

## Cultural Evolution and Gene–Culture Coevolution

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The purpose of this journal is to publish work on imaginative culture, viewed “as arising out of human nature—the evolved and adapted character of the human mind.” Work on cultural evolution and gene–culture coevolution can fit under this statement only if “human nature” and “mind” are defined in a slightly unorthodox way. The idea of human nature smacks of the essentialism that Darwin’s focus on heritable variation successfully overthrew (Hull 1986). The term is sometimes used informally to mean the ensemble of genetic differences between humans and our relatives and ancestors. This use of “human nature” is fine, but it does no real theoretical work (Lewens 2012). Similarly, locating the important evolved properties of humans in the “mind” is problematic. The brain is certainly an organ that does a lot of work, though how it works is still an uncertain and controversial field. The relationship of the mind to the brain is fraught. Some people speak of “embodied cognition” (Anderson 2014). For example, our hands are very well adapted to making and using tools (Bril, Parry, and Dietrich 2015). Perhaps brains gradually learn what evolved hands can do, as when small children master their hands well enough to feed themselves treats. Human adaptations are instantiated in organs all over our body. Only if “mind” is stretched to include our short gut, our ample supply of sweat glands, our physically helpless infants, and so forth, can we fully comprehend human evolution and adaptation.

Cultural evolutionists argue that culture is a major part of our evolved embodied minds in two senses. First, we are genetically adapted to use culture. Our hands are adapted

for toolmaking and our norm-obsessed social psychology is adapted to socially learn the institutions by which our societies operate (Chudek and Henrich 2011). Second, specific cultural traditions evolve and are instantiated in our embodied cognition. For example, the Southern culture of honor described by Nisbett and Cohen (1996) works by calibrating perceptions of threats, and manipulating hormone titers respond to them aggressively.

I will characterize the cultural evolutionist’s views of the causes of human behavior by defending five theses that are central to the theory of gene–culture coevolution.

**1. Humans are massively cultural.** The Darwinian focus on heritable variation led Darwin himself and contemporary cultural evolutionists to culture. Although our genes are not very variable, our cultures are highly variable, comprising some 7,000 languages and all the other cultural variations in technology, social organization, and imaginative culture. Like languages, many cultural traditions have historical roots millennia deep (Currie and Mace 2009). Cognitive adaptations for imitation and teaching are reasonably well studied (Carey 2009; Kline 2015). The natural history of humans furnishes ample evidence for the importance of culture. When European settlers came to California, they did not become acorn collectors but brought with them farming, ranching, and mining techniques with evolutionary histories stretching back 10 millennia. Over the intervening millennia, new techniques and domesticates were gradually

added to the early farmer's toolkits—pottery, animal traction, vegetative propagation of tree crops, metal tools, and, as the first farmers arrived in California, industrial products. Cultures, much like genes, evolve in a pattern of descent with modification.

**2. Much culture is adaptive.** To a biologist, human cultural variation looks in part like a vast adaptive radiation. Humans have spread to virtually every terrestrial habitat on earth using a wide variety of subsistence techniques. Over the last 5,000 years, we have evolved complex societies with an intricate division of labor. As traditional subsistence systems evolved about 50,000 years ago, human populations began to increase all around the world (Atkinson, Gray, and Drummond 2008), as increasingly sophisticated technologies were deployed to raise local carrying capacities.

Culture is a system that links phenotypic adaptation by individual learning to an inheritance system that propagates ideas and practices by imitation and teaching (Henrich 2016). Individual learning, imitation, and teaching are all selective. Individual learners try to make desirable innovations, imitators attempt to acquire desirable ideas and practices, and teachers attempt to impart their best ideas. In the case of causally opaque cultural variants, we may depend on rules of thumb rather than direct evaluations of desirability. Is eating chilies really good enough for you to make you want to eat them in the face of their causing the pain sensors in your mouth to fire vigorously? People acquire a taste for chilies perhaps because of the influence of parents or other prestigious figures, or because most people in their culture like them. The ultimate advantage of putting chilies in food is probably their antioxidant and antimicrobial properties (Nascimento et al. 2014).

A critical issue in cultural evolution is what counts as desirable in the eyes of discriminating social learners. Much is made in some quarters of

universal innate cognitive attractiveness (Tooby and Cosmides 1992; Morin 2016). From the point of view of explaining our Holocene adaptive radiation, a special class of innate universal attractors explains how we adapted so finely to the novel environments of the Holocene. They are what behaviorists call “reinforcers” (Baum 2017). People prefer shelters that keep them warm and dry, food that is satisfying and healthy, and a social system that provides security and companionship. Inferior practices and ideas are dropped in favor of ones that work better. Different practices and ideas work better in different environments, hence reinforcement over time shapes practices and ideas into sophisticated cultural adaptations to local conditions. Only a few cooks in any one generation need to notice that a highly seasoned dish lasts longer than a less seasoned one for reinforcement to be a powerful evolutionary force over the generations. Perhaps natural selection plays some role. Cooks whose underspiced meals kill them will not be around to teach the next generation of cooks. By the hitching of reinforcement-based selection to cultural transmission, culture can evolve more rapidly than genes and hence adapt us more finely to spatial and temporal variation. It is probably no accident that our massive capacity for culture evolved in the Pleistocene, a time of exaggerated temporal and spatial variation (Richerson and Boyd 2013).

Imaginative culture is much less constrained by adaptive factors than subsistence and social systems. It seems to evolve mainly by a process of “limited neophilia” (Martindale 1975; Deutscher 2005).

**3. Some culture is maladaptive.** Cultural adaptations can be outmoded by ongoing change. Prestige-biased cultural transmission can lead to maladaptive runaways, such as the runaway increase in consumption that makes modern societies unsustainable. The recreational consumption of psychoactive substances may have deleterious long-term consequences. Maladaptations are sometimes

very deleterious, but they are also interesting scientifically. Many processes lead to adaptation, whereas maladaptations frequently trace to one or a few processes, giving us better insight into how evolution works than adaptations.

**4. Cultural evolution is multilevel.** Culture, like genes, exhibits variation at all levels of organization. Individuals, villages, cities, and nations vary. Selective processes can operate on any pattern of variation that exists. In the case of genes, selection at higher levels is difficult to make effective because variation between large groups is difficult to maintain. Culture is different in this regard (Henrich 2004). Faster cultural evolution creates more cultural than genetic variation among sub-populations (Bell, Richerson, and McElreath 2009). Ample evidence suggests that selection operates on levels of cultural variation above the individual and family (Richerson et al. 2016). Hunter-gatherers live in institutionalized groups of a thousand or so people who compete in organized ways. Businesses compete for customers and churches compete for members.

**5. Genes and culture coevolve and codevelop.** Cultures substantially construct the environments in which genes evolve. Examples include genetic adaptations to niches opened up by cultural radiations. The high Arctic

Inuit have diets very high in omega-3 fatty acids, and their genes related to lipid metabolism have evolved accordingly (Fumagalli et al. 2015). Likely many features of our anatomy and physiology are a result of having adopted cultural adaptations. Our large brain, apparently required to manage culture, imposes a heavy metabolic demand on us that is met in part by shortening our gut. Cultural strategies for hunting and acquiring protected plant resources allow us to provide the high-quality diet to support expensive brains and brain growth despite our short gut. Once rudimentary human social institutions evolved, they acted as social selection, favoring individuals who were prepared to follow rules. Today we institutionalize people who are not prepared to follow rules handicapping their genetic fitness. Traits like psychopathy are said to have high heritabilities. If so, institutions will result in strong counterselection against genes that lead to psychopathy. Social selection to conform to institutions is substantially responsible for favoring our relatively docile and rule-respecting social psychology. Humans domesticated themselves, some people say. By the age of 12 months, infants are skilled social learners (Carey 2009). For the rest of their lives, genes and culture will interact as the life cycle unfolds. Coevolution and codevelopment mean that the contributions of genes and culture to phenotypes are exceedingly hard to disentangle except in rare simple cases.

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