Cultural adaptation, norms, and the evolution of human cooperation

Robert Boyd
Department of Anthropology, UCLA and the Santa Fe Institute

Humans are much more cooperative than other vertebrates. In other species, cooperation is mainly limited to close relatives, there is little division of labor, no trade, and no large scale conflict, the sick and disabled must fend for themselves, and the strong take from the weak without fear of sanctions by third parties. In contrast, division of labor, trade, and large scale conflict are prominent features of most known human societies, the sick and disabled are often cared for, and social life is regulated by shared moral systems that specify the rights and duties of individuals enforced, albeit imperfectly, by third party sanctions.

This contrast is a major evolutionary puzzle. All of the available evidence suggests that the societies of our Pliocene ancestors were like those of other social primates. Sometime during the last two million years important changes occurred in human psychology that support larger, more cooperative societies. Given the magnitude and complexity of the changes, the most plausible hypothesis is that they were the product of natural selection. However, the limited cooperation seen in other vertebrates fits more comfortably within the received theory of the evolution than do high levels of human cooperation, especially large-scale cooperation among non-kin. Something makes our species different, and here I argue that something is the rapid cultural evolution of norms enforced by third parties.

Culture allows rapid local adaptation

The human species occupies a wider range of habitats, utilizes a much greater range of resources, and lives in more diverse social systems than any other animal species. Most accounts of human evolution explain our ecological success as the result of superior cognitive abilities. While it is likely that individual humans are smarter than other animals, I do not think this difference is sufficient to explain our ability to rapidly adapt to such a wide range of environments.

The reason is that, while we are rather clever animals, we are not close to clever enough. It is easy to underestimate the scope and sophistication of the technology used in even what seem to be the simplest foraging societies. Consider, for example, the Central Inuit of the Canadian Arctic. These foraging peoples lived in small groups and their life-ways were simple compared to other Arctic foragers. Nonetheless, they depended utterly on a toolkit crammed with complex, beautifully designed tools—clothes and houses for thermoregulation, lamps for light and heat, toggle harpoons, leisters, and composite bows for foraging, kayaks and dog sleds for transport. An Inuit “Instruction Manual for Technology” would run to hundreds of pages. And this is just the tools; you’d also need to master the equally lengthy “Natural History Handbook”, and “Social Policies and Procedures” to survive in the central Arctic.
So, here is the question: do you think that you could acquire all the local knowledge necessary to create these volumes on your own? I think you will agree that the answer is obviously not. Moreover, this is not a ridiculous query. To a first approximation, this is the way that other animals have to learn about their environments—they must rely mainly on innate information and personal experience to figure out how to find food, make shelter, and make useful artifacts like nests and snares.

Arctic foragers could make and do all the other things that they needed because they could access a vast pool of useful information available in the behavior and teachings of other people in their population. The information contained in this pool is adaptive because combining even limited, imperfect learning mechanisms with cultural transmission allows human populations to gradually accumulate highly adaptive technologies, knowledge, and social rules that are far beyond the cognitive capacities of individuals. This process can be slow when measured in human lifetimes, but blindingly fast compared to the genetic evolution of complex adaptations.

**The potential for cooperation is everywhere**

Opportunities for cooperation are omnipresent in social life. Exchange and division of labor increase the efficiency of productive processes. The potential for conflict over land, food, and other resources is everywhere. In such conflicts larger more cooperative groups defeat smaller less cooperative groups. Capital facilities like roads, fortifications, and irrigation systems can provide huge benefits. However, the benefits often flow to everyone, whether or not they contributed to the construction.

However, aside from humans, only a few other taxa take advantage of these opportunities, but those that do are spectacular evolutionary successes. It has been estimated, for example, that termites account for half of the animal biomass in the tropics. Nonetheless, cooperative behavior does not usually evolve because it is vulnerable to exploitation. Even if everyone benefits by behaving cooperatively, selection usually favors individuals who take the benefits without paying the costs, and, as a result, the immense benefit that can be generated for everyone through cooperation remains untapped.

**Reputation, reciprocation and retribution and can explain the stability but not the evolution of larger scale cooperation**

While there is some controversy, the evolution of large scale cooperation in other species seems to require close kinship, at least during its initial evolution. This explanation obviously does not work for large scale human cooperation. Instead, evolutionary thinkers typically explain human cooperation as the resulting from the “three R’s”: reputation, reciprocation, and retribution. If cheaters are despised by others in their group, and, as a consequence, suffer social costs—lose status, mating opportunities, the benefits of mutual aid when ill or injured—then they may be motivated to cooperate, even though prosocial motivations are entirely absent from their psychology. Of course, punishment may be costly, but there are by now several plausible solutions to this second order free
rider problem and so it seems likely that the three R’s can explain why cooperation is evolutionarily stable.

The problem is that the three R’s can stabilize any behavior. If everybody agrees that individuals must do X, and punish those who don’t do X, then X will be evolutionarily stable as long as the costs of being punished exceed the costs of doing X. It is irrelevant whether X is socially beneficial or destructive. It will pay to do X. Thus, the three R’s can explain how cooperative behaviors like participating in group defense can be favored by evolution, but they can also explain anything else. Since cooperative behaviors are a tiny subset of all possible behaviors, the three R’s do not explain why large-scale cooperation is so widely observed. Something has to be added to the model.

Multiple equilibria plus rapid adaptation = stable variation among groups

We have seen that the three R’s can stabilize a vast range of alternative behaviors in different groups. When this is the case, different groups may evolve different norms—one set of practices gets higher reputational benefits in one group, a different set in another group, a third set in a third group and so on. This tendency will be opposed by the flow of genes or cultural variants between groups due to migration and other kinds of social contact. If local adaptation is rapid compared to mixing, the variation among groups will persist as is likely the case in cultural evolution; if mixing is stronger, as is likely in genetic evolution, all groups will converge to a single variant.

Stable variation among groups leads to group selection

Three conditions are necessary for adaptation by natural selection: First, there must be a “struggle for existence” so that not all types survive and reproduce. Second, there must be variation so that some types are more likely to survive and reproduce than others, and finally, variation must be heritable so that the offspring of survivors resemble their parents. Only the first two conditions are satisfied by most other kinds of animal groups. For example, vervet monkey groups compete with one another, and groups vary in their ability to survive and grow, but, and this is a big but, the causes of group-level variation in competitive ability are not heritable, so there is no cumulative adaptation.

Different human groups have different norms and the cultural transmission of these traits can cause such differences can persist for long periods of time. The norms and values that predominate in a group can affect the probability that the group survives, whether it is economically successful, whether it expands, and whether its norms are imitated by its neighbors. For example, suppose that groups with norms that promote patriotism are more likely to survive than groups lacking this sentiment. This creates a selective process that leads to the spread of patriotism. Of course, this process may be opposed by an evolved psychology that makes us more prone to imitate, remember, and invent nepotistic beliefs than patriotic beliefs. The long run evolutionary outcome would then depend on the balance of these two processes.
This argument is consistent with an evolved psychology

The claim that cultural evolution can give rise to forms of novel cooperation is vulnerable to an obvious objection: Cultural evolution can lead to the spread of cooperation in large, weakly related groups only if computational and motivational systems existed in the human brain that allowed people to acquire and perform the requisite behaviors. Given that such behaviors were not favored by natural selection, why should these systems exist?

The most likely answer is that these systems were initially evolved to support cooperation in small groups in which genetic relatedness was sufficient to select group beneficial norms. This conjecture is consistent with the fact that humans are much more cooperative at small scales than other mammals, and that our small scale cooperation is heavily regulated by norms. Levels of relatedness within human hunter gatherer groups are similar to the levels observed in other primate species so kin selection should generate as much cooperation in other species as in humans. Models of the evolution of reciprocity suggest that cognitive complexity does not increase levels of reciprocal cooperation, and there is no obvious correlation of encephalization and cooperation in primates. So, reciprocity should work equally well in other species. In fact, we see much less kin based cooperation, and very little reciprocity in other species consistent with the idea that norms are crucial for small scale human cooperation. Once this norm psychology evolved, it could activated by norms spread by cultural group selection on larger scales.

Natural selection in culturally evolved social environments may have favored new tribal social instincts

I hypothesize that this new social world, created by rapid cultural adaptation, led to the genetic evolution of new, derived social instincts. Cultural evolution created large cooperative groups. Such environments favored the evolution of a suite of new social instincts suited to life in such groups including a psychology which “expects” life to be structured by moral norms, and that is designed to learn and internalize such norms. New emotions evolved, like shame and guilt which increase the chance the norms are followed. Individuals lacking the new social instincts more often violated prevailing norms and experienced adverse selection. They might have suffered ostracism, been denied the benefits of public goods, or lost points in the mating game.

These new tribal social instincts did not eliminate ancient ones favoring self, kin, and friends. The tribal instincts that support identification and cooperation in large groups, are often at odds with selfishness, nepotism, and face-to-face reciprocity. People feel deep loyalty to their kin and friends, but they are also moved by larger loyalties to clan, tribe, class, caste, and nation.