

## Cross-Cultural Universals and Variations: The Evolutionary Paradox of Informational Novelty

Mark V. Flinn

*University of Missouri–Columbia*

### Psychological Universals and Adaptive Variation

The identification of universals in a species is an important method for inferring adaptive design (Mayr, 1982). Among humans, large (~1300cc) brains and habitual upright bipedal locomotion are ubiquitous traits that distinguish us from our primate relatives, providing important clues about hominin evolutionary history. The identification of psychological universals is similarly useful (Brown, 1991; Ekman, 1993; Norenzayan & Heine, 2005) and has been emphasized by the evolutionary psychology paradigm (e.g., Buss, 1995; Tooby & Cosmides, 1990).

The identification of variation can also be a powerful scientific tool. For example, different color morphs of *Heliconius* butterflies suggest advantages for distinctive aposematic color patterns (Langham, 2004), maintaining allelic diversity at relevant loci. In addition to genetic differences, phenotypic variation usually involves ontogenetic responses to the environment (West-Eberhard, 2003). Gangestad, Haselton, and Buss (this issue) note the flexible production of melanin in melanocytes in response to solar radiation. Other classic examples include seasonal changes in cryptic fur coloration in the arctic hare, production of a protective shield in *Daphnia* in response to predation risk (Agrawal, Laforsch, & Tollrian, 1999), and the canalization of migratory locusts into short-winged nondispersing or long-winged dispersing adult morphs contingent on exposure to crowded conditions as juveniles (for a general discussion, see Schlichting & Pigliucci, 1998). Learning constraints follow similar “reaction norms” (e.g., Garcia, 1974). The phenotypic variations associated with human culture, however, present some added complexities for inferring evolutionary design.

### The Problem of Culture

Vygotsky (1978) observed that children are especially tuned to their social worlds and the information that it provides. More recent evolutionary theorists of the mind suggest a complementary adaptive logic: The social world is a rich source of useful information for cognitive development. The human brain has been designed by natural selection to take advantage of this bonanza of data (e.g., Alexander, 1979; Belsky, 2005; Bjorklund & Pellegrini, 2002; Tooby & Cosmides,

1992). Some, perhaps in a gesture of appeasement to the cultural *tabula rasa* old guard, would have culture running off in its own evolutionary system with its own separate (but linked!) inheritance mechanisms (for reviews, see Dawkins, 1982; Durham, 1991; Henrich & McElreath, 2003; Richerson & Boyd, 2005). Others advocate a more restrictive grounding in the biology of learning (e.g., Galef, 2004; Gottlieb, 2002; Shettleworth, 1998; Tomasello, 1999), viewing culture as a rather special type of phenotypic plasticity (Alcock, 2005; Coe, 2003; Flinn, 1997; Flinn & Alexander, 1982). Gangestad et al (this issue) exemplify this latter paradigm, modeling culture—with mate choice as a specific component—as a compilation of flexible responses by individuals to specific environmental contingencies, analogous to the biological concept of reaction norms and consistent with the basic premises of evolutionary psychology (e.g., Daly & Wilson, 1983).

Here I aim to push this evolutionary perspective beyond the concept of “evoked culture” as constrained response to variable environments guided by specialized psychological modules. Startling advances in the understanding of the evolutionary basis of the phenotype, captured in part by the emergent field of “evo-devo” (evolutionary developmental biology) and its re-emphasis of the complexity of ontogeny (West-Eberhard, 2003), have apparent relevance to this question of culture and its variants (e.g., Heyes, 2003).

Culture may be viewed as a highly dynamic information pool that coevolved with the extensive information-processing abilities associated with our flexible communicative and sociocognitive competencies (Alexander, 1979). With the increasing importance and power of information in hominin social interaction, culture and tradition may have become an arena of social cooperation and competition (Coe, 2003; Flinn, 2004; see also Sternberg & Grigorenko, 2004).

The key issue is novelty. One of the most difficult challenges to understanding human cognitive evolution, and its handmaiden culture, is the unique informational arms race that underlies human behavior. The reaction norms posited by evolutionary psychology to guide evoked culture within specific domains may be necessary but insufficient (Chiappe & MacDonald, 2005). The mind does not appear limited to a predetermined Pleistocene set of options—such as choosing mate A if in environment X but choosing mate B if in environment Y—analogous to examples of simple phenotypic plasticity (MacDonald & Hershberger, 2005). The human jukebox does not just keep the same

old selection of tunes; the Beatles displaced Elvis, and so forth.

Keeping up in the hominin social chess game required imitation. Getting ahead favored creativity to produce new solutions to beat the current winning strategies. Random changes, however, are risky and ineffective. Hence the importance of cognitive abilities to hone choices among imagined innovations in ever more complex social scenarios. The theater of the mind that allows humans to “understand other persons as intentional agents” (Tomasello, 1999, p. 526) provides the basis for the evaluation and refinement of creative solutions to the never-ending novelty of the social arms race. This process of filtering the riot of novel information generated by the creative mind favored the cognitive mechanisms for recursive pattern recognition in the open domains of both language (Deacon, 1997; Nowak, Komarova, & Niyogi, 2001; Pinker, 1994) and social dynamics (Geary, 2005). The evolutionary basis for these psychological mechanisms underlying culture appears rooted in a process of “runaway social selection” (Alexander, 2005; Flinn, Alexander, & Coe, 2006).

### Runaway Social Selection

Darwin (1871) recognized that there could be important differences between (a) selection occurring as a consequence of interaction with ecological factors such as predators, climate, and food, and (b) selection occurring as a consequence of interactions among conspecifics (i.e., members of the same species competing with each other over resources such as nest sites, food, and mates). The former is termed *natural selection* and the latter *social selection*, of which sexual selection may be considered a special subtype (West-Eberhard, 1983). The pace and directions of evolutionary changes in behavior and morphology produced by these two types of selection—natural and social—can be significantly different (Alexander, 1974, 2005; R. A. Fisher, 1930; West-Eberhard, 2003).

Selection that occurs as a consequence of interactions between species can be intense and unending, for example with parasite–host red queen evolution (Hamilton, Axelrod, & Tanese, 1990). Intraspecific social competition may generate selective pressures that cause even more rapid and dramatic evolutionary changes. Decreasing constraints from natural selection, combined with increasing social competition, can generate a potent runaway process. Human evolution appears characterized by such circumstances (Alexander, 2005; Flinn, Geary, & Ward, 2005). Humans, more so than any other species, appear to have become their own most potent selective pressure via social competition involving coalitions (Alexander, 1989; Geary & Flinn, 2002; Wrangham, 1999; e.g., Chagnon, 1988) and dominance of their ecologies involving niche con-

struction (Deacon, 1997; Laland, Odling-Smee, & Feldman, 2000). The primary functions of the most extraordinary human mental abilities—language, imagination, self-awareness, ToM, foresight, and consciousness—involve the negotiation of social relationships (Adolphs, 2003; Geary, 2005; Siegal & Varley, 2003; Tulving, 2002). The multiple-party reciprocity and shifting nested subcoalitions characteristic of human sociality generate especially difficult information-processing demands for these cognitive facilities that underlie social competency. Hominin social competition involved increasing amounts of novel information and creative strategies. Culture emerged as a new selective pressure on the evolving brain.

### Evolution of the Cultural Brain

The human brain is a big evolutionary paradox. It has high metabolic costs, it takes a long time to develop, it evolved rapidly, it enables behavior to change quickly, and it generates unusual levels of informational novelty. As noted earlier, its primary functions include dealing with other human brains (Adolphs, 2003; Gallagher & Frith, 2003; Siegal & Varley, 2002; Tulving, 2002). The currency is not foot-speed or antibody production but the generation and processing of data in the social worlds of the human brains’ own collective and historical information pools. Some of the standout features of the human brain that distinguish us from our primate relatives are asymmetrically localized in the prefrontal cortex, including especially the dorsolateral prefrontal cortex and frontal pole (Allman, Hakeem, Erwin, Nimchinsky, & Hof, 2001; Semendeferi et al., 2001; Zilles et al., 1996; for a review, see Geary, 2005). These areas appear to be involved with “social scenario building” or the ability to “see ourselves as others see us so that we may cause competitive others to see us as we wish them to” (Alexander, 1990, p. 7; cf. Bekoff & Sherman, 2004) and are linked to specific social abilities such as understanding sarcasm (Shamay-Tsoory, Tomer, & Aharon-Peretz, 2005) and morality (Moll, Zahn, de Oliveira-Souza, Krueger, & Grafman, 2005). An extended childhood seems to enable the development of these necessary social skills (Joffe, 1997). Learning, practice, and experience are imperative for social success. The information-processing capacity used in human social competition is considerable and perhaps significantly greater than that involved with foraging skills (Roth & Dicke, 2005).

### Evolution of the Cultural Child

The altricial (helpless) infant is indicative of a protective environment provided by intense parental and

alloparental care in the context of kin groups (Chisholm, 1999). The human baby does not need to be physically precocial. Rather than investing in the development of locomotion, defense, and food acquisition systems that function early in ontogeny, the infant can work instead toward building a more effective adult phenotype. The brain continues rapid growth, and the corresponding cognitive competencies largely direct attention toward the social environment. Plastic neural systems adapt to the nuances of the local community, such as its language (Alexander, 1990; Bjorklund & Pellegrini, 2002; Bloom, 2000; Geary & Bjorklund, 2000; Geary & Huffman, 2002; Small, 1998, 2001). In contrast to the slow development of ecological skills of movement, fighting, and feeding, the human child rapidly acquires skill with the complex communication system of human language (Pinker, 1999). The extraordinary information-transfer abilities enabled by linguistic competency provide a conduit to the knowledge available in other human minds. This emergent capability for intensive and extensive communication potentiates the social dynamics characteristic of human groups (Deacon, 1997; Dunbar, 1997) and provides a new mechanism for social learning and culture. The recursive pattern recognition and abstract symbolic representation central to linguistic competencies enable the open-ended, creative, and flexible information-processing characteristic of humans, especially of children.

### **Reconciling Domain-Specific Modularity With Informational Novelty**

Humans are unique in the extraordinary levels of novelty that are generated by the cognitive processing of abstract mental representations. Human culture is cumulative; human cognition produces new ideas built on the old. To a degree that far surpasses that of any other species, human mental processes must contend with a constantly changing information environment of their own creation.

Cultural information may be especially dynamic because it is a fundamental aspect of human social coalitions. Apparently arbitrary changes in cultural traits, such as clothing styles, music, art, perceptions of beauty, food, dialects, and mate choice decisions, may reflect information “arms races” among and within coalitions. The remarkable developmental plasticity and cross-domain integration of some cognitive mechanisms may be products of selection for special sensitivity to variable social context (e.g., Boyer, 1998; Carruthers, 2002; Sperber & Hirschfeld, 2004). Human culture is not just a pool or source of information; it is an arena and theater of social manipulation and

competition via cooperation. Culture is contested because it is a contest.

The effects of coalition conformity and imitation of success may drive culture in directions difficult to predict solely on the basis of simple functional concerns or evolved psychological mechanisms. This social dynamic would explain the apparent lack of a simple biological utilitarianism of so much of culture and the great importance of historical context and social power (e.g., Wolf, 2001). Deconstruction is a complicated but necessary enterprise, for we are all players in the social arena. The twist is that we are evolved participants.

This perspective may reconcile important gaps between the evolutionary psychological paradigm and the more history-oriented anthropological approaches (e.g., Richerson & Boyd, 2005) because it suggests an evolved human psychology that is creative, dynamic, and responsive to cultural context (e.g., Kenrick, Li, & Butner, 2003), rather than being more rigidly constrained by domain-specific modules.

#### **Culture and Mate Choice: Context-Specific and Context-General Conditional Responses**

Beauty appears to have some cross-culturally universal components (Jones, 1996; Kenrick & Keefe, 1992). Health, youth, fertility, and status have near-ubiquitous appeal. Romantic attachment involves the same hormones and neurotransmitters and the same locations in the brain (Bartels & Zeki, 2004; H. Fisher et al., 2002). The devil is in the details. Evolutionary psychology has tended to focus on a limited set of mate choice criteria, largely based on research among industrialized global cultures. Analyses of variation in mating systems from human behavioral ecology have tended to focus on associations between subsistence practices, control of material resources, and male–female reproductive strategies (e.g., Borgerhoff Mulder, 1991; Geary & Flinn, 2001; Hill & Hurtado, 1996; Smith, Borgerhoff Mulder, & Hill, 2001). For example, mating relationships tend to be less stable and less exclusive in societies with subsistence ecologies that lack important resources individual men can monopolize (Flinn, 1981). Moreover, individual variability of mating relationships within a society also tracks resource control (e.g., Flinn, 1986, 1988, 1992). Gangestad et al (this issue) reiterate the importance of this type of flexible evoked culture response to the material world.

The importance of kin-based coalitions for the control of social and material resources, and the resultant nuances of human mating systems in traditional societies (Chagnon, 1997; Flinn & Low 1986; Irons, 1983), however, have not yet been incorporated into a comprehensive theoretical framework in evolutionary psychology. The awareness of these shortcomings, and the interest in a broader cross-cultural database advocated by Gangestad et al. (this issue), are potential great strengths that will go far to advance our understanding

of the nature of human psychology and its adaptive variations. This synthesis also portends renewed interdisciplinary efforts among anthropology, biology, and psychology across a broad range of research questions that may help resolve concerns that “many psychologists have not been studying human nature—they have been studying the nature of educated, middle-class, young adult Westerners (or the children of such people)” (Norenzayan & Heine, 2005, p. 765).

### Note

Correspondence should be sent to Mark V. Flinn,  
XXXXXXXXMAILING ADDRESS  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.  
E-mail: XXXXXXXXXXXXXXXXXXXXXXX .

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## Evolution and Transmitted Culture

Ara Norenzayan

University of British Columbia

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