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The unselfish, altruistic behavior of insect societies can be explained by way of unusually close genetic relatedness, while the cooperative behavior of chimpanzee and other distantly related mammalian social groups results from their daily, social "tit-for-tat" trading of favors. These sociobiological explanations, however, are inadequate to explain altruistic behavior among human groups with members numbering in the thousands or millions, groups consisting for the most part of genetically unrelated individuals with little or no daily social contact. Religion, cultural evolutionary theory suggests, may be the glue that binds them together.

Altruism is the unselfish concern for others, especially at the expense of one's own well-being. Altruistic behavior among animals seems, however, to run counter to the theory of evolution. How could the genes for altruistic behavior be selected for and propagated down through the generations when such behavior is an expensive disadvantage to those who possess it—it *diminishes* their chances of survival, their fitness? William Hamilton resolved this dilemma with his concept of "inclusive fitness." From a gene's point of view, Hamilton suggested, what counts is being propagated down through the generations, not who specifically does the propagation.[1] Parents, obviously, share genes with their offspring, and one can see how it might pay, from an evolutionary viewpoint, for parents to aid their children's survival, even at the expense of their own, at times. Stories of parents—particularly mothers—sacrificing their lives to save their children are legendary. What is not so obvious is that sacrificial or altruistic behavior benefiting a sister, cousin, or other relative could, under the right circumstances, also be evolutionarily advantageous, and therefore preferentially selected generation after generation. Ants, for instance, are noted for their sacrificial altruistic behavior in the numerous wars between their colonies.

The workers in ant colonies, sisters all, are unusually closely related to each other and to their mother queen due to a quirk in the ant's reproductive process.[2] Helping their mother reproduce is, from a selfish genetic viewpoint, more advantageous than having their own offspring. As a result, worker ants do not produce their own offspring, as a rule. They pass their genes along indirectly by helping—in concert with thousands or millions of other sister-workers—their mother pass along her genes. The entire group as a "superorganism" is being selected by genetic evolutionary forces. So, which ant groups are being selected? and which fall by the evolutionary wayside?

The key to ant evolutionary success is group size. When it comes to all-out warfare, the larger group usually wins. It is a matter of simple attrition arithmetic. The slaughter ends when one of the two warring groups has been totally decimated. Even with losses about equal on both sides, it is the larger group that still has more live ants in the end, and they march unopposed into the loser's nest to haul off their war booty.

But to work together so effectively as a group, ants need group identification. Lacking flags, they achieve group solidarity chemically: each ant colony has a different "smell." To be effective in war, ants need to bring thousands of warriors quickly into battle, and individual ants must be genetically programmed to lay down their lives for the greater good of the group in defense of the mother queen. Ant colonies with such altruistic genes survive (are selected) at the expense of those that lack such genes. Although close genetic relatedness and group selection via large-scale warfare may explain altruistic behavior among the social insects, it does not explain altruism among groups of animals, such as baboon troops, which include family groups and also outside individuals unrelated to the others. Why should these animals, often unrelated, go out of their way to help each other?

To understand this behavior, a form of altruism has been proposed, often termed "tit-for-tat." I may help you (even if you are not genetically related to me) if I feel confident that you will return my favor in the future. When I have extra food and you are short, I will give you some of mine; but I will expect you to return the favor when the situation is reversed. Tit-for-tat requires keeping track of who owes favors to whom, as well as the relative size of the favors. Tit-for-tat can be a beneficial system for all concerned, but the system of favors breaks down if cheaters (who accept favors but do not return them) are allowed to flourish. Thus, they must be punished and, in severe cases, banned.

Monkeys and apes might have evolved unusually large brains for their body size because such brains are required to keep track of the many tit-for-tat deals in their large social groups. Such intelligence has been labeled Machiavellian, and resembles human politics in its complexity, as suggested by the title of Frans de Waal's book, *Chimpanzee Politics: Power and Sex Among Apes*.[3]

Biological altruism, resulting from either genetic relatedness or tit-for-tat behavior, is the basis of animal social behavior and forms the heart of the field of sociobiology, launched by Edward O. Wilson, the noted myrmecologist (ant scientist) at Harvard, in the mid-1970s. In *The Insect Societies*, he considered sociality across the societies of ants, bees, termites, and social wasps, looking for commonalities and differences. Having one of those minds that insist on firmly placing his own specialty within the context of the next higher level, Wilson saw no reason to stop with the sociality of insects, so proceeded onward and upward to consider sociality across all life. He named his broad look "sociobiology."[4]

However, as had numerous biologists before him, Wilson ran into difficulties when he extended his biological reasoning to that most troublesome of species, *Homo sapiens*. Specifically, Wilson thought his sociobiology could and should serve as the basis for a new human sociology, a suggestion few sociologists accepted, because sociobiology does not really explain large-group behavior among humans. For, in contrast to the closely related societies of insects, there is little genetic relatedness in large-scale human societies. Furthermore, while humans do have unusually large brains for their physical size, they are not, computers or ledgers aside, able to keep track, in a tit-for-tat sense, of the many favors that individuals might owe them.

So how is the recent urban guise, from an evolutionary perspective, to be explained? How, via the forces and course of evolution, could such a phenomenon have arisen? How could an obscure primate have evolved in just a few thousand years from a planet-wide population of two or three million hunter-gatherers to ultra-social, ant-like, highly organized groups now numbering in the billions? What had sociobiology overlooked?

The answer lies in a theoretical difficulty with Wilson's sociobiology: he failed to distinguish between medium-scale social groupings such as wolf packs, and large-scale, ultra-social animal societies such as ant colonies, termite nests, and human urban societies. Donald Campbell overcame this difficulty with the concept of "ultrasociality," which he suggested occurred in both large-scale insect societies and human urban societies.[5] Such

societies are now often termed "superorganisms."[6] Campbell suggested that while both insect and human superorganisms had evolved as groups rather than as individuals, the difference between them was that insect superorganisms had evolved by way of genetic selection rules, while human urban societies had evolved by way of cultural selection rules.[7] Although genetic evolutionary theory and cultural evolutionary theory share many similarities, there are also fundamental differences in how these two evolutionary mechanisms operate, differences first noted by Charles Darwin in *The Descent of Man*[8] and, more recently, by Robert Boyd and Peter Richerson.[9]

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The distinction between genetic and cultural evolution is critical. As long as *Homo sapiens* and their hominid ancestors existed in small groups, comparable in size to those of thier closest relatives, the chimpanzees, then their behavior was explicable through sociobiological (genetic) reasoning by way of inclusive fitness (genetic relatedness) and tit-for-tat social trading. However, as discussed above, such sociobiological reasoning is ineffective when it comes to explaining human large-group behavior, i.e. groups numbering in the thousands or even millions—groups which sprang into existence in just a few thousand years. Genetic evolution is quite slow in humans, occurring over timescales of tens of thousands of years or more, which makes it difficult to see how civilizations could have resulted from genetic evolution. Furthermore, there is considerable genetic diffusion between human groups. Genetic group selection does not operate as effectively with human groups as it does with ant colonies, because the winning group usually absorbs the losing group—genes and all. Although hominid altruism, presumably, was initially sociobiologically based, i.e., similar to their chimpanzee relatives, at some point in hominid evolution cultural evolutionary selection rules must have become dominant over genetic evolutionary selection rules. When did cultural group selection begin shaping the species in the direction of human superorganisms?

The archeological record suggests that, starting some 40,000 years ago, human groups began symbolically distinguishing themselves, one group from another, via decorations. Such group-distinguishing identification was a necessary prerequisite to effective cultural group selection, marking off what was being selected. For cultural evolution to operate effectively, there also had to be a group selection mechanism. Among humans, as is the case with ants, this mechanism was group warfare. Contrary to the myth of the "peaceful savage," war existed well before the earliest civilizations.[10] When a culturally-identified group was defeated at war, its genes continued on, but its identity, its existence as a cultural group, was often lost. Successful cultural groups, on the other hand, grew by absorbing unsuccessful groups. They occasionally split into two groups (fission reproduction), and their cultural stories and beliefs (proto-religions) spread by way of cultural conquest.

With cultural group identification, selection, and reproduction in place, *cultural* evolution (as opposed to *genetic* evolution) quickly came to dominate the evolution of the human species. The result should come as no surprise: large, well-organized, and well-armed groups with good internal cooperation survived and grew. The members and genes of the losing group were incorporated within

the larger, winning groups, but the cultural ways of the losers, their weaker myths, their less altruistic proto-religions were not. Thus, there were strong cultural evolutionary pressures for increased group size and close internal cooperation.[11] The direction cultural evolution took is clear: larger groups were better.

Hunter-gatherers spread out over tens of thousands of square miles could not form large, cohesive groups; but with the advent of agriculture, truly large, concentrated groups became possible. Cultural evolution rapidly searched for, found, and strengthened those cultural features that enhanced cooperation within such large groups. These groups, numbering in the tens of thousands, were of necessity composed primarily of unrelated individuals. Holding such groups of unrelated individuals together by way of coercion is both difficult and inefficient. What was needed was a moral code, an organized religion that would bind members together with common myths and a shared worldview. Altruistic behavior could then emerge, even though group members were unrelated and could not expect direct tit-for-tat returns. But how could such groups avoid accumulating cheaters who accepted the benefits of group membership but failed to contribute? What these early moral codes needed for enforcement, according to Kevin Sharpe, is a deity.

For a code of morality to work, it needs an extra kick that other motivations lack. The additional power arises by a natural process in which believers project the morality onto a deity (the All-Powerful). Group members, then, believe in an independent and objective moral code that is changeless and independent of human conditions. It emanates from something higher than and outside of themselves. Feeling this absolute moral "other" as a force acting upon them, they follow its moral dictates. They believe their deity requires it of them, and they strive to obey it.[12]

The notion of the Divine is cleverness itself. It is, perhaps, the greatest all-time discovery of cultural evolution in its effort to enable ant-like human superorganisms without the necessity of excessive coercion. Ants, if they had larger brains, would fully appreciate the Golden Rule to treat others in your group, stranger or not, as you treat yourself. That is exactly what ants do.

Michael Ruse and Edward Wilson have described morality as "an illusion fobbed off on us by our genes to get us to cooperate.... It's a shared illusion of the human race."[13] They miss the boat: It is human culture, not human genes, that have evolved to compensate for a total lack of genetic preparedness for living in groups numbered in the millions. Cultural evolution, fueled by the cohesive power of religion, has rocketed the human species to planetary dominance in only ten thousand years. By contrast it took genetic evolution some fifty million years to bring ants to their dominant position in the insect world. Having devised a unique style of altruism, humans have evolved into a "crude superorganism,"[14] becoming the "chimpanzees who would be ants."[15] Ants may have their fine-tuned superorganism genes, but we've got religion!

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Endnotes:

1. See Hamilton's classic paper.

2. Haplodiploidy.

3. For support of the social brain hypothesis, see Byrne, Dunbar, Parker and McKinney; and Corballis and Lea. For chimpanzee politics, see de Waal.

4. Wilson's *Sociobiology* is a classic. I prefer the abridged edition.

5. Campbell's concept of ultrasociality overcame the difficulty with E. O. Wilsons's rather broad categorization of the more social animals.

6. Although the concept of urban humanity as insect-like superorganisms is an old one, its modern revival is primarily due to Campbell. Recent expansions of Campbell's concept include those by Genet, Richerson and Boyd, and Wright.

7. The concept of cultural group selection and its controversial history is treated at length by Sober and Wilson.

8. Although Darwin's launching of biological evolution is well known, his initiation of the study of cultural evolution is less well known and lay fallow for over a century.

9. The modern revival of cultural evolutionary theory has been spearheaded by Robert Boyd and Peter Richerson.

10. The "myth of the peaceful savage" has been shown to be incorrect through anthropological research. See Keeley.

11. Sober and Wilson.

12. Sharpe, p. 127.

13. As quoted in Sharpe, p. 134.

14. The characterization of humanity as a "crude superorganism" is taken from Richerson and Boyd.

15. The conceptialization of humanity as the "chimpanzees who would be ants" is my own. See Genet.

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