

## **SOCIOBIOLOGY AND SOCIOLOGY**

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### **Summary**

Sociobiology is the scientific study of the biological bases of social behavior among animals, including humans. The new field of evolutionary sociology is the product of recent efforts by sociologists to integrate sociobiological reasoning into their theoretical thinking and empirical research. Evolutionary sociologists reject the Standard Social Science Model of human nature and human social behavior and replace it with a new model based upon evolutionary biology. The human brain and mind is the product of evolution by natural selection that occurred in archaic, ancestral “environments of evolutionary adaptedness.” Early hominids overcame the limits to sociality posed by the weak social ties that are characteristic of most species of apes and evolved behavioral capabilities conducive to the evolution of primary groups based upon strong social ties. More than most other social species, humans have evolved the ability to form large-scale societies not restricted to social relationships among genetic kin. Evolutionary sociologists identify and study the patterns of social organization that acted as selection forces which helped shape the design properties of the human brain and mind. Adapted to the scale and organizational features of hunting-gathering societies, the human mind confronts novel social environments in post-hunting-gathering eras, especially in urban-industrial societies. Although equipped with extensive learning abilities and cultural resources, a “mismatch” occasionally occurs between the evolved features of human nature and various features of contemporary, urban-industrial societies. This mismatch poses novel behavioral challenges to the inhabitants of urban-industrial societies, and these challenges express themselves in psychological, social, and health contexts. Evolutionary sociologists have employed sociobiological theory and research findings to develop and pursue new research programs on topics of traditional sociological interest, such as sex, reproduction, family, kinship, social inequality, ethnic relations, and crime.

### **1. Introduction**

Sociobiology, a branch of evolutionary biology, is the scientific study of the biological

bases of social behavior among animals, including humans. Sociology is the scientific study of human societies and social behavior. Not to be confused with the non-scientific body of thought known as “Social Darwinism”, sociobiology uses evolutionary theory to describe and analyze patterns of social behavior as adaptations that evolve by natural selection and sexual selection. Although sociobiological thinking is rooted in and related to older scientific disciplines such as ethology and comparative psychology, it coalesced into a new and distinct branch of behavioral biology in 1975 with the publication of *Sociobiology: The New Synthesis* by Edward O. Wilson, an evolutionary biologist who specializes in myrmecology, the study of ants. In the years immediately following the publication of *Sociobiology*, numerous critics, including sociologists, objected that sociobiology was but the most recent iteration of biological reductionism and genetic determinism. By the mid-1980s, however, sociobiological thinking had established a foothold in several of the behavioral and social sciences, including psychology and anthropology. Concurrently, a growing number of sociologists began to apply sociobiological reasoning to the study of phenomena such as marriage and family, ethnic relations, social inequality, crime, urbanization, and demography, and by the late 1990s, the term “evolutionary sociology” was being used to label the work of sociologists whose research is informed by evolutionary biology, especially sociobiology and behavioral ecology. Today, some sociologists characterize themselves as “evolutionary sociologists,” while others call themselves “behavioral ecologists” or “sociobiologists.” And although a few intellectual differences separate them, all such evolutionary-minded sociologists share in common their reliance on the explanatory logic of contemporary, neo-Darwinian scientific theory. This article reviews and explains the new type of evolutionary analysis that has emerged in sociology as a result of the influence of sociobiology and related branches of the evolutionary life- sciences.

## **2. Sociobiology and Evolution by Natural Selection**

### **2.1. Basic Concepts and Explanatory Principles**

Phenotypic traits that contribute to an organism’s chances of survival and reproductive success are called *adaptations*. Evolution by natural selection produces three basic types of adaptations: morphological (anatomical) traits, physiological traits, and behavioral traits, including social behaviors. Sociobiology seeks to identify and analyze patterns of social behavior as possible evolved adaptations. Categories of social behavior that have been analyzed as evolved adaptations include, but are not restricted to, parenting, mating and mate selection, cooperation, competition, conflict, communication, altruism, reciprocity and exchange, aggression and violence, parent-offspring conflict, sibling competition, and status competition. When applied to the study of human societies, the scope of sociobiological reasoning has been expanded to include more complex and large-scale social phenomena such as family and kinship systems, stratification systems, patterns of crime and crime causation, ethnic relations, urbanization and industrialization, and societal-level evolution. The range of human societies and social behaviors subject to evolutionary analysis by contemporary sociologists continues to expand.

*Natural selection* refers to differentials in reproductive success attributable to genotypic variation among individuals of the same population. The forces of selection include, for

example, factors such as disease, climate, food availability, competition, predation, and parasitism. These and other such forces act directly on the phenotypes of organisms and (in most cases) indirectly on the genotypes from which phenotypes develop. The *ultimate causes* of adaptations are features of environments that confer survival and/or reproductive advantages to individuals expressing a phenotype, and the *proximate causes* of adaptations are stimuli that activate responses from an organism. Natural selection favors traits which, within extant ecological conditions, maximize an individual's *fitness*, or its genetic representation in the next generation. *Individual fitness* (or "Darwinian" fitness) refers to the success of an individual in contributing its genes to the next generation by reproduction, and *inclusive fitness* refers to the sum of an organism's individual fitness plus that organism's contribution to the fitness of its relatives other than direct descendents. Thus, inclusive fitness is increased by the process of *kin selection*.

*Sexual selection* refers to the differential ability of individuals with different phenotypes to compete successfully for mates. By producing traits that are attractive to prospective mates, such as brightly colored plumage among male birds, sexual selection increases the chances of an individual's reproductive success. However, the same trait that is favored by sexual selection can be penalized by natural selection, as in the case where brightly colored plumage simultaneously attracts mates and predators.

If an evolved trait reduces the fitness of the individual bearing it but increases the fitness of others, it is said to be *altruistic*. By definition, "genuine" altruism cannot evolve by natural selection. However, actions that appear to be altruistic may yield fitness returns to the altruist if the recipient of the action is genetically closely related to the altruist. Such altruism is favored by kin selection. Alternatively, an act of apparent altruism may actually be an instance of *reciprocal altruism*, or delayed exchange, the effects of which rebound to the altruist in the future when it is "paid back" for the costs it incurred when bestowing a benefit on another.

Sociobiologists aspire to explain the nature, bases, and evolution of social behavior by using these and other concepts derived from evolutionary biology

## **2.2. Natural Selection and Social Behavior**

Earlier in the history of evolutionary biology, it was common to interpret adaptive traits as having been selected so as to assure the survival of "the species," and, in the case of social organisms, the survival of "the group." By the late 1960s, however, the idea of "species selection" and "group selection" had come under criticism by evolutionary biologists such as George C. Williams. During the last quarter of the 20<sup>th</sup> century, a majority view emerged among evolutionary biologists whereby adaptations are seen as having evolved because they serve the reproductive interests of the individual and the replicative success of genes, not the persistence "the species" or the survival of "the group." Consequently, when sociobiology emerged, its practitioners commonly explained social behaviors in terms of individual or gene level selection. While group-level selection was seen as a possibility, most sociobiologists took recourse to individual or gene level selection in their efforts to explain various forms of social behavior. Sociobiological explanations that invoke the principles of kin selection and

inclusive fitness entail the “selection at the level of the gene” approach.

An analogy helps clarify how social behaviors, such as cooperation, that might seem to have evolved for the benefit of the group can be explained alternatively as having evolved for the benefit of individuals and the genes they carry. As an individual, even a formidable predator such as a gray wolf is unlikely to prey successfully on a healthy, full grown moose. However, by acting in concert with several other wolves, it can make an adult moose, often weighing well over 1000 lbs, an important component of its diet. Cooperative hunting among wolves can be described as a process whereby individual wolves “borrow” or avail themselves of the weaponry available in the bodies of other wolves to their personal advantage. In general, sociobiologists commonly interpret patterns of cooperative social behavior among *conspecifics* (members of the same species) as adaptations that confer both somatic (health and survival) and reproductive advantages to individual participants in such forms of cooperation. Thus, like morphological and physiological adaptations (such as the powerful jaws and teeth of wolves and their ability to digest meat), the bodies and behaviors of other wolves comprise phenotypic extensions of an individual wolf’s own body. Examples of genetically coded phenotypic traits that extend beyond the bodies of the individuals in which those genes reside include wasp nests, bee hives, termite mounds, bird nests, and beaver dams, to name but a few. It is in this sense that cooperative social behavior is viewed by sociobiologists as an extended phenotype of the individuals participating in such behavior. Cooperation makes available to an individual the somatic resources located in the bodies of *other* individuals, thus permitting the view of social behaviors as extended phenotypes.

Sociobiologists conceptualize “intimate social interactions” (*symbioses*) in terms of three possible cost-benefit outcomes: *mutualism*, *commensalism*, and *social parasitism*. Each of these symbiotic forms can best be explained in terms of dyadic interactions. In mutualism, both individuals derive fitness benefits (but not necessarily the same types of benefits or benefits of equal value) from their interaction; in commensalism, one individual benefits from the interaction, and the second individual neither derives a benefit nor incurs a cost; in social parasitism, one individual derives a benefit at the expense of the other. The concepts of mutualism and social parasitism enable sociobiologists to describe and analyze a wide spectrum of behaviors ranging from highly cooperative patterns of group life to extreme forms of social exploitation.

Providing food for the offspring of close relatives (nieces, nephews, etc.) rather than one’s own offspring does not enhance individual fitness, but it can enhance one’s inclusive fitness, thus, natural selection can favor the evolution of altruistic behaviors that are directed toward close kin. The ideas of inclusive fitness and kin selection were proposed and developed by W. D. Hamilton, who was puzzled by the curious genetics of ants, bees, and wasps, all of which are *haplodiploid* organisms. In haplodiploidy, males have only one complement of chromosomes, because they develop from unfertilized eggs. Females, on the other hand, develop from fertilized eggs and, thus, have a pair of chromosomes, inheriting one set from their mothers and the other set from their fathers. This results in an unusual pattern whereby full sisters are more closely related to each other ( $r=0.75$ ) than each is to her mother ( $r=0.5$ ). *Hyperrelatedness* among sisters means that they share, on average, 75% of their genes

with each other, thereby creating a situation whereby there is a 25% greater coincidence of their genetic interests than there is among full siblings in diploid species, which share, on average, only 50% of their genes.

The importance of haplodiploidy as a basis for the highly cooperative nature of ant colonies has come under criticism recently by none other than E. O. Wilson, the “father of sociobiology,” and his colleague David Sloan Wilson, but most of the past three decades of sociobiological thought and research has underscored the importance of close genetic relatedness among individuals as the biological substrate upon which much social behavior has evolved. Thus, the apparent altruistic (fitness-reducing) behavior of organisms like honeybees, which sometimes are said to commit “suicide” selflessly on behalf of the group, is actually better understood as behavior that is genetically “selfish.” If, in fact, the death of the “suicidal” bee contributes to the survival and reproductive success of her sisters, with whom she shares a large number of genes, then her behavior is selfless (or altruistic) in terms of the phenotypic sacrifice she makes, but selfish in terms of the genetic returns that it yields. In general, sociobiologists predict that the probability of cooperative social behavior increases strongly to the extent that individuals have a high *coefficient of relationship* (the fraction of genes shared by two individuals that are identical by descent), or are “close kin.”

Cooperative social interaction also can evolve among individuals who are not close kin. For example, food sharing, a form of reciprocity (also called reciprocal altruism) contributes to the health and survival of members of social networks in which sharing occurs, thereby enhancing their individual fitness. The members of such social networks need not be kin. An often-cited example of such reciprocal altruism among non-kin is food sharing among New World vampire bats (*Desmodus rotundus*). Vampire bats roost together in groups ranging from 20 to 2000 individuals. Roosts are occupied by males and females as well as by kin and non-kin. Vampire bats feed on both native fauna (deer, peccaries, tapirs) and domesticated livestock such as cattle and horses. Although bats over two years of age succeed in finding prey nine of every ten nights spent hunting, younger bats may fail to find a blood meal one of every three nights. Biologists describe resources that are unevenly and unpredictably distributed in time or space as “patchy,” and the likelihood of failure in acquiring such resources creates an incentive for food-sharing. Among humans, for example, food sharing is much more common among hunters than among those who forage for plant materials. Food sharing is especially beneficial to vampire bats, because they are at risk of dying of starvation if they fail to feed for three days. The sharing of blood meals occurs among vampire bats that are both kin and non-kin. Kin selection easily explains food sharing among kin, but biologists invoke the idea of reciprocity or reciprocal altruism to account for sharing among non-kin. Research has revealed, however, that sharing will not occur at all among bats that have not roosted together at least 60% of the time. Presumably, bats that roost together gain familiarity with each other, thereby reducing the risk that they will provide a blood meal to an individual who cannot be “trusted” to reciprocate when, at some time in the future, the donor fails to find a blood source and needs to be fed by a regurgitation of blood from another bat that has hunted successfully.

The *phylogeny* (evolutionary history and origins) of cooperation and exchange is

beginning to be understood with the development of explanatory principles such as *tolerated theft*. Tolerated theft refers to a situation whereby a predator that succeeds in killing a prey animal may tolerate other predators feeding off the kill after the successful hunter has been satiated. If such tolerance is repaid to the hunter at some time in the future when it fails to make a kill, the evolutionary foundation for more complex behaviors such as collaborative hunting, food sharing, and food exchange may have been laid. Such systems of cooperation and exchange, however, are vulnerable to non-reciprocity or “cheating,” and much thought and research in recent years has been devoted to the topic of cheating and cheating detection among social species, including humans.

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### **Biographical Sketch**

**Richard Machalek** received the Ph.D. in sociology from the University of Texas at Austin in 1975. Prior to joining the faculty of the Department of Sociology at the University of Wyoming in 1988, he was a member of the Department of Sociology and Anthropology at Trinity University, San Antonio, Texas (1975-1988). He has served as Head of the UW Department of Sociology (1988-1991; 2004-2005) and chair of the Department of Sociology and Anthropology at Trinity University (1985-1988). Machalek also has held appointments as Distinguished Visiting Professor of Behavioral Sciences and Leadership at the United States Air Force Academy (2002-2003), as Interim Dean of the University of Wyoming Libraries (2001-2002), as Visiting Scientist at the Centre for Rainforest Studies (Queensland, Australia; 1995), as Visiting Scholar in the Museum of Comparative Zoology at Harvard University (1986), and as Visiting Associate Professor of Sociology at the University of Texas at Austin (1979-1980; 1983). His primary teaching and research interests pertain to the evolution of social behavior among both humans and nonhumans. Other areas of interest include the sociology of religion, the sociology of the military, and sociological theory.