ongaro pointed out that such a scenario is empirically impossible. Fair enough, but this misses the point of a thought experiment. My goal wasn't to outline a testable scenario but to make a theoretical claim – namely, that ubiquitous cultural forms arise because humans reliably reproduce them, even in the absence of shared cultural history.

Still, the impossibility of true experimental edens shouldn't discourage us from seeking contexts in which cultural practices might emerge spontaneously and with minimal cultural influence. My search landed me on the Andaman Islands (section 6.1). Bui proposes a different setting: the Intensive Care Unit, or ICU. She describes it as “an archetype of the ‘empty habitat’” where “patients, families, and clinicians unconsciously rebuild culture under extreme conditions of uncertainty and death.” She explains how rituals related to spirituality and healing emerge in such contexts, attesting to their robust appeal. It is a fascinating proposal and deserves future investigation, but, without additional details, it seems hasty to conclude that an ICU is culturally pristine. There are numerous opportunities for patients, families, and clinicians to introduce practices that they have encountered outside of the hospital. In either case, ICUs seem informative as sites where super-attractors might be redeployed in novel environments, revealing their portability and widespread utility.

Table R2. Core criteria for identifying super-attractors

Criterion	What would count as evidence	Example of how it could be tested or demonstrated
Cross-cultural recurrence	Tradition appears across societies spanning diverse ecologies, subsistence modes, and historical trajectories	Compile a stratified global sample and test whether the tradition appears at rates exceeding those expected under diffusion alone, controlling for linguistic relatedness and geographic proximity
Robustness to environmental variation	Tradition persists despite substantial variation in ecology, demography, and social organization	Compare the presence and core features of the tradition across contrasting environments (e.g., foragers vs. agriculturalists, low vs. high population density)
Internal complexity	Tradition comprises multiple interdependent components	Identify component features and test whether they reliably co-occur across cultures
Functional integration	Components interact to produce emergent functions not reducible to any single component	Test whether disruption to a component results in degradation of the overall function

R3.4. Core knowledge

Thomas and Samani propose that core knowledge systems, such as about objects, agents, and social relations, help explain super-attractors. Defining core knowledge as the set of “innate (or very easily learned), abstract cognitive representations that humans possess,” they outline two mechanisms by which they might shape super-attractors:

1. Universal, innate priors make some solutions more likely to be considered and easier to learn.
2. Universal, innate priors are shared across individuals, which is relevant for cultural traditions in which people need to coordinate or reason about others' minds, such as some social institutions and magico-religious traditions.

The first mechanism likely plays a role. Magic is a straightforward example. Anthropologists have long recognized that magical practices around the world exhibit principles of “sympathetic” causality (Frazer, 1922; Hong, 2022; Nemeroff & Rozin, 2000). According to the “law of contagion,” for example, objects once in contact continue to affect each other at a distance, as when a sorcerer manipulates a person's clothing to make them sick. Given the prevalence of such principles across cultures, it is plausible that they derive from innate or easily learned priors about causality, and the research directions Thomas and Samani describe, such as infant cognition and developmental cross-cultural studies, seem like promising avenues to investigate their origins in core knowledge.

The second mechanism is trickier to evaluate. Take the example that Thomas and Samani propose – that shamans engage with spirits partly because they understand others to believe in them. In their example, core knowledge intuitions about agents or objects presumably underlie beliefs in supernatural agents and predispose both shamans and their clients to believe in or reason about them (mechanism 1). But it's not clear what explanatory work core knowledge intuitions are doing beyond creating a local belief. To appreciate this, consider money managers, who also promise control over ultimately uncontrollable systems (S. G. B. Johnson, 2018; Millsap, 2020). The clients of money managers have very different causal models from those of shamans, yet money managers just as easily adapt their methods to these understandings. Magical service providers seem competent at working with beliefs their clients hold, regardless of whether those are idiosyncratic or universally resonant.

R4. Power, influence, and affordances

Several commentators observe that the same cultural product can have different uses for different people – a feature that Chentsova-Dutton et al. call “multifinality.” Moon helpfully uses the analogy of “affordances”: beliefs, practices, and technologies afford people distinct opportunities. He argues that this helps explain demographic differences in religiosity. Considering that many world religions regulate sexual behavior, puritanical parents may have more of a reason to adopt and endorse religious creeds than their sexually active offspring. Similarly, women and lower-status individuals may be more religious in some contexts, but, in others, men and elites seem more interested in the supernatural, especially when they can deploy beliefs and traditions for social control (Bentzen & Gokmen, 2023; Buckner, 2025).

Affordances and multifinality connect to a related set of questions raised by commentators. Sure, culture might be intuitive, compelling, or subjectively appealing, particularly for achieving goals, but they ask for more: “*Intuitive to whom?*” (Alam and Rai) “*Compelling to whom?*” (Haraldsen et al.) “*Whose subjectivity?*” (Garfield)

For these commentators, the answers to these questions lie in power structures and networks of influence (see also Ongaro). Individuals with greater enforcement power or access to communication channels can perpetuate traditions that they perceive to be useful even when they harm the interests of other group members (see also Baumard et al.).

As someone who has argued that cultural evolution needs to attend more to power asymmetries (Singh, Wrangham, & Glowacki, 2017), I am sympathetic to these ideas and agree that comprehensive attempts to explain culture must incorporate them. Based on existing research and the commentaries, we can identify at least three mechanisms by which power and influence might influence how subjective selection occurs:

1. *Powerful parties selectively retain self-serving traditions and maintain them through enforcement.* As long as some parties have a greater capacity to impose their preferences, such as because they have disproportionate access to institutions of rule-making and enforcement (Alam and Rai), variants can evolve to better satisfy their perceived self-interest (Singh et al., 2017). This dynamic likely characterizes the development of many oppressive systems (Wilkerson, 2020), including legally enforced segregation in the southern United States following the American Civil War (Woodward, 1974). It may also underlie the evolution of norms that demand deference to high-status individuals (Zhang et al.).
2. *Individuals who control channels of communication can bias which variants are introduced* (Garfield). Potential examples include adults who manage the information their children encounter, storytellers who curate which narratives are in circulation, and social media companies whose algorithms determine the media their users consume. In all these cases, gatekeepers' interests filter the variation that subjective selection can act on.
3. *Influential individuals shape others' goals or evaluations of usefulness* (Garfield). There are many hypothetical ways in which influential individuals might bias goals or evaluations. A political leader might coordinate instrumental behavior, such as putting forward an agenda to achieve a shared objective. More intriguing, however, is the proposal that leaders can shift followers' goals or evaluations in ways that would diverge from what we would predict based on the instrumental pursuit of core biological goals. Can leaders reweight their followers' motivations or distort judgments of utility? Garfield suggests that they can, but it seems an open question of how and to what extent.

Alam and Rai present an example of how subjective selection may interact with power asymmetries. They focus on harsh punitive institutions, which appear minimally effective at deterring crime, despite substantial support in some Western societies and the common impression that modern punitive practices are more efficient or humane than their historical counterparts (see, e.g., Lavazza). They argue that harsh punitive institutions succeed because people wrongly expect them to boost cooperation – a claim they support with experimental evidence.

Crucially, Alam and Rai point out that “the intuitive appeal of punitive justice is unevenly distributed.” They suggest that people disproportionately targeted by such severe practices might be more skeptical of their effects than people who are never punished. As long as the people who shape punitive institutions are mostly untouched by them (which appears to be the case in some Western contexts), then we should expect them to persist regardless of their inefficiencies. Although various details in their account remain unresolved – for example, they do not provide evidence that real-world communities targeted more often by harsh punishment regard it as less effective – their case study illustrates the importance of both subjective evaluations and political influence in sustaining culture.

R5. Concluding remarks and future directions

R5.1. Explaining moral progress and other historical trends

“Cultural evolution is not only a story of attractors,” writes Lavazza; “it is also a story of breakthroughs.” Societies today look nothing like they did three hundred years ago – let alone thousands of years ago – and the shifts involved in such transformations “appear difficult to reduce to subjective utility alone,” he claims.

Lavazza focuses on the example of “genuine moral progress,” which, for him, encompasses “the transition from irrational to rational beliefs, from retributive to consequentialist models of justice, or from common-sense intuitions to counterintuitive scientific commitments,” as well as “the expansion of moral status.” The trends he describes are genuine and profound, although we should be careful not to overstate their scope or direction. Yes, an epistemology that prioritizes rigorous scientific experimentation has spread and weakened less empirically supported beliefs (Wootton, 2015). Nevertheless, large proportions of Westerners still believe in ghosts (National Folklore Survey of England, 2025) and souls (Pew Research Center, 2023) and engage in superstitious behavior (Caspi, Shmuel, & Chajut, 2024). And despite Lavazza’s contention that “primitive forms of punishment – now considered cruel and unacceptable – are gradually replaced by sanctions oriented toward the rehabilitation of the offender,” a simple contrast between the more restorative justice systems of small-scale societies (Fitouchi & Singh, 2023; Hoebel & 1954; Singh & Garfield, 2022; Wiessner, 2020) and the harsh punitive institutions of many Western states (Alam and Rai) would suggest the opposite trend.

Complexities aside, can subjective selection explain historical trends such as these? On its own, no. A complete account would require considering many other factors, including ecology, power relations, and historical contingency (Diamond, 1997; Morris, 2010). But subjective selection may play a role. Take the expansion of the moral circle, the process by which groups such as propertyless men, women, religious minorities, and homosexuals gained moral status. I have elsewhere argued that this was driven, in part, by the reputational benefits of appearing committed to principles of human equality and liberty (Singh & Hoffman, 2022). Those principles, in turn, appear to have evolved through subjective selection as people crafted and adopted ideologies that justified resistance against authorities and built coalitions, especially in relatively fluid social ecologies.

The paradigmatic case here involves the Huguenots during the French Wars of Religion, who sought “a theory of resistance capable of appealing not merely to the ranks of their co-religionists, but also to a much wider spectrum of opposition to the government” (Skinner, 1978, p. 268). After cycling through different

ideologies, they eventually developed the now-familiar principle of natural liberty, which proved effective at attracting both French Protestants and some Catholics. In the decades afterward, the ideology spread within France; into the Netherlands, where a version was used to justify revolt against Habsburg Spain; and eventually into England, where it was articulated by the Levellers and their successors during the English Civil War (Hill, 1972; see Singh & Hoffman, 2022, pp. 15–16). Although subjective selection cannot, on its own, explain the entirety of historical trends, it can help clarify the currents that comprised them.

R5.2. Formalizing subjective selection

The discipline of cultural evolution is firmly rooted in mathematical modeling, especially approaches from population genetics and evolutionary game theory (Boyd & Richerson, 1985; Cavalli-Sforza & Feldman, 1981). These frameworks have provided powerful tools for studying topics as varied as cultural group selection (Boyd & Richerson, 2009, 2010), ethnic markers (McElreath, Boyd, & Richerson, 2003), and norm enforcement (Boyd & Richerson, 1992). Along with other approaches (e.g., Acerbi & de Courson, 2025; Enquist, Ghirlanda, & Eriksson, 2011), however, they are less well suited to modeling the processes emphasized by subjective selection: the instrumental production of cultural variants and their evaluation using often imperfect criteria of usefulness. Modeling subjective selection requires representing agents who search cultural design spaces, generate variants in biased ways, evaluate them, and preferentially maintain those that appear to best satisfy goals.

A promising source of inspiration is computational cognitive science, which provides formal tools of internal simulation, production, and evaluation. An illustrative example is the “sample, simulate, update” (SSUP) model developed by Allen et al. (2020), in which agents simulate tools before implementing them and then modify those tools after observing their effects in the world. As illustrated in Table R1, some inefficiencies expected from subjective selection depend on the structure of feedback; models that vary parameters like the timing and noisiness of rewards and costs could thus generate sharper predictions about the conditions under which useful cultural practices should not evolve or ineffective practices should persist. Other relevant literature describes models of hierarchical planning (Correa et al., 2025) and hierarchical reinforcement learning (Eppe et al., 2022), as well as efforts to integrate these with model-based approaches (Botvinick & Weinstein, 2014). The modern behavioral sciences offer an impressive collection of modeling approaches, many engineered to capture the sophistication and quirks of human decision-making. Even if not used to formalize subjective selection, applying them to cultural evolution will likely yield insights not possible with current frameworks.

R5.3. Going beyond transmission fidelity to explain human-unique cultural evolution

Cultural evolution has long been dominated by what might be called the “social learning paradigm.” Definitions equate culture with socially learned information (see, e.g., Table 1 in Rendell & Whitehead, 2001). Theories of cultural adaptations have emphasized how social learning, when iterated, gives rise to cultural evolutionary processes that produce adaptive design (Boyd et al., 2011; Boyd & Richerson, 1985).

The social learning paradigm has been influential in explanations of human uniqueness. Human culture is clearly distinct

from that of other animals, and theories for why have long emphasized the cumulative nature of human culture, or the tendency to accumulate modifications such that cultural forms exceed the innovative capacity of any single individual (Boyd & Richerson, 1996; Henrich, 2016; Mesoudi & Thornton, 2018; Tomasello, 1999). Cumulative culture, in turn, has been explained with reference to social learning. Research programs have centered on how social learning differs between humans and other apes (Tomasello, Kruger, & Ratner, 1993; Whiten et al., 2009), with researchers pointing to high-fidelity transmission as the critical factor enabling human uniqueness (Dean et al., 2014; Lewis & Laland, 2012).

Although social learning features in the subjective selection framework, it is not nearly as critical a mechanism as in previously theorized processes of cultural evolution. Rather, what is central is the production, evaluation, and adoption of behavior directed at the satisfaction of hierarchically nested goals. Key capacities thus include the ability to represent hierarchies of goals and flexibly modulate behavior at any level within them, including creating elaborate, entirely new goal schemes.

This reorientation parallels recent work suggesting that open-endedness, more than the mere accumulation of modifications, makes human culture unique. Derex (2022) provided evidence that only humans can continuously exploit a broader set of natural phenomena to build progressively complex and effective technologies. Morgan and Feldman (2025) argued that, whereas non-human cultural behaviors are usually limited to specific domains, especially feeding and communication systems, human cultural behaviors seem possible in many more contexts.

Combining their insights, humans seem uniquely capable not only of combining many novel sub-routines to satisfy a goal but also of modifying a larger array of goal-directed actions. In fact, Morgan and Feldman (2025, p. 35) similarly conclude that studying “how individuals mentally represent actions and their goals” is a fruitful direction for assessing open-endedness and human uniqueness. While the primary place afforded to social learning has no doubt been scientifically generative, future progress – whether in identifying what makes us special or in explaining where cultural forms come from – may come from directing some attention away from transmission and toward evaluation within flexible goal hierarchies.

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