The best known and most controversial recent development in behavioral science is the emergence of the sociobiology movement. Using the ethology literature as a base, the sociobiologists have been stressing an evolutionary analysis of social behavior in general and making a number of speculations about the genetic basis of human behavior. These speculations have gained considerable attention in the fields of zoology, psychology and anthropology and have also been widely publicized in the popular press, including cover articles in national news magazines, feature-length reviews in major newspapers, hour-long documentary films on television, etc. In the scientific community, the growing interest in sociobiology has sparked the most spirited debates since the Vietnam war, with a number of prominent researchers taking sides. The new movement has grown to the point that there have been several national meetings on the topic, as well as special symposia at a number of recent conventions.

**Sociobiology as an issue.** The controversy surrounding the sociobiology movement is almost totally concerned with human behavior (1). Without any direct evidence, and ignoring considerable evidence, the sociobiologists postulate that various generalized and specific behavioral traits are controlled by innate (genetic) factors. If these speculations were merely bad science, they would be largely ignored by researchers, and the news media would give them only passing attention. However, since the primary issue concerns the factors controlling human social behavior, sociobiology is quite naturally and inextricably associated with political questions. It is this political aspect that fuels the debate and draws the attention of the popular press (2).

The major figure in this controversy is E.O. Wilson who pushed the debate into public view with the publication of *Sociobiology: The New Synthesis* (3). Drawing on ethology and population biology, his book presents an integrated and beautifully illustrated treatment of animal behavior. Claims to a new approach, however, may be somewhat misleading. First, an evolutionary analysis of social behavior is at least as old as Darwin and second, an evolutionary/ecological emphasis has dominated the study of animal behavior for at least the past 30 years. Wilson does present an extensive literature review, but what really sets him apart from other ethologists is his eagerness to speculate on the influence of evolutionary process on human behavior. His theoretical approach is made clear in his first chapter (p. 4):

The hypothalamic-hypophysial complex of a highly social species, such as man, "knows", or more precisely it has been programed to perform as if it knows, that its underlying genes will be proliferated maximally only if it orchestrates behavioral responses that bring into play an efficient mixture of personal survival, reproduction, and altruism. Consequently, the centers of the complex tax the conscious mind with ambivalences whenever the organisms encounter stressful situations. Love joins hate; aggression, fear; expansiveness, withdrawal; and so on; in blends designed not to promote the happiness and survival of the individual, but to favor the maximum transmission of the controlling genes.

Basically, Wilson is arguing that there are good reasons to believe that most human behavior is genetically controlled or at least strongly influenced by genetic factors. In a manner reminiscent of William McDougall, he even suggests that specific aspects of social behavior are genetically controlled. Examples include: indoctrinability (p. 362); spite and clan feuds (p. 119); the nuclear family (p. 553); male dominance over females (p. 552); genocide (p. 575); warfare (p. 572); and xenophobia (p. 656).

In essence, Wilson's approach is just a modern form of biological determinism. This theoretical perspective has been well described by the Sociobiology Study Group (4):

**Biological determinism attempts to show that the present states of human societies are the result of biological forces and the biological 'nature' of the human species. Determinists' theories differ in detail, but all have a similar form. They begin by describing a particular model of society which corresponds to the writers' socio-economic prejudices. It is then asserted that the characteristics of their society are a necessary consequence of the biological nature of the human species. Therefore, present human social arrangements are either unchangeable or, if altered, will demand continued conscious social control because the changed conditions will be 'unnatural'... It is not surprising that the model of society that turns out to be 'natural' bears a remarkable resemblance to the institutions of modern market society, since the theorists who produce these models are themselves privileged members of just such a society. Thus we find that aggression, competition, extreme division of labor, the nuclear family, the domination of women by men, the defense of national territory, individualism, are over and over stated to be manifestations of 'human nature'.**

**Reciprocal altruism.** Before pursuing the political analysis further, a closer look at the theoretical perspective of sociobiologists should be made. As an example I have chosen reciprocal altruism, a particularly important concept in the sociobiological analysis of human behavior and one of special interest to psychologists. Originally proposed by R.L. Trivers (5) and prominently featured in Wilson's book, this construct is a way of explaining cooperative behavior in terms of genetics. Briefly, Trivers suggests that if there were a gene or genetic combination which induced an individual to help another at its own expense, it would still confer the bearer a selective advantage if the other individual was similarly inclined and reciprocated. For this system to operate, the bearers of the altruistic genes would have to be able to recognize each other in some way, most likely through experiencing reciprocation, and then differentially respond by helping other altruists and ignoring non-altruists or 'cheaters'. It is not necessary that the cooperators be related, only that they reciprocate each other's aid-giving behavior.

Using this theory, Trivers explains the following human traits: 'friendship, dislike, moralistic aggression, gratitude, sympathy, trust, suspicion, trustworthiness, aspects of guilt, and some forms of dishonesty and hypocrisy' (p. 35). Developmental variables are seen as only providing the fine tuning for these behaviors.

Analysis of the reciprocal altruism construct shows the extent to which the sociobiologists are willing to explain behavior in terms of genetics. Even Trivers admits that there is no direct evidence indicating that variation in human cooperation is genetically influenced. His argument is based on
only two major points: that cooperation is a universal daily occurrence among humans, and that if it was genetically controlled, it is conceivable that it could provide a selective advantage. No attention is given to alternative explanations, which is particularly surprising since the most elementary knowledge of conditioning principles leads to a much simpler model of cooperative behavior. In fact, Trivers dismisses developmental (i.e., environmental) models of human cooperative behavior in two sentences. This kind of forced avoidance of the experimental analysis of behavior is typical of the sociobiological treatment of human behavior. Of course, the sociobiologists must ignore the experimental literature since even a quick review would reveal numerous examples in which simple contingency management techniques have been shown to control behaviors they claim are genetically controlled.

Political Implications of Sociobiology

The sociobiological approach, seeing the modifiability of behavior limited by the constraints of a genetically determined "human nature", offers a strong argument to those wishing to justify the status quo. As the Sociobiology Study Groups puts it (4):

For more than a century, the idea that human social behavior is determined by evolutionary imperatives and constrained by innate or inherited predispositions has been advanced as an ostensibly justification for particular social policies. Determinist theories have been seized upon and widely entertained not so much for their alleged correspondence to reality, but for their more obvious political value, their value as a kind of social excuse for what exists.

The precise form of biological determinism has varied, depending upon the particular social institutions to be justified and upon the state of biological science at the time. In the 19th century, when genetics had not yet been invented and biological evolution was still controversial, zoologists like Louis Agassiz, an anti-evolutionist, tried to prove the biological inferiority of races and classes by the evidence of comparative anatomy and embryology. On the other hand, the social philosopher Herbert Spencer, who was an evolutionist, saw society as being molded by the survival of the fittest through struggle among individuals. In the 20th century, DNA has replaced gross anatomical features as the supposed determinant of human nature. Now we are told that the genes of blacks or members of the working class, rather than the shapes of their skulls, doom them to an inferior status in a species in which the status hierarchy is itself an inevitable result of the "human genotype".

Although Wilson and other sociobiologists may not have political motives for their work, an examination of Wilson's book shows serious discussion of the following politically charged topics: genetic differences underlying behavioral characteristics of ethnic groups, including such traits as "introversion-extroversion measures, personal tempo, psychomotor and sports activities, neuroticism, dominance", etc. (p. 550); genetic differences between social classes (p. 554); homosexuality (p. 555); conformity to social norms (p. 562); and even ethics (p. 3, 562-564), not to mention genocide (p. 573).

To be fair to the sociobiologists, and particularly Wilson, it should be noted that they usually preface their comments about human behavior by stating that they are speculating beyond the available data. Unfortunately, these qualifications tend to be omitted or skimmed over when reports are made in the press, and what starts as a "maybe" becomes "science has shown that...". Because of this tendency and the serious political implications described earlier, the speculations of biological determinists cannot simply be ignored as is often done with spurious theories. Instead, they must be vigorously attacked and exposed as hypotheses without supporting data. As has been shown clearly in the race/I.Q. debate, once a false concept is firmly established in the popular press as having a "scientific basis", it becomes very hard to dispel, even with the most damaging evidence.

Unfortunately, the political nature of the controversy surrounding sociobiologists and the other biological determinists brings them much greater fame than their work in basic research. They become celebrities of a sort with much attention to their theoretical writings and many public speaking engagements. As the issue becomes well known, inviting a major figure may even be seen as an exercise in academic freedom or free speech. When their speculations are attacked, an easy diversionary tactic is to label the opposition as merely political and thereby avoid potentially embarrassing confrontations with data-based arguments.

Data Base of Sociobiology

Since there is no direct evidence of genetic control of human social behavior, the sociobiologists must argue by analogy from the animal behavior literature (4). There are many problems inherent in pursuing this course, not the least of which is our relative lack of knowledge about even the most extensively studied species. In the primate order, which contains our closest relatives, most known species have not been systematically studied in the wild or in captivity. However, considering only what is currently known about primate behavior, it seems clear that there is not a particular social structure which is typical of the order. For example, infant care in some species is done exclusively by the mothers while in others, such as callicetus monkeys and siamangs, the fathers perform all or a major part of this function (with the exception of nursing). The conclusion to be drawn is that even in our own order, there is no universal infant care role associated with gender. In fact, there is great variation between species and, at least with humans, considerable variation observable within a species. If we broaden our view to include all vertebrates, virtually every conceivable social structure and infant care pattern may be found.

Another important instance in which social behavior proves to be much more complex than was first thought is the relationship between male dominance and reproductive success. In discussing human evolution, Wilson often makes references to sexual selection and differential reproductive success. He uses this construct because it has been shown in a number of studies on a small variety of species that the highly-ranking males perform most of the observed copulations. For example, this has been shown in some species of sea lions, deer, birds, and other groups. However, there have also been studies showing that copulatory frequency is not always positively correlated to dominance status. Watching groups of Norway rats, Stevens and Kendregan (6) found that the dominant male was often one of the least active sexually. Eaton (7) found that male dominance status and copulatory frequency were uncorrelated in a large group of captive Japanese macaques. Also, Duvall, Bernstein, and Gordon (8) found that paternity in a group of rhesus macaques, as determined by blood protein analysis, was unrelated to the dominance status of males one year and only
weakly related another year. Clearly, differential dominance may not necessarily be related to differential reproductive success, and indeed Eaton's data suggests that learned social skills may be accounting for differential dominance rank.

Comparatively little is known about behavioral genetics and the ways in which the evolutionary process affects social behavior. It is much too soon to be making wild generalizations about the genetic constraints on behavior, and especially something as important as human behavior.

The Experimental Analysis of Behavior

The tendency of psychologists to see behavior as flexible and highly responsive to environmental factors is based on a large body of research evidence. Unlike the speculations and arguments by analogy used by the sociobiologists, the flexibility of behavior can be directly tested by use of the experimental method. The experimental analysis of behavior has led to the formulation of basic principles describing the ways in which environmental variables affect behavior. These principles make very accurate prediction of behavior possible and have allowed the field of applied behavior analysis to make great progress in dealing with specific human problems. While undoubtedly there are genetic influences on behavior, they appear to be very general in nature, providing the individual with a great degree of ontogenic adaption.

An error commonly made by biological determinists is to assume that a behavior is genetically controlled (i.e., unaffected by environmental influences) simply because it is adaptive or because superficially similar behaviors are seen in a number of species. The simple occurrence of a behavior tells us nothing about its provenance. In the laboratory we are able to elicit reflexes either by exposing the animal to the unconditioned stimuli (releaser in ethological terminology) or by use of classical (or Pavlovian) conditioning. Without knowing the animal's history, the observer would have no way of knowing the origin of the final behavior.

Similarly, researchers using operant conditioning techniques have repeatedly shown that there may be a great deal of flexibility in behaviors which are of indisputable adaptive value. For example, David Premack found that rats can be trained to drink water at a much higher rate than normal if access to a running wheel is made contingent on drinking. Conversely, when water is deprived, the same rats will increase running in the wheel if they are reinforced with access to water. Using similar operant conditioning techniques, the form and/or frequency of a number of other behaviors related to survival can be easily modified, including the following examples: fighting, eating, exercise, avoidance of predators, general activity, reluctance to jump from high places, and so on.

Environmental variables affecting a wide variety of other behaviors essential to survival have been studied carefully. Perhaps the best example is that of food preferences. A number of researchers, most notably John Garcia, have been concerned with this question and have found that food preferences, both likes and dislikes, may be easily conditioned in the laboratory. Briefly, when exposure to a new food is followed a few hours later by gastric distress, the future probability of eating that food greatly decreases (in many species to zero). However, if the animal is ill or in mild distress, and consumption of a new food is followed by relief from distress, then the future probability of consumption greatly increases. In this way, food preferences may be easily manipulated in the laboratory. Apparently what happens in the wild is quite similar with the consequences of eating distinctive food substances determining future choice of those foods. Therefore, it is not necessary to postulate genetic control of specific food preferences to account for these phenomena. It seems quite likely that the ability to learn by experience in this way is determined in some way by genetic factors, but flexibility at the behavioral level is very great. No doubt there are numerous similar mechanisms also directly related to survival which allow for environmental shaping of behavior.

Postulating genetic control of a behavior does not further understanding of it and often obscures the actual controlling variables. For example, if reciprocal altruism can be accounted for by reference to an ability to modify behavior from experience, then its learning and not altruism which is being selected for in the evolutionary process. This general ability may also be seen as responsible for a wide variety of human behavior including agriculture, art, science, and all other aspects of human culture. So the ability to learn may be seen as offering a great selective advantage with this ability expressed in a number of diverse ways. Yet what has been explained? Such a general statement tells us nothing about how behavior is modified during experience or how we can use learning principles to improve our lives. In fact, it simply tells us that we are here because our ancestors were successful. Such an explanation is so general it really explains nothing and to know more about human behavior we must return to systematic experimental research on how behavior is modified by experience.

In sharp contrast to the political stagnation of the biological determinist position, behavioral principles derived from experimental analysis have led directly to the development of effective techniques for solving human problems. These behavior modification techniques have been successfully applied in many diverse situations including: individual therapy, self-control efforts, group therapy, families with problem children, hospitals, schools, even planned communities. The most important aspect of applied behavior analysis is the recognition that control of behavior lies in the environment, not within the individual. Therefore, to improve social conditions, the economic and political environment in which we live must be changed. This essentially revolutionary perspective must be taken if we are to make social progress.

Notes

(1) Although most criticisms of sociobiology have been political there have been others from different perspectives. The best compilation of these criticisms may be found in multiple reviews of E.O. Wilson's book (see note 3) published in Animal Behavior 1976, 24, 698-718.

(2) Many ethologists have been upset by the political nature of the sociobiology debate and have tended to see attacks on theories as personal. I would like to make it clear that I have no personal antagonism toward E.O. Wilson or other sociobiologists and, in most cases, I have great respect for their work in animal behavior. Unfortunately, their armchair speculations and theories about human social behavior are not at all consistent with the available data and have distinctly reactionary implications.

(4) A highly recommended critique of sociobiology from both biological and political perspectives is: "Sociobiology - A New Biological Determinism". Available from the Sociobiology Study Group, Science for the People, 16 Union Square, Somerville, MA 02143.


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