

# RELIGION'S ROLE IN HUMAN EVOLUTION: THE MISSING LINK BETWEEN APE-MAN'S SELFISH GENES AND CIVILIZED ALTRUISM

by *Ralph Wendell Burhoe*

Drawing on an elaboration of recent scientific and scholarly evidence concerning the evolution of human nature, I seek to explain how it is that humans may manifest a kind of altruism not evident elsewhere in the biological world and to account for the unique role religion plays in the human segment of sociobiology. I am concerned also with the development of a more adequate scientific theory of religion, which perchance might revitalize a scientifically sound religious belief, reverse a decline in altruism, and prevent a new "Dark Ages."

My general theory is that of a presently developing, general-systems evolutionary theory that seems to give new coherence to the description and explanation of the dynamic mechanisms that operate continually to extend the hierarchy of more or less stable states in cosmic evolution, states which include the persisting entities of biological and cultural evolution on earth and include even the microdynamics of psychosocial development in individual persons.

This general-systems type of evolutionary theory is, as Eric J. Chaisson has pointed out, inherently interdisciplinary and provides an essentially value-orienting or religious understanding of man's place in the scheme of things.<sup>1</sup> A sector of that general-systems theory is sociobiology—a larger sector than the psychological, black-box learning model and perhaps large enough to yield some understanding of religion and its capacity to engender altruistic behavior. I use the term "sociobiology" in the broad sense of Edward O. Wilson's definition: the "study of the biological basis of all social behavior."<sup>2</sup>

But we should note that biological patterns and behaviors are not limited to determination by genes alone, as many unsophisticated

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critics of sociobiology seem to imply. I think most good biologists, geneticists, and sociobiologists, when carefully read, will be found to be saying that organic structure and behavior are products of the interaction of the genetic information with a particular set of environmental circumstances, including culture and other nonrandom and enduring factors, which properly have been called "paragenetic" information by such a veteran biological and evolutionary theorist as C. H. Waddington.<sup>3</sup>

The term "information" as used here in conjunction with genetic and paragenetic information signifies whatever it is that physically shapes, molds, or forms something. This is Webster's current, unabridged dictionary's first but historically "obsolete" meaning and at the same time is very close to Webster's last and newest technical meaning of the term, used in such sciences as cybernetics that describe the negative feedback forces involved in the control or maintenance of suitable behavior in natural, organic, and artificial systems. (It is interesting to me that these first and last lexicological meanings of "information" are—through the implications of the operations of the brain as a neurophysiological machine for shaping organic response patterns by means of negative feedback mechanisms—inclusive of the more common lexical meanings of information.)

In short, both the genetic and the paragenetic sources of information (including the information in brains and cultures) are necessary and are inseparable in shaping the behaviors and patterns of living systems. Herbert A. Simon and others have gone so far as to point out that only a small (even though critical) part of the information that structures a living system can be or is found in the DNA of the genotype.<sup>4</sup> Hence S. L. Washburn was correct in his 1977 address to the American Psychological Association when he cautioned about some excessive claims by some so-called sociobiologists concerning the role of the DNA.<sup>5</sup>

But Washburn's caution in no way should diminish our excitement in the promise of sound sociobiology to help us better understand not only the social behavior of various levels of the animal kingdom but also the social behavior of mankind. Furthermore, this symposium on sociobiology and religion was stimulated as a response to Donald T. Campbell's bringing sociobiology to the attention of the American Psychological Association in his presidential address in 1975; and we are engaged here in examining his thesis that sociobiology helps us understand the positive and natural role religion has played in generating altruistic behavior in admittedly selfish humans.<sup>6</sup>

Campbell has been recognized as a most significant pioneer in refining and enlarging various elements of the intellectual toolbox of

the psychosocial sciences. But in his presidential address to the association he shocked many of his colleagues in both the physicalist-determinist camp and the humanistic-therapeutic camp. In his introduction he suggested that—of all things—traditional religions were, “on purely scientific grounds, . . . better tested [recipes for living] than the best of psychology’s and psychiatry’s [scientifically unverified] speculations.” At the same time he pointed out that genetics and “hard-line neo-Darwinian” evolutionary theory—of all things—support his picture of the role of religion as superior to that of psychotherapy for either understanding or generating human altruism.

In his conclusion Campbell summarized:

Urban humanity is a product of both biological and social evolution. Evolutionary genetics shows that, when there is genetic competition among the cooperators (as [is the case] for humans but not for social insects), great limitations are placed upon the degree of socially useful, individually self-sacrificial altruism that [genetic] evolution can produce. Human social complexity is a product of social [but not only genetic] evolution [where the culturally transmitted information is accumulated under a program of “blind variation and systematic selective retention” analogous to that of the genes] and has had to counter with inhibitory moral norms the biological selfishness which genetic competition has selected continually.<sup>7</sup>

In general I think Campbell’s broad scientific picture of human nature is correct. I recognize him as a creative pioneer in providing here some sound bridges uniting the psychosocial, biological, and humanistic islands of our contemporary culture’s understandings of human nature. His contribution to our understanding of the independent but analogous evolution of culture alongside genetic information is outstanding and is an essential complement to genetics in a maturing discipline of sociobiology. His pioneering of a scientifically based account of religion’s role in human evolution is so far ahead of the understanding of many colleagues in the psychosocial sciences that it took great courage for him to dare to speak of it in his presidential address to the psychological community. I opined, as I observed the responses at the meeting and reflected on what I have heard in discussions and seen in the literature, that for many of the psychological community his introduction of genetics was beyond the pale of both their understanding and their views of relevance. But even more, his introduction of the concept of the natural but nongenetic selection of culture and of nature thus endowing religion with an essential function in life was simply out of their capacity to conceive. I know how he agonized in advance of his presentation about how much he might dare say about these results of his research.

I shall give a brief overview of some extensions of his theory to provide the kinds of developments and corrections which I think he would be among the first to encourage—in fact he already has formally done so in various ways, including his suggestion that I participate in this symposium. My efforts, like Campbell's and Wilson's, toward a scientific understanding of the sources of human altruism have been in progress over a number of years. I believe I have a piece in the picture puzzle that is a necessary addition not only to Campbell's but also to Wilson's in order to make scientific sense. I call this missing piece, in a play upon words used in an earlier problem of evolutionary theory, the "missing link" between ape-man's selfish genes and civilized altruism. For background we must turn to Wilson's picture.

THE PARADOX OF HUMAN ALTRUISM FOR SOCIOBIOLOGY

In his classic *Sociobiology: The New Synthesis*, published in 1975, Wilson notes that

to visualize the main features of social behavior in all organisms at once, from colonial jellyfish to man, is to encounter a paradox. We should first note that social systems have originated repeatedly in one major group of organisms after another, achieving widely different degrees of specialization and complexity. Four groups occupy pinnacles high above the others: the colonial invertebrates, the social insects, the non-human mammals, and man. . . . Although the sequence just given proceeds from unquestionably more primitive and older forms of life to more advanced and recent ones, the key properties of social existence, including cohesiveness, altruism, and cooperativeness, decline. It seems as though social evolution has slowed as the body plan of the individual organism became more elaborate.<sup>8</sup>

Wilson then points out that the basic mechanism of genetic selection plays a major role in this since the possibility of genetic programming of social cooperation is maximum and unlimited for organisms with genetic identity and, because of the mechanisms involved in natural selection, falls off as the individuals in a society become less close kin. As the degree of kinship or genetic identity among the individuals in a society decreases, so does the degree of altruistic cooperation, as one surveys the characteristics that have emerged over the past billion years to constitute these four successive pinnacles of social evolution—from complete identity of genotypes and high social cooperation among the individual organisms that constitute a jellyfish, down to a two-thirds relationship and a lesser cooperation in the societies of ants and other social hymenoptera, down to one-half or less relationship in many mammalian societies, which necessarily are much smaller in size and at best have much lower levels of altruistic behavior.

But the great paradox comes when we note that out of the mammalian group called apes there have emerged human societies, which may have large populations of individuals with little or no genetic kinship relation but which manifest such high degrees of cooperation and altruism as to reverse the downward trend of social evolution Wilson noted in the previous sequence from lower to higher forms. This human phenomenon so completely bypasses the genetic requirements and facts concerning altruism that Wilson has called it the "culminating mystery of all biology."<sup>9</sup>

I suggest this mystery may be explained in terms of well-understood biological theory if we can show, as I think we can, that human sociocultural organisms constitute in effect a new, transgenetic living species capable of symbiosis (of the "social mutualism" type) with populations of ape-men.<sup>10</sup>

#### EVOLUTIONARY BACKGROUND OF RELIGION AS THE MISSING LINK

Here I must only summarize some basic elements of my conclusions in this matter. I stand with the hard core of those who find that genes by their nature cannot program favors for competing genes since any risk to themselves would bring them to the end of their line—natural selection's way of operating.<sup>11</sup> Therefore I hold that genes cannot be selected to program an organism to provide gifts that benefit another organism except when the benefits given do not reduce the inclusive fitness of the donor's genetic line. But under some circumstances such a donor's inclusive fitness is enhanced rather than reduced, as when the gift is (1) for very close kin, to serve whom is also to serve one's own genetic line; (2) for nonkin spouses, to serve whom is also to serve one's own genetic line; and (3) for nonrelated organisms which for some reason happen to be programmed to provide some degree of reciprocally beneficial services for the donor's genetic line. For all such self-giving of a phenotype we have copious evidence that genes are selected; but for understanding human society the third case, "reciprocal altruism," is of primary interest.<sup>12</sup>

Reciprocal altruism among nonrelated organisms is very common as a genetically programmed, reciprocally beneficial behavior between many kinds of species, whereby the organisms of one species provide benefits for those of the other species in what is called symbiotic cooperation. Since there can be no allelic competition with the genes of other species, symbiotic altruism bypasses natural selection's bar to programming genetic production of altruism among conspecific but nonkin organisms. One species coadapts at the genetic level to interact with the other, just as it adapts to any other factor in

its environment.<sup>13</sup> In this way the gene pools of two or more species may become coadapted to produce cooperation that is so close that a casual observer may not be able to distinguish that what appears to be a single organism of cooperating parts is in reality an ecosystem of two or more symbiotic but very distinct species genetically coadapted to cooperate in a socially symbiotic system—such as flagellates endosymbiotic in termites or primitive prokaryotic organelle species endosymbiotic in human cells.<sup>14</sup>

Within a species, however—since any consequences of what an altruistic gene does to favor a competing gene's relative frequency in a population will diminish its own frequency and tend to its own elimination—it seems logically impossible for any gene to be selected to generate altruistic self-sacrifice in order to benefit other genes. As I have pointed out, some genetic theorists such as George C. Williams therefore have asserted that natural selection cannot favor the selection of genes that would produce altruism toward other members of the population or group except toward those who carry the same genes.

The same genes may be continued through one's offspring and the offspring of close relatives. Hence phenotypic altruism—the risk or sacrifice of the body in order to insure the continuity of one's genes through offspring—is a behavior that nature does select. As a matter of fact, since DNA eventually deteriorates and would bring an individual organism eventually to death, the life cycle—which includes reproduction of multiple sets of genes to continue in a new generation of organisms and includes the death of the old body—serves as a filtering process to maintain or enhance the value of the gene pool. Only the viable genes pass through this filter, and they may be multiplied or increased in frequency by the phenomena of the transient life cycle of an organism. Thus organisms by nature are selected to be sacrificial of themselves for the greater treasure for life that inheres in the continuity and enhancement of the wisdom of the genes. Hence altruism toward or cooperation with spouses, kin, and any agency that would enhance the “inclusive fitness” (the continuity of genes like one's own, as in offspring) can be understood readily.

While Williams and others have argued from this picture that we cannot expect anything but selfishness from genes and that the mechanism of selection among competing alleles is not likely to produce altruism except altruism that enhances the donor's inclusive fitness, Wilson and others have been more concerned to see if altruism to nonkin may be explained by some mechanisms of selecting genes through the selection of a group, population, or deme for its virtues instead of through selection of an individual organism for its virtues. Wilson summarizes the efforts toward such an explanation in chapter

5, entitled "Group Selection and Altruism," of his *Sociobiology*. There are indeed some theoretical models. But, as Wilson reports, "the evidence for interdemic selection is fragmentary and somewhat peculiar in nature"; "in spite of the frequently permissible conditions that exist in nature, actual cases of interdemic selection have only rarely been reported in the literature." He also notes in reporting on the altruism involved in warning calls that there seem to be more theoretical difficulties with explanation by interdemic selection than by kin selection or individual selection. In reporting on other evidences of altruism he points out that it is often equally or better explained by kin and individual selection. Nevertheless, he concludes his chapter by leaving the door open on whether group selection can explain altruism.

My studies of religion, human nature, and biological theory all cohere in leading me to agree with the view of Williams and others that the genes must be inherently selfish. For me the altruism of phenotypes or organisms for the genes is in fact an altruism for the sacred and has been selected to operate that way analogously to the selection of human self-sacrificial altruism for the sacred or religious core of culture. Moreover, I find that Wilson's own eloquent demonstration of the decline of altruism with the decline in the index of genetic relatedness itself argues strongly against any genetic programs for altruism except when it enhances the donor's inclusive fitness.

Richard Dawkins in his *The Selfish Gene* has provided an excellent and generally readable account for this case. He also has introduced a plausible scientific account of cultural evolution under the "natural selection" of cultural information, akin to the views advanced by Campbell and me. He calls the information units in culture "memes" in analogy with genes. In the 1950s Henry Alexander Murray similarly had suggested we call them "idenes." In reading Dawkins I felt that he may have introduced his last-chapter excursion into cultural evolution in an effort to explain human altruism, which just could not be explained by natural selection of genes. But Dawkins rightly concludes that memes, by selection from among competing individuals, are bound to be just as selfish as genes. Unfortunately, after concluding this, he quickly finishes his book with an admittedly lame hope for any explanation of human altruism.<sup>15</sup>

But there is a solution to our problem of accounting for human as well as insect altruism by natural selection. I already have noted how natural selection brings about altruism between species without running into the problem of competing alleles in any natural-selection mechanism of either genes or memes—the problem that forced Dawkins and many others to declare quite honestly that not only are genes

utterly selfish but so are the memes (or idenes) of the cultural information that rides piggyback on, and modifies the expression of, the genotype. But what if we should discover upon careful examination that culturetypes and their expression in sociocultural organisms are an independent "species" of living substance symbiotic with populations of *Homo*—selected independently because the units of selection, while dependent upon a human population, are not dependent upon any particular human population? What if, to speak in a dynamic analogy, the sociocultural organism and its culturetype were as independent of what anthropoid population flows through it as a whirlpool of a particular configuration that is shaped by its stream bed is independent of which population of water molecules flow through it? Does this happen in life?

The differences among religions, languages, particular technologies, and other sociocultural interaction configurations or customs may be very little shaped by the particular genetics of the populations that are thus enculturated so long as the normal distribution of genes in these populations is not too divergent from the normal distribution of genes in the larger gene pool from which the particular culture draws its population. A language can be learned and effectively used by almost any genetic population of humans. But no complex language can be confined to a population as small as an extended family or can be as short-lived as a generation. The lifetime and space dimensions of sociocultural structures and organisms (and of the memory banks or stream beds that are essential for characterizing them) are, I suggest, of quite different dimensions from those of the individual ape-men. The ape-men are the "water drops" that contribute the "substance" of a sociocultural configuration that is shaped by a nongenetic memory bank.

If cultural patterns are of such different dimensions that they are not selected by the same selectors for whose benefits individual organisms compete, they can evolve independently. What if there indeed has emerged in human evolution a new living entity that organizes not just the individuals in a family of genetic kin but any number of individuals provided they represent a fair sample of the population of human genotypes? What if this sociocultural organizing entity is able to integrate populations of thousands or millions into serving it, in return for its enhancing the probability of the genetic lines of a significant sample of a population over what would be the case in any competing ecological niche? What if such sociocultural organizers or organisms do compete in fact for limited resources and some are better?



The great puzzle of explaining human reciprocal altruism spread through a large population of nonkin conspecifics disappears should it be the case that there is an independent "species" to which ape-men are coadapted to serve. Their behavior could be explained as genetically produced reciprocity with a creature of different "species" and not necessarily providing genetic benefits for conspecifics that contemporary genetic theory denies apart from inclusive fitness. We are quite familiar with the adaptation of a species to any source of benefits, including various other species. And we have numerous cases of the coadaptation of two or more species into a common ecosystem that may give the appearance of a single organism, so closely knit are their functions and so invisible have they been to our previous capacities for perceiving or conceiving. Moreover, we can explain such cooperation in terms of natural selection of genes.

But in humans we probably have the first such symbiotic system, constituting an apparently unitary living creature, in which one of the symbionts is not programmed by DNA but by cultural information, independently transmitted and selected. What is new in the ecosystem that constitutes a human society is not that one of the symbionts utilizes for its own phenotype the phenotypic substance or patterns generated by the programs of the DNA of the other symbiont, for that relation is common and is the relation between our prokaryotic and eukaryotic cells. What is new is that the separate and "species-specific" package of information generating the symbiont we call the sociocultural organism is not a genotype but a culturetype. If individual ape-men are bonded by the coadaptation of their genes in a symbiotic service to a sociocultural organism that is also an evolving system of living substance independent of any particular human genotypes and yet that binds its anthropoid population to serve it in exchange for reciprocal benefits provided by the species-specific behaviors selected in the coadaptation, then our paradox disappears. The paradox here, as in the sciences generally, is resolved by revising our model or presuppositions until we have found a better fit between our conceptual system and the actual events it models.

There are hundreds of fascinating details to be more fully worked out in my model for resolving this problem, such as the origin, nature, and stability of culturetypes. But there is also much evidence that seems to confirm the picture. Here I can consider only some primary features.

In short, my hypothesis is that sociocultural systems are "organisms" of a new living kingdom, quite different from either the animal or plant kingdoms of ordinary biology, and are beneficent "parasites," so to say, which are completely dependent upon the spe-

cial animal species *Homo sapiens*, as a *Homo* cell is dependent upon prokaryotes for the necessary substance of its life. The sociocultural organisms have been almost as hidden from our scientific view as the alien but essential prokaryotic creatures that are such necessary agencies in each of our eukaryotic cells. The sociocultural organisms are equally real and essential to our being human.

The sociocultural organisms are a species with which ape-men are endosymbiotic. But one can say not only that as individuals we live within a sociocultural organism but also that the sociocultural organism lives within us. Not only are we individual units within an organized society, but organized society is represented and incarnated within our brains. Hence we can say that according to one kind of analysis the sociocultural organisms are endosymbiotic in the brain of man—much of a total society's "culturetype" may lie in an individual brain. In fact, in primitive societies the primary locus of the culturetype is the reiterated incarnations in brain after brain of the patterns of the language, customs, and socially transmitted values that characterize the sociocultural organism. Apart from the sociocultural organism, whether viewed as the product of the enculturated patterns inside an individual brain or viewed as the coordinated and mutually supportive patterns of behavior in a city or nation that result from such incarnations, the human individual loses his humanity and becomes a rather helpless hominid, inviable in a nonenculturating habitat.

It may help if it is understood that I am describing human nature in a physicalistic, scientific conceptual system. Within this conceptual system the research findings of the past few decades have been making it possible to describe man with the greatest degree of coherence and clarity thus far. This is especially true for understanding how our conscious and aesthetic commonsense views of ourselves are related to our physical bodies, to the society of other persons, and to the whole complex environment within which we live and move and have our being. As F. S. C. Northrop pointed out some thirty years ago, the physical conceptual system is the crowning epistemological tool achieved in the West for providing coherent and "objective" views or "truth" in theology as well as in the sciences in general. It is by using this model that I am putting together in this paper such varied facets of human nature ranging over the spectrum of disciplines ("ways of talking") from subjective, spiritual, cultural, religious, esthetic (feeling, emotions, values), social, economic, biological, chemical, to physical—with the modifiers "objective" and "true" being applicable all the way along, according to one's system of definitions. I cannot elaborate this recent scientific development of the old philosophical

“epistemology” and “ontology” here but simply assert that if one tries to read what I am saying about language, culture, brains, societies, morals, religion, and theology in this paper in the physicalistic languages of physical and chemical systems into which I assert they all can be translated neatly, then one perhaps will come to enjoy the unified picture I see, a picture that provides for a rational integration of many of the confusions of our present historical epoch. Some, according to their background in the various disciplinary jargons or ways of talking, will have to accept on faith that all my translations into a physicalistic language are valid and that the physicalistic model operates to explain and make coherent all the otherwise disjunctive bits and pieces.<sup>16</sup> With this digression to help understand more clearly what I am trying to do, let us return to some of the concrete aspects of our discussion of religion’s role in human evolution and continue with our summary of our hypothesis concerning the emergence and nature of human culture in the evolutionary scene, a scene in which culture is interlocked with biology, chemistry, and the physics of the cosmos.

In my model of cultural evolution the heritage of information comes packaged as a culturetype, made up of units as in Dawkins’s memes or Murray’s idenes. The culturetype is of course an analogue of the genotype only in a general sense, the detailed mechanisms being quite different. The corresponding dynamics are still obscure. A culturetype provides the information which, in interaction with the human gene pool and other elements of its ecological niche, produces the ecosystemic phenotype that we know as a human society. The information package that is the culturetype is symbiotic to the point of parasitic dependence upon the brains of a population of *Homo*. It is transmitted to and from a storage “gland,” one might say, which is at the other end of the spinal column from that of the gonad, namely, the neopallium of the brain. This culturetypic information is what shapes the specific characteristics of a sociocultural organism—its particular language, technologies, rituals, mores, myths, institutions, etc.<sup>17</sup>

A culturetype, as an information packet which is “extraspecific” to the gene pool of *Homo*, operates on a population of ape-men in a way analogous to a virus that infects only the outer cortex of the brain, using the brain as a resource for its own propagation. This theory provides a proper basis for the natural selection of memes and hence of culturetypes, independently from (although always constrained to be symbiotically coadapted with) the genes and genotypes of *Homo*.

While the theory of the natural selection of cultures is now in as confused or vague a state as that of the natural selection of genes was

a half-century ago, I believe that recent work has provided grounds for a new understanding of human nature that has as much potential as did the genetic theories earlier for understanding animal nature. In particular I believe that my symbiosis model provides a conceptual framework adequate for explaining Wilson's "culminating mystery of all biology": human altruism.

My model of the relation between culturetypes and gene pools as symbiotic and of the culturally transmitted information as undergoing a kind of natural selection is one somewhat akin to that proposed by Campbell. However, my model differs from Campbell's in that I do not hypothesize that cultural information can fight or overcome genetic information to provide altruism, which is the way I read his presidential address. I do not see how any constraint that conflicts with the basic requirements to which the genotype has adapted can be viable. Moreover, I stand with Dawkins in seeing that cultural information units are as inherently "selfish" as genetic information units and for analogous reasons which derive from any mechanism of natural selection from among competing units.

Campbell too sees cultural selection as the product of random variations and selective retention in an operation that is logically or mathematically analogous to the selection of genetic DNA packages, and he first called my attention in the late 1960s to the overpowering logic and evidence of Williams in *Adaptation and Natural Selection* to the effect that one cannot expect selection of competing alleles to produce behavior that favors one's competitor.<sup>18</sup> But I do not find that Campbell presents a convincing case on how cultural practices can defy the genetic requirements. My systems theoretical approach forces me into the traditional biological view of the opportunism in evolutionary processes which are forced to build stage  $n$  on stage  $n-1$  and so on down the hierarchy. If genes are built of molecules, they use the molecular laws in special ways to accomplish their adaptive end. If cultures are built on genetically programmed animal populations, I suspect they use those populations according to their given natures to accomplish adaptations to the ends of sociocultural organisms.

I already have referred to Dawkins's failure to explain human altruism.<sup>19</sup> But regardless of the incompleteness of Campbell's or Dawkins's or other efforts to resolve this biologically anomalous problem of altruism, it seems to me quite clearly solvable on very traditional biological information. Reciprocal altruism between individuals in a population of humans and a sociocultural organism clearly can come from natural selection, if there is indeed a symbiosis between two separate "species." This kind of reciprocal altruism is one that various

investigators have found established between the coadapted gene pools of many combinations of separate but symbiotic species, such as the prokaryotic organelles which are endosymbiotic in the eukaryotic cells of humans or the flagellate protozoan species that are endosymbiotic in the digestive tracts of termites. The resultant phenotypes are so tightly interdependent that they have become an ecosystemic organism, or what Alfred E. Emerson called a "supraorganism."<sup>20</sup>

Like the flagellate in the termite, an individual ape-man who is endosymbiotic within a cultural organism does not so much serve his fellow humans individually (except close kin and mates, which he serves under genetic programming naturally selected under competition of alternate alleles) as he serves the sociocultural organism. He serves the sociocultural organism because of the reciprocal altruism built into both the cultural organism "species" and the ape-man species by the coadaptation of their noncompeting information packages.<sup>21</sup>

If our analysis that each human individual is not a single organism but an element of a symbiotic ecosystem or superorganism is confirmed, then each of us can be seen as motivated (programmed) simultaneously by the two separate, semi-independent but coadapted information systems that have emerged as the significant determinants in our analysis of human behavior: genotype and culturetype. To the extent that culturetypes do program significant differences of the mean goal orientation (values) and behavior patterns of the phenotypes in two population groups from what is contributed by the differences in the gene pools of the two populations, the new phenomenon of unprecedented and mystifying phenotypic altruism pointed out by Wilson can be explained by the culturetypes of the ape-man. Since the significant features of an ape-man's culturetype may be essentially identical with the culturetype of the other ape-men whose ecological niche is the same cultural organism, his "index of relatedness"—in terms of his cultural, not genetic, heritage—may approach the unity of an "identical twin."

In other words, if my model of selection in the evolution of a culture (a model in part shared by Campbell and Dawkins) is valid, if cultural information is selected independently of genetic information (provided only that its selection yields coadaptation toward symbiosis), if interaction goals between individuals sometimes are dominated by the culturetypic aspects of our motivating system (this is highly plausible when the genetic aspects are not in conflict), and if some mathematical analogues of the genotypic relatedness index also apply to the fostering of phenotypic altruism in the expression of culturetypes, then, since the cultural relatedness of most members of the

same culture may be more than the three-quarter relationship found in the genotypes of hymenopteran societies (and perhaps in some cases as much as the unity relatedness index of the colonial microorganism societies), we may have an explanation on the basis of an analogue of genetic natural selection for the very mystifying human behavior of risking one's life even more readily for one's spiritual or cultural "brother" than for one's genetic brother. Insofar as the cultural brother is an identical twin in the "value core" of his culturetype, and to the degree that under the circumstances the culturetype is operative in determining one's behavior, to that extent one can expect motivation for such extremes of altruism as have not been seen, Wilson points out, since the first phylogenetic peak of altruism.<sup>22</sup>

To be sure, the potential relationship of unity in the culturetype segment of the human phenotype's programming is diluted by the degree in which the genotype determines the behavior in a particular circumstance. It also is diluted by the degree in which the culturetype lacks the features specified above. Moreover, I do not see how the symbiotic coadaptation of culturetype and genotype statistically can repay the genes for risks to the phenotype too much above the level of the norms obtaining in mammalian groups generally. Nevertheless, human nature has manifested various levels of these altruistic behaviors and has included the saints as well as the most selfish sinners. The point is that this model allows for an explanation of both, as a function of the coadaptedness of genotypes with culturetypes in particular populations and circumstances. It provides a sociobiological picture that may be able to explain many of the intriguing features of human nature and behavior that hitherto have been indeed a mystery to the sciences of man. It also may prove useful for aiding humanity in any intentional efforts that it may make to adapt to higher patterns of life.

But I must leave unsaid a lot of what needs saying about the two natures or information packages that program man and how they are interrelated at neurophysiological levels. For purposes of this paper I must move quickly to a brief review of the significance of religion in this mechanism for generating the strange phenomenon of human altruism.

#### RELIGION SEEN SCIENTIFICALLY

Before discussing religion's role in human evolution to resolve the culminating mystery of all biology, I must digress to provide a brief picture of religion seen scientifically. Many of my colleagues in the scientific and secular world understand the term "religion" to refer

only to obsolete myth. It is characteristic that writers like Campbell, Dawkins, Wilson, and others are quite ready seriously to involve religion to explain how in ancient history human societies larger than kinfolk tribes were established and maintained. But it would seem that their "current culture" picture of religion as henceforth irrelevant must be replaced by a more scientific one if they are to resolve the paradox of human altruism.

Religion, I suggest, is the key and hitherto missing link in the scientific explanation of how ape-men are transformed to civilized altruism. Religion—as I am using the term—is the system of rituals, myths, rational theologies, etc., that constitute and convey our basic heritage of culturally communicated values. Values are patterns of information that shape the goals of behavior, that structure the cybernetic mechanisms in our bodies and nervous systems that determine what we love or hate, want or fear, go for or flee from, etc. Hence values shape our overall behavior patterns and the way we spend our lives. Technically values are the norms of our cybernetic mechanisms. Every creature has basic values, and these are shaped or determined ultimately by the information in its genotype, which shapes the cybernetic mechanisms for admitting benefits and rejecting harmful substances through cell walls and also shapes the neurochemical structures of brains that coordinate the value hierarchies of complex organisms.

But in humans, if my earlier analysis is right, there are two separate natures—one shaped by the genotype and the other shaped by the culturetype—which are packages of structuring information coadapted by natural selection as they evolved during the past million years, although the culturetypes have made some major step jumps in their evolutionary rate during the past few centuries, few thousand years, and few ten-thousand-year periods. During these periods religions have emerged as the agencies or cybernetic mechanisms for coordinating the coadaptation between the basic values of genotypes and culturetypes. There are genetic components for religion as well as for language, but both are primarily dependent upon sociocultural transmission so far as particular sociocultural structuring and dynamics are concerned.<sup>23</sup> As such, religious information is transmitted from brain to brain where it operates to modify the expression of the information supplied by the varied genotypes in the population so as to give viable attitudes, feelings, and goals. In other words, viable attitudes, feelings, and goals are the cybernetic norms of "ultimate concern" in a population, to use the theologian Paul Tillich's term for characterizing religion.

While humans—and all other symbiotic systems that behave as a single organism or superorganism—have two or more semiindependent core packages of information that program their behavior, their selection as a viable ecosystemic unit—it must be recalled—requires that natural selection sufficiently coadapt the separate information packages so that their interaction in a particular habitat will produce in fact a viable ecosystemic or symbiotic unit. Hence, according to my hypothesis, religions have been selected—both through the transformations of genetic information in the generations of ape-men and the cultural information in the generations of sociocultural organisms—to integrate the values of both coadapted systems. (I must warn quickly anyone who has not studied my previous work in this area that the term “generations” of sociocultural organism should not imply the same kind of mechanisms of variation and selection as that involved in genotypes, and most of us working in the field do not conceive of such simplistic analogues any more than good evolutionary biologists conceive of the analogous genotypes of flying bugs, birds, and bats as homologous. I should indicate also that I have shown in other papers some of the evidence that this particular formulation of the nature of religion in terms of scientific categories does conform to a remarkable degree with religion known through prescientific historical, philosophical, and commonsense languages.

Religions at the sociocultural level are the product jointly of the culturetype and of the society's gene pool. Religions at the level of personal behavior and experience are similarly the product of the culturetype and genetically only of the particular genotype of the individual person. Religions are the agency of coadaptation or synthesis of the individual's unique, genotypically programmed system of values and his values as structured by his symbiont sociocultural organism, so that he becomes indeed a suitably coadapted product of the interaction of two separate species—ape-man and sociocultural organism. Our psychotherapeutic and religious terms suggesting the desirability of integration and wholeness are testimony to this nature and the need for integrating the two systems.<sup>24</sup>

If either the genotype or the culturetype is not well coadapted, the one with the other, then the individual person experiences the inner conflict between his “bodily” and his “spiritual” natures, to express it in Saint Paul's language. But when they are all well coadapted the torturing conflict disappears, as in Saint Paul's interpretation of Christian salvation, and is replaced by a natural joy in giving one's self in gracious love to the service of one's fellow humans, confident in the hope that one's ultimate or long-term rewards, guaranteed by the superhuman Lord of History, will be greater than the temporary



sacrifices that one now renders for such an outcome. A human being who in his culturally informed brain can regain a culturally unspoiled, pristine, genotypically programmed trust of the essentially good relationship between himself and the ultimate source of his being can keep his sophisticated culture and yet reenter the paradise of primitive animal innocence and trust—and live confidently in this world, being possessed of a sound hope and as free from overweening anxiety or fear of inevitable, natural death and multiple other hazards as the birds of the air and lilies of the field. Good religions have functioned to release ape-men's brains from the overload of anxieties about the primitive culture's natural world. The potential for emotional overload increased with the evolutionarily rapid increase of the brain's outer layers. These layers mediated associative and predictive powers and communication of information by language. The emotional charge of linguistic information input was not susceptible to harmonious adaptation to each individual's genetic information since linguistic communication was the statistical product of the brains in a genetically diverse interacting population. It thus became necessary for any culturetype that had evolved linguistic communication also to evolve a religion that could adapt successfully to the particular needs of the average individual in its population the meaning, values, or emotional impact of the enlarged, unfiltered, and sometimes maladaptive information load.

It should be noted that religions are cybernetic mechanisms and not simply the opiates, as Karl Marx correctly suggested. That is, religions present the other side inherent in any control mechanisms: the stimulus to action as well as the prevention of overloads that terrorize and immobilize. As Campbell and others correctly note, religions have been the source of moral and other stimulus in our sociocultural control mechanism. They have been indeed a vital mechanism for the possibility of altruism to a total community beyond the nuclear family.

However, in the past few centuries the new revelations by the sciences have destroyed for many the effectiveness of the symbolic expressions of earlier religious belief systems that engendered proper confidence about the nature of the self in the context of that upon which it is dependent for life and that engendered a proper sense of duty and hope in the same context. There has been lost a needed conviction or faith in a system of transhuman powers that define our meaning and destiny and sanction our loyalties and morals in our sociocultural organism. Lost also is the equally necessary belief concerning the salvation of our souls in the end, if we behave properly.

As a result there is a sickness spreading simultaneously through our sociocultural organism and in the "hearts" (brains' limbic systems?) of

the populations of poorly humanized ape-men. There is a widespread literature on this anomie and anxiety that seems to be increasing as sociocultural prophets from Fyodor Dostoevski to Aleksandr Solzhenitsyn seek to point out the dangerousness of our situation. There are a considerable and growing consensus on the dire symptoms and some consensus on the diagnosis of humanity's illness—but little on the cure.

It is my conviction that the cure is at hand and a new epoch in human history will begin when we can reformulate our heritage of sociocultural values and truths so as to interpret them in the light or context of present science. I find strong evidence that the general structure of this culturetypic heritage, found in the religions of the world, has been long selected by the same reality or nature that has selected our gene pools. In this selection process various culturetypes have been coadapted with the wisdom of the gene pool in very subtle and not yet very fully understood ways so as to guide the successive stages of genetic expression into complex patternings of nonkin, conspecific individuals whose behavior cooperates in such ways as to produce the emergence and evolution of the unprecedented phenomenon of sociocultural organisms at an accelerating pace up into the contemporary age of science. But the emergence of modern science, like the emergence of writing and of philosophy, poses not only miraculous opportunities but grave threats to the basic values that sustain man's symbiotic synthesis. Therefore I see as today's most important task for mankind the effort to unite religious and scientific beliefs into a union that can provide again a successful symbiosis of genotypes and culturetypes—but now within the new sociocultural ecological niche produced by modern science and technology where traditional formulations of religious belief have become less adequate as maps of reality and grounds for action. Such a union of religious and scientific beliefs has become possible as recent scientific and scholarly studies of religion have provided new insights into the wisdom that has been selected by the processes that have created human life and culture, as Campbell has helped make clear. This allows new translations or interpretations of religious wisdom in the light of scientific concepts and the revitalization of that wisdom for an age of science.<sup>25</sup>

At this point I turn from a brief outline of religion seen in the light of the sciences to show how such an understanding of religion can move us farther than Campbell, Dawkins, or Wilson has yet supposed to resolve sociobiology's paradox of human altruism.

HOW DO RELIGIONS RESOLVE SOCIOBIOLOGY'S PARADOX?

How have religions specifically operated to generate the necessary altruism for human societies—the first large and complex societies of conspecific organisms that are not close kin to appear in evolution of life on earth? Here I shall give only a brief characterization of the religious function in generating the minimal threshold of faith—and hence of practice—that altruistic acts to the cultural organism would be reciprocated. A nervous system not programmed with a confidence in such reciprocation would not be compatible or coadapted with the underlying motivations programmed by its genotype and hence would not succeed. Such a confidence or faith is prerequisite to the practice of reciprocal altruism.

Reciprocal altruism among conspecifics might be genetically sustained, Wilson points out using data from S. A. Boorman and P. R. Levitt, if a certain critical frequency of an "altruist gene" were to be reached. But he notes that we are still left with the problem of how such critical frequencies can be reached.<sup>26</sup> As I have pointed out, this problem does not exist in cooperating behavior between one species and another. Therefore genetic selection of reciprocal altruism is natural for a population of ape-men coadapting to an extraspecific, benign, culturetypic "virus." The symbiosis of ape-men with a sociocultural organism requires a harmoniously binding connection, in each brain of the ape-man population, between the implicit requirements and promises of the sociocultural organism (which are encoded in each ape-man's neocortex) and the implicit requirements and promises of the genetically programmed norms in the lower brain structures of each ape-man, structures that provide the basic fears, desires, and other motivations. Each sociocultural organism is phenotypically "parasitic" upon a population of *Homo*, where its culturetype is encoded in the brain's outer layers, which by coadaptation have been programmed readily to incorporate culturetypic patterns transmitted from brain to brain in the sociocultural community, including the patterns of the language and other symbol systems.<sup>27</sup>

The most primitive stages of religion, according to this analysis, begin with and ever must depend upon genetically programmed, animal-ritual communication—for example, bowing the head as a sign of submission that is common in mammalian populations. The initially genetically programmed, animal-ritual communications system among individual ape-men already is included in the neurological connections between the cybernetic norms of their primitive social life and the norms of the motivational mechanisms in the lower or reptilian levels of our brains. It was through this connection that primitive

cultural organisms could enculturate the particular refinements that paragenetically guide the "expression" of the genetically programmed symbols of good and evil. There are several hierarchical stages of this neuronal mechanism for transforming response to signals of good or evil.<sup>28</sup>

These stages are illumined by recent psychological studies of stages of human ontogeny, such as those by Jean Piaget and Lawrence Kohlberg. It would seem probable that the phylogenetic stages of sociocultural organisms were akin to those still necessary in the ontogeny of our essentially anthropoid organisms (chimpanzee and gorilla genes differ from *Homo* by less than 1 percent) into civilized humans.<sup>29</sup> This is why there is so much ritual communication in even the higher religions; motivation always requires ultimate stimulation all the way down to the basic, genetically programmed motivational mechanisms. I see no escape from ultimate satisfaction of the basic genetic requirements, and I can see no culturetype succeeding that does not cooperate to fulfill such genetic requirements. But when the paragenetic patterns of a viable culturetype are well coadapted with these the resultant norms or values of both systems are integrated. And when these norms are adapted to the larger environing ecosystem so that this subecosystem is viable in the larger one they are what the philosophers have called "intrinsic values." In evolutionary theory of course such basic values never can be absolute for all time but must be evolving continually to adapt to new conditions that occur with the passage of time.<sup>30</sup>

Above the stages of basic ritual communication, as our ancestors began to have brains that allowed symbolic communication involving neurological codes in which symbolic models of self and world were patterned inside the head, they began to talk and to conceptualize. They used language to communicate explanations of hitherto unperceived relations of cause and effect among the events of their experiences. There began to evolve the stories to explain the puzzling mysteries of life, mysteries because the newly evolved but quite finite logical computer in the brain (coadapted with programs fed to it from an emerging culturetype) gradually opened the windows of perception or conception upon a scene of infinite complexity. In this complexity there naturally arose misunderstandings that seemed to threaten the core values of the living system as "comprehended" by the more limited perspective of the genotype. The rising anxieties connected with expanding awareness of death and other threats always had to be dealt with by each brain, usually with the help of a culturetypic heritage that already had made a more or less satisfactory adaptation to the problem.

The culturetypes became adapted through the selective process by evolving new, paragenetic information input to give more adequate models of the self and its environment and hence more adequate models of what to seek or avoid—good and evil. This information, by its nature, was not and could not be encoded as such in the gene pool. Yet culturetypes always had to defer to the basic demands of the gene pools, with which they were symbiotic, or else be selected out. The culturetypically transformed prescriptions (whether at conscious or the more usual unconscious levels is immaterial) of what to do that did not immediately satisfy the genetic norms of the lower brain structures had to be “explained” as somehow ultimately fulfilling the implicit goals of the genotype. A present postponement of an instinctively warranted good could be negotiated successfully only if there was a credible promise of a later payment with a still larger good.

One has to suppose the gradual evolution of the culturetypes of various sociocultural organisms to accumulate a stock of descriptions, prescriptions, and warrants optimally coadapted with the available genetic and environmental requirements for viability. A statistically successful delivery of the payment of the postponed reciprocal rewards to the faithful servants of the sociocultural organism was experienced in fact (with a consequently enhanced inclusive fitness for the surviving gene pool of that population); otherwise individual ape-men deserted that particular culture or their gene pool thereby was diminished in fitness. The religious stories or myths had to be “true” in basic consequences for life and became so by the natural selection of culturetypes along with genes. Thus religious wisdom became sacred, and the gods were real.

The stories or myths had to explain to each member of the population, in forms meaningful to its stock of symbolic structures, why and how certain culturally evolved requirements should be acted upon, even though they may not have been motivated immediately in an untutored brain. And in all this the system of penalties and rewards that individuals experienced had to connect neurologically and resonate with those penalties and rewards involved in the animal-ritual communications that previously sufficed to structure social behavior without verbal explanations because this was the route to the necessary, genetically based motivation system.

Also the penalties and rewards would have to match what statistically was experienced as meted out by the social system and by the larger ecosystem surrounding it. In addition to the long-term requirement that the implicit and explicit promises of delayed rewards be valid was the problem of keeping these promises and threats (sanctions) constantly alive in the central nervous systems of the popula-

tion. Religions, as the core institutions for the transmission of these vital or sacred schemes or promised later rewards and punishments in a sociocultural organism, necessarily became involved in a constant round of sacred rituals in which animal-level ritual was combined with the new, coadapted myth-level rites to insure remembrance and observance of the viable culturetypic modifications in the expression of the genetically patterned mechanisms for perceiving and responding to signals of what is good or evil for life. From the perspective of contemporary history of religions this stage is called that of the formation of the symbolic myths.

The religious myths provided a special category of a culturetype that could connect the more complex, verbally programmed patterns in the brain with the nonverbal and the more central motivational core of the brain.<sup>31</sup> They functioned to shape the most fundamental or ultimate values that must be held in common in the brain structures of a population of anthropoids if they were to live in symbiosis with a beneficial cultural organism. These myths, like the related rituals before them, were the product not so much of conscious planning as of the same kind of wisdom-generating and wisdom-selecting forces that have operated eternally in the evolution of living systems: the natural selection of the more viable or stable among an assortment of boundary conditions guiding homeostatic energy-flow patterns at increasing levels of remove from thermodynamic equilibrium.<sup>32</sup> The selection of the pattern most fit to ensure the survival of the symbiotic populations of anthropoids and cultural organisms was accomplished by the greater flourishing of those symbiotic memes and genes that conjointly produced the more viable or persistent ecosystemic patterns just as in the previous evolution of the coadapted gene pools of two or more symbiotic species to form a more advantageous ecosystem. The only new thing is that the memory of the culturetype was never in the genes but only in the brains and the related artifacts generated by those brains and found in human cultural communities.

It follows from this hypothesis that all religions are products of the same general process of selection that produced animal and plant life. The religious gods of the life-explaining myths are themselves the naturally selected symbols which effectively motivated within the brain structures of those times the suitable response patterns to the realities that were in fact the creators and determiners of human destiny as now understood scientifically. Religious wisdom, like Walter B. Cannon's celebrated *Wisdom of the Body* (wisdom of the genes), is itself a product of the evolution of the reality system (nature).<sup>33</sup> The gods were indeed proper symbols of the hidden realities that explained why life was as it was and why men must do what the

combined and fairly well-coadapted cultural and genetic information in them told them they must do. The same myths also were the sciences of their day. They told primitive peoples about the origins and major developments of themselves in relation to the world they live in. The sacred knowledge of what was basically good or evil was conjoined with and inseparable from their knowledge of the world and all things in it. Of course the basic good always was tied inherently to the maintenance of the implicit contracts of reciprocal altruism between an individual and his symbiont, the sociocultural organism, and thus to the ultimate requirements of the ecosystem (the gods, collectively God) for viability.

I shall not here discuss a later level in the evolutionary emergence of a rational, analytic stage of discourse in religion—theology—some two or three thousand years ago, or how that development in turn was tied to the earlier stages by analogous requirements in the nature of the hierarchies of such systems. But I shall conclude by calling attention to the fact that it also follows from this hypothesis concerning the origin of human civilization that religions or some functionally equivalent cultural agencies are essential for any civilization at any stage, including ours, since, beginning with their genetically based rituals and on through myths and theologies, they are the cultural source of coadapted basic values which motivate that genetically selfish ape-man to serve his symbiotic sociocultural organism. While this may appear to be serving his potential genetic competitors, since a civilized society includes many more than one's close kin, religion transforms genetic selfishness into reciprocal altruism between the ape-man and the sociocultural organism in which he abides by so structuring the behavior of the inhabiting ape-man as to enhance the inclusive fitness of all ape-men who are allowed to remain. It does this by guaranteeing a system of reciprocal altruisms and a higher probability for genetic success in competition with those ape-men who do not dwell in such a favorable ecological niche as that supplied by a well-adapted or viable sociocultural organism.

From the standpoint of individual ape-men the sociocultural organism is simply a more favorable ecological habitat, even though it is structured by their collaboration with the brains of the genetic competitors. According to this hypothesis the operations of nature will select against and diminish or eliminate any civilization, state, or lesser sociocultural organism if it fails to provide this kind of favorable habitat for the ape-men who inhabit it. And any ape-men whose genetic disposition or whose inadequate enculturation fails to produce behavior suitably devoted to the cultural code will be punished, driven out, or killed—thus inhibiting their individual inclusive fitness and

riding the sociocultural organism of a "cancer." The viable sociocultural organism thus has captured in its tradition—and sometimes in the conscious thought of some of its inhabiting ape-men—the wisdom that there can be enhanced inclusive fitness for individuals through certain kinds of cooperation with what otherwise would be competitors. I would note that ancient theologies captured and reflected this wisdom in their doctrines of man. Saint Paul's organic analogy of the Christian community and the many notions of loyalty to brotherhoods of the spirit transcending or enhancing genetic kin loyalties are examples.

But I shall make a special point of the central notion of the major religious doctrines or theologies that is far ahead of contemporary secular thinking and more in keeping with evolutionary theory for understanding man's place in the scheme of things. This is the notion of man's dependence upon the system of objective requirements posed by a nature that is much more than human, to which all living systems must adapt, the ultimate reality system, whether we call it nature or God. Of course the thus-far evolved and surviving systems of genetic and cultural information obviously have adapted more or less their hedonic or motivational norms to this reality system. But clearly for a high civilization requiring altruism to genetic competitors this reality system, which is the ultimate criterion for all human values, does not allow us unconditioned, genetically programmed hedonism, as Campbell's presidential address correctly indicated. When I say unconditioned hedonism I do not mean to deny the hedonic basis of motivation but to assert that some equivalent to the hitherto evolved religious modes of conditioning the genetically based hedonic response patterns is necessary if we are to continue the symbiosis that transforms the expression of 99-percent-anthropoid genes into organisms with sufficient altruism to nonkin conspecifics to make civilization possible.

#### NOTES

1. The interdisciplinary character of evolutionary theory has existed from its beginning when several areas of geological and biological sciences in the nineteenth century contributed to the formulation of the evolutionary picture. In the twentieth century, with significant new developments from the chemical, physical, and astrophysical sciences to illuminate the evolutionary picture from the more physical levels of analysis on the earlier side and significant new developments from the psychosocial and humanistic disciplines (especially early were contributions from the study of language) to illuminate human development and cultural evolution in more recent levels of emergence, the modern pictures of the phylogeny and ontogeny of man are truly interdisciplinary. An interesting testimony of this is given by the astronomer Eric J. Chaisson in his "The Scenario of Cosmic Evolution," first published in *Harvard Magazine* 80 (November-December 1977): 20-33 and with minor changes republished



as "Cosmic Evolution: A Synthesis of Matter and Life" in *Zygon* 14 (March 1979): 23-39. Chaisson, after illustrating the range of disciplines involved in understanding human evolution, in his last paragraph provides an excellent summary in which he indicates that the "philosophy that we are the product of cosmic evolution [is] very much an interdisciplinary approach, interweaving knowledge from virtually every approach, interweaving knowledge from virtually every subject a university can offer." For a different but relevant discussion of systems theory see H. Sodak and A. Iberall, "Homeokinetics: A Physical Science for Complex Systems," *Science* 201 (1978): 579-82.

2. Edward O. Wilson, *Sociobiology: The New Synthesis* (Cambridge, Mass.: Harvard University Press, 1975). In his glossary, on p. 595, he defines "sociobiology" this way. In chap. 1 he defines the term more fully. I use the terms "altruistic behavior" and "altruism" also to designate the kind of behavior which is defined in Wilson's glossary more operationally or objectively than in Webster's dictionary. Wilson's glossary defines altruism as "self-destructive behavior performed for the benefit of others." This avoids specifying just what is the self that is destroyed. As will become clear from this paper, I limit the self-destruction to the phenotype but exclude the genes, which some writers include (I think mistakenly) in their definition of what is risked in altruistic behavior. I would include more behavior than the above definition by Wilson, namely, all behavior that even risks some probability of self-destruction.

3. C. H. Waddington, *The Ethical Animal* (New York: Atheneum Publishers, 1961), esp. p. 131.

4. Herbert A. Simon, *The Sciences of the Artificial* (Cambridge, Mass.: M.I.T. Press, 1969), esp. p. 25: "A man, viewed as a behaving system, is quite simple. The apparent complexity of his behavior over time is largely a reflection of the complexity of the environment in which he finds himself."

5. S. L. Washburn, "Human Behavior and the Behavior of Other Animals," *American Psychologist* 33 (May 1978): 405-18.

6. Donald T. Campbell, "On the Conflicts between Biological and Social Evolution and between Psychology and Moral Tradition," *American Psychologist* 30 (December 1975): 1103-26 (reprinted in *Zygon* 11 [September 1976]: 167-208).

7. *Ibid.*, p. 202.

8. Wilson (n. 2 above), p. 379.

9. *Ibid.*, p. 362.

10. *Ibid.*, pp. 354, 356-58.

11. George C. Williams, *Adaptation and Natural Selection* (Princeton, N.J.: Princeton University Press, 1966). This is perhaps the classic American statement of the problem, clearly arguing and documenting with evidence that the currently established model or view of how natural selection works does not allow for selection of groups within an ecological niche. See esp. p. 95 for the pithy statement of the main point: "The natural selection of alternative alleles can foster the production of individuals willing to sacrifice their lives for their offspring, but never for mere friends."

12. Wilson (n. 2 above) provides details on various aspects of the genetic problems and potentialities for producing altruism. See p. 120 for "reciprocal altruism."

13. Williams (n. 11 above), pp. 246-47, points out that for the symbiotic mutualisms, such as the termite and its intestinal symbionts, "the selection of alternative alleles can simply and adequately explain the origin and maintenance of such relationships."

14. Alfred E. Emerson, in "Ecology, Evolution and Society" (*American Naturalist* 77 [1943]: 117-18), his 1941 presidential address to the Ecological Society of America, gave some pioneering analyses of interspecific cooperative communities, where he found populations from several species operating as an ecosystem so closely adapted and effectively coordinated as to warrant being called a supraorganism. In numerous earlier and later papers (e.g., n. 20 below) he provided a wealth of detailed evidence on the coadaptation of the genes and correlated phenotypic structures and behaviors of several species to constitute such an integrated interspecific living system. My many discussions with him were a prime source of my hypothesis of the sociocultural organism as a truly independently selected species to account for human altruism, after Campbell had

led me to take Williams's taboo on group selection seriously. The recent discovery that human beings are themselves symbiotic systems is described in a fascinating, poetic form by Lewis Thomas in his *The Lives of a Cell* (New York: Viking Press, 1974) in the chapter "Organelles as Organisms." An earlier and more detailed summary of the explanation of such phenomena is given by Lynn Margulis, "Symbiosis and Evolution," *Scientific American* 225 (August 1971): 48-57.

15. Richard Dawkins, *The Selfish Gene* (Oxford: Oxford University Press, 1976). This is a lively and readable introduction for nonspecialists into the basic problem of the selfish gene and the big paradox of human altruism for sociobiology. For the term "idene," the cultural analogue of the genotype's gene, we are indebted to Henry Alexander Murray's quip in a 1959 conference of the American Academy of Arts and Sciences on "The Concept of Progress in Terms of Biological and Cultural Evolution." Hudson Hoagland and Julian Huxley used "idea" deriving from Murray's use. For Huxley's statement see *Nature* 196 (1962): 203. Dawkins introduces "meme" in his last chapter.

16. F. S. C. Northrop's "The Methods and Grounds of Religious Knowledge" was published as chap. 23 in his *The Logic of the Sciences and the Humanities* (New York: Macmillan Co., 1947) and was reprinted in *Zygon* 12 (December 1977): 237-88. The term "way of talking" I owe to Philipp Frank who commonly used this phrase when he sought to calm the antipathies of persons from different disciplines and ideologies when they were affronted by the seeming incredibility of terms used in the alien jargon. Frank's "ways of talking" may be a more simple and useful term than the "paradigms" of Thomas Kuhn, for whom he was a mentor, incidentally. For an insight into how a physicist's way of talking in no way diminishes the importance of subjective knowing or "speaking in the first person" see P. W. Bridgman, *The Way Things Are* (Cambridge, Mass.: Harvard University Press, 1959), esp. the preface and introduction.

17. Most of my papers since the early 1950s have been concerned with the role of religion in human cultural evolution and hence with religion's real function in biological and cosmic evolution; I was early educated to understand each successive stage of evolution as riding piggyback on all those prior to it. Most of what I have written have been referred to in three recent papers in *Zygon*: "The Human Prospect and the 'Lord of History,'" *Zygon* 10 (September 1975): 299-375; "The Source of Civilization in the Natural Selection of Coadapted Information in Genes and Culture," *ibid.* 11 (September 1976): 263-303; and "What Does Determine Human Destiny?—Science Applied to Interpret Religion," *ibid.* 12 (December 1977): 336-89.

18. See n. 11 above.

19. Dawkins (n. 15 above), esp. the last few pages.

20. Alfred E. Emerson's "Dynamic Homeostasis: A Unifying Principle in Organic, Social and Ethical Evolution" (*Zygon* 3 [June 1968]: 129-68) contains on p. 141 his reference to his analysis of the concept of "supraorganism" published in 1952. He developed the notion in many papers describing the essential cooperation of members of several species whose interactions were difficult to distinguish from that of an organism and none of which could continue to exist without the contributions of the others. A recent summary of his position appeared in his "Tertiary Fossil Species of Rhinotermitidae . . .," *Bulletin of the American Museum of Natural History* 146 (1971): 245-303.

21. Williams (n. 11 above) concurs in principle that natural selection of alternative alleles can account for symbiotic cooperation among species, even though it forbids selection of cooperative altruism within a species except for close family kin. But he does not seem to be so impressed as Emerson with the degree of complex organization possible through such coadaptation.

22. The term "value core" of the culturetype is used here to indicate that certain information in culturetypes as well as in genotypes now is understood clearly to be more critical than other information where variability is more tolerable. In culturetypes the value core is designated properly as the more vital or sacred information, the alteration of which would lead to the breakdown of the sociocultural system; other patterns of the

culture can tolerate much more variation. In general the religious information in a culture has this character of sacrality. Whether a cultural brother is a tinker, tailor, cowboy, or sailor is not critical for arousing attitudes of liking or disliking him; but whether he properly manifests the same morals and ideology may make for deep affection or extinction.

23. Concerning the genetic coadaptation in ape-men for symbiosis with the central or religious values of culturetypes, Hudson Hoagland long ago suggested that "the brain is first and foremost an organ of survival . . . by natural selection. . . . [Man's] unique psychosocial evolution has had a feedback on his biological evolution further to develop his brain. . . . The ability to form meaningful configurations that encompass large segments of the environment is a property of the more highly developed brains, and a good case can be made for the view that man's concerns with science, philosophy, political ideologies, and theologies are a reflection of a basic property of his nervous system to integrate extensive configurations relating himself to his environment." The above words come from Hoagland's "The Brain and Crises in Human Values" (*Zygon* 1 [June 1966]: 140-57) given at the Institute on Religion in an Age of Science summer conference on Star Island in 1964. See esp. pp. 153-55: "Some Religious Implications of Biological Knowledge." A more recent IRAS paper adds to a long succession of papers on the role of genetically programmed characteristics of the brain in religion: Eugene G. d'Aquili's "The Neurobiological Bases of Myth and Concepts of Deity," *Zygon* 13 (December 1978): 257-75.

24. Emerson (nn. 14 and 20 above) elaborated in many papers the exquisite detail of synthetic operations between two or more species in shaping the viable or adaptive behavior of symbiotic superorganisms.

25. I think the papers published in *Zygon* and the work of hundreds associated with the formation and activities of IRAS and the Center for Advanced Study in Religion and Science (CASIRAS) demonstrate this possibility.

26. Wilson (n. 2 above), p. 120.

27. Noam Chomsky pioneered in showing the coadaptation between human languages and genetically structured brain patterns.

28. Paul D. MacLean's "The Brain's Generation Gap: Some Human Implications" (*Zygon* 8 [June 1973]: 113-17) gives a good picture of the hierarchical and phylogenetic structures of the brain. The role of animal-level ritual, which MacLean finds programmed in the lower or reptilian brain, was brought first to my attention on reading Konrad Lorenz's *On Aggression* (New York: Harcourt, Brace & World, 1966).

29. Lawrence Kohlberg's "Indoctrination versus Relativity in Value Education" (*Zygon* 4 [December 1971]: 285-310) is illustrative of his development of the stages in human moral development. The close relation of man and chimpanzee has been demonstrated in a new way by studies in the evolution of macromolecules in the past couple of decades. See, for instance, Mary-Claire King and A. C. Wilson, "Evolution at Two Levels in Humans and Chimpanzees," *Science* 188 (April 11, 1975): 107.

30. It is well known that the environment and the genotype in their interaction constrain the brain to present a more or less successful adaptive response to what under the circumstances is required for life. See Hoagland, for instance, in n. 23 above. Whenever the brain completely fails so to perform, nature's selection weeds it out and leaves on the scene only those brains that have been successful. Psychotherapists are also familiar with the fact that the same forces prohibit a brain that for any length of time produces a self-awareness that denies the worth or hope for the future of the self. But in the evolutionary emergence of increasingly complex cultural transmissions of information to the brains of ape-men the genetically programmed brain cannot be prepared to handle all the complex adjustments necessary to function in this way without help from the culture. The geneticist Theodosius Dobzhansky sensed this and expressed it in our conversations on many occasions and wrote of it in his "An Essay on Religion, Death, and Evolutionary Adaptation," *Zygon* 1 (December 1966): 317-31, the publication of a paper given at the same 1964 IRAS conference referred to in n. 23 above. Dobzhansky, along with others, inferred from archaeological findings of human

burials around 100,000 B.C. that religions already had begun to be a necessary and significant cultural institution for informing brains how to transcend what otherwise would seem to be man's fragmentariness, to provide some plausible source of meaning and hope as the consciously expanding horizons of man had to adapt to information that the genotype had never "been aware of."

31. IRAS conferences and *Zygon* papers have provided numerous papers by persons in different disciplines all reflecting the function of religious myths to alleviate emotionally destructive fears, none perhaps more graphically and authoritatively than Erwin Goodenough's "A Historian of Religion Tries to Define Religion," *Zygon* 2 (March 1967): 7-22, another paper given at the above-mentioned 1964 IRAS Star Island conference. Following Goodenough one can say that religious myths are the stage "scenery" or the culturally artifacted loci that define the stage setting on which we act out our lives. It is a different scene from what the untutored or unenculturated animal sees, for no genes can be selected to be adaptive for circumstances to which only culturetypes are being selected for adaptedness.

32. I revert here to my scientific setting for life portrayed physically as a dissipative flow pattern. It comes out of the work particularly of I. Prigogine but was introduced to me by Aharon Katchalsky-Katzir, whose "Thermodynamics of Flow and Biological Organization" was published in *Zygon* 6 (June 1971): 99-125. It is a paper closely related to J. Bronowski's "New Concepts in the Evolution of Complexity: Stratified Stability and Unbounded Plans," *Zygon* 5 (March 1969): 18-35. It is fascinating to contemplate that these living patterns in the dissipative flow streams of the cosmos have been made more stable than the biblical mountains which were symbols of eternity. This stability we now know is produced by the stable, continually replicated and selected memory patterns that provide homeostasis, or, as Emerson suggested, "dynamic homeostasis." Some of these patterns as produced by DNA are hundreds of millions of years old, going back to times when the continents of the earth and their mountain systems were utterly different from today.

33. Walter B. Cannon, *The Wisdom of the Body* (New York: W. W. Norton & Co., 1932).