

THE IMPORTANCE OF HUMAN INDIVIDUALITY FOR SOCIOBIOLOGY

by *Bernard D. Davis*

It is obvious that genes contribute to differences in human behavior. But because we cannot define their role with precision, and we cannot modify them as readily as we can modify the environment, an extreme environmentalism has long prevailed in the social sciences and in liberal circles.¹ In the last few years, however, Edward O. Wilson's *Sociobiology* has stimulated a broad renewal of interest in the role of genes in human affairs.²

Like *Origin of Species*, this book defines a new field, of wide social as well as scientific interest, by synthesizing a large accumulation of scientific information. Unlike Charles Darwin, however, Wilson is the product of an age that has become very conscious of the impact of science on society, and he speculates about the future social implications of his field in considerable detail. Indeed, in *On Human Nature*, he presents these implications with some zeal, not simply as an inevitable by-product of advances in sociobiology but as part of the justification for regarding it as a major discipline.³

Wilson argues that if we wish to acquire a deep understanding of human social behavior we should not rely only on the intuitive insights of the humanities and on the phenomenological observations of the social sciences; we must also look into past evolutionary origins and into present genetic determinants. I agree. However, I would like to discuss a major difference: Wilson, with the comparative approach of a naturalist, concentrates almost exclusively on the universal characteristics of each species, while I would emphasize the implications of our genetic diversity for several of the issues that he discusses.

In particular, Wilson predicts that sociobiology will provide a firm foundation for ethics, while I would suggest that because of the genet-

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ic diversity of our species scientific knowledge will not be able to displace political negotiation in the development of our rules. Similarly, emphasizing that religions express a deep-seated, inescapable aspect of our biological heritage, Wilson struggles bravely to reconcile their aims with the scientific outlook, but in the end his projected solution—a new religion based on evolution as our presiding myth—ignores the wide variety in our emotional patterns and needs. Finally, as the architect of a new field, Wilson understandably concentrates on its future directions. But even our present knowledge of our evolutionary origins, and particularly of the resulting genetic diversity, could help us build our social policies on a more realistic base. His predictions of long-term future benefits might therefore be more convincing if he started with this more immediate possibility.

In thus advocating greater attention to the present I am no doubt reflecting my initial training in medicine, a field with a much shorter temporal perspective than evolutionary biology. But I am encouraged to proceed by the thought that this pragmatic background may be useful for discussing the possible applications of biology to the equally pragmatic problems of social behavior.

INTEGRATIVE REDUCTIONISM

On Human Nature offers us an exciting vision: When we understand the neurobiological basis of human motivation and action we will be able to fashion value systems that are based on this reality rather than on illusions and false preconceptions. Wilson presents this proposition as a logical extension of integrative reductionism. This is an aspect of science in which the initial analysis of a phenomenon, in terms of its obvious units, leads to much deeper understanding when we can further interpret the properties and interactions of these units in terms of their component elements. At the same time the principles developed at one level of organization cannot by themselves predict the detailed phenomena, and hence cannot replace the principles observed, at higher levels.

This integrative approach not only is inherent in the scientific method; it is responsible for the remarkable coherence of the resulting body of knowledge. But we must not confuse it with, or allow it to become, the “nothing-but” kind of reductionism: an impoverished, simplistic interpretation of scientific materialism that belittles the higher levels of organization, thus overemphasizing the common features and minimizing the differences between man and lower animals.

In his discussion of integrative reductionism Wilson describes the natural sciences as a hierarchy in which each discipline is firmly based on its antidiscipline, that is, the next finer level of organization.⁴ The social sciences, in contrast, lack roots in an antidiscipline. In his view they will become strong only when they develop such roots, and these obviously lie in sociobiology. While I agree that such integration will be valuable, I would question whether sociobiology is the sole antidiscipline to the complex social sciences and whether the continuity between the two can ever become nearly as complete as the continuity between neighboring natural sciences. The problem is not simply the territorial resistance of social scientists to an integration with biology; as I shall discuss in the next section, there are also more fundamental obstacles.

LIMITS TO THE SCIENTIFIC ANALYSIS OF VALUES

The most important obstacle to a thorough fusion of the natural and the social sciences is epistemological. Many of the questions asked in the social sciences involve value judgments; and with such questions we cannot readily find an objective basis for identifying an answer as correct—as we can, in principle, with any questions about the nature of the material world. This distinction is well known in philosophy as the naturalistic fallacy: David Hume's principle that we cannot derive an "ought" from an "is."

Wilson explicitly questions this principle. In *On Human Nature* he proposes that the new knowledge will make it possible to fashion "a biology of ethics," and "a genetically accurate and hence completely fair code of ethics." Similarly an understanding of the limbic system, and thus of the origin of our drives, will lead us to choose the "truer emotional guides" among various alternatives. These phrases seem to suggest the expectation that science will eventually prescribe an objectively correct ethics.

As Gerald Holton has pointed out, here Wilson is joining the scientific tradition of Hermann Helmholtz, Ernst Haeckel, and Jacques Loeb, that is, the assumption that the scientific method will be able to provide definitive solutions to the problems of society.⁵ However, they built on analogies and projections from organ physiology, and his base is much more sophisticated. Even with our present rudimentary knowledge it is clear that the levels of various hormones, and of the recently discovered neurohormones released within the brain, strikingly affect such features of our behavior as output of energy, sex drives, appetite, and mood. Moreover, future advances in neurobiol-

ogy will surely provide increasingly fine-tuned knowledge of the material basis for those mental processes that give rise to value judgments. With such developments, in Wilson's view, the logical limitations imposed by the naturalistic fallacy will no longer be so self-evident or so absolute. And I do not believe we can simply dismiss this view with the pejorative term scientism, since we will be considering a radically new kind of knowledge. But in trying to imagine how far neurobiology will be able to take us, I still see several reasons to doubt that it will be able to prescribe a correct ethics.

The main reason is that the criteria for what is good or right will not be deducible from the properties of any individual limbic system, or even from the shared, universal properties of human limbic systems: Interactions within the group play an indispensable role. Conceivably, detailed knowledge of an individual's limbic system (and of much more of his brain) could tell us why that individual attaches greater value to one rather than to another goal or activity, or why he balances immediate advantages against long-term advantages in a particular way. But this person's preferences will not be equally congenial to all other persons. Moreover, even individuals with identical goals will be in conflict when they compete for the same resource. Accordingly the values that guide social behavior within a group will continue basically to be derived by a political process, whether of negotiated agreement or of imposed authority.

This is an aspect of ethics that Wilson seems to ignore. To be sure, the advance of neurobiology should eventually permit us to project more accurately the population distributions of alternative reactions to various possible restraints and incentives. But reducing in this way the error in the assumptions and predictions on which we build our social code is not the same as prescribing that code.

A second limit to the scientific analysis of values arises from the vast volume of data that would be involved in pursuing this analysis at the neurobiological level, for we can accumulate and process only a finite amount of knowledge, even with computers. And although one can conceive in principle of translating the votes of millions of persons into a neurobiological analysis of the mechanisms underlying each vote, converting the principle into practice is another matter.

To illustrate the problem, consider the widely quoted assertion that one thousand monkeys typing randomly for one thousand years would produce all of William Shakespeare. This statement is in fact extraordinarily inaccurate. With random typing of the twenty-six letters of the English alphabet a length of only fifteen units would have more different sequences (26^{15}) than the number of seconds in the

history of the universe (taken as 15×10^9 years). Hence in all of time so far a monkey would have little probability of reaching even one predicted line of print! With this recognition of the difference between dealing with such numbers in principle and dealing with them in practice, we can hardly expect decision making to be defined in terms of measurements of activities of human brain cells.

We thus see two major limits to the biological analysis of ethical problems: the ultimately political origin of values and the virtually infinite number of neural events involved. In addition, a third, probably minor limit is inherent in the predictive powers of science. We have known for over a century, since the development of statistical mechanics and the discovery of radioactivity, that the world is not strictly deterministic. Under its apparently deterministic macroscopic surface lie microscopic events that are predictable only statistically and not individually. Moreover, as the recently developed field of catastrophe theory has emphasized, in some systems a chain triggered by such a small event can have large, irreversible consequences for the system as a whole. In human populations such amplification, with significant effects on history, could arise from various kinds of unpredictable events: the random occurrence of a particular mutation, the random fusion of two germ cells to produce a particular genotype in a future political leader, or the firing of a particular brain cell that swings a closely balanced decision.

I conclude then that in the cultural evolution of ethical systems the social interactions and the processes within each individual are too numerous and too incompletely deterministic to be adequately definable in neurobiological terms, even though they are all composed of neurobiological events. Hence even for knowledge that penetrates to the limbic system the naturalistic fallacy would hold. Accordingly in this area we cannot expect a scientific process to replace the political process, with its reliance on trial and error and on compromise.

POSSIBLE POSITIVE CONTRIBUTIONS OF SCIENCE TO ETHICS

Having emphasized limits, let us now consider what positive contributions science can make to ethics. First, the scientific method itself has an impact, apart from the content of science, for it provides a powerful tool for making our predictions and our assumptions more reliable (i.e., more concordant with reality). And in the decisions that an individual makes, in choosing between alternative actions, predictions of possible consequences enter (though not always explicitly), along with a weighing of the values that the individual attaches to each consequence. The same is true of group decisions: Every public policy

implies a prediction of its consequences. Finally, in the development of social value systems, which underlie the value judgments made in specific situations, cultures also build on predictions about the consequences of alternative kinds of actions and on assumptions about human nature.

The success of science has clearly fostered a more pragmatic, situation-oriented approach to ethics in the modern world, employing such calculations. This approach should be applicable both to our decisions in specific situations, concerned with short-term consequences, and to our ethical guidelines, concerned with long-term social goals. But in making this kind of contribution science can be only an adjuvant to, rather than a replacement for, a political process (using this term in a broad sense).

In addition to this general role of the scientific method in helping us build on reality, the content of sociobiology may also have a more specific role: that of helping to enculturate moral motivation by convincingly legitimizing, within a materialist and evolutionary framework, the principle of a moral consensus. As Ralph Wendell Burhoe has emphasized, this goal has been the main concern of the Institute on Religion in an Age of Science, for the discovery of our origin by natural selection, rather than by purposeful divine creation, seems to have contributed to a weakening of the moral consensus in the modern world.⁶ This discovery not only destroyed a traditional foundation of morality, without providing a satisfactory substitute; it also seems to many persons to have entailed as its logical consequence an extreme moral relativism. But this view is based on the belief that the fundamental law of evolution is the unrestrained competition of "Nature red in tooth and claw." And we now recognize that this is a misconception: Evolutionary mechanisms yield altruistic as well as selfish drives, and both are essential parts of our nature as a social species. Indeed the recognition and analysis of these mechanisms have been among the main contributions of sociobiology.

Nevertheless, recognizing a biological basis for altruism is still a long way from providing a foundation for a moral consensus, for the only firm mechanism, that for "hard-core" altruism, applies only to kin with shared genes. "Soft-core," reciprocal altruism, with a much broader range of beneficiaries, is also recognized in sociobiology, but its relation to the general problem of ethics is far from clear. And many scholars have tried to derive ethics from evolution, ever since Herbert Spencer and Thomas Henry Huxley, but unfortunately their success has not been impressive.

I would suggest that we might be more successful if we set our sights lower, that is, if we try to apply an evolutionary perspective in a

conditional mode, comparing the long-term consequences of alternative attitudes, rather than trying to apply it in an imperative mode, specifying detailed personal obligations. Sociobiology cannot specify any particular degree of altruism as correct, and it cannot even establish species survival as a cardinal value; but it can predict that if we are to survive and function as a social species we must agree on a set of ethical standards. Within this framework any particular standards would continue to be evolved by a cultural, political process—and in this process surely few would question the desirability of having our species survive, even though the “correctness” of this goal cannot be rigorously proven. In other words, sociobiology can say that the idea of right and wrong, with its implications of socially sanctioned obligations and restrictions, is not simply an artificial cultural construct, imposed by those in power. It is rooted in genetically conditioned drives, shared by all people, though varying widely in intensity from one person to another. The genes thus provide the potentiality, and the need, for moral behavior.

This principle does not seem very novel; nor does it offer much help in the eternal human problem of choosing specific values. But it offers us a philosophic basis for developing those values within the framework of respect for the social order rather than within the socially destructive framework of extreme moral relativism. Moreover, it builds on postulates that are thoroughly consistent with the scientific world view, without the need to invoke the transcendent.

While I thus conclude that sociobiology can have only an adjuvant role (but a valuable one) in the development of ethics, Wilson seems to expect a larger role. And one could argue that even if his claims are too optimistic the interest that they stimulate may be useful. On the other hand, there is a danger. For example, a few decades ago some pioneers in molecular genetics were tempted to speculate proudly about the future miracles of genetic engineering, but as gene manipulation drew closer these fantasies bounced back painfully. To avoid excessive hopes, and anxieties, perhaps it would be best to let the science of sociobiology advance without too much effort to anticipate its social applications. For we have limited capacity to predict future developments in science, and even less to predict their social consequences.

ROLE OF GENETICALLY ENCODED AND OF LEARNED INFORMATION

Let us now consider some implications of modern biology for our understanding of our relation to the external world, and hence for epistemology as well as for ethics.

ZYGON

In recent years molecular biology has developed the novel concept of molecular storage and transfer of information. This concept has immensely sharpened our insight into the interactions of genes and environment that create the phenotype, for it recognizes the continuity between the several kinds of information that enter this process. Thus genotypic (inherited) information is stored as a program in the sequences of DNA; this information is expressed (epigenetics) as the program is worked out during embryonic development (including that of the brain); and finally acquired (learned) information is stored in the form of modifications (as yet little understood) in the distribution and the functional properties of the synaptic connections in the network of neural cells. Indeed a particular activity, such as the formation of a specific enzyme in a bacterium or the use of a specific call by a bird, may be rigidly determined by genes in one species, but in another the response may involve learning as well. With phylogenetic ascent the ration of learned information to inherited information increases, that is, the genes increasingly provide ranges of behavioral potential rather than specific behavior. At the extreme the human species can process information in a uniquely subtle and complex way, as a result of selection for adaptability to varying circumstances more than for adaptation to specific circumstances. Nevertheless the "hard-wired" information coded by the genes still has a role, hidden beneath our learning.

With this recognition that we possess genetic information and that it merges with our acquired information about the external world, it is now clear that Immanuel Kant's epistemology, involving a priori, in-born categories of knowledge, was much closer to reality than British empiricism. The evolutionary survival of our species has depended on the ability of individuals to interact effectively with a challenging environment; and these interactions could not be effective unless our genes programmed our nervous system with the necessary internal information on which to graft our learned information. We also could not survive unless the resulting information about the external world was reasonably reliable (though not necessarily infallible). Hence as infants make contact with their surroundings they develop the concepts of space, time, and causality that are necessary for effective interaction. They also correlate the evidence provided by their five senses. These aspects of growth and development must involve appropriate prewiring in the brain as well as subsequent modification by experience.

A similar evolutionary principle obviously applies to linguistics, where it has been amplified into a major thesis. We are not born to

know a particular language, but our intense selection for improved communication has evolved hard-wired connections in the brain that create the capacity for a complex, rich language.

In the same way our functioning as a social species requires that our brain contain a prewired general foundation for ethical judgments. The details then emerge as a social construct, developed in response to our needs, based on our biological natures and our cultural histories, changing as part of cultural evolution, and not dependent on any immanent purpose in the universe. Sociobiology thus provides a naturalistic explanation, in terms of gene-environment interactions, for the origin of ethics. In this perspective ethics is partly deontological (but with a genetic rather than extramaterial source), and at the same time it is partly utilitarian (i.e., calculated in response to environmental opportunities and constraints).

This perspective provides only a soft foundation for ethical systems. It therefore may not satisfy those philosophers who seek something rigorous and sharply defined, such as Kant's categorical imperative or John Rawls's postulates. But at the risk of ignoring an enormous and sophisticated literature I would suggest that ethics, as the product of biological and cultural evolution, does not lend itself to rigorous philosophical argument, and it may benefit from the naïve approach of biology. Because of the immense behavioral plasticity that has evolved biologically in our species we can adapt our conduct, in cultural evolution, to a broader range of circumstances than any other species. We can therefore experiment with a far broader range of social patterns. Our evolutionary success depends on this flexibility: on balance, compromise, and continual adaptation to changing specific circumstances rather than on uniformity and consistency. And the resulting patterns are all built on a norm of reaction (i.e., on the range of genetically determined potentialities within the population) that has been programmed by natural selection to be adaptive for our survival and for that of our progeny. Wilson makes this point bluntly: "Morality has no other demonstrable ultimate function [than to keep] the human genetic . . . material intact."⁷ Richard Dawkins has developed this point in detail in *The Selfish Gene*.⁸ But it does not follow that morality is "nothing but" genetics!

SOCIOBIOLOGY AND UTOPIAS

I would like now to turn briefly to the implications of sociobiology for a special set of moral problems: those recently created by our development of a complex technology. We have belatedly recognized that technology has costs as well as benefits. In response one alienated

group, the counterculture, has revived the romantic notion that man was free until society fettered him with unnatural bonds. As Wilson has noted, this approach leads to a retreat from reason as well as from reality. Another group is the neo-Lysenkoists, opposed to all applications of genetics to human behavior. For them sociobiology is a reactionary force that discourages social change and even supports racism. Yet as I read Wilson I do not find him concerned with defending any particular political or economic system; I find him concerned with learning how to build, whatever the system we choose, on a deeper understanding of human nature.

Nevertheless it is not hard to find a realistic reason for the opposition from political ideologues: Their utopias are built on assumptions of human malleability and perfectibility, and a sociobiological perspective does threaten these assumptions. Like the insights of Sigmund Freud, of the masters of literature, and of the great religious leaders, the sociobiological approach recognizes that tensions and conflicts are an unavoidable price of our evolutionary gifts of social interdependence, behavioral plasticity, and diversity. Hence society, regardless of its structure, will always be struggling to promote a balance between our aggressive and our altruistic drives. Moreover, as Wilson notes, aggressiveness has many forms, and some are essential for the creativity and the dynamism that have built up civilization.

But while Wilson recognizes the conflict and tragedy inherent in the human condition he does not emphasize it; he prefers to focus optimistically on the future contributions of sociobiology. As Charles Frankel points out, this perspective is ironic.⁹ In presenting sociobiology not only as an area of scientific investigation but also as the path to a true system of ethics Wilson resembles his severest critics in himself having a utopian vision, though with a biological rather than a political base.

HUMAN DIVERSITY

Thus far I have been raising largely philosophic and social issues, concerned with the validity of various extrapolations from sociobiology to human social problems. Now I would like to consider an aspect of the scientific content of sociobiology as presented by Wilson. His approach is almost entirely ethological, concentrating on the universal behavioral characteristics of each species (or larger taxonomic group); he pays little attention to individual behavioral diversity. And his approach seems to me to result in an imbalance, with important consequences in several areas.

One consequence, already noted, is that Wilson fails to take into account the political foundations of ethics. In addition, his focus on universals contributes to a preoccupation with future contributions of sociobiology to society while neglecting real present implications, based on our recognition of wide genetic diversity. Individual behavioral differences—in intellectual capacities, motor skills, special talents, drives, preferences, and emotional responses—are obviously relevant to our handling of many urgent problems: in education, job allocation, economic rewards, and other aspects of distributive justice. Our present knowledge is sufficient to tell us that we flee from reality if we deny that diversity. And the most valuable ultimate contribution of biology to the social sciences may be to identify precisely the genetic and the environmental factors that contribute to these differences.

The results will not prescribe how society should handle our biological diversity. But they can improve our ability to maximize individual self-fulfillment, for the better we understand inborn differences the better we can fit the environment to the genotype. As Theodosius Dobzhansky emphasizes, we jeopardize the quest for greater social equality if we rest it on the assumption of biological identity rather than on the foundation of moral and political principles, for the former, but not the latter, is vulnerable to empirical disproof.¹⁰ We can legislate our social institutions, but not our genes.

Nevertheless, because genetic diversity sets limits to equality of achievement, it is widely regarded today as negligible, or else as an unfortunate cost of evolution—like painful childbirth as the price of a large brain, or susceptibility to backstrain as the price of a bipedal posture. Biology can help us recover a realistic and sensible attitude on this matter, for it is axiomatic that genetic diversity has great value for species survival. In addition, diversity is indispensable for the development of a rich and interesting culture. What an incredibly dull world it would be if we were all genetically identical!

This aspect of sociobiology seems to me central. Wilson, in contrast, has concluded that altruism is the central theoretical problem of sociobiology. And at the moment the latter topic looks large because a reasonable and testable theory has recently been developed. But in the long run diversity seems to offer more extended horizons, at least for human sociobiology.

Human diversity, of course, has become the subject of intense political controversy. And since Wilson was already offering a challenge to widely held beliefs, it is understandable that he would not wish to look for additional trouble. But he goes beyond merely sidestepping the issue when he states that genes have only a “moderate” influence on

mental ability.¹¹ Our present knowledge does not warrant such a definite conclusion. In fact it supports a high probability of a very substantial influence of genes—at least 50 percent of the observed variance within the populations tested. Similarly Wilson notes that reassortment of genes will permit ordinary parents to yield an exceptionally talented genotype.¹² This is technically correct; but the statement might mislead a reader since it seems to imply that abilities are randomized from one generation to the next. In fact they are not: Even though recombination of genes allows individual progeny to deviate broadly from their parents, the average genotypic level of the progeny in a family will ordinarily be close to the midpoint of the two parental values. Genetic diversity is thus clearly a significant factor in human social behavior, and it would be unfortunate if political sensitivity should inhibit its inclusion in sociobiology. Indeed, since the component elements of human social phenomena include individual patterns of behavior as well as the universals of our species, sociobiology can hardly claim to be the antidiscipline of the social sciences until it takes account of both.

In two other areas that Wilson discusses, religion and free will, diversity (in emotional patterns and needs) is also pertinent, as we shall note below. And as a final cost, failure to face squarely the topic of genetic diversity deprives Wilson of the opportunity to rebut the greatest source of resistance to his thesis: the fear that any attention to genetic differences might distract attention from, or might even undermine, the goal of eradicating inequitable social practices.

The historical cause of this fear is quite understandable. The tragic consequences of earlier applications of evolutionary and genetic principles to society by social Darwinists, eugenicists, and racists justify concern and vigilance. But if we examine this history more closely we will find that these destructive early applications were based on premature extrapolations, or on gross distortions that should be recognized as pseudoscience rather than as science. A careful, stepwise accumulation of knowledge of sociobiology should help protect us from such distortions in the future rather than promote them.

FREE WILL AND DETERMINISM

Let us now turn to Wilson's discussion of a central paradox: free will and determinism.¹³ He suggests that we appear to have free will simply because the human mind is so complex, and our social relations so intricate and variable, that detailed individual histories cannot be predicted; yet the paradox of freedom and determinism is resolvable in theory. I agree, but I would suggest that these propositions are

incomplete. The source of apparent free will is not simply the complexity of the human mind; it is also the genetic diversity of human minds. If we were all genetically identical we would behave very similarly—indeed much more similarly than identical twins do today, for they are exposed to the diverse models of the behavior of many other genotypes. And the more predictable our individual behavior, the less free will, as we now understand it, would remain.

Accordingly, while theological formulations of the problem of free will and determinism have led to postulates of an autonomous soul, able to choose between virtue and temptation, if we wish to consider the problem in biological terms we must see free will as an expression of the complex interactions between diverse genotypes and diverse environments. The basic question should then be framed quite differently: not how much of our action is free and how much is determined but (1) how much my reactions and my choices in responding to competing stimuli differ from those of my neighbor, (2) how much of a change in the strength of these stimuli is needed to eliminate such a difference in responses, and (3) how much each difference in our patterns of response is due to differences in genes and how much to past exposure to different environments.

The element of freedom in our behavior can thus be divided, like all phenotypic traits, into genetic and epigenetic components. There may be a third source of variation, “developmental noise”—a phenomenon readily seen in our physical phenotypes as the persistent effect of random molecular fluctuations on a developing organ (such as differences in the fingerprints of identical twins). It seems reasonable to suppose that in the function of the nervous system a parallel kind of noise—the unpredictable, chance firing of a critical neuron—occasionally also affects actions, thus contributing (probably very slightly) to what appears to be free will.

SOCIOBIOLOGY AND RELIGION

The traditional theological problem of free will and determinism brings us to the final chapters in *On Human Nature*, which consider science and religion. I find it hard to comment on these chapters, for, as is frequent in this perennial controversy, the term “religion” and the associated beliefs do not have clear or consistent meanings. Émile Durkheim’s definition, “consecration of the group,”¹⁴ would not have to be stretched very far to include the fans (derived from the word fanatic) wildly cheering the local basketball team, or the staid members of the National Academy of Sciences politely applauding this year’s recipient of the U.S. Steel Award in Molecular Biology. More-

over, Wilson accepts an anthropologist's estimate that mankind has produced on the order of one hundred thousand religions. On the other hand, elsewhere he states that his concern is "real" religions—presumably ranging in our culture from fundamentalist orthodoxies to ethical culture. The protean nature of religious belief (and also Wilson's tact) thus make the discussion less tightly organized and reasoned than his earlier discussion of ethics.

Nevertheless Wilson has introduced a novel and interesting approach. Instead of either defending the value of faith or criticizing its conflict with evidence, he focuses on the religious impulse as a product of human evolution. He concludes that religions serve an inescapable set of emotional needs, determined by our genes. These services include mechanisms for encouraging altruism and promoting adherence to the group's moral norms and for providing several sources of inner security: a sense of individual and group identification, submission to hierarchical leadership, comfort in time of distress, confidence in time of battle, a sense of purpose and destiny, a promise of future salvation that removes the dread of death and makes present suffering more tolerable, and a magic influence over external events. In addition symbolism, myth, and ritual are used only to lend affective support to these beliefs but also to cultivate aesthetic sensibility and sensitivity to human feelings, in ways that are missing from the cool, rational approach of science. In Wilson's view a detailed understanding of the biological basis for these emotional needs will permit us to develop a new kind of religion, one that will eliminate the traditional conflict with science.

I would suggest that this discussion might have been more sharply focused if Wilson had not treated the body of religion as a whole but had separated its function of enculturating moral values from its several other functions. Even the most intransigent atheist would agree that the need for a moral consensus is universal. The various other services of religion, in contrast, meet needs that are less universal and in ways that often conflict with science. Hence many liberal theologians now concentrate on preserving what they see as the heart of the religious tradition: the culturally evolved wisdom about man's relation to man.

The problem of finding a reconciling format is illustrated by the persistence of prayer in religious services. It is understandable that the influence of this traditional ritual on feelings and attitudes continues to give satisfaction to the supplicants, even though they no longer expect it to influence external events. Yet many scientific materialists, fearful of any concessions to irrational forces in our soci-

ety, are made uneasy by the ambiguity between symbolism and literal content in the words of prayer, and they suspect that it encourages a lingering hope of a magical influence in times of desperation and hence a weakening of support for the effort to build policies on reality.

Recognizing the problem engendered by this split between two concerned groups, and considering religion inevitable (for biological reasons) as a major social force, Wilson tries sympathetically to seek compromise and reconciliation. Indeed it seems to me that he even exaggerates the role of organized religion in this country today. He emphasizes the large proportion of professed adherents in the population without differentiating between intellectual leaders and followers and without differentiating between real commitment and social convenience. Even more, he underestimates the roles of other institutions (the family, education, law) when he describes religion as "above all the process by which individuals are persuaded to subordinate their immediate self-interests to the interests of the group."¹⁵ Yet beneath his conscientious effort one cannot help recognizing some ambivalence. He speaks at one point of the large fraction of the population that adheres to a traditional faith, yet at another of the "fatal deterioration" of the traditional myths. Similarly he dismisses as obscurantist the search of Theodore Roszak for meaning in the "dark, shadowy tones of religious experience," but in a later chapter he is much more sympathetic.¹⁶ In the end, by a circuitous route, he winds up with a classical replacement of theology by science. The coup de grace comes from sociobiology's capacity to explain the evolution of the religious impulse as a wholly material phenomenon.¹⁷ But it is not clear why this kind of evidence from science, over origins, should threaten religions any more than earlier evidence conflicting with their content.

On the other hand the conclusion that our need for religion has inescapable biological roots leads Wilson to the hope that we can finally reach a reconciliation by a new approach that makes evolution the "presiding myth." He thereby seems to be seeking an essentially single modified religion, as logically coherent, as consistent with reality, and as universal as the scientific world view on which he builds. But, as I noted above, this expectation seems to suffer from neglect of our diversity. As with all behavioral traits, the genetic factors that contribute to our reactions to religion will vary widely. Some individuals are more discomforted by uncertainty and by lack of answers to "ultimate" questions than by the inconsistencies that arise when traditional religions provide the answers; with others the opposite is

true. Moreover, people obviously vary enormously in their receptivity to various kinds of reasons for accepting a belief: whether because the evidence is convincing, or because most of their neighbors share the belief, or because it makes them feel better, or because they think it will encourage them and others to act better. Finally the cultural milieu in which individuals make their religious choices varies, influencing their "freedom" of choice. Accordingly recognition of genetically based emotional needs does not tell us how many people will continue to meet these needs in terms that resemble traditional religions, any more than recognizing a genetic basis for aggression can tell us how effectively a civilized society can persuade people to alter their patterns of expressing aggression from those of our neolithic ancestors.

Given this genetic and cultural diversity, it is hardly surprising that various individuals and groups have met their religious needs in many ways. Stoicism, for example, was a secular religion without the postulate, so prominent in the Judeo-Christian tradition, of a transcendent creator; and the major Eastern religions also place little emphasis on a conscious god watching over us.

Despite advances in sociobiology, the future of religion seems likely to continue to be pluralistic rather than monolithic, involving different patterns that meet different individual needs rather than a single pattern that achieves thorough consistency with science. Many people will continue to postulate a source of purpose and identity that transcends the material world. But for others this concept is too hard to reconcile with man's emergence as a chance product of evolution. The latter group may be no less concerned with the need to transcend immediate, hedonistic self-interest, by dedication to some goal outside oneself. However, if we wish to promote clear communication it would be a dubious solution to try to soften the conflict by subsuming both approaches under the term transcendence, redefined in the broader sense of self-transcendence. In traditional religious usage the word refers to transcending the material world, and it is thus a euphemism for supernatural; the fundamental problem of reconciling religion and science will not be solved by evading this issue.

On the whole I do not share Wilson's confidence that sociobiology can achieve this reconciliation by leading to an evolution-based religion. On the contrary the contribution of sociobiology to moral values might be weakened if we also link the field to the other aspects of religion, to which science can contribute very little. More broadly, treatment of the evolutionary epic as a myth might weaken science without strengthening religion.

Wilson resembles Freud in seeking to analyze rationally the basis of nonrational behavior, but he works on a different level. He concentrates on the evolution of indoctrinability and religious faith as well as of altruism. But it is not evident how sociobiological evidence on the origins of the religious impulse will help solve the problems that religions now wrestle with or lessen the conflict between faith and reason. In contrast, Freud, working at the level of observed behavior and with a physician's concern with the present, uses ontogeny rather than phylogeny to explain the irrational elements in our behavior. He sees religion as the expression of a persistent, unconscious infantile yearning for dependence on a protective, powerful parent. And since his general aim is to replace childhood fantasies with reality-based adult behavior, he is not very sympathetic with the religious tradition. Freud is thus more tough-minded than Wilson, both in recognizing a deep conflict between the perspective of science and that of traditional religions and in recognizing the implications of the inherence of tragedy and conflict in human nature.

CONCLUSIONS: THE SCOPE AND THE LIMITS OF SOCIOBIOLOGY

Wilson has convincingly established the evolutionary biology of social behavior as a major field, and he has thereby done much to stimulate interest in the role of genes in human behavior. However, in his focus on the universals that characterize each species I believe he has neglected individual genetic diversity. This diversity is especially important in our species, where it must strongly influence the paths of cultural evolution.

This neglect has a serious effect on Wilson's discussion of ethics. He suggests that when we can delve in detail into the aspects of the human brain that are concerned with motivation Hume's sharp distinction between is and ought will no longer be valid, and we will be able to develop a completely fair system of ethics. I question this conclusion. Although science can help us evolve better rules and make better individual choices by improving our predictions of the consequences of alternative actions, it seems very doubtful that we will ever be able adequately to specify in neurobiological and genetic terms the elements that enter into an individual's value judgments. Moreover, given the heterogeneity of our population, it is even more difficult to see how even the most detailed knowledge of the average limbic system could displace a broadly political process in forming rules of conduct. Indeed the greatest accomplishment of applied sociobiology may be almost the opposite of prescribing ethics. Instead, by recognizing the importance of genetic differences and the inevitability of

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genetically based conflicts within individuals and between individuals, sociobiology could supply a corrective to the illusion that progress in science and technology, or in politics, can lead to a completely harmonious society based on the moral perfection of man.

Individuality is also pertinent to the discussion of religion. Emphasizing that deep, genetically based emotional needs underlie religion, Wilson hopes that evolution will become the presiding myth of a religion that will meet these needs without conflict with the scientific world view. I would suggest, however, that attention to human diversity would favor a more pluralistic solution. Moreover, in avoiding discussion of the political aspects of social behavior, Wilson fails to note how much politics (in the usual sense) has displaced religion and ethical analysis, in recent centuries, as a source of our rules of conduct. Finally, in emphasizing the future applications of sociobiology to man, he virtually ignores implications of our present knowledge—especially of diversity.

Alfred North Whitehead describes philosophy as the critic of our abstractions. In the area of morality and social policy biology will undoubtedly play a parallel role, as a critic of our assumptions. Today sociobiology, focusing on evolutionary origins and dynamics, provides the key. But insight into our origins offers us much less guidance than knowing how we function. We can therefore expect the future contributions to come increasingly from neurobiology, linked to sociobiology by the still nascent field of neurogenetics.

It is impossible to foresee how far sociobiology and neurobiology will go in improving our ethical systems and in promoting their acceptance. But we must recognize limits. Biology can provide firm facts and can reveal underlying mechanisms, but these are only a foundation. Not only for those who feel a need to invoke the transcendent but equally for those who do not, the biological description of human nature can only be coarse grained: Analysis of gene-environment interactions is no substitute for such concepts as poetry, inspiration, and love.

In the search for the biological roots of human behavior what is justly feared is that an integrative reductionism, intended to broaden our perspective, could slip into the kind of reductionism that would narrow that perspective. To avoid that pitfall sociobiology, like the humanities, must surely focus on our individuality as well as on our common humanity.

NOTES

1. This environmentalism is also an overreaction to the naive hopes, early in this century, for rapid contributions of genetics to the social sciences. This history is well

reviewed, from the point of view of a sociologist seeking a balance, by M. Bressler, *Genetics*, ed. D. C. Glass (New York: Rockefeller University Press, 1968), pp. 178-210.

2. Edward Wilson, *Sociobiology: The New Synthesis* (Cambridge, Mass.: Harvard University Press, 1975).

3. Edward O. Wilson, *On Human Nature* (Cambridge, Mass.: Harvard University Press, 1978).

4. Edward O. Wilson, "Biology and the Social Sciences," *Daedalus* (Fall 1977), pp. 127-40.

5. Gerald Holton, "Sociobiology: The New Synthesis?" *Science, Technology, and Human Values* 3 (October 1977): 28-43.

6. Ralph Wendell Burhoe, "Editorial," *Zygon* 13 (December 1978): 250-56.

7. Wilson, *On Human Nature*, p. 167.

8. Richard Dawkins, *The Selfish Gene* (Oxford: Oxford University Press, 1976).

9. Charles Frankel, "Sociobiology and Its Critics," *Commentary* 68 (July 1979): 39-47; reprinted in this issue.

10. Theodosius Dobzhansky, *Genetic Diversity and Human Equality* (New York: Basic Books, 1973).

11. Wilson, *On Human Nature*, p. 198.

12. *Ibid.*, p. 77.

13. *Ibid.*, p. 169.

14. *Ibid.*, p. 176.

15. *Ibid.*, p. 10.

16. *Ibid.*, p. 192.

17. *Ibid.*