Cultural Evolutionary Theory: A Synthetic Theory for Fragmented Disciplines

KEYWORDS: Cultural evolution, social institutions, co-evolution, cooperation, altruism, experimental methods

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Submitted for inclusion in *Bridging Social Psychology,* Paul Van Lange

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. 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. Their new book *The Nature of Cultures* is forthcoming from the University of Chicago Press.

Cultural Evolutionary Theory: A Synthetic Theory for Fragmented Disciplines

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. Concerning 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 theory is 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 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 examples of empirical research. First, to understand cultural evolution we need to know more about the micro-level mechanisms of social learning. Researchers pursuing this route should search for methodologies that address how individuals *within populations* make decisions with realistic and important outcomes (e.g., making money). Second, we illustrate how gene-cultural co-evolution generates testable hypotheses using the example of the evolution of cooperative social institutions. These hypotheses suggest that researchers should search for groups with variable social institutions to create natural experiments in which to understand topics such as cooperation and altruism.

Social Learning and Microevolution

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 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. Classic work by psychologists (Bandura, 1986; Rosenthal & Zimmerman, 1978; Heyes & Galef, 1996) was an excellent beginning, but suffered from a lack of understanding of the population-level consequences of social learning.

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 by giving players the opportunity to give future players written advice about the best game strategy (Schotter & Sopher, 2003). These games (e.g., Ultimatum, Trust) place players in conflict with respect to individual and collective interests. 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 is a key methodology with revolutionary implications for dissecting the micro level foundations of cultural evolution.

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. 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, & Henrich, 2003). 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 (Richerson et al., 2003). 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 et al., 2003). Social psychologists have found in "minimal group" experiments that abstract ingroup categories can promote other-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., 2001), 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, 2003). Social psychologists in many respects are already leading the social sciences in illustrating how experimental methods can sharpen our understanding of 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 about the proximate mechanisms of human behavior into a multi-level and evolutionarily sophisticated understanding of the ultimate

causes of such behavior. Two main routes of research will prove valuable. First, a promising way to promote dialog between theory and experiment is develop micro-evolutionary experiments to understand the relative importance of individual and social learning within real and evolving populations of individuals. Second, although it is difficult to untangle the often long evolutionary histories of social institutions, the cross-cultural variability in social institutions provide natural experiments to explore how much these influence behavior. The critical task will be to obtain quantitative measures of psychological, environmental, and institutional variables to evaluate the strength of different forces. Social psychologists well versed in evolutionary theory will find a productive field of endeavor with many tasks that play to their strengths of rigorous experiments and accurate measurements of cultural variation.

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