

SOCIOBIOLOGY AND ITS THEOLOGICAL IMPLICATIONS

by Arthur Peacocke

Abstract. The broad character of the arguments used by sociobiologists is assessed, particularly in relation to criticisms coming from anthropology. The implications of sociobiology for theology are developed with respect to the general impact of evolutionary ideas, the reductionist assumptions of sociobiologists, whether or not "survival" can be a value, and more holistic accounts of the physical and biological grounding of the mental and spiritual lives of human beings.

Ever since Charles Darwin, developments in biology have continued to uncover more and more aspects of the human personality that can be related to its evolutionary origins. The response of theologians to these developments has varied from the pugnacious to the indifferent, and any reading of the history of the dialogue cannot but counsel caution and warn against premature judgments. After all, did not Aubrey Moore, writing some thirty years after the publication of the *Origin of Species*, opine that Darwinism had, in fact, "under the disguise of a foe" done "the work of a friend" for the Christian concept of God (1891, 73)?

The advent of sociobiology accompanied, as in the case of Darwinism, by overtly antireligious sentiments on the part of some of its proponents may likewise tempt the theologian into ill-advised and premature opposition. Not that this has been the stance of articles characteristic of this journal, or indeed of the theological contributions to the 1983 Durham Conference reported elsewhere in this issue. One has to be reminded that "sociobiology" as a distinctive biological discipline or, rather, program is still a relative newcomer. It is still less than ten years since E. O. Wilson's volume launched that title for his claimed "new synthesis."

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The aim of this article is to assess the core of sociobiological arguments that seem to be important for theology and to point to what might be appropriate theological responses to this new multi-faceted activity.

SOCIOBIOLOGY AND THE UNIT OF NATURAL SELECTION

One of the all-pervasive problems in the history of evolutionary theory is the identification of the unit which is being selected as subject to evolutionary laws. Nearly all the possible levels of analysis have, at some time or another, been chosen by some biologist as the unit of selection—genes, parts of chromosomes, whole chromosomes, genotypes, organisms, Mendelian populations, biological species, and so on (Williams 1973).

In the last few years this area of biology has witnessed sharp controversy which has emanated from the confrontation of the theory, until then widely accepted by biologists, of group selection, with the theory of individual, or gene, selection. This latter theory has been largely expounded by its supporters in a reductionist manner not only in relation to animal behavior but also in relation to human behavior, ethics, sociology, and anthropology—and even wider aspects of culture. Broadly, sociobiology may be described as the interdisciplinary study of the biological basis of all social behavior. It aims at exploring the relationships between biological constraints and cultural evolution.

The controversy was initially associated with different interpretations of biologically altruistic behavior which, for these purposes, may be defined as behavior by an individual organism of a kind that increases the chances of survival of another like individual, with increased risk to its own survival. *Survival* is taken here in its Darwinian sense, namely, survival in order to reproduce, and it is now well established that quite small increments in the chance of survival, in this sense, lead surprisingly rapidly to the dominance in biological populations of individuals possessing the genetic factors responsible for this increment. In the group selection theory, altruism was explained on the supposition that a group, for example, a species or a population within a species, whose individual members were altruistic, was less likely to become extinct than one whose members were nonaltruistic, that is, selfish (Wynne-Edwards 1962, Ardrey 1970).

But there was a paradox here—for altruistic behavior reduces the chance of an organism to survive through reproduction, and so, eventually, organisms which behave thus should disappear from the group, or species. In recent years, as is well known to readers of *Zygon*, a very active group of biologists have resuscitated Charles Darwin's own emphasis on individual selection and now represent altruistic behavior as

genetic selfishness. In this theory, what we call altruistic behavior on the part of an individual, apparently on behalf of other organisms in the group, is simply behavior which enhances the chance of survival, and so of the reappearance in the next generation, of the genes in those other organisms which they also share with the altruistic individual. So those on behalf of whom the altruistic sacrifice is made must be genetically kin to the altruistic individual. For example, the altruism of a bird emitting a warning cry to the rest of its kin-group of the approach of a predator, thereby attracting the attack to itself, is simply, on this view, a mechanism for enhancing the chances of survival of genes which are like its own but are carried by those other, related, individuals. We recall (with practically all other writers on sociobiology) that J. B. S. Haldane once affirmed he would lay down his life for two brothers or eight cousins (Haldane 1955)! No special motivation, purpose, or any special awareness of the group needs to be attributed to the organism—the selection processes and their statistical features ensure this result (the increased chance of reproduction of the genes that the altruistic individual shares with the rest of the group)—and to introduce teleological or group language is simply a post ipso facto gloss on what is actually going on. These ideas have been powerfully argued in E. O. Wilson's monumental work, *Sociobiology* (1975) and, more popularly, expounded in Richard Dawkins's *The Selfish Gene* (1976).

The argument for individual, or gene, selection as the appropriate interpretative category of behavior rests on the assumption that one can properly speak of a gene for a particular kind of behavior, even if we have no knowledge of the actual causal chains linking genes and behavior.¹ Thus a gene for altruistic behavior would be one that transmits information which affects the development of the organism's nervous system so as to make it more likely to behave altruistically, and so might have its effect at a number of levels.² This way of regarding the role of the "selfish gene"³ has been applied to interpreting a wide range of behavior, other than altruistic, for example, aggression, the battle of the sexes, parental policies, feeding habits, the relation between old and young, and so on. The application involves employing the theory of games to work out what is the most evolutionarily stable strategy, that is, the behavioral policy which, if adopted by most members of a population, cannot be bettered, from the viewpoint of gene and population survival, by any other strategy.

THE ISSUE OF SOCIOBIOLOGICAL REDUCTIONISM

In recent years some of the sociobiologists, after rebutting the attempts of recent decades to reduce biology to the molecular sciences, have taken upon themselves the role of the unjust steward and have ap-

peared to be attempting to reduce sociology, anthropology, and the sciences of human behavior to biology. Perhaps this assertiveness should not be taken as an attempt at outright reduction of these sciences to biology, for Wilson has, since the publication of *Sociobiology*, argued for the value to any discipline of its *antidiscipline* (referring to the special, creative, adversary relation that exists initially between the studies of adjacent levels of organization), with biology as the antidiscipline to the social sciences (Wilson 1977, 127-40). Moreover, in the same article he explicitly repudiates any reductionist ambitions of biology with respect to the social sciences, which he recognizes as "potentially far richer in content" than biology. For Wilson is quite aware that the properties of societies are emergent and hence deserving of "a special language and treatment" (Wilson 1975, 7); nevertheless, he wishes to give a prime and determinative role to the biological basis of human social behavior and patterns.⁴ Such apparent intellectual imperialism has provoked strong reactions from the native denizens of anthropology and sociology—not to mention political opposition which sees sociobiologists as reincarnated nineteenth-century social Darwinists.

One of the weightiest attacks on sociobiology so far published from within one of the threatened sciences is that of Marshall Sahlins, an anthropologist. To Wilson's question of "whether the social sciences can be truly biologicized in this fashion [of sociobiology]," Sahlins responds: "The answer I suggest here is that they cannot, because biology, while it is an absolutely necessary condition for culture, is equally and absolutely insufficient: it is completely unable to specify the cultural properties of human behavior or their variations from one human group to another" (Sahlins 1976, xi). For, he argues: "the central intellectual problem does come down to the autonomy of culture and of the study of culture. *Sociobiology* [E. O. Wilson's book] challenges the integrity of culture as a thing-in-itself, as a distinctive and symbolic human creation. In place of a social constitution of meanings, it offers a biological determination of human interactions with a source primarily in the general evolutionary propensity of individual genotypes to maximize their reproductive success" (Sahlins 1976, x).⁵ Scientific sociobiologists who attempt to place social behavior on sound evolutionary principles (notably the self-maximization of the individual genotype) do so, Sahlins suggests, by assuming that human social behavior can be explained as the expression of those needs and drives of the human organisms which have been imprinted by biological evolution.⁶ But this position, he claims, does not correspond to the results of anthropological study.⁷ As evidence of this he cites *inter alia* the absence of any relation between war and individual human aggressiveness. The latter may be mobilized to pursue a war but its existence

does not in itself explain the existence of war, in general, and the causes of any particular war: "Aggression does not regulate social conflict, but social conflict does regulate aggression" (Sahlins 1976, 9).

Many sociobiologists, such as Wilson, R. L. Trivers, and others, argue that kin selection—an essentially cost-benefit analysis of an individual's behavior towards genetic relatives, the selfish gene model—is the deep structure of human social patterns and behavior. Sahlins, by ranging over the actual arrangements in a number of carefully studied cultures claims to demonstrate that "sociobiological reasoning from evolutionary phylogeny to social morphology is interrupted by culture" (Sahlins 1976, 11), so that any claims for sociobiology to be the key to all the human sciences, and indeed all the humanities, are exaggerated.⁸

This attack by a leading anthropologist, whose research results have been used by sociobiologists themselves to support their case, has had considerable influence and cannot, in my view, easily be set aside. Michael Ruse thinks Sahlins's objections are nowhere near as devastating as Sahlins thinks because he has ignored two important ideas in sociobiology (Ruse 1979, 122-26). One is reciprocal altruism—altruistic action directed at nongenetic kin, on the basis that this evokes reciprocal action which does benefit one's genetic kin: "if I am ready to do it for you, then you are ready to do it for me." The other is parental manipulation—a form of altruism of the genetic cost-benefit variety in which one individual (one offspring) is being manipulated or forced by a second (the parent) to help a third (a sibling of the other offspring), all to help survival of the parents' genes. These two ideas, Ruse claims, can explain, respectively, two kinds of observations that Sahlins thinks are fatal to the sociobiological approach, namely, adoption of the enemy's children and infanticide (by an admittedly extreme application of parental manipulation in favor of the survival of some siblings at the expense of others). The bother with this counterattack is that it invokes both altruism and reciprocal altruism (in the sociobiological senses), very much a fail-safe intellectual ploy. For a combination of these would allow one to explain any behavior whatever: if it *does* directly benefit one's own genes (now located in some kin), by the altruism interpretation; or if it *does not* benefit them directly, by the reciprocal altruism interpretation. What is needed is actual observational evidence that each is the proper explanation in its respective case. Can this combination, which appears to be what Ruse is invoking, now constitute a *scientific* explanation, for no evidence can ever falsify these two hypotheses if they are used in conjunction? So the argument continues and it is clear that the plausibility of such sociobiological explanations depends on much more research, as judiciously recognized, for exam-

ple, by J. H. Crook (1980, 162), who clearly believes that "in principle" such genetic "biostrategies [are] at work beneath the surface layer of culture that determines the relationships themselves."⁹

The sharp and furious controversy has continued not only between sociobiologists and philosophers (Midgley 1980; 1979; Hampshire 1978), and between sociobiologists and anthropologists (Sahlins 1976, Leach 1981, Cloninger and Yokoyama 1981), but also among biologists themselves (Caplan 1978, Ruse 1979), not to mention the political antagonism it has aroused from American groups such as Science for the People (Caplan 1978, 280-90), an antagonism almost totally ill-founded, in my view, gratuitously attributing, as it does, political motivations to the scientists involved.¹⁰ Crook's summary of the present situation is one of the fairest:

The tentative explanation [if it really is tentative] of human conduct that stems from the sociobiological paradigm relates man to behavioural and social evolution in the animal kingdom generally and thus for the first time anchors the study of society in evolutionary biology through a fundamental theory. None the less the enormous variety of cultural processes cannot be interpreted solely by sociobiological explanation. Cultures express the attempts of individuals to find meaning in their lives and to produce collectively systems of meaning that make life comprehensible and legitimize action. The capacity to construct interpretative systems rests in the advanced cognitive capacities of man which have evolved in relation to a need to represent social relations in language. The study of what people say in accounting for their actions (emic theory)¹¹ gives an understanding of the processes of culture while sociobiological theorizing gives an insight into the ultimate meaning of culture itself (etic theory).¹² . . . Cultural evolution comprises the historical process which provides the sociological environment within which the basic biological strategies of the species find varied expression (Crook 1980, 189-90).

So we must welcome the real insights biology can provide into the *constraints* which human biological nature places upon us. That this is the way biology can help in the understanding of humans in society has become apparent from the extensive discussions, which began in the nineteenth century, about whether our knowledge of the evolutionary process could generate ethical norms. The conclusion of most philosophers of ethics is that it cannot do so, being guilty of the naturalistic fallacy of deducing what *ought* to be the case from what *is*, though this conclusion needs considerable qualification (Quinton 1965, 107-30; Flew 1967; Hefner 1981, 58-78; Hesse 1981, 283-84; Zygon June 1980).

THEOLOGICAL IMPLICATIONS

Sociobiology is concerned with interpreting human social behavior, with its rich cultural expression and variety, in the light of animal, bird, and insect social behavior, with their more fixed behavior patterns (often entirely so in the case of insects) that are described in terms of

genetic cost-benefit exchanges. By virtue of thus straddling the world of human culture and that of the behavior of the nonhuman biological world, it inevitably touches, indeed sometimes forcibly strikes, upon many issues concerning the fundamental nature of man. The debate about sociobiology is not entirely a replay of the old controversy concerning the nature-nurture dichotomy as factors in human behavior, because there has been an enormous increase in knowledge of the complexity of the strategy of gene perpetuation and of the many-levelled character of any adequate interpretation of human behavior (symbolic, psychological, hormonal, neurological, nutritional—not to mention the spiritual, ethical, and intellectual). So many of the issues that the proponents of sociobiology touch upon are those that have again and again been raised by both science and philosophy for theology.

The emphatically evolutionary outlook of sociobiology does not, in itself, have any new implications for theology that have not been raised in relation to the general idea of biological (and indeed, cosmic) evolution, namely, questions concerning continuity, chance, emergence, and interconnectedness, with their resulting renewed stress on the immanence of God in the natural processes of creation. However, it is true that the wide-ranging scope of sociobiology and the energy and zest with which its expositors apply and extend it, undoubtedly makes even more urgent the need for Christian (and indeed all) theology to become much clearer and explicit about its relation to such views, that is, to the world view of scientific “evolutionary naturalism.” This latter is the dominant viewpoint of the contemporary scientific community and has been described by Karl E. Peters in the following terms:

evolutionary naturalism may be described as follows: First, the realm of nature is all there is; there is no supernatural in the sense of a realm of knowable reality totally other than that which is open to some possible interpretation of everyday experience by some possible scientific theories. Second, nature is dynamic; it evolves. Change is not merely an appearance or an indication of a second-class reality but is essential to the way things are. Third, at least at the level of life, the evolution of nature is best understood by updated Darwinian mechanisms: a continuing inheritance by the replication of major bodies of information; continual, essentially random, small variations of these information systems; and environmental selection pressures favoring the reproduction of some variations over others and thus modifying in small steps the information heritage (Peters 1980, 213).

However incomplete we may regard this view in itself (and Peters’s definition of “no supernatural . . .” needs much qualification), it is one that is extremely well supported on scientific grounds and one whose religious implications require exploration. It will not go away, however uncongenial to traditional theology, and is increasingly the most

widely, generally accepted account of at least how we arrived here, if not why. For myself, it is in its bare outline the best account we have of the natural world of which we now know we are part—and sociobiology, stripped of its reductionist overtones, is certainly a new and positive contribution to that evolutionary naturalism. As Peters points out, such evolutionary naturalism is not by itself definitive of any particular theistic or atheistic position and is, as a matter of observation, shared by at least liberal theists, religious humanists, and agnostic and atheistic humanists—if not always by orthodox Christian theologians. But for anyone who believes that the natural world is the sphere of action of God the Creator, it makes new demands upon theological conceptualization.

Sociobiologists are not a uniform group with respect to their philosophical positions. However, I think it is fair to say that, by successfully delineating the genetic strategies underlying behavior patterns and roles in many insect, bird, and animal societies, they have often been confidently and explicitly deterministic, reductionist, and functionalistic in their interpretation of human behavior—or, perhaps it is more accurate to say, they have shown a general tendency to favor interpretations of human behavior that have been easily seized upon by those who are determinists, reductionists, and functionalists. Some sociobiologists such as Wilson (1977) and Dawkins (1976) have gone out of their way to disavow such extreme positions, which at times their writings may have seemed to imply. But the net effect has been a renewed stress on reducing accounts of biological behavior to a deterministic level that interprets them functionally in terms of their contribution to the survival of genes; behavior is regarded as a strategy, however indirect, for gene survival. There can be no doubt of the success of many such interpretations in the nonhuman biological field, but it is on their application to human behavior that particular controversy arises, as we have seen in the example of kin selection. So the theological response to these ideas is, in their general import, that which must be made to any purely deterministic and reductionistic accounts of human behavior.¹³ But in making any such appropriate responses, theologians would do well to recognize, more explicitly than they have done in the past, the complexity of human nature and the fact that its basic foundational level is biological and genetic, however overlaid by nurture and culture. And they must couple this also with an acknowledgment that it is this kind of genetically based creature that God has actually created as a human being through the evolutionary process. God has made human beings thus with their genetically constrained behavior—but, through the freedom God has allowed to evolve in such creatures, he has also opened up new possibilities of

self-fulfillment, creativity, and openness to the future that require a language other than that of genetics to elaborate and express.

The scientifically reductionist account has a limited range and needs to be incorporated into a larger theistic framework that has been constructed in response to questions of the kind, Why is there anything at all? and What kind of universe must it be if insentient matter can evolve naturally into self-conscious, thinking persons? and What is the meaning of personal life in such a cosmos? Scientists *per se* are unlikely to seek such incorporation but at least they may be prepared to recognize that the scientific method is not of the kind that can be directed to answering such questions. Meanwhile theologians have to take more seriously the mode of God's actual creation of human beings through evolution and also our new understanding of the creature thus formed—even though, in the past, words such as *determinism*, *reductionism*, and *functionalism* have been red rags to the theological bull! For the genetic constraints upon our nature and action are, from a theistic viewpoint, what God has determined shall provide the matrix within which freedom can operate. But is not this nothing other, in a new form, than the old theological chestnut of predestination and free will? Where the Christian theist differs from the sociobiologist, as such, is in his affirmation of God as “primary cause” or ground of being of the whole evolutionary process and, indeed, of God as the agent in, with, and under this process of creation through time. What constitutes the challenge to theology is a new apprehension and explication of God's presence and agency in the processes that biology, in general, and sociobiology, in particular, have unveiled. Of course, many sociobiologists will be opposed to setting their science in such a wider, theistic framework; for Wilson, for example, “no species, our own included, possesses a purpose beyond the imperatives created by its genetic history. . . . If the brain evolved by natural selection, even the capacities to select particular esthetic judgments and religious beliefs must have arisen by the same mechanistic processes” (Wilson 1978, 2), and “scientists cannot in all honesty serve as priests” (Wilson 1978, 193).

Here conflict between theology and a particular philosophical interpretation of biology is inevitable, but the theologian should not enter the lists with destructive ambitions. Indeed some theologians have even argued that theology must come to terms with the domination of the biological process by the prime requirement for *survival*, whether it be of genes, individuals, groups or species. Philip Hefner, for example, argues that, in the light of biological evolution in general and the sociobiological critique in particular, the whole discussion of the is/ought dichotomy—which for too long (he thinks), as the naturalistic fallacy, has prevented us from seeing how the biological process

generates human values—has moved into the arena of survival and nonsurvival (Hefner 1981, 58-78). He goes on to use the categories of A. J. Dyck to elaborate the “ought” as “moral requiredness” which is described as a “gap-induced requiredness”: moral requiredness is a gap we feel compels us (moral obligation) to act so as to fill it in order to improve some situation (Dyck 1978, 293-318; Barker 1976, 2-13). So Hefner then argues that: “The most urgent gap experienced by humans [in relation to its value-requirements]—and therefore the most pressing gap-induced requiredness—is the gap created by the possibility of not surviving. Theology, therefore, has no alternative but to speak its truth about what is and ought to be in terms relevant to survival—the survival of the species, of the world, *of values, of human worth, of all the conditions upon which the human spirit is dependent*” (italics added) (Hefner 1981, 76). But the question is: Can the values, and so on, whose survival is spoken of in the italicized end of this quotation, be regarded as derivable simply from contemplation of the sociobiological facts (if they are facts)? Mary Hesse comments on this prescription of theology’s task by Hefner as follows: “But whatever facts may be discovered about the conditions of survival by sociobiology, the conclusion that the survival of the human species is the most urgent *value* may itself be regarded as *morally* repugnant. This is surely a sufficient rebuttal of the claim that the facts alone permit the ‘ought’ to be derived from the ‘is’. . . . God in his wisdom may have ordained values which are consistent with earthly extinction; to suppose otherwise is to embrace some form of materialism” (Hesse 1981, 28). Whether or not this is a “sufficient rebuttal” will certainly be argued, but I quote this interchange as an example of a new kind of question regarding *survival* and what it means that is raised for theology by sociobiology (Hefner 1980, 203-12; Austin 1980, 193-201).

There is an application of sociobiology which is relevant to theology and which has been taken up by a number of evolutionary naturalists sympathetic to religion in general, if not especially to Christian theology as such. This is the view that the religions have had a function in enabling human societies (and genes?) to survive and, to that extent, can be justified as useful, functional mythologies—even if they are now ripe, according to Wilson for replacement by “the evolutionary epic” as “probably the best myth we will ever have” (Wilson 1978, 201). Donald T. Campbell and Ralph Wendell Burhoe both argue for a positively selective role for religion in the survival of cultures (which is their unit of survival, and so of selection); and Burhoe especially, unlike Wilson, argues for its continuing role in the development and survival of human culture, providing it can incorporate the scientific world view (Burhoe 1973, 299-375; Campbell 1975, 1103-26; *Zygon* September

1976). No doubt Christian theologians will be grateful for this attribution of a survival function to religion in human culture, but the attribution again raises the questions of Survival for what? Is survival a value? What kind of survival? However, theologians will (or should, in my view) first want to ask questions about the *truth* of religious notions, regardless of the contribution of religion to the survival of human culture(s). And could one not argue that it is the ultimate commitment to the truth that is in God and his Christ that characterizes the Christian faith without regard to survival calculations—think too of Job's "Though he slay me, yet will I wait for him" (Job 13:15)? Is not that the core of a religion which has a cross as its central symbol and historical focus?¹⁴

Whatever the outcome is of this particular argument concerning the relation to theology of the central role of survival in biology, what we have witnessed in the last few years is a spate of publications of those who wish to emphasize, in a positively holistic fashion, the physical and biological rooting of the mental and spiritual lives of human beings (Midgley 1979, 1980; Wilson 1975, 1977, 1978; Crook 1980; Burhoe 1973; Campbell 1975; Pugh 1977; Jaynes 1976; Altner 1974; Sagan 1977; H. Harris 1979). In varying degrees these works see human mental and spiritual life as continuous with, and a development and elaboration of, the physical and biological (especially genetic) substratum through which evolution has operated. We have also witnessed the recognition by at least one eminent biologist, Sir Alister Hardy, of the religious experience of human beings as one of their natural characteristics and amenable to scientific investigation, at least in the style of natural history (Hardy 1979). Our mental and spiritual life, it seems, must fulfill at least basic, evolutionary requirements long established, whatever terms it may have to use to interpret itself to itself at its own level. So the pressure from the ideas of sociobiology, in particular, and that of biology and cosmic evolution, in general, is towards a franker recognition of our natural relatedness to the physical and biological worlds and an acknowledgment that our mental and spiritual aspirations are so grounded. But what they should aspire to is not thereby prescribed and so it is that theology has, in my view, a new and exciting role to play if it will only recognize its new brief.

NOTES

1. On any reckoning, it would have to be a *system* of concomitantly acting, linked genes, i.e., inheritance of behavioral characteristics is likely to be polygenic. So in the text, as in the Dawkins quotation, take the singular *gene* to refer to such a system.

2. "For purposes of argument it will be necessary to speculate about genes 'for' doing all sorts of improbable things. . . . We are saying nothing about the question of whether learning, experience, or environmental influences enter into the development of the

behaviour. All you have to concede is that it is possible for a single gene, other things being equal and lots of other essential genes and environmental factors being present, to make a body more likely to save somebody from drowning than its allele would" (Dawkins 1976, 66).

3. Dawkins summarizes this way of looking at biological evolution and the behavior of living organisms: "Replicators began not merely to exist, but to construct for themselves containers, vehicles for continued existence. The replicators which survived were the ones which built *survival machines* for themselves to live in. The first survival machines probably consisted of nothing more than a protective coat. But making a living got steadily harder as new arrivals arose with better and more efficient survival machines. Survival machines got bigger and more elaborate, and the process was cumulative and progressive. Was there to be any end to the gradual improvement in the techniques and artifices used by the replicators to ensure their own continuance in the world? There would be plenty of time for improvement. What weird engines of self-preservation would the millennia bring forth? Four thousand million years on, what was to be the fate of the ancient replicators? They did not die out, for they are past masters of the survival arts. But do not look for them floating loose in the sea; they gave up that cavalier freedom long ago. Now they swarm in huge colonies, safe inside gigantic lumbering robots, sealed off from the outside world, communicating with it by tortuous indirect routes, manipulating it by remote control. They are in you and in me; they created us, body and mind; and their preservation is the ultimate rationale for our existence. They have come a long way, those replicators. Now they go by the name of genes, and we are their survival machines. . . . We are survival machines, but 'we' does not mean just people, it embraces all animals, plants, bacteria, and viruses" (Dawkins 1976, 21-22).

4. "Sociobiology is defined as the systematic study of the biological basis of all social behavior. For the present it focuses on animal societies, their population structure, castes, and communication, together with all the physiology underlying the social adaptations. But the discipline is also concerned with the social behavior of early man and the adaptive features of organization in the more primitive contemporary human societies. . . . It may not be too much to say that sociology and the other social sciences, as well as the humanities, are the last branches of biology waiting to be included in the Modern Synthesis. One of the functions of sociobiology, then is to reformulate the foundations of the social sciences in a way that draws these subjects into the Modern Synthesis. Whether the social sciences can be truly biologized in this fashion remains to be seen" (Wilson 1975, 4).

5. For a thorough-going attempt to interpret cultural "evolution" in terms based on the mathematical theory of biological evolution, see Cavalli-Sforza and Feldman (1979 and 1981) and Cloninger (1981).

6. "[In sociobiology] the chain of biological causation is accordingly lengthened: from genes through phenotypical dispositions to characteristic social interactions. But the idea of a necessary correspondence between the last two, between human emotions or needs and human social relations, remains indispensable to the scientific analysis. . . . The interactions of organisms will inscribe these organic tendencies [aggressiveness, altruism, male 'bonding,' sexuality, etc.] in their social relations. Accordingly there is a one-to-one parallel between the character of human biological propensities and the properties of human social systems. . . . For him [E. O. Wilson], any Durkheimian notion of the independent existence and persistence of the social fact is a lapse into mysticism. Social organization is rather, and nothing more than, the behavioral outcome of the interaction of organisms having biologically fixed inclinations. There is nothing in society that was not first in the organisms" (Sahlins 1976, 4-5).

7. For "the problem is that there is no necessary relation between the phenomenal form of a human social institution and the individual motivations that may be realized or satisfied therein. The idea of a fixed correspondence between innate human dispositions and human social forms constitutes a weak link, a rupture in fact, in the chain of sociobiological reasoning" (Sahlins 1976, 7).

8. Sahlins argues this on the grounds that, first, no system of human kinship relations is organized in accord with the genetic coefficients of relationship as known to

sociobiologists; second, the *culturally constituted* kinship relations, which govern production, property, mutual aid, and marital exchange, have an entirely different calculus from that predicted by genetic kin selection; third, kinship is a unique characteristic of human societies, distinguishable precisely by its freedom from natural (genetic) relationships; fourth, human beings reproduce not as physical or biological beings but as *social* beings, i.e., human reproduction is engaged as the means for the persistence of cooperative social orders not vice versa, and finally, fifth, culture is the indispensable condition of systems of human organization and reproduction. For, he would argue, "human society is cultural, unique in virtue of its construction by symbolic means" (Sahlins 1976, 61) and "culture is biology plus the symbolic faculty" (Sahlins 1976, 65), where the importance of the symbolic is to generate meaning not merely to convey information, as Wilson seems to want to say.

9. In Crook's view, "sociobiology explains why human behavior is not arbitrary, why it is structured in a broadly characteristic way wherever people are, but it does not proceed to reduce all descriptions of individual human action to biological causation. . . . Cultural evolution thus comprises a historical process that provides human beings with the sociological environment within which the basic biological strategies of the species are worked out" (Crook 1980, 186, 187).

10. See Wilson's rejoinder in Caplan (1978, 291-303) and Dawkins's spirited response (1981) in Britain to a similar attack from S. Rose (1981).

11. Emic explanations are those which account for complex social processes entirely in terms of the ideology of the people concerned; that set of concepts regarding relationships and roles that legitimates the behavior of a people. They amount to causal explanations at the level of the reasons people attribute to their own actions (Crook 1980, 172).

12. Etic observations are explanations by disinterested observers or experimentalists which are dependent upon distinctions judged appropriate by a community of scientific observers (M. Harris 1968, 576). Etic theory can be falsified through the dismissal of hypotheses by independent observers (Crook 1980, 173).

13. It needs, of course, much amplification along the lines I have developed in *Creation and the World of Science* (1979), chapter 4 and appendix C, which outline the arguments against reductionist interpretations of human behavior, and attempt to establish a placement for theological discourse.

14. To this Hefner's reply would be "the most fundamental affirmation in the Judeo-Christian traditions concerning God is that of his faithfulness to and love for his creation. . . . The theologian has no alternative but to assume God's faithfulness will not allow creation, including the human portion of that creation, to go unconsummated. . . . when the term *survival* is incorporated within the theological perview, it takes on the meanings associated with consummation and destiny under God. . . . Christian faith gives the created order very significant status within the purposes of God: if therefore it is determined that the survival thrust is a major motif operative within that order, a motif that gives shape and dynamic to the created order, even where that order includes human beings, the theologian must make the effort to discern how that motif is related to God" (Hefner 1981, 209-10, ref 105).

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