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## Evolution and Transmitted Culture

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It is a truism that cultures, or widely distributed clusters of ideas, practices, and their material effects, exist in all human populations, vary markedly from one group to another, and shape human lives in profound ways. Linguistic dialects, cooking methods, technology, calendars, time-keeping devices, writing, formal schooling, folktales, religious beliefs, agricultural practices, and, as recent evidence indicates, even basic psychological processes such as selfways and cognitive tendencies vary across groups and form the bulk of human activity in all societies in the world.

Culture is an evolutionary puzzle for two reasons: (a) No other unitary species in the world shows the extent of intergroup variation in behavior that is seen in humans, and (b) this intergroup variation is largely independent of reproductive events. What accounts for this variation? It cannot be genetic differences. Although there is considerable evidence from behavioral genetics that some individual differences in behavior within any given group are partly genetic (e.g., Plomin, Owen, & McGuffin, 1994), genetic differences between human groups are too small and behavioral variation between groups too large for genetic evolution to explain most human intergroup variation. Moreover, two groups of genetically similar individuals who live in different environments end up with radically different beliefs and behaviors. Nongenetic explanations are needed. Gangestad, Haselton, and Buss (this issue), are right that evolutionary processes that do not invoke genetic differences can shed light on why and how cultural variation emerges.

### Cultural Variation in Psychology

In most of psychology as well as anthropology, culture is treated as a given. Psychologists interested in culture have tended to focus on the extent to which cultures vary and how this variation affects not just the superficial content of beliefs and behaviors but the very nature of basic domain general psychological processes, including the self (Markus & Kitayama, 1991;

Triandis, 1989), cognition (Medin & Atran, 2004; Nisbett, Peng, Choi, & Norenzayan, 2001), attention and perception (Nisbett & Miyamoto, 2005), motivation (Heine, Lehman, Kitayama, & Markus, 1999), and emotion (Mesquita, 2001; Nisbett & Cohen, 1996).

This is understandable. For most of its modern history, psychology has faced a daunting cultural challenge. The vast bulk of empirical research in psychology, with some notable exceptions, many originating from evolutionary psychology (e.g., Buss, 1989; Daly & Wilson, 1988), has been conducted with an astonishingly narrow subset of the world's population: Western, middle-class, industrialized, secular people (and their children). Needless to say, this subgroup is a culturally unrepresentative sample of the world and comprises a small percentage of the world's population. As a result, until recently the invariance of psychological processes was assumed as a given, and little was known about the extent to which psychological theories and findings would generalize to the rest of the world's population, and in fact many of the central theories and findings of psychology do not travel well (see Norenzayan & Heine, 2005, for a discussion of universals and cultural differences). This picture has been changing slowly. Growing cross-cultural research promises to expand the psychological database to encompass the world's cultural diversity, and, as a result, theories about human behavior can gain greater accuracy and generality, placing psychological science on firmer empirical foundations.

But culture is not just the *explanans* but also the *explanandum* of social science. It is a thing that must be explained. Why does culture exist at all? Are there phylogenetic homologies of culture in other species? How does culture emerge, and what are the psychological mechanisms by which beliefs and behaviors achieve cultural stability in a population of minds? Why are some distributions of beliefs and behaviors more culturally prevalent than others? How do culturally acquired beliefs interact with innate tendencies? These are important questions about culture that invite psychologists to treat culture as an emerging process as

well as a causal force in human psychology (Kameda, Takezawa, & Hastie, 2003; Lehman, Chiu, & Schaller, 2004; Norenzayan, Schaller, & Heine, in press; Schaller & Crandall, 2004).

### Evoked and Transmitted Cultural Variation

As Tooby and Cosmides (1992) have proposed, from an evolutionary perspective, there are two known processes that offer a naturalistic account of how culture emerges: (a) Culture can be evoked by local environmental triggers acting on the same underlying psychology (evoked culture); (b) culture can travel from mind to mind by processes of transmission, analogous, but not identical, to Darwinian genetic evolution (transmitted or epidemiological culture, e.g., Sperber, 1996). To illustrate how evoked culture operates, Tooby and Cosmides discussed how the same food-sharing mechanism can lead to different cultural norms depending on the degree of variability in foraging success. Egalitarian norms for food sharing and sanctions against hoarding are strong where foraging or hunting success is highly variable across time, but not when the supply of food is relatively stable. In their article, Gangestad et al. (this issue) admirably elaborate on the notion of evoked culture to explain cultural variation in mate preferences. In this case, the authors argue that the same underlying mate preference for indicators of health interacts with an ecological cue to produce cultural variation—where parasite prevalence is high, features signaling health are more important and diagnostic of underlying health, and as a result attractive mates are preferred more strongly than in regions with low parasite prevalence.

Transmitted or epidemiological culture, in contrast, is prototypically what most social scientists consider culture (Nisbett, 2003; Richerson & Boyd, 2005; Sperber 1996). This refers to the fact that genetically similar people living in similar environments may possess strikingly different beliefs and practices that they acquire from others in their group. Culture emerges when information is transmitted not genetically but socially through social learning mechanisms such as mimicry, imitation, and instruction (Tomasello, Kruger, & Ratner, 1993), as well as a byproduct of communicative processes such as gossip, conversations, and telling of stories (Schaller, 2001). With significant assistance from other human beings, people acquire and transmit substantial amounts of information that subsequently alters their behavior in profound ways. Growing research points to some rudimentary forms of cultural transmission in other species, particularly chimpanzees, who exhibit culturally variable traditions in some 39 behaviors (Whiten, 2005). However, cultural transmission in humans is so massive and

rapidly cumulative that many evolutionary scientists consider it a species-specific second system of inheritance in humans, distinct from, but interacting with, genetic inheritance (Richerson & Boyd, 2005; Tomasello, 1999). Richerson and Boyd went so far as to argue that transmitted culture is an adaptation and that babies are born biologically prepared to rapidly learn the beliefs and practices of their social group. A learning bias that adopts the most common behaviors of the ingroup may have been selected in the ecologically fluctuating ancestral environment in which human psychology evolved. Whether or not transmitted culture can best be considered a naturally selected adaptation, psychological research grounded in evolutionary science can shed light on this powerful but poorly understood engine that drives culture.

Although Gangestad et al. (this issue) are careful to note that cultural variation is likely to be the result of both evocation and transmission, like Tooby and Cosmides (1992) and many evolutionary psychologists, they privilege the notion of evoked culture as the central evolutionary framework to explain cultural variation. Of course, evoked culture is a welcome development that promises to engage evolutionary psychology with cultural psychology and may encourage fruitful new avenues to explain not just psychological universals but cultural variation as well. But why have evolutionary psychologists been wary of the concept of transmitted culture? Is transmitted culture a Trojan horse that, once invited in, would unleash conceptual anarchy and unravel the project of anchoring psychology in an evolutionary framework? On first thought, it might seem so. Many of the cultural elements that spread in a population are, at best, arbitrary conventions such as dress code, whether to eat horse meat or dog meat, or whether to serve the said meat as a sizzling steak or boil it into a goopy goulash. At worst, they are Darwinian nightmares, competing with genetic interests and even undermining them, such as when the idea of celibacy, suicide, the practice of using contraceptives, eating rotten foods, or writing scientific articles instead of having children succeed in colonizing a large number of minds.

But no need to worry about transmitted culture! Even if a significant part of the content of culture may be fitness-neutral or in some cases may even compete with genetic fitness, evolutionary thinking is essential for our understanding of (a) the evolved psychological capacities that power cultural transmission and (b) whether cultural elements themselves are subject to a secondary evolutionary process—variation, selection, and retention analogous to natural selection. Evolutionary thinking is also essential to understand how genetic and cultural evolution influence each other. In the rest of this article, then, I aim to give transmitted culture its due, with two goals in mind. With evolutionary psychologists in mind, I argue for the centrality of

transmitted culture in accounting for a significant, if not overwhelming, bulk of human variation on the planet. With cultural psychologists in mind, I argue for the importance of evolutionary science in explaining cultural transmission as one of the central mechanisms of human cultural variation.

### **Evolved Capacities for Transmitted Culture**

The set of psychological capacities that allowed humans to learn from others and calibrate their behavior to the cultural group in which they live are rooted in evolutionary processes. There is already a great deal of good theoretical work, mostly from anthropology, about such capacities (Boyd & Richerson, 1985; Richerson & Boyd, 2005; in psychology, see Tomasello et al., 1993). Several independent mechanisms that may contribute to transmitted cultural differences have been proposed and examined. The simplest of those is social learning, which allows humans to imitate other humans without any particular bias as to who gets to be the model of imitation. This mechanism could have been selected for, because individuals in a group live in more or less the same environment and are likely to face similar survival challenges. By allowing individuals to imitate the behavior of others, social learning can evolve by freeing individuals from the costs of trial and error learning, as long as the alternative cost of imitating maladaptive behaviors are not too high.

Another mechanism identified by Henrich and Boyd (1998) is “conformist transmission,” which, unlike simple social learning, is biased toward adopting the most common behaviors in a group. Such conformist transmission is robust in environments that fluctuate within space and over time and may have been selected for in the human ancestral environment that seems to have been quite unstable, for example in weather and in availability of food supply (see Richerson & Boyd, 2005). Finally, a form of biased transmission may have evolved that is sensitive to the success or prestige markers of individuals, such that successful individuals in a group are more likely to be imitated (Henrich & Gil-White, 2001). Although social psychologists have examined similar social influence processes, there has been insufficient effort to ground this research in an evolutionary framework. Most likely, there are several, psychologically distinct, flexible transmission mechanisms that optimally operate in different social contexts. It is up to evolutionary social psychology to generate hypotheses regarding the behavior of these mechanisms, examine their boundary conditions, and link them to known culturally acquired beliefs and behaviors. Such work is mutually relevant to both evolutionary psychology and cultural psychology and prom-

ises to enrich both fields as well as psychology more broadly.

### **Cultural Evolution**

Clarifying the psychological mechanisms of transmitted culture is only part of the evolutionary story of culture. Once transmission mechanisms give rise to cultural forms of learning, they open the floodgates to cultural evolution. Cultural elements then enter into what is probably a secondary evolutionary process in humans that is distinct from genetic evolution but interacts with it in complex ways. This is because evolution is substrate-neutral (Dennett, 1995). Any entity—be it DNA, computer viruses, or mental representations—capable of replication, selection, and retention is likely to undergo Darwinian processes. Cultural evolution is a hotly debated topic, and several theoretical issues still remain open. One issue that has received attention is the accuracy of cultural transmission. Unlike genetic transmission, cultural transmission has low fidelity (Atran, 2001). Whereas genetic transmission is largely a process of faithful replication, cultural transmission is more akin to transformation or inference (Sperber, 1996; see also Boyer, 1994). At every instance of cultural transmission from one individual to another, cognitive and emotional biases transform the mental representations. For example, a folktale or an urban legend that is told and retold is not preserved in identical form across minds the same way DNA replicates from parent to offspring. Rather, each act of transmission is a systematic reconstruction, and several versions of the same folktale or urban legend emerge in oral traditions. Nevertheless, quasi-stable cultural traditions do emerge over time, either because these psychological biases or what Sperber called “attractors” systematically push beliefs into certain regions, or because, as Henrich and Boyd (2002) argued, stable cultural beliefs at the population level can plausibly emerge even if transmission is low-fidelity at the individual level.

Either way, these cognitive and emotional biases render psychology central to the study of cultural evolution (see, e.g., Boyer & Ramble, 2001; Heath, Bell, & Sternberg, 2001; Norenzayan, Atran, Faulkner, & Schaller, in press). Here again, psychology informed by evolutionary thinking can contribute to our understanding of how ideas achieve cultural success. The cultural prevalence of supernatural beliefs such as ghosts and Gods, for instance, can be understood as by-products of cognitive and emotional programs that were designed for other purposes, such as agency detection, memory, and existential fears (e.g., Atran & Norenzayan, 2004; Barrett, 2001; Boyer, 1994; Guthrie, 1993).

Furthermore, cultural evolution is essential for our understanding of human nature because it sheds light on many (culturally altered) behaviors that are otherwise quite puzzling from the standpoint of genetic evolution or evoked culture. Evolutionary psychologists correctly point out that human mental adaptations were selected for in the ancestral environment, not in the modern cultural environment, and therefore they could be maladaptive today. But why did the modern cultural environment become so astonishingly different from the ancestral environment in less than 10,000 years? The answer is cultural evolution. For example, populations exposed to higher education are less likely to have offspring, which means that the practice of higher education can spread in populations even though it has the net effect of reducing genetic fitness (Richerson & Boyd, 2005). The most compelling naturalistic explanation for such effects is cultural evolution.

### Back to Evoked Culture

Although evoked and transmitted culture are theoretically distinct processes, it is notoriously difficult to disentangle the two. In their framework, Gangestad et al. (this issue) tested variation in parasite prevalence against variation in gender inequality to explain mate preferences. Although parasite prevalence clearly is an evoked variable (characteristic of the environment), it is unclear whether gender inequality is best construed as the product of evocation or transmission. As Gangestad et al. discuss in some detail, there are various competing explanations for gender inequality across cultures in the first place. When men produce more surplus calories (usually by hunting) than women, gender roles diverge. Men and women may engage in different activities because of evocation (ecological factors) or transmission (how boys and girls are socialized and trained in the society). Most likely it is both. Therefore, Gangestad et al. provide evidence that evocation does account for cultural variation in mate preferences, but their design does not allow for a clear test of whether transmission contributes to this variation.

Indeed, Gangestad et al. (this issue) point to the issue of the inseparability of evoked and transmitted culture when they discuss Nisbett and Cohen's (1996) work on the culture of honor. The southern United States, as well as the Mediterranean region, has a tradition of honor, in which toughness and aggressive response to insults is prized in a way that it is not in the northern United States or in most of northern Europe. The origin story of this difference is in fact evoked culture: Where wealth is easily stolen, as in ecologies supporting herding economies, men are more deeply preoccupied with maintaining their honor or reputation for toughness. The U.S. South was settled by Scotch

Irish herders, whereas the U.S. North was settled mostly by European farmers, and as a result a tradition of honor is prevalent in the South but not in the North. But cultural differences persist even when the original economic conditions disappear. Culture of honor continues to flourish in industrialized Houston, even though herding is a thing of the past. The best explanation for the persistence of honor cultures is social transmission, and indeed a variety of evidence supports this view (Nisbett & Cohen, 1996; see also Cohen, Vandello, Puente, & Rantilla, 1999). Perhaps a common scenario across cultures is that ecological differences evoke an initial cultural response that adaptively varies but then is picked up by processes of transmitted culture, amplified, and perpetuated even when the initial conditions are no longer present.

How, then, can we disentangle the relative contributions of evoked and transmitted culture? Richerson and Boyd (2005) proposed the ideal "common garden experiment": Take two groups of individuals with very different cultures, say, Inuit fishermen and Ache foragers, and switch them around—some Inuit move into the rainforests of Paraguay and some Ache move into the icy fringes of Greenland. Would the Ache foragers in Greenland begin to resemble the Inuit more than they would resemble their Ache compatriots in Paraguay, as the evoked culture explanation would predict? Or would they remain more like their Ache compatriots and, without the cultural repertoire of arctic survival, quickly perish in the harsh climate, as the transmitted culture explanation would maintain?

In the absence of such a naturalistic experiment, what can researchers do? One approach is to hold one variable constant while examining the effect of the other variable. Comparing groups living in similar environments but with different beliefs and practices allows researchers to isolate the effects of transmitted culture. The Amish of the U.S. Midwest, for example, live in the same ecological environment as neighboring German-ancestry farmers but to this day have maintained beliefs and practices that are markedly different. The complementary strategy would be to measure the effects of a novel ecological variable on a group that shares the same culture (e.g., by examining how farmers in the U.S. North living in a farming community differ from farmers who have migrated to a new environment in which they adopt herding). Psychologists interested in cultural variation have been slow in adopting such research questions that are ultimately important in isolating the mechanisms of cultural variation. These questions can be fruitfully examined by studying immigrant populations who move to an ecologically different setting and conversely by tracking cultural evolution in several groups who live in similar ecological circumstances.

For example, one interesting study (Rice & Steele, 2005) compared the average subjective well being

(SWB) of European countries with various European ethnic groups in the United States whose ancestry is derived from these countries. Cultures across countries differ markedly in their average SWB, and it was found that the relative differences in SWB among these American ethnic groups, although smaller, were nevertheless preserved even after generations of living in the same country, under similar ecological conditions of American middle-class life. Because group differences in SWB in these samples are likely not genetic, such a finding supports the idea that an important psychological variable such as SWB is transmitted socially across generations and can persist for a long time even in a different environment.

### Conclusion

In the past two decades, both cultural psychology and evolutionary psychology have enjoyed marked growth. Cultural psychologists have been documenting the extent of cultural variation in psychological functioning. Evolutionary psychologists have been documenting the species-specific mental architecture that evolved to solve adaptive problems in the ancestral environment. Yet evolutionary explanations for how culture emerges in the first place, as well as for cultural differences, have been relatively neglected in cultural psychology and are beginning to be addressed only recently. Conversely, empirical work on cultural variation has been relatively neglected in evolutionary psychology. Greater interest in the scope and nature of cultural variation among evolutionary psychologists, and greater interest in evolutionary explanations in cultural psychology, are a welcome development that stands to strengthen psychology as a science. Evolutionary considerations that underlie processes of both evoked and transmitted cultural variation are an exciting point of convergence between these two fields and are an important scientific advance for a psychology that encompasses the world's cultural diversity.

### Notes

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## Evoked Culture and Evoked Nature: Coevolution and the Emergence of Cultural Animals

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Arguments about whether behavior is best explained by invoking nature or culture have been a staple of social sciences for decades. Declaring them over and resolved, especially in the form of both sides' repeated claims to have won, has not brought them to an end. In work such as the target article by Gangestad, Haselton, and Buss (this issue), however, one can begin to get a glimpse of how a conceptual integration might occur. As they suggest, cultural variation is not a prime-mover sort of autonomous explanation for behavior but rather a well-documented phenomenon that itself calls for explanation. The authors propose that evolutionary theories can potentially offer a powerful basis for explaining cultural variation.

Our enthusiastic support for the target article's line of argument is accompanied by a sense that the nature–nurture debates are not likely to be ended even if conceptual integration continues apace. The practical issues concerning proximal causation, for example, likely will continue to revive debates as to how much a change in cultural conditions or socialization practices can alter problem behaviors. Can murderers and sex offenders be rehabilitated to become model citizens? Can race differences in intellectual performance be eliminated? Do women inevitably make better parents, lovers, and leaders than men?

Our purpose in this brief comment is not to dispute or criticize the thoughtful arguments made by

Gangestad et al. (this issue) so much as to offer complementary ideas that can possibly advance the project of integrating nature and culture within the same theory. We suspect that researchers sympathetic to culture will regard the target article—and similar efforts to explain culture by invoking nature—as a sort of hostile takeover. It might be easy for cultural sympathizers to read this work as saying that evolution can explain everything, including culture. Perceptions of hostile takeover can perhaps be softened, however, by suggesting that culture has also influenced nature, thus augmenting “evoked culture” with “evoked nature.”

In a model of human nature based on a survey of psychological research findings, Baumeister (2005) concluded that the most apt integrative formula would treat the human psyche as exceptionally well designed for culture. Humans have the same basic wants and needs as most other animals, but the ability for humans to live in culture changes the strategies by which they set out to satisfy these basic goals. That is, moving beyond the long-standing notion that humans are simply social animals, the most all-encompassing explanation of what is distinctive about humans would depict them as cultural animals.

To argue that culture influenced (evoked) nature, several conceptual refinements are necessary. First, the importance of culture is not limited to cultural differences. In practice, the vast majority of theorizing about