

WAR, PEACE, AND RELIGION'S BIOCULTURAL EVOLUTION

by *Ralph Wendell Burhoe*

Abstract. A recent scientifically and historically grounded theory on human genetic and cultural evolution suggests why the religious elements of culture became the primary source of both peaceful cooperation within societal ingroups and at the same time of destructive wars with outgroups. It also describes the role of religion in the evolution of ape-men into humans. The theory indicates why human societal life is not long viable without the underpinning of a healthy, noncoercive, religious faith; why sound religious faith is weak now; and why we may hope both for better morals and for worldwide cooperation in peace.

In what follows I shall outline an emerging model of human nature as a symbiosis of genetic and cultural information. This model resolves the paradox of religion as a prime causal agent of both peace and war and also shows how and why religion was an evolutionary adaptation that made possible the phenomenon unique to humanity: social behavior generated not merely among close kin by genetic selection but also among nonkin by nature's selection of the value core of cultural information—religion. This selection has been and remains possible exactly because cultural information or heritage is quasi independent of, or only loosely coupled with, genetic information and also because religious heritage in general is highly *coadapted* with the genetic, so that the two are *mutually symbiotic*. Hence religion could draw together ever larger and more richly endowed social populations, which were not close kin, to work altruistically and cooperatively together. The accordance of this theory with the facts of genetics and history also provides new grounds for understanding first, the emergence of humanity as a

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kingdom of life above that of animals, second, the rapid evolutionary expansion of the outer brain cortex as the womb and cradle of language and technology, third, the fantastic explosion of primitive cultures into civilizations, and, fourth, many other puzzles, general as well as scientific, concerning human nature.

Of greatest significance for this current paper is that the theory provides new grounds for understanding what must be done in order for humanity to avoid the contemporary, unprecedentedly lethal, and self-defeating threat of international warfare that could be released by fanatical loyalties stemming from neurologically deep-seated and conflicting religious or quasi-religious ideologies in the context of our recently advancing scientific technologies. At the same time it suggests how we may maintain a proper religious/ideological faith for the altruistic orientation and bonding of individuals within a society, a basic and necessary ingredient for a society's long-term stability or viability.

SOME BIOCULTURAL BACKGROUND FOR SOLVING THE PROBLEM

Deeply puzzling to scientists as well as to historians, philosophers, and others has been the paradox that the brave soldier who is motivated to destroy and kill the enemy is doing this altruistically to defend his own society, at serious risk of his own life. He does this even though his own society is made up of people who for the most part are not his family or kin. This altruism to nonkin runs counter to the laws of genetic selection and motivation of *Homo* as well as of other animals. How can it be understood? (Alcock 1984; Alexander 1982; Burhoe 1968a; 1976a; 1979; 1982; 1984a; 1984b, 113-17, 178-85).

Sociobiology, a new synthesis of many scientific facts and theories on social behavior, is very helpful in providing a fuller and more objective picture, indeed a tremendous enlightenment of our situation. E. O. Wilson, in a classic synthesis that provided the now widely known name "sociobiology" for the field, showed how in *Homo sapiens* (as in its ancestral species) there were indeed close relations between genotypes and many characteristics of social behavior, including religious behavior (Wilson 1975, 554-64; 1978, 169-93). More recently, a breakthrough into a very promising theory of a coevolution of genes and cultures has been advanced (Lumsden & Wilson 1981; 1983), which I believe will be as exciting and fruitful for the social and human sciences as were the conjectures and empirical tests a few decades ago on DNA strands for genetics and biology.

My own hypothesis, while very close and indebted to several pioneers in the field, includes two major differences with most of them, including the Lumsden-Wilson coevolution theory. One difference is on the role of genes and the other on the role of culture. I found my hypothe-

sis clinched on reading George C. Williams's (1966) alignment of evidence against earlier attempts at genetic accounting for social cooperation in nonkin groups, as well as by Wilson's own evidence. A key source of the evidence that natural selection can produce cooperating societies only among very close kin was produced by W. D. Hamilton (1964).

My serious work on this began shortly after the close of World War II, when I associated with a number of concerned scientists and other scholars to see if we could come up with an answer to the radical changes necessary for peace in our new ecological niche created by science and technology. This stimulated a still continuing line of papers, which showed overlapping conceptual responses by various persons. A good number of the papers are to be found in *Zygon: Journal of Religion and Science*. Here I intend to focus on some of mine (see papers of various dates listed under Burhoe, especially 1962; 1971a, Epilogue; 1973; 1975; 1981, 151-233; 1984a, 219-27, 238-42; 1984b), where I have developed a theory of religion as a naturally selected "organ" for replicating the central values of various kinds or "species" of the "biocultural organisms" or human societies that have been emerging ever since the beginning of the coevolution of cultures and genes. I give a brief technical outline.

Human nature as dual—a symbiosis of genes and culture. Following Alfred Emerson (1954, esp. 157 of the 1968 reprinting; 1960, 332-35) as well as various other scientific and scholarly contributions to the understanding of human values, I increasingly refined my theory of human nature as a highly coadapted *mutual symbiosis* between two unprecedentedly distant "species," in terms of relationship of heritages. The first species is some species or subspecies of *Homo*, which is *epigenetic from* (is shaped by) the interaction of its *genotypes* (patterns of DNA information that internally shape organisms) with some outside environment, including other species.

The other "species," with which *Homo* has become a tightly knit mutualistic symbiont, has been rapidly emerging in the past million years as a new *kingdom* of life on earth. The creatures of this new kingdom are *sociocultural organisms*, programmed and reproduced from the non-DNA-information of *culturetypes* (patterns of cultural information that internally shape sociocultural organisms). Culturetypes are distinct from genotypes in both their replication and selection processes. The replications of the two different information packets are only loosely or indirectly coupled, as is the case for symbiotic species generally.

These sociocultural organisms are epigenetic phenomena growing out of the interaction of their culturetypes with some habitat of the

earth, a habitate which, as for any parasitic creatures, must include its host species. In the case of sociocultural organisms the essential host is some species or subspecies of *Homo*. The interaction of genotypes and culturetypes provides the dual information pools that operate jointly as the internal program for a *biocultural organism* (human society), whose tightly interwoven symbiotic nature earlier has eluded us.

Viable culturetypes and *Homo* gene-pools obviously on the average have been selected to be coadapted enough so as to be mutual symbionts—"mutually beneficial parasites"—which are more viable in symbiotic, ecosystemic population groups than either would be alone. This means that, as the circumstances of either of these two loosely coupled but highly coadapted systems change, the goals and responses of the other may need to be changed at the same time (in phase), if the adaptive advantage of the symbiosis is to be maintained (Emerson 1960, 332-35).

Moreover, within the purely cultural program of a biocultural organism, as within an animal organism's program, there are parts that must develop and operate in proper phase relative to one another and to environing circumstances, in order for the system to maintain itself, to be viable. For instance, an immigrant society may not be sufficiently in phase with the strange trades or language of their adopted society, so as to be able to fulfill the economically available job requirements. Hence they may be underprivileged economically until they become adapted to their new situation or updated and in phase with its requirements.

The subdivisions of a societal entity in general must be coordinated to one another so that each of them plays its proper role for the total organization of the society to work, to survive. But a more vital problem arises when within a society the institutions that transmit its sacred values become out of phase or lag in their capacity to communicate to a people whose secular information has made obsolete and ineffective many of the old religious symbols of reality. The tragedy of this is that, if the fundamental or sacred values upon which a society is founded—especially people's mutual concern or love of its symbiotic community—fail to be adequately transmitted, then those values tend to disintegrate and the society whose viability depends upon them disintegrates with them.

The failure to transmit a viable value system that binds the society into a successful unit can come about in a number of ways, such as the influx of nonassimilable, alien values from another culture. To prevent that dire event, societies have evolved to defend the ingroup against all outsiders and especially against potentially disruptive alien faiths. This is illustrated by the religious wars of the past, including between Islam

and Christianity, or the current, widespread ideological denunciations and military skirmishes between Jeffersonian and Marxist societies, based on at least quasi-religious convictions.

The failure of values also may occur entirely internally in a society if the sacred and secular ideologies get out of phase. This has been happening within Christendom since the rise of the scientific sector of culture some three centuries ago, and more rapidly in the past century, under the explosive leaps of science and scientific technology. Science has come to present a markedly different picture of reality from the pictures in which traditional faiths have been transmitted. As a result, traditional religious faith and practice have become increasingly unconvincing and have diminished in power, while secularization has increased, in spite of the well-meant efforts to maintain the integrity of the scientific and the religious cultures by isolating them from one another. Such separation only makes one or both of them irrelevant to a public that is not convinced by dubious prescientific hair-splitting. The more that people find the scientific world view relevant, the less they are moved by medieval and premedieval philosophies of traditional religion's salvation and central-value scheme, at least until they are able to translate from religious language to scientific, or unless they divide their minds as some can into two relatively isolated compartments.

When, for this or other reasons, the net impact of the culturetypic unit becomes less coadapted within itself, and hence to its more slowly evolving gene pool, the delicately balanced functioning of the culture and the mutually beneficial symbiotic "parasitism" between culture and genes may become disrupted. This can seriously endanger both the culture and the gene pool. A poorly coadapted culturetype tends to become a death-dealing rather than a mutually beneficial symbiont to its *Homo* population, and it is selected out. That is, the culture becomes inviable: its natural consequences diminish or extinguish it because they diminish that upon which it is dependent.

Individuals in a poorly coadapted culturetype come to recognize they are less well off. If they cannot reform the culture they try to leave it to find a better one. If they cannot find and enter a viable one, they perish with their nonviable society. The nonviable culturetype "starves" when individuals in its gene pool, upon which it "feeds," abandon it. Incidentally this process helps accelerate the evolution of gene pools as well as of culturetypes. Especially genes that happen to program brains more suitable for biocultural living are more rapidly selected. Hence the rapid evolution of the brain. In brief, a biocultural organism (human society) without a sufficiently strong and viable heritage of behavior-organizing, sacred values (religion) tends to wither.

But, when the mutualistic coadaptation of a society's sacred-core values becomes closely in phase with both the secular segment of its culture and gene pool, as well as with its nonhuman ecological niche, the society may become a very powerful society. This may make it a threat, and perhaps a lethal threat, to *external* societies, especially if the externals pose any obstacle to the goals of that now very viable society. This psychosocial dynamics leading to destructive conquest did not so often come into play for early societies that were separated from conflict by natural barriers or by their mutual, commonly observed, territorial boundaries. But in times of growing empires and of today's global village the only inherently stable and enduring solution left is to increase the number and strength of feeling of those who may constitute a viable ingroup. Religious cultures are as "selfish" against alien competition as are selfish genes, and for the same reasons: the rules imposed by nature for the selection of any competitive and adaptive heritages (Burhoe 1979, 145-46). In my theory such culturetypic adaptations to common fundamental rules and behaviors could include the world population of human religions as readily as humans born in all human genetic and cultural pools can learn to use a common language or technology.

It is important to be clear that the brain-encoded, non-DNA, culturetypic memory systems, such as language and religion, are relatively stable over many *Homo* generations. These codes are necessary to maintain and reproduce the biocultural organisms. They are as independent from the *Homo*-gene-pool heritage as is the genetic heritage of any one from others in two or more mutualistically symbiotic species, programmed only by DNA information packets—such as, for example, the independence of the gene pools of the termites and their endosymbiotic flagellate protozoa populations, which stimulated Emerson's view of certain very close alliances among two or more symbiotic species to constitute what he called a "supraorganism" (Emerson 1954; 1960). The emergence of culturetypes, and their resulting symbioses with ape-man genes to form biocultural organisms, may be said to have enabled an evolutionary jump of even greater magnitude than some of the earlier great jumps, such as that from the modifications and symbioses of different species of prokaryotes which became mutualistically symbiotic under the aegis of certain eukaryotic species (Thomas 1975, 81-87).

Reasons for and application of the symbiotic model of human nature. Two important points, which support my model of human nature as the product of the symbiosis of gene pools of *Homo* and the nongenetic information pools of cultures, I found in Williams's critique of evolu-

tionary thought under two categories: The first concerns the limits of the genetic production of altruism, which he put pithily, saying, "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"; hence *intraspecific* genes by themselves may not be selected for generating stable societies beyond close kin (Williams 1966, 95). The second concerns why Emerson's *interspecific* mutualism could do what *intraspecific* selection could not. Williams summarized this by saying that "the selection of alternative alleles can simply and adequately explain the origin and maintenance of . . . cooperative mutualistic mechanisms . . . between any two species in which each constitutes, for the other, an important source of some aid to survival" (Williams 1966, 246-47).

My model of the coevolutionary scheme differs from that of Charles Lumsden and Edward O. Wilson (1981; 1983) in that they seem not to have separated their "culturgens" as representing a species selected independently from the gene pool of *Homo*. Their chains of epigenetic stages seem to come from but one species, from which are derived all their culturgens. Of course, *intraspecific* selection of competing genes is always going on. But I have not seen evidence that frees this from the rule that competitive selection favors genes whose phenotypes do not operate to favor other genetic lines more than their own. Given the nature of selection, this is almost a tautology. It is somewhat surprising that the otherwise rich new theory of Lumsden and Wilson does not take more seriously Wilson's (1975, 382) own correlation of the decline in altruistic social cooperation with the decline in genetic relatedness in each of his first three "pinnacles" of social evolution among animals. When he comes to the fourth pinnacle, uniquely represented by *Homo sapiens*, he noted that "man . . . has achieved an extraordinary degree of cooperation with little or no sacrifice of personal survival and reproduction. Exactly how he alone has been able to cross to this fourth pinnacle, reversing the downward trend of social evolution in general, is the culminating mystery of all biology." It seems to me that the later Lumsden-Wilson combination now disregards the prohibition of genetic generation of altruism other than to close kin. But John Alcock (1984, ch. 1) finds the prohibition still holds.

My model also differs from Lumsden and Wilson and most other models of the coevolution of genes and cultures in my use of Williams's second point recounted above: that "selection of alternative alleles" provides a very proper explanation of *interspecific* mutualistic cooperation, widely documented in biotic systems. If culturetypes, and particularly their prime goals or values, become so coadapted with the prime values of the evolving gene pools of *Homo* that the inclusive

fitness of both systems is enhanced, then there is what I think is a sound explanation of human altruism beyond the limits of close-kin populations. Start with this coadaptation of two very different "species of heritage," then I think much else of the Lumsden-Wilson coevolution model follows beautifully.

The big hindrance to understanding a culturetype—or the biocultural organism that is the phenotypic expression jointly of it and its symbiotic genotype—as being a different and mutualistic symbiotic species with *H. sapiens sapiens* species has been our tardy taxonomy in recognizing a new kingdom of life, one which has a nongenetic but sufficiently persistent, culturally replicated and transmitted memory code for heritage. In contemporary cosmic evolutionary theory there has been arising a new understanding that selection by nature is not restricted to the alternative-allele, DNA model of the post-Darwinian synthesis. J. Bronowski (1970) presented, in my view, one of the earlier and better models of how the biogenetic theory of selection is a special case of a cosmically universal picture of how events in time are shaped by nature's intrinsic dynamics, which can account for the formations of atoms and molecules as well as of the events in human cultural and mental history, with genetic selection as an intermediate stage. This has been illumined by others, including Donald T. Campbell (1975); H. J. Hamilton (1977); Aharon Katchalsky-Katzir (1971); Ilya Prigogine (1984); and A. F. C. Wallace (1966). For pioneering views on selection processes in cultural evolution alone, see B. F. Skinner (1953; 1962; and especially 1966).

In sum, to understand human nature I believe we need to recognize the symbiosis of *Homo* with a new kind of nongenetically replicated, symbiotic "species." This model provides much better explanations than do most other models for the uniqueness of humans and their new level above animals, as well as explanations of the many psychosocial benefits and difficulties emergent from our symbiotic nature. It also allows a better explanation of the symbiotic role of the genes of *Homo* as well as of the selective pressures for the increasing coadaptation of the separate symbiotic sets of genetic and cultural heritage. Further it provides a naturalistic account of the ubiquity of religious or parareligious ideologies in human cultures, a category of natural history and naturally selected functions that as yet has not been very much appreciated either in the scientific or humanistic segments of the split culture of contemporary civilization.

Here I am concerned particularly with this new theory's account of religion's role in the correlation of phenotypically altruistic cooperation with insiders and aggressive warfare with outsiders. Moreover, I suggest that my new symbiotic paradigm of human nature and the

processes that shape its history provides us with a more realistic and fruitful understanding of what must be done if humans are to live peacefully or live at all as they enter a radically new environment into which scientific technology has put them: a global village, filled by diverse, often mutually hostile, parareligious groups, armed with all kinds of fantastic powers that devastate outgroups and probably the ingroup too.

THE ROLE OF RELIGION IN HUMAN EVOLUTION

How can we account for the long-known dual functions of religion: first, to produce high probabilities of phenotypic altruism of individuals to insiders, who constitute the biocultural system or supraorganism that is a human society, and, second, at the same time to produce the life-risking enmity to competing outside societies? These dual functions arise under selection by the same cybernetic conditions that gave rise to the similar dualistic functions for organic viability. In any unit of life there is no escape from this necessity to be loyal to its own function as defined internally. This requires that it defend itself against outside forces that threaten to disrupt that function. The defense will be selected to be aggressive if aggression turns out to be more economic or viable than erecting and residing within defensive barricades, such as a shell. Such defensive behavior of the parts on behalf of their whole is true for creatures from the simplest forms of life to human biocultural organisms. This helps us to understand the paradoxical dual functions of religious culture that bind insiders together and defend insiders against outsiders, even aggressively. It is clearly illustrated recently by the events in Iran, Ireland, Lebanon, and Pakistan, between the Soviets and the West, and so on. Gerd Theissen has shown it for biblical religion (1985, 159), and John Ferguson (1978) has provided a useful summary of the history of world religions in war and peace.

Can a new scientific understanding of this phenomenon be a guide to contemporary actions for generating widespread acceptance of more inclusive networks of what is sacred for insiders (whether units of an individual organism, family, or larger social group), thus to bring outsiders in? Could the world agree to a basic, sacredly held ideology that might be sufficiently shared to bring all peoples to an insider community? Could the world's different culturetypic "immunologies" be transcended to convert the presently mutually rejecting, fighting faiths to integration at a higher level in time to avoid nuclear holocaust and other species-debilitating hazards in an age of scientific technology? First, let us examine religion.

Religion as the "missing link." In response to the search for intermediate steps to account for the huge evolutionary jump between ape-men and humans, I have proposed the evolution of the religious or value core of the cultural symbiont (Burhoe 1979). I have provided plausible evidence that, from its animal-ritual origins until today, religion has been the agency in the complex dynamic system of culturally transmitted information that so integrates the conjoined value and motivation inputs coming from the secular agencies of culture, from the genes, and from the environment as to integrate the core values (sacred vectors) that are basically necessary for the phenomenon of humanity. Humanity requires the highly coadapted, genetic-cultural heritages to raise it above the animal systems of life. Animal heritages are largely confined to DNA. I have suggested that religion's bridging and integrating of the genetic and cultural adaptational systems, thus making human sociocultural systems viable, warrants its place in the necessary explanatory linkage of how humans were created upon ape-man bases. Understanding this complex dynamics and religion's key role in human evolution requires the integrated involvement of information from many different sciences, including the physical, biological, and psychosocial sciences, as well as from history and other studies of humanity.

This sort of interdisciplinary illumination of phenomena has been growing fast in this century. A so-called reductionistic line runs from physics to explain chemistry, then molecular biology, genetics, sociobiology, neurophysiology, up to some much broader visions of humanity's place in the scheme of cosmic evolution (Bronowski 1970). For those who object to "reductionism," it should be noted that scientists also find feedbacks of cause and effect in the reverse direction. For instance, there are the long-known biological causes of the proportion between atmospheric chemicals, such as oxygen and nitrogen. Also, recent human industrial causes of the increase of atmospheric carbon dioxide provide causal explanation backward from more recent human cultural emergents to the changing (for better or worse) of the outcome of earlier-established regulators of the net amount of solar radiation received on the earth's surface. This reversed direction has been dubbed "downward causation" by Campbell (1974), in pointing out that later-emerged systems determine the distributions and hence the functions of the earlier-emerged ones. An earlier-published range of downward as well as upward causation was set forth by R. W. Sperry (1965, 79) between minds and particles. In general one can "reduce" (describe cause and effect) in both directions between events on the hierarchic levels of the ladder of evolution at least as widespread as from the activities of human consciousness to those of subatomic particles. What is the place of religion in all this?

Religion defined. In the scientific custom of classifying phenomena by related forms and functions, religion may be defined as whatever it is that faithfully remembers and transmits the various sacred rituals, myths, or ideologies, and so on, which, among other things, motivate the moral behavior of individuals so that they become sufficiently voluntarily cooperating and altruistic associates as to transform ape-man kin groups into human trans-kin communities. In its role as transmitter of what is culturally most sacred, religion could not arise except as coadapted to a population's genetically defined prime values. Culture is a relatively recently emerged symbiont, mostly in the past million years, and it is radically different from a genetic symbiont. In principle its emergence is indeed more radical than that of the great leap of genetically mutant prokaryotic cells of two or three billion years ago, whose coadaptations created the eukaryotes that made possible the higher forms of life.

There are many subsidiary functions of religion that both this definition and empirical findings imply. Such functions include the biocultural-neurophysiological generation not only of human societies of nonkin *Homo* populations but also of the necessary desires, love, hope, courage, and self-esteem, so that individuals will want to behave well socially. The cultural production of desire, love, hope, and so on, has become necessary because culture's evolution is much more rapid than the gene pool's. Hence it is no longer feasible for genotypes to adapt rapidly enough, as they formerly did, to provide those necessary functions.

Today, examination of ailing remnants of prescientific "religions" may not always reveal them to be effectively filling the above functions. To understand this we need to remember our earlier point, that religions and their sacred values may lag so out of phase with a contemporary culture in which they find themselves that their powers dwindle, and under the selective processes they may become subject to either obsolescence and replacement or reform.

Further warrants for my definition of religion appear below and in the references. But a primary element of our theory needs to be kept in mind from the beginning: our alleged fact that religion arose by nature's selection of the long-range viability requirements for the phenotypical joint product of the dual information patterns—one from variant *Homo* genotypes and one from their variant, novel, extraspecific, and nongenetically programmed culturetypes. Coherence with the rules of genetic selection requires that a culturetype be mutualistically symbiotic with the gene pool of its population. This selection process would explain the close coadaptation of the two sets of information, so that they jointly would produce the emergence of

trans-kin human societies as supraorganisms, the closely knit ecosystemic population units in senses earlier defined.

This definition of religion and its functions holds true even when, in critical periods of rapid cultural change, earlier forms of religion lose their adequacy for engendering behaviors necessary for viable societies under a changed environment or ecological niche. Deaths or reforms of religion occur. Clearly we live at such a time of crisis in religion. But we should no more discount the ever-continuing religious functions on the tree of human life than we should discount the ongoing functioning of leaves when they wither come winter.

Sacred faiths, although omnipresent in human societies, have all the virtues and faults of any evolving systems. Faiths are constantly being modified, albeit necessarily more slowly than other elements of culture, because their inbuilt resistance to change is a condition of their faithful replication of the central cultural values thus far achieved. Radically new forms of religion, like mutated genes, usually are not very viable. Heresy charges help to weed out or correct changes that are feared to be lethal. Inviabilities of faiths that cause such things as lethal wars and internal weaknesses finish the job. Recently we have seen the rise of the rituals and myths of "civil religion," Democracy, Freudianism, Hedonism, Marxism, Nazism, and so on (Kluckhohn 1958). While new variants are necessary to allow trials for better adaptations, new combinations of long-tested traditional variations, as in sexual reproduction, are also more often successful in religious evolution than radically new variations, such as mutations or wholly new structures.

The above picture or definition of religion includes phenomena that in part are not included in many common understandings of what religion is on the part of those who know only certain aspects of some local adaptations of religion. This should not be any more surprising than that the larger scientific views of agriculture in terms of biochemistry, genes, and ecosystems are more than what the average farmer contemplates. It is just this capacity of scientific views that enables their help for agriculture and potentially for religion.

Religious wisdom evolved in selection by superhuman power. In our theory of genetic and cultural coevolution, religions, like everything else, are products of long periods of selection in evolutionary processes. In the philosophical and religious terminology of the past twenty-five hundred years such transcending forces have been called "supernatural." Today they may be understood as "superhuman" forces, the forces that are required for the viability of the cosmic ecological niche in which the religion is embedded (Burhoe 1972a).

It should be noted that in human history, as well as in evolution generally, nature's selections are opportunistic. Living systems are

advanced by the selection of slightly modified extensions or combinations or pre-existing patterns, whenever (by chance or otherwise) they happen to fit a newly viable niche. Both chance and selection are involved in the intentions and responses of humans. The mind is an important agency in the selection process. (Incidentally, this opportunistic building upon previously established forms by selection of some of the chance variations that fit them to a newly viable niche applies also to most of the novel, rationally constructed advances in government, economics, technology, or scientific theory—to cultural structures in general. Also the brain's or mind's searches of memory or environment for needed information are shown to be partly random just because the search is necessary.) Genetic, mental, and cultural development (in spite of some occasionally modest saltations) in general are limited to quite minor steps of change, if the resulting system is to be viable.

It recently has been clarified why no genetic, cultural, individual, or population system could achieve the present complexities of its viable form merely by random variation and selection, if at each stage it had to start from scratch to erect its present stage of complex pattern (Simon 1962). Complex systems are inevitably hierarchical and built upon pre-existing bases. Hence, insofar as earlier religious patterns have accumulated the know-how for eliciting behaviors vital for the dynamic homeostasis of the inherently tension-ridden mixes of genetically unique individual organisms with their sociocultural symbionts, then one would expect to find a more viable group appear when those who seek to reform such a symbiotic supraorganism build upon the wisdom of the earlier, still valid levels of the underlying heritages.

Thus the long-evolved religions, like viable phenotypic expressions of genes, contain hierarchies of earlier-selected patterns, where later stages generally cannot appear until the prior stages have been developed. In this, religion is like language. This helps explain traditional orders of religious input to elicit responses as to what is sacred, suitable for stages of life, suitable also for orders of worship. As J. Piaget, L. Kohlberg (1971, 296-98), and others have pointed out, those who have not experienced the proper earlier inputs at critical stages of development often are not able to advance adequately to higher stages.

The brain's role in religion. Since in human development we cannot expect later patterns to be possible without going through certain foundation patterns, we can appreciate why religions customarily start in our earliest years to establish certain foundations. Since, at any age, we cannot wholly separate mind from brain, it will be helpful to note some hierarchical features of our brains in evolution and in development.

Light on this, quite helpful in understanding the evolutionary stages linking genes and religious culture, is given by Paul D. MacLean (1973) in his outline of three major stages in the human brain's long-term evolution and in its development and operation in a single lifetime. While neither he nor anyone else can expect to be certain in separating homologous (genetically from the same source) from homoplasous (functionally analogous but not from a common genetic heritage) traits (Northcutt 1984), MacLean describes three concrete, empirical examples of hierarchical levels of brain structure and operations that in some degree lie behind stages involved in human development and behavior, including religious experience.

As a significant early stage, MacLean began with an anatomical structure in our brain which is also possessed by and functions similarly in reptiles and which seems to have been continuous in our ancestors since they were at the reptilian level. This reptilian level of our brain seems to be fairly rigidly specified genetically. One can say that it is on a short leash from the genotype and not so readily able to be transformed by new learning. Here the basic life-protecting, life-sustaining, and life-procreating responses are produced at the nearly automatic level of primitive, animal-ritual behavior. In my theory it is at this reptilian level of the human brain that religious ritual originates in human development and provides the grounds for the culturetype's continued selection to be closely coadapted to the gene pool, and hence for religion's basic provision of meaning and values (ultimate concerns) to humans, who could not exist without being highly coadapted to a flourishing gene pool.

MacLean and others have pointed to the structures in the phylogenetically later, paleomammalian or limbic system of our brain as involved in providing emotion-producing tensions and action goals or conscious intentions, as motivations of much longer duration and more modifiable than the reptilian nearer-knee-jerk responses. In humans this duration permits the intervention of forebrain explorations of new or old complex-memory patterns in the neocortex in determining a response. These also are essential and characteristic ingredients in deep religious or ideological feelings, convictions, motivations, and adaptive responses. Without connection through this limbic ("gut") level of motivation, the more delicate, complex, and time-consuming response strategies provided by the outer cortex could not be sustained long enough for completion (Burhoe 1968a, 81-97; 1976a, 268-72).

MacLean's third and most recent brain level, reaching its greatest development in humans, comprises the neocortex and the structures of the brainstem with which it is primarily connected. Others have revealed

the special functions of its split hemispheres, its forebrain, the integrations of sensory and other modalities, and the reception, utilization, modification, and reproduction of culturetypes, without which there would be no humans. Some have made sketches of the brain's role in the reception, modification, and replication of the more important or sacred values such as those lodged in religious culture (Sperry 1974; 1983). My own view, without as yet a fully clear support from brain architectonics, is that this outer cortex must be the locus making possible the associations, projections, and decisions which find responses that are viable with respect to both of the symbiotic masters of human nature—the never fully coadapted or fully harmonious genetic and cultural demands. Some coadaptations—viable degrees of acceptance, correction, and compromise of the most fundamental or sacred values or goals from both genetic and cultural sources—have to be worked out and acted upon by the brain, including the associated self-conscious behavior through symbols of intention and linguistic logics, always seeking optimal adaptation to the perceived realities.

The hierarchical orders of the human brain (with dual-direction cybernetic feedbacks between the earlier and most recent levels) enable it to link experience generated by religious culture with the basic requirements for life by the dynamics of the search for optimal interactions among its several levels. Hypotheses and evidence of the brain's action in religion have been given among others by Solomon H. Katz (1973) who noted, with particular application to Eskimo culture, that in biocultural evolution the brain operates to integrate adaptations to the combinations of its genetic, cultural, and other environmental information pools, leading to humanity's unusually progressive adaptations to new niches. Eugene d'Aquili (1975; 1978; 1982; 1983) and John Bowker (1978) early advanced theories relating brain function to religious experience. We should keep in mind that the brain's operations with systems of symbols of self, society, and outer reality seem to integrate response to them all so as to advance the inclusive fitness of the symbiosis of our coadapted gene pool, culturetypes, and ecological niches.

The source of religion's sacrality and prime motivating power. In the light of all given above, including the genetic-cultural duality of human nature and religion's evolution to integrate in the brain the most necessary goals or values of the culturetype with those of the genes, we can begin to understand some of religion's most important and most sacred values. The gene pool contains the basic information or heritage that shapes our most important goals or values—adaptation to reality for the endurance of life and for life's continuation beyond death. It

gives us our most powerful motivation to accomplish these goals. My theory holds that, in the beginning of culture, what in recent millennia we call religion arose as that segment of culture most closely coadapted with these genetic goals and motivations toward the well-being and duration of present and future life. This helps explain the close linkage between parenthood and religion, both of which are accompanied by the most powerful internal desires or motivations (including love and ecstasy). It helps explain why religious information and behavior has been regarded as sacred (of highest importance) in any human sociocultural system. This is the key to understanding why and how, in a cultural system, religion is the agency whose cultural heritage can induce nonkin creatures into the altruism that makes possible the support and defense of a human society just as a certain genetic heritage can induce creatures into the altruistic behavior that makes possible the support and defense of a family. We should note the importance of future life in the selective process.

Optimal inclusive fitness is the prime genetically produced value for all organisms, since life, not only during but even more particularly beyond the life of the organism, is the function for which genes have been selected to provide. The totality of the forces that operate in the selective processes, as discussed in an earlier section, by their nature select for this inclusive fitness, that is, for those genes of an individual (and of close relatives in proportion to their relatedness) that produce the longest-lasting line of descendents. This is a logical tautology in selection theory, since by definition the heirs of less viable genetic lines dwindle or die out first. What validates this statement empirically as well as logically and thus makes it scientific are the countless correlations between genetic theory and observed results. The validated theory shows that genes are very properly called "selfish" for their own candidacy for life beyond the necessary death of the organism to which they presently give life and that this is good and necessary for life. Hence we find the well-known tendencies of all living creatures to support and defend one's children and close kin first.

The reason that genetic selection in general cannot and does not produce societies except among close kin is that survival requires the inclusive-fitness-selection process. But, as I earlier noted, selection of information that coadapts creatures of two different but symbiotic species can produce high mutual cooperation between the symbionts, since that can enhance the fitness of each symbiont without violating the inclusive-fitness process in either species.

In the evolution of the emerging symbiotic "species" of cultural information, religious elements of that information had to be the most sovereign or sacred, if, as defined above, a prime function of religion is

to make possible and to engender the necessary altruism and cooperation for the symbiosis between a population of ape-men and their sociocultural system to be viable. Altruism to nonkin could only happen if the symbiotic sociocultural system enhanced the genetic inclusive fitness of its individuals more than if the individuals operated outside the sociocultural system. Such a guarantee or covenant was a primary task for which religions were selected. What happened, says our theory, is that the selective pressure upon the incipient symbiosis of religious culturetypes and *Homo* gene populations increasingly enhanced the symbiosis to the extent that the equivalent of a "sacred contract or covenant" (whether implicit or explicit) for mutually beneficial exchanges between a religious culture and its anthropoid gene pool, did result in greater genetic inclusive fitness for the genes as well as in greater sociocultural fitness for the religion. Both symbionts, ape-man genes and cultures, profited. The selection pressure arose out of the much greater viability of individuals if they could both cooperate as parts of a society and yet have greater inclusive genetic fitness. Hence religions were able to and did motivate some degree of family love (altruism) to the insiders in the religious community, which extended far beyond the genetic kinship of family. This made possible larger tribes and finally civilization. The consequent transcendent fitness of this new kind of symbiotic creature as compared with competing mammalian populations is very well known.

Now in the section above on the role of the brain in religion, we have seen how religious ritual, which in human development is the first sign and basic ground of religion, has roots in the level of the brain that is very ancient and is closely prescribed by genetic information. Hence our theory says that the animal-level ritual, generated in the reptilian heritage of our brain structures, is a basic means for the binding or coadaptation of any religious or sacred culture to the requirements of the gene pool. Religion's transmission of cultural information has been selected to fulfill the sacred genetic requirement for inclusive fitness, or the higher probability of a longer-lasting line both of genetic and cultural descendents, of a future life or life beyond death for both the individual's genes and religious culturetype, and hence for the society.

Individuals are strongly attracted to religion by the fact that behavior according to religious rules will indeed enhance their inclusive fitness, genetical and cultural. Since, as we noted above, religion has been coadapted to work most closely with our symbiotic genotypes to provide the most sacred genetic requirement (optimal inclusive fitness), it is not surprising that individual as well as corporate religious worship experience of oneness with the cosmic-all may also be infused with the genotypically based ecstatic overtones of eros or libido, as well as with

eros's cultural extension in agape. The greater viability of close coadaptation of our two natures seems to have selected our brains to fuse or integrate the dual elements of our being into one. This makes the experiences of love in sex and religion fundamental and allied sources of family and societal altruism.

THE RELATION OF RELIGION AND CIVIL GOVERNMENT

Our theory shows that religious values are more adequately coadapted than other aspects of culture to provide positive motivations (desires) to serve the ultimate values (viability) of a trans-kin society's gene-pool base. The selection process for this was briefly noted above as coming from religious culture's necessity to transcend but to be highly coadapted with the elemental, genetically programmed value or goal required if the organism is to serve its basic procreation or future-life program, that is, inclusive fitness via care and defense of the family. Religion's selection made possible a larger than genetic "family" (a society) while still maintaining the base on which it was built, the genetic program of the family. This has enabled religion to provide the internally motivated (noncoerced) altruistic desires to cooperate within a religious society. This motivation simultaneously vitalizes civilian societies, families, and individuals. Through what we have defined as religion (which concurs with this scientifically grounded analysis of essential functions in human nature) individuals who inherit a vital religion generally wish to serve their society and hence to serve individuals in the society beyond their own families and beyond their own lifetimes. But, for various reasons noncoercive religious persuasion seldom has been adequate to influence all persons within and around a society to be sufficiently motivated to do what the religious rules require for a successful society. I shall discuss only two major functions of government that relate to religion.

Primary function of governments. From primitive tribes to today, a primary function of governments therefore arose from the need for some coercive mechanisms to keep societal order where religion could not or did not shape minds-brains that sufficiently unfailingly wanted to love and serve the social community. Also since, as previously shown, sacred values provide devotion to the ingroup and generate animosity toward threatening religious outgroups, religions were thereby selected to motivate people (and hence governments) to defend the viability or order of the ingroup against threats from outgroups. The ingroup's religious base motivates altruistic readiness of citizens to take serious personal risks for this task.

Partial exceptions to this rule of defense or offense, to keep out-groups out, emerged whenever two or more religions impacted upon the same population. Each religion evolved an implicit acknowledgment of a sufficiently common core of values with the other so that individuals in both felt it paid to live peaceably together, at least for the time being, rather than to fight. For instance, as empires emerged in Egypt, the Near East, and the Mediterranean, there arose a mixture of religious groups, which formerly had been separated and hence potentially were conflicting, that reached some degree of overlapping sharing of gods or sacred beliefs.

In those times there also emerged phenomena such as those of certain Judaic, early Christian, and other cults, most of which found their supreme values better accommodated by tolerating one another and the economic, military, and political requirements of obeisance to the sacred requirements of the empire. Christianity, in particular during its first two or three centuries, provides a clear example of how a nonaggressive religious community could emerge, flourish, and expand peacefully (noncoercively, albeit with some suffering inflicted upon it), later to become the religious foundation for a large community such as the Roman Empire.

Our theory of religion would suggest that that empire was decaying in large measure from a diminishing of its earlier union of state with an adequate religious foundation. This loss of religion lessened the motivation of its population to common sacred goals necessary for volunteered service to and defense of the state. After motivating the Holy Roman Empire, by the thirteenth century Christianity had become so fully adapted to Hellenistic philosophy that it provided a faith essential for the founding of Western Civilization in the context of the Renaissance.

In following centuries, Christendom's ability to maintain noncoercive internal authority was weakened by its internal splits and by the newly rising sciences that made the church's Hellenistic rational base inadequately credible. Belief's power to motivate common sacred goals and peace increasingly failed.

A second function of government. The failures of religions to bring about sufficient ingroup altruism and order by persuasion illustrates a second function of government. If a small fraction of a society is not religiously persuaded to a reasonably altruistic cooperation, the coercive powers of government become necessary to protect social order from disruptive insiders. We witness those powers as police and legal penalties. However, from primitive tribes on up, governments alone cannot control more than a rather small minority of determined selfish

profiteers or otherwise disturbers of the social order. Lasting rule by, or justice for, the whole population of a state requires the provision of a relatively widespread and powerful religious faith, reaching adequately among the state's most able and powerful individuals. In general, the purposes, acts, and viabilities of states seem largely underlain by the shared and deeply felt sacred values in their populations. According to my scientifically based definitions and a large survey of human nature and history, it is religion that accumulates and propagates noncoercively those sacred values, thus preparing populations of genetically programmed creatures for societal living and the sacred grounds that enable the existence of states.

To be sure, the line between government and religion is often difficult to determine exactly, since the social nature of humans demands a close fit between government and religion. Sometimes states, through public education and ritual, often backed in greater or lesser degree by the state's coercive restraints, seek to provide their own version of religion, or more properly a quasireligion, as in the worship of the tribal chief, the ruling emperor, Marxism, or Americanism. However, the state's coercive power alone can neither motivate good soldiers to volunteer to risk their lives to defend against outsiders nor motivate sufficient altruism necessary to maintain order inside the community. For these tasks religions came first and remain primary.

THREATS TO PEACE AND RELIGION'S LAG IN CULTURAL EVOLUTION

Our theory of religion says it is the prime source of peace. But a look at the state of the world today seems to suggest that, if anything, religion moves us toward war. Our theory must correspond with that hard fact of history.

First we need to note the unprecedented degree of religious impotence and seeming irrelevance in the late twentieth century. From this follows the weakening of religion's effectiveness in motivating the highest forms of voluntary, self-sacrificial loyalties leading to the collective behavior that undergirds a viable society.

The advanced forms of the relatively rationalized beliefs of the religions of the West may be said to be pretty emaciated and impotent. Our theory has attributed this to their failure to translate their interpretations at rational theological levels from the concepts of earlier and no-longer-compelling metaphysics to the concepts of modern science. At the end of the earlier section on "The Brain's Role in Religion," we noted only sketchily that the brain seeks to integrate information from all its levels and parts so as to generate response patterns that yield optimal life.

The role of the highest reasoning level of the brain in religion. If new rational conclusions, such as those offered by the sciences, lead to doubts about earlier views of reality, the earlier culturally transmitted views to the brain tend to be discounted and abandoned. For humans to operate religiously at rational levels in the context of secular reasoning, the sacred and the secular beliefs need to be coherent and thus relevant as grounds for action. When they do not match, the doubts and the resulting incoherence lead to failure of the new secular state of mind to resonate with the religious wisdom built into the lower levels of the symbiotic brain by the coherence between its genotype and earlier stages of its culturetypes.

Religion, continuing to be explained in the vocabulary and thought forms of Hellenistic and medieval Christianity, seems to be increasingly incredible in an ever more secular world, and it has left the growing and scientifically enlightened secular world with inadequate meaning, hope, morals, and morale as foundation stones for personal, national, or international living.

The inadequacy of many recent efforts at religious reform. The spreading weakness of religions in the face of science everywhere is perilous in that it provides a vacuum into which would-be salvatory, quasi-religious, ideologies rush to fill. Included are ideological myths inadequately realistic for enduring sociopolitical strength (such as Nazism or Marxism). On the other side are hedonistic myths intended to relieve individuals of tensions that grow up between them and their societies when religion is inadequate (as in many Western societies). But when beliefs about society or self fail sufficiently to strengthen both society and self, this leads to decreased viability for both the society and its individuals. Hence individuals fail to get satisfactory moral motivation, reward, and hope. This leads to drugs or other psychological escapes from tensions of internal or external disorders, even though the "cure" results in worse disorder (Burhoe 1975, 300-1, 321-24; 1982, 120-23).

Leaders and followers of the modern hedonistic cults that disregard requirements for societal viability have failed as yet to recognize what Campbell proclaimed in his presidential address to the American Psychological Association: the wisdom in prescientific religious traditions, whose "validity in recipes for living . . . has been evolved, tested, and winnowed through hundreds of generations of human social history. On purely scientific grounds, these recipes for living might be regarded as better tested than the best of psychology's and psychiatry's speculations on how lives should be lived. This argument comes from a natural-selectionist theory of social evolution" (Campbell 1975, 1103).

Many efforts at reform (as in Marxism) fail to evoke positively reinforced (noncoercive) responses, closely coadapted to the genotypes

and thus free or voluntary. Others (as in some psychotherapeutic and hedonistic doctrines) fail to engender behavior that fulfills the necessary requirements for a viable society. Human problems cannot be resolved so long as the therapy is directed to the values of only the genotype or only the culturetype. In the past, religions have been effective by furthering the viability of both genotype and culturetype as a joint heritage.

The disintegration of personal meaning and of loyalties to the social order, which presently is so observable in today's world and so conspicuous in literature and the arts, should be a warning that something is disastrously wrong with today's societies. Since coercive deterrence neither produces stable peace nor holds societies together, I shall return to how religion could perform its miracle of ingroup loyalty for a worldwide society. But first we should briefly note how religion, presently in a state of poor health, might be restored. Its weakness stems from many other sources than our fears of its dangerous intensification of aggression and war.

Can religious functions be revitalized among believers in science? In earlier ages cultures evolved more slowly and had sufficient time-span for primitive, prerational, and prescientific levels of religion to become more or less well coadapted internally within its larger culturetype and externally with its gene pool. Then, the culture's evolving mythological view of reality was a resource within which religion fit. This contrasts with religious interpretation's bad fit to the reality portrayed by today's sciences. In the ancient stages of religion there was meaning and sacrality in their cosmic schemes, which have been lost in ours. Mircea Eliade (1961, 165) noted: "we might say that for the nonreligious men of the modern age, the cosmos has become opaque, inert, mute; it transmits no message. . . . As for Christianity of the industrial societies and especially the Christianity of intellectuals, it has long since lost the cosmic values that it still possessed in the Middle Ages. . . . The religious sense of [contemporary] urban populations is gravely impoverished."

My thesis indicates that the great wisdom and effectiveness of religion through the ages to generate social loyalty, morals, morale, meaning, and hope that unites individuals and societies can be revitalized by a reform that is now possible for the first time since religious belief has become so estranged from the beliefs of modern science. Religious interpreters and leaders are beginning to have a new capacity to make the core elements of religion more credible, not by denying the relevance of science but by showing how science helps to understand and make credible the vital functions of religion. In addition to the pioneering work of the Institute on Religion in an Age of Science and affiliated institutions, and their journal *Zygon*, there are increasing signs of very

great advances recently being made through other agencies. For instance, a significant advance in showing the potentiality of scientific interpretation for biblical faith has been made by the University of Heidelberg's New Testament professor Gerd Theissen (1985).

Just as scientific interpretations of better possibilities for local agricultural, medical, and other secular technological practices rather quickly are accepted in various communities around the world, so should be scientific analyses of local religious and moral practices. This depends on how readily it can become apparent to local religious leaders that their traditions have been highly significant local adaptations to the most vital and sacred problems of life, and that, as in agriculture, medicine, and so on, there are important new interpretations for appreciating ancient religious wisdom as well as for some improvements and enhancements of their understandings and practices. This is particularly true for interpreting religious faith to the increasing numbers who believe in the scientific pictures of reality. If so, then leaders in religion, as in agriculture for example, should tend to want to enhance their traditional profession by the use of this new information. But, as we have noted, enhancement of religious efficacy in ingroups is not enough for peace with outgroups.

How can religious animosity and war against outsiders be overcome? From our theory the obvious answer is to bring the world population into a single inside group, into a universal spiritual kinship. If, as our theory predicts, the powerful new scientific interpretations can show local religious leaders the virtues of their own religion as a highly significant local adaptation whose functions can be extended and revitalized in the new light, could we not expect these leaders also to respond and apply science as is done in agriculture, medicine, and other technologies? Would not the fact that in religion, too, there may be a hitherto hidden universal system of underlying facts and values (a pan-human religious "biochemistry") draw each local religion to interpret itself in terms of the broader and deeper understanding of worldwide sacred facts and values for human life? I believe that under active promotion and human effort to discover what is required of us, such a scientifically suggested common core of all religious faith could lead to a world community on the inside of a sufficiently common faith, with reformation perhaps during the time remaining to prevent a nuclear holocaust.

If my thesis is correct, that religion is the universal source for internal harmony and cooperation within a society, then one should recognize that all the world's religious cultures, at the underlying level of their basic values, can be interpreted properly today only as a single, universal set of values, common for humanity, even though quite differently

expressed in various times and places. This is exactly what is required for the coming one-world village to exist in peace. Peaceful or not, the world village is coming so long as we do not make the mistake of massacring ourselves first and so long as some major nation continues to utilize the new technological powers and the reduction of world communication and travel times to what used to be characteristic of ancient village cultures.

However, in their presently incongruous and antagonistic forms, the ideologies and faiths in this same technological world today have become a dangerous threat to peace or even to continued life. They include not only the Buddhist, Christian, Hindu, Jewish, Muslim, and other ancient traditions but also the various less well-tested secular and national efforts at ideological reforms, with all their inbuilt biases for a restricted ingroup.

A basically common faith would be intensely supported by a growing realization that all faith groups on earth might "go to hell" if they are not reformed and interpreted as one of the significant divisions of a new, single, world-sized community, which is forever being selected by a supreme system of more-than-human power that the sciences as well as religious faiths commonly recognize is in charge of our destiny. The present handwriting on the wall is that the essential commandment of that supreme power clearly is that all peoples are being required to exist in a single community, and every faith is urgently called upon to interlock sufficiently at a basic level with every other faith so as to make a single worldwide ingroup of mutual concern.

Confidence in this scenario that a worldwide faith is coming is enhanced by the above-sketched theory of the evolution of religions. The theory shows why religions in this matter can do what, by our definition and scientific analysis, we say no state can do: religion can noncoercively motivate ingroup mutual concern and religion can spread noncoercively and indefinitely to embrace more people into its ingroup. Throughout historical times the theory predicts that, when different cultures and religions become involved in a common community, they are selected gradually toward an implicit or explicit new enlightenment, teaching, and reformation that adapts the faith to the more inclusive community. Otherwise the faith or the community or both tend to wither. Hence, when circumstances produced (by intention or by chance) the situation of two or more religious cultures occupying the same territory or community and therein opening a new potentially viable niche, then selection would favor one or all insofar as they transmitted values for mutual cooperation as a sufficiently common ingroup.

The merger of sacred cultures does not require the death of the persons, but it does require a conversion or reformation of elements of

the sacred faiths within the individuals where the merger takes place. The situation sometimes may require extinction of the aspects of a faith that are no longer adequate for the situation. Sometimes the faiths may merge with more or less even give and take. In any case, such reformations can effectively unite the sacred values of the several cultures so that they would be coadapted to provide ingroup altruism for the newly emerging and larger biocultural system. A classically insightful case of the psychosocial dynamics of this was set forth by anthropologist Wallace (1966; 1970) who studied the religious reformations and revitalizations of the Iroquois Indians in the late eighteenth century as they adapted to the alien circumstances of European settlers in their territories.

In general, our theory helps to account for and to predict the convergences of ultimate deities or value systems as populations merge, just because this seems to be what the supreme system of power selects. That is, on grounds of psychosocial dynamics as well as history, seriously conflicting diversity in the most sacred values cannot sustain a community; at that level convergence becomes essential. Moreover, no community can be very strong or successful internally, apart from a shared and effective sacred-value foundation.

PROPHECY OF THE WORLD'S MOST WIDESPREAD RELIGIOUS REFORMATION

This, then, has led us to the prophecy that we are on the verge of the world's most widespread and rapid religious reformation, aided by the sciences in understanding and appreciating the most basic and important functions of religion, just as the earlier Hellenistic philosophies were important for a broader cognitive ground for the reformation of early Christianity into a more universal religion. Reforming missionaries today, who understand the implications of modern science for the nature of reality and religion, can become as religiously passionate and as culturally sophisticated as such missionaries and interpreters as Paul of Tarsus and Augustine of Hippo were in universalizing Christianity in the context of the then existing Hellenistic philosophies. The scientific mind in its own field commonly becomes passionate about problems of life and death as about validity or truth. When religion becomes scientifically interpreted and revolutionized, a scientific mind can participate and yet remain as rational and as passionate as it does in scientific revolutions.

Such a religious reformation in the light of the sciences today would inaugurate, at least at a common underlying level, a sufficient union or integration of a one-world religious *ingroup* that extends to provide religious motivation adequate for an altruistic and peacefully advanc-

ing worldwide civilization. A peaceful and generally acceptable interpretation of ultimate concerns in a common ideology, in which each traditional ideology is a more or less viable subspecies, would be tantamount to the inclusion, at the level of the higher concerns, of all faiths in one. Scientifically interpreted faiths around the world would tend to reform and merge or yield to the better adaptations as have scientifically interpreted medicines. This would make possible a worldwide loyalty to a common ultimate god, which is necessary for producing nonkin ingroup loyalties leading to mutual cooperation and a peaceful social order within that world community (Burhoe 1971a Epilogue; 1975; 1981, 151-233; Katz 1973; 1984).

Whether a viable pattern for living is achieved soon and with a minimum of suffering depends on how soon the basic virtues and wisdom of traditional religions can be made clear and credible in the now nearly universally accepted scientific conceptual scheme for revealing what seems a most reasonable and valid picture of reality at the present time. But, science by itself cannot save us. This brief presentation of our theory has claimed that underlying religious wisdom by its evolved nature is the prime agency for human salvation but that it needs new interpretation to be credible in the main scientifically informed communities.

I suspect that only minor reformations will be needed of the earlier or primary levels of religion. Our theory credits those levels as having core values accrued by a long, selective process, involving coadapted genes and earlier levels of sacred culture whose basic structures reappear in each new child as essential for subsequent enculturation. These core religious values we are only beginning to understand scientifically. Because science is so limited in its understanding of much more primitive structures, such as genotypes, we may have to depend on the basic mental and societal values at the heart of long-evolved religions. This is parallel to our dependence upon very ancient genetic and cultural heritages in order to acquire and utilize the food that keeps us alive, since the availability of that food depends upon the preliving and living structures of our ecological niche that give us our air, water, and daily bread. In our excitement over the increasing range of what we can know and do by ourselves, we have tended to overinflate ourselves and forget the infinite complexity and power of the larger context of reality upon whose grace we ultimately depend and whose requirements we ultimately serve.

THE JOINT ROLES OF RELIGION AND SCIENCE IN WORLD PEACE

Human responsibility. In spite of our ultimate dependence on an only partially illuminated reality system, nevertheless, it should be noted

that in the past six thousand years since written language emerged in cultural evolution, human societies have been increasingly able to participate consciously and cognitively in accelerating their own evolution. We have been using "cultural engineering" much more heavily than we have been using "genetic engineering," ever since we started dimly, and then more fully, consciously to select improved varieties of religion, agricultural seeds, and other adaptations required for life in given circumstances. It is part of our destiny to be cocreators, who in turn are ourselves selected as we find new viable niches. We need fear only our failure to keep searching for that which reality (one could translate this as nature or God) will require for continuing life.

A seeming problem is posed by this vision, a vision of a sacred-value core from whose objective reality and necessity we are in the end not free to do whatever we first chance to want. It made us and not we ourselves. It continues to set the viability requirements for our life.

Freedom and responsibility. Under an ultimately inescapable power, in what sense are we free to be responsible? An answer to this problem also is suggested by science as well as by religion. Intensive competition for better hypotheses is wide open in the scientific enterprise, not only between different schools of science but even within the mind of one scientist. Here we find perhaps the world's greatest freedom for dissent, revision, and diversity in hypotheses—hence maximum opportunities for selection of more valid or viable patterns. Moreover, this rapid selection and evolution, without beheading any scientific contender, is the byproduct of the very rigidity of the basic faith that scientists hold sacred: the faith that the ultimate reality or nature herself, a transhuman authority, is the selector or ultimate judge, before which every hypothesis must be laid upon the altar and fire-tested by effective operational definitions and observations, experimental or otherwise. Only then will be granted the ultimate stamp of approval or selection as truly scientific. Sooner or later this faith is carried out despite the nonscientific pressures of governments (e.g., Lysenkoism), of financing agencies, or of other sociopolitical opinions; otherwise it becomes nonscience. In short, *within* their scientific enterprise leading scientists commonly worship one supreme, transhuman reality system that is the ultimate judge. This also makes possible the relatively unhostile world community of scientists.

Can science combine with theology to interpret basic values? I submit that it can, and especially the values of and ways to a peaceful and viable world society. This seems to fly in the face of philosophic warnings such as G. E. Moore's so-called naturalistic fallacy, with roots in David

Hume's claims about moral distinctions not being derived from reason, that values are not natural and cannot be deduced from scientific facts. In my view the alleged isolation of values from facts has been torn to shreds by recent findings on basic values of animals and humans. Realities of the human world—including mind, thought, culture, values, and religion—have become illumined recently in many more new directions by the sciences than by the traditional humanities (e.g., d'Aquili 1978; Burhoe 1954; 1960; 1967; 1968a; 1968b; 1970; 1971a; 1971b; 1972b; 1972c; 1972d; 1974; 1976b; 1977; Emerson 1954; Hoagland & Burhoe 1962; Katz 1973; 1984; Kluckhohn 1958; MacLean 1973; Northrop [1947] 1977; Pugh 1976; Sperry 1965; 1974; 1983; Theissen 1985; Wilson 1978). In general, if human continuation or significance is once granted as a basic value, "oughts" may be derived from some set of "ises." It seems possible to illumine "oughts" by the light of the sciences more than by many earlier lights. This does not mean that either the sciences or their technologies can alter the foundational values; they can only discover their reality and perhaps improve our way to them. I have suggested the close relation between Natural Selection and God (1972a). Either term implies that values are determined in the end by an *objective* reality.

The cold war between science and religion is coming to an end, now that values are seen not in the narrow stereotypes of earlier days but as important consequences of human history, selected by the realities of the world, its biota, and its cultures. Not only can a scientific interpretation of universal basic values for a one-world village be discovered underlying both science and existing religions, as under the aegis of a common higher power, the reality system out of which all life proceeds. But, unlike totalitarian cults, instead of quashing individual freedom to be unique and different, both nongovernmental religions and science increase freedom to find better interpretations of the phenomena we experience and their requirements for life.

A powerful selection pressure for religion-science cooperation is our world crisis. Prior to a sufficiently peaceful, worldwide ingroup, the basic goals of one nation may threaten what is held to be sacred by another, such as the conflicting goals of the Soviet Union and the United States. Here we find that, as the sacred borders or claims becomes more threatened, the greater becomes the coercive armament for defense-offense, that is, for the protection of what is felt to be sacredly important. When the traditional goals to protect by coercion (armaments) become more and more enhanced and expensive under modern scientific technology, the costs tend to become prohibitive and the means futile.

For instance, in the 1985 spring and summer issues of *Daedalus* on "Weapons in Space," dealing with the principal issues raised by the

strategic defense initiative, the near impotence of governments to assure peace by either offensive-retaliative or by defensive systems is rehearsed by various leading scholarly, scientific, and practical investigators of the situation. Jeffrey Boutwell and F. A. Long (1985, 317) noted that the SDI might well cost "\$1000 billion for final deployment of the full system." Full deployment could hardly be expected in the twentieth century, if ever. In any case, its foolproof protection seems doubtful. Also, our present efforts to deter war based on the threat of nuclear retaliation seems equally improbable for future stability and peace. To the extent that maintaining a sacred system by coercion becomes futile then viability demands the finding of more objective and internally persuasive ways to maintain the sacred goals.

I recall the understandings about the new order of danger created by atomic war that were spread by the early Pugwash scientists. My partially inside observations of the Pugwash movement led me to conclude that the spread of this knowledge among leading scientists on both sides of the Iron Curtain (who readily understood its validity) and the subsequent spread of this new truth by the scientists to their respective military and political leaders—and thus eventually to wider public opinion—was significant in restraining both the Western and Soviet military and political opinion leaders to the point that has so far saved us from nuclear war.

The crucial power and influence of the few hundred Pugwash people in the world population was not in their superior numbers but in their superior understanding of a fundamental body of truth. To escape the eventual futility of a major reliance upon coercive repression to maintain either local or international social order in the emerging world community, we now need to clarify and effectively communicate both ancient and new knowledge about what are the objective truths and values for optimal human life set by the reality of our own nature and circumstances.

I think we are now beginning to have an even more powerful and useful truth concerning ultimate values of our life that can help us escape from threats of holocaust—a truth about the objectivity and internal personal appeal of a reformed and commonly shared worldwide value system underlying our presently much too parochial religious views. Important for this is the understanding that the values are indeed objective and, if not internalized in the brain so that we respond properly to them, are ultimately enforced not by human will and might but by the judgment of the transcendent reality governing all life—the selective forces in our evolving history. This new truth comes from scientific studies that show how ancient genetic and religious truth may be fully integrated into the most advanced scientific understanding about human values.

SUMMARY

I have suggested that each human brain has always been constrained by its heritage to do all it can to protect the system of which it is the coordinating agent, to defend its local body and the total life support system on which it is dependent and in which it also is agent, including states and ecosystems. In human evolution an early stage was the protection of the family, the kin gene-pool, and its welfare in a territory. Aggression and defense were essential then and at every stage since for the evolution of competing genes. At that level the genes were selected to provide such sacred values.

But, because of the kin-limited nature of genetic selection, it prohibited stable societies of *Homo* larger than close-kin groups. A unique phenomenon in the emerging symbiosis of *Homo* creatures and human sociocultural organisms was the capacity for cultural as well as genetic heritage. This began when the selective processes arrived at the point where the most important values of the gene pool and of the radically different but living nongenetic species of a culture could provide even better genetic survival to all who cooperated with those sacred cultural and (by symbiotic coadaptation) genetic values. Family defense became enhanced by the defense of the sacred societal ingroup, today much larger and more powerful than an extended family. Under the religion, that linked the genetic and cultural values, aggression became primarily focused upon alien outgroups, even if this risked some minor fatalities in the ingroup's genetic lines.

At a later stage in cultural evolution's selective processes there could be mutual survival advantage for two or more alien religious cultures to occupy the same territory and cooperate to enhance their viability. The most sacred values of each culture would be selected to be coadapted with the others, if they were to survive in a common community. This happened sometimes by the death of one of the sacred cultures. But this was not necessarily the death of the persons. It was primarily the death in some minds of inviably conflicting sacred values. Those who had been enculturated in the religion of a less dominant society often adopted the religion of the dominant society sufficiently so as not to conflict with the most sacred values of either. This coadaptation of religion went further when one or more of the religions in merging cultures could reform sufficiently to achieve a wider integration of the core values of the mixed-up system. Such reformations could effectively unite the sacred values of the several cultures so that they would be mutually coadapted as well as adapted to the larger system that selects future life.

We noted that sacred commitments weaken to the point of societal dissolution when their conceptual vehicles are made obsolete by newer

conceptual vehicles from neighboring cultures or new science. We have noted also that diverse religious formulations can approach unification under selection pressures. The history of religion presents wide evidence of their reformations and their tendency during periods of change to be selected to the extent that they meet better their new reality conditions for viability. We have suggested some of the reasons why the scientists have not been very active in helping religion, especially because of the prohibitions set in recent centuries by philosophers and theologians and widely accepted by the public. But we have argued that a new scientific understanding of religion in the last few decades brings the dawn of a new day for religious reformation and revitalization.

By such processes of reformation, religions can provide the grounds for sufficiently common values for peace and order presumably among and within all gene pool and cultural combinations of humanity. But escalation of coercive defense or offense with weapons made possible by modern science today approaches suicide. Peace with beneficial societal order can be made more probable by the best brains of the world perceiving the capacity and power of evolving religion for globally internal peace and order. Important to bring it about would be the uniting of leaders of traditional religions and leaders of the new scientific picture of evolving religions to work toward the necessary reformations.

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