

Cultural Evolutionary Theory: A Synthetic Theory for Fragmented Disciplines

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Abstract

Cultural evolutionary theory, like other evolutionary theories, links individual-level and population or society-level phenomena. It provides numerous bridges between social psychology and other disciplines and sub-disciplines. The theory uses mathematical models to understand the population level consequences of the individual-level processes of individual and social learning. The theory has been used to explain group-level behavior such as cooperation, altruism, and the cross-cultural variation associated with social institutions. The empirical study of social psychological assumptions of such models and experimental tests of cultural-evolutionary hypotheses are in their infancy.

Biographic Sketch

Brian Paciotti is a 2002 PhD graduate from an interdisciplinary social sciences program at UC Davis where he currently teaches social psychology and conducts research on the influence of religious institutions on altruistic behavior. He was a student of Peter Richerson, and is interested in the influence of social institutions on interpersonal violence and altruistic behavior. Peter Richerson and Robert Boyd are both UC Davis PhDs (1969 and 1973 respectively), where Richerson remains in the Department of Environmental Science and Policy. Boyd is in the Anthropology Department at UCLA. They have collaborated since the 1970s on the study of the theory of cultural evolution. Their 1985 book *Culture and the Evolutionary Process* won the Staley Prize for a major contribution to the human sciences.

The field of social psychology has generated an impressive array of empirical studies, yet it suffers from a lack of a strong connection to disciplines like anthropology, sociology and economics. In the social sciences more generally, one of the most difficult problems is linking individual-level phenomena like social learning with societal scale ones like social institutions. Evolutionary theory begins with models of individual behavior and then aggregates across individuals and across time to deduce the long run population-level outcomes of an evolving system. In the case of humans, we have to keep track of two systems of inheritance, genes and culture. Individuals inherit genes and culture by sampling from the population of which they are a part. In the case of culture, the sampling process differs both in the identity and number of people sampled and in the biasing decision rules people can use to acquire culture. As people use cultural or genetic variants they have inherited, they may prove varyingly successful in surviving and transmitting variants to other individuals. These mostly minor changes at the individual-level modify the population that is available for imitation, teaching, and genetic reproduction in the next time period. Minor changes at the individual level, if reasonably consistent across individuals and over time, have big effects at the population level. Evolutionary models thus always keep track of at least two levels of analysis, varying individuals and the state of the population and culture they comprise. The synthetic nature of evolutionary theory comes from this attention to multiple levels and the temporal dimensions. Evolutionary theory is for this reason one of the important unifying forces in biology, and, when proper attention is paid to our peculiar cultural system of inheritance, it will play a similar role in the human sciences.

Many evolutionary psychologists use evolutionary principles to predict what cognitive mechanisms ought to have evolved in Pleistocene hunter-gather societies (Barkow, Cosmides & Tooby, 1992). Our application of evolutionary theory is certainly compatible with this paradigm (Laland & Brown, 2002), but differs in its sharp focus on the details of cultural evolution. Cultural evolutionists have devoted much effort to the evolutionary analysis of the decision rules that individuals appear to use to acquire adaptive behaviors by social transmission. For example, a conformist strategy for acquiring information from others is a very generally adaptive, at least in theory (Henrich & Boyd, 1998). This rule also has very interesting evolutionary implications because it has the effect of preserving variation between groups, as we detail below.

To illustrate the central role social psychology will play in a comprehensive evolutionary theory of human behavior, we focus on two important empirical problems. First, we argue that to understand cultural evolution we need to know more about the micro-level mechanisms of social learning. Second, we illustrate how gene-cultural co-evolution generates testable hypotheses using the example of the evolution of cooperative social institutions.

Social Learning and Microevolution

The cultural analog of Mendelian genetics is still a rudimentary science. Studies of social learning pioneered by Albert Bandura (1986) give an incomplete picture of how individuals synthesize their cultural repertoire from many models, how stable initial syntheses are in the face of continuous exposure to models throughout life, and similar

questions that are fundamental to understanding the macro consequences of cultural transmission.

Complex human culture became exceptionally developed only in the recent past. Our own hypothesis is that human cognitive evolution developed under the intensely variable climate of the Pleistocene Ice Ages. Environments that vary on intermediate time scales (a few to a few hundred generations for vertical transmission from parents to offspring) favor the evolution of an advanced capacity for social learning guided by a mixture of direct individual learning and by cruder rules of thumb like a conformist transmission bias. Innate mechanisms are an efficient guide to adaptive behaviors when the environment changes over 1000s of generations, and individual learning is the best strategy when the environment is so unstable that social and innate influences are unreliable. Theory suggests that the fitness payoffs were greatest to individuals who specialized in an expensive capacity for social learning. Among the important elements of this capacity should be efficient rules of thumb for biasing culture acquisition in the face of incomplete and costly information. Research on conformity suggests that regardless of their pre-existing habits, people are susceptible to the influence of others (Asch, 1955). Whether, and if so how, conformity can lead to adaptive decision-making is poorly understood, but recent modeling efforts suggest that conformist bias leads to adaptive behaviors in a broad range of spatially and temporally varying environments (Henrich & Boyd, 1998). The pioneering study of Kameda and Nakanishi (2002) shows with a simulation and an experiment that the advantages of conformity are reduced if information “scroungers” that use conformist imitation but do not engage costly individual learning are allowed to evolve. Humans probably use a complex, context

dependent suite of strategies to acquire their culture. An understanding of the intricacies of the human imitation in light of their population-level effects is a major outstanding question.

Most empirical research on social learning (e.g., Rosenthal & Zimmerman, 1978; Heyes, 1996) focuses on the individual-level mechanisms by which one organism acquires behavior from another. Little research addresses how these individual-level mechanisms influence the population level, and such work is critical to the synthetic project. We need to understand the statistics of the social learning process. Individuals obtain their cultural repertoire after they are exposed to many “models” such as parents, teachers, and peers. Do people first survey a few models, and then use some type of conformity rule to make their decision? Are social models the same for many characters, or do people take a new sample of models for every new character? This last is a question about the cultural analog of genetic recombination and we know that recombination plays a big role in evolution. Once a decision is made, is it fairly fixed, or are people always updating based on new social and individual experiences? To the extent that people do continue to adjust their culture throughout life, horizontal and oblique transmission from peers and older non-relatives can speed cultural evolution up enormously relative to the conservative parent to child route. On the other hand, pathological traits can arise more easily in the horizontal and oblique modes of transmission.

One way to answer these questions is to study cultural evolution under controlled conditions. Jacobs and Campbell (1961) pioneered this technique by beginning a tradition of an exaggerated perceptual illusion in a small group of subjects using stooges who publicly reported exaggerated estimates. The naïve members went along with the stooges

initially, but as the stooges were replaced periodically with new naïve subjects, and then initially naïve subjects by new naïve subjects, the magnitude of the illusion reported gradually decreased to normal levels. The exaggeration persisted, however, for several replacements (“generations”) beyond the elimination of all stooges, suggesting some tendency for a tradition, once established, to have perceptible inertia. Such experiments embed the individual-level processes of individual learning and biased cultural transmission in a simple but real population. Insko et. al. (1983) studied three four-person groups making and trading origami products. About every 20 minutes a member in each group was replaced with someone naïve. The groups themselves interacted, and because one group was more powerful than the other two, the focus of the experiment was largely on evolution of differences among the groups. The experimenters recorded the tendency to instruct newcomers, and were able to document patterns of cultural transmission related to the task of origami production and to a perception of leadership among groups. Experimental economists have recently analyzed the effects of social learning in social dilemma games (e.g., Ultimatum, Trust) by giving players the opportunity to give future players written advice about the best game strategy (Schotter & Sopher, 2003). Their results suggest that socialization played an important role in generating conventions that often solved the social dilemma. Sometimes, however, maladaptive strategies evolved. Bringing individuals into an evolving system under experimental controls offers many possibilities for further research.

Gene-Culture Co-evolution, Cooperation, and Social Institutions,

One application of cultural evolution theory has been to address the puzzle of why humans find it so natural, and other animals so difficult, to create complex societies based on cooperation among non-relatives. We have proposed that conformity acts to maintain between group differences and thus makes group selection a plausible force. Sometime during the Pleistocene, this process perhaps resulted in rudimentary social institutions. Once ancestral humans had rudimentary cooperative institutions, social selection against those who cannot or will not obey the rules would tend to favor individuals with more prosocial innate dispositions. More prosocial norms in turn would have permitted the evolution of more sophisticated cultural institutions. Thus, co-evolutionary processes likely created innate “social instincts” that resulted in the capacity for individuals to function within group-level sets of cultural rules, or social institutions (Richerson & Boyd, 1998). Then, beginning about 10,000 year ago, agricultural systems and increasing population densities created the preconditions for the evolution of more complex societies. The institutions of complex societies are, we suppose, constrained by same innate preferences that operated in simpler societies (e.g., intolerance for inequality). The evolving institutions of complex societies had to “work around” psychological constraints using hierarchical roles, symbolic in-groups, and a sense of legitimate order and leadership (Richerson & Boyd, 2001). The interplay between social instincts and the actual social institutions is similar to the Chomskian linguists “principles and parameters” view of language (Pinker, 1994). At the innate level, all humans share the same social psychology. At the cultural level, quite diverse institutions inform people who are in their

groups, how members should be rewarded and punished, and how other groups should be treated.

We think evolutionary theory is particularly useful since it generates *ultimate* explanations of human behavior that help elucidate the types of *proximate* mechanisms that have evolved. For example, the argument from cultural group selection suggests that people should have evolved to cooperate with people from social units over which conformity operates. Concerning the scope of conformity, ancient tribes were one culture, and the advent of mass media permits whole nations to share a common culture (Anderson, 1991). Thus, when searching for the mechanisms promoting altruism, we should not be surprised at studies that find both egoist and altruistic motives (Batson, 1991), especially when situational and cultural parameters vary. Humans are also likely to be keenly responsive to individual and kinship interests, even if our “social instincts” also give rise to genuine “other-regarding” preferences. Much work needs to be done to adequately test this hypothesis and its evolutionary competitors (Richerson, Boyd, & Henrich, 2003). Social psychologists have found in “minimal group” experiments that abstract ingroup categories can promote group regarding behavior, at least in the absence of a dilemma of cooperation (Tajfel, 1981). We need much more information on real cultural boundaries, especially when dilemmas of cooperation exist. We expect to find behavioral diversity that corresponds with institutional variation. Indeed, experimental games conducted in diverse cultural settings has nicely illustrated how social institutions influence both the magnitude of prosocial behavior (Henrich et. al, 2002), as well as the who the benefactors of generous acts should be (Paciotti & Hadley, 2003). Richard Nisbett and his colleagues have shown how larger-scale variation in culture influence

patterns of violence (Nisbett & Cohen, 1996), as well as general differences in cognitive processing (Nisbett et. al., 2003). Social psychologists in many respects are already leading the social sciences in illustrating how experimental methods can sharpen our understanding of the cultural variation. The study of culture at the hands of anthropologists and historians has not benefited from either the theoretical rigor of mathematical models or the empirical rigor of careful experiments and quantitative measurement. Pioneering work in these regards illustrates that both approaches are powerful and that they are natural partners in the investigation of culture.

Conclusions

Cultural evolutionary theory has much to offer the field of social psychology. The models incorporate numerous cognitive and social “forces,” and thus can readily link middle-range theories and empirical findings into a multi-level and evolutionarily sophisticated understanding of human behavior. The development of micro-evolutionary experiments to understand how individual-level forces work in conjunction with evolving populations are a promising way to promote a direct dialog between theory and experiment. Natural experiments are a useful way to explain real-world social institutions that are the product of a long evolutionary history that we cannot study directly. Here the quantitative measurement of the psychological, institutional and environmental variables that figure in the hypothesis is the critical task. Social psychologists well versed in evolutionary theory will find building bridges between contemporary research traditions straightforward. The integration of micro and macro in evolutionary theory demonstrates how middle-range processes (e.g., heuristics) link at one end to the social-cognitive

processes by which individual learners combine innate, environmental, and cultural factors in acquiring their behavioral repertoire and on the other end to the long run, large scale patterns of cultural variation normally studied by anthropologists, sociologists and historians.

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