

Editorial

For many years attempts to understand human behavior oscillated between two emphases: on the one hand, explanations laid emphasis on innate, genetically programmed conditions, which supplied (at the very least) the ground rules of behavior; on the other hand, the emphasis was laid on the acquisition of behaviors through experience and learning. The swings of the pendulum were summarized in such phrases as the nature-nurture debate.

More recently, it has come to be realized that what constructs and constrains human behavior is not the one or the other, or some vague combination of the two, but a complex and dynamic interaction between genes and what may loosely be summarized as culture. What have to be understood are the nature and the mechanisms of that interaction in terms which do justice not only to straight-forward considerations of biogenetics and evolution but also to the extreme varieties of human behavior. To do this and to turn it into quantifiable and predictive science is no easy task.

Two recent attempts to do so are the books by C. J. Lumsden and E. O. Wilson, *Genes, Mind and Culture: the Co-evolutionary Process* (Cambridge, Mass.: Harvard University Press, 1981), and by L. L. Cavalli-Sforza and M. W. Feldman, *Cultural Transmission and Evolution: A Quantitative Approach* (Princeton: N.J.: Princeton University Press, 1981). Cavalli-Sforza and Feldman summarized the issue in this way:

Does natural selection have direct control over culture? Many ethologists would argue that, through its control over "the physical basis of behavior," natural selection dictates cultural activities so that the latter are in fact only superficially culturally determined, but in reality are innate. The alternative view is that, in humans, and to a lesser extent some higher animals, the chain of events connecting most behaviors to physical structures is very long, complex and indirect, so that genetic preprogramming cannot determine all behaviors that demand some kind of choice or decision making. . . . It may often be most difficult to decide experimentally where on the continuum between completely preprogrammed and completely learned a cultural trait lies, and which of natural or cultural selection is more important in determining the state of this trait in a population. In some of our models, both cultural transmission and Darwinian fitness enter the evolutionary formulation; in some there is a potential conflict between the two, while in others two types of selection may converge (p. 16).

That last sentence indicates how wide and open the possibilities are and how difficult it is to become more precise in determining the nature of the interaction between the genetic programs and the cultural systems in which and through which they are expressed. The papers in this issue of *Zygon* are from the symposium on "The Functions and Management of Aggression and Cooperation in Biocultural Evolution," which took a single test case in order to explore this problem and its complexity.

The symposium was organized by the Institute on Religion in an Age of Science and held at the 1982 annual meeting of the American Association for the Advancement of Science in Washington, D.C. The Institute, an affiliate member of the AAAS, represents an attempt to draw together people and minds from different disciplines and backgrounds in order to understand more clearly—or at least a little more constructively—the interaction between science and religion and in particular the role that religion has played and still continues to play in evolutionary history.

That may seem a little far removed from the concerns of the AAAS and from the theme of aggression and cooperation; but if one thinks of Iran, Poland, Northern Ireland, Lebanon, South Africa, the Philippines—and the list could easily be extended—one can see that almost all of the world's most dangerous and intransigent problems have deep religious roots. In fact, to put the point as aggressively as possible, it would not be very hard to make the case that no human invention has done quite so much damage as religion.

However, that is not the whole story: religion also has been one of the most creative resources of human cultural achievements—including science itself—if one looks at the matter historically. Even more to the point, in the context of the AAAS symposium and this issue of *Zygon*, religions have served as the most effective systems for the processing of decisively important cultural information which has secured and protected human evolution and survival. Consequently, one of the major concerns of IRAS has been to try to understand what are the connections (the actual and specific interactions) between the two coevolving systems, the genetic and the cultural, in which and through which human beings continue and maintain their lives.

There is of course no problem in observing them as two separate though no doubt interconnected systems. The really tough problem is to understand the exact nature of the interconnection. What kind of interaction is there between the genetic programs which construct the human organism and the cultural artifacts (and mentifacts) through which and in which individuals and societies express and continue their lives? If we take Ralph Wendell Burhoe's summary, in his recent book *Toward a Scientific Theology* (Belfast: Christian Journals, 1981), the main problem becomes obvious: "The 'culturetype' (the information packet, including language, religion, etc.), that shapes the behavior of a socio-cultural organism, is indeed selected independently from, but coadapted with, the more ancient packets of genetic information, the genotypes that guide the basic development of ape-man organisms" (p. 19). But which, if either, is dominant in producing the lives we live? In a particular instance which controls the other? Or if they are in some kind of balance, how is the balance maintained in some kind of dynamic equilibrium?

What we find articulated at the present time are answers at two extremes of possibility. At one extreme there is the argument that in the process of evolution human brains are selected to transcend all but the more elementary innate behavior patterns, thereby being left with a virtually unlimited capacity to learn any behavior which a culture or an environment happens to offer. In an intuitive way that view is summarized by Simone de Beauvoir in her claim that we are the being whose nature it is to have no nature. Thus, although all humans are necessarily the expression of their genetic programs, according to this view the distinctively human specificity arises precisely because humans carry the set of genes which sets us free from our genes. This in brief is the view summarized and attacked by Wilson and Lumsden in *Genes, Mind and Culture* as "the Promethean gene hypothesis." They describe that hypothesis as the view that "genetic evolution produced culture, but only in the sense of creating the capacity to evolve by culture; thus a group of promethean genes has freed the human mind from other genes" (p. 1).

In strong contrast and at the other extreme, Wilson and Lumsden argue that in the long run cultural possibility is effectively delimited, that is, controlled into at least its prevailing outcomes, by the extent to which it "locks onto" Darwinian fitness. So even if (for the sake of argument) the Promethean gene

did exist and did program an almost Lockean organism, a *tabula rasa* open to virtually any kind of impression from its environment, they point out that such an organism would not be stable from an evolutionary point of view. For example, in terms of this argument the possession of slings and arrows, safety belts, ritual controls of violence, fire alarms, and so on will increase the chances of gene replication. A gene mutation influencing or (more strongly) causing its subject to adopt such cultural artifacts more readily than others will be rewarded by natural selection and will establish itself in the population. Thus, in contrast to the Promethean gene hypothesis, Wilson and Lumsden argue that “the central tenet of sociobiology is that social behaviors are shaped by natural selection. In spite of perturbations due to time lag and random effects, those behaviors conferring the highest replacement rate in successive generations are expected to prevail throughout local populations and hence ultimately to influence the statistical distribution of cultures on a worldwide basis” (p. 99).

Put this way, of course, how could it not be true? However, the unresolved issue of the book and the reason why this *Zygon* issue struggles with the problem is that, as the argument stands, it still remains possible that the relevant genes might simply be genes for *general* learning abilities, even though they happen to be expressed on particular (and no doubt in many cases culturally available) behaviors: conjunction does not prove cause as David Hume and logic have long since taught us. In that case, cultural expressions (for which, if they are relatively homogeneous and transmissible, Wilson and Lumsden coin the term “culturgens”) could still be regarded as the product of behaviors which have been learned from particular environments.

Obviously Wilson and Lumsden appreciate the point, and one can say that the real purpose of the book is to specify the epigenetic rules which govern cultural forms. The epigenetic rules are “the genetically determined procedures that direct the assembly of the mind, including the screening of stimuli by peripheral sensory filters, the internuncial cellular organizing processes, and the deeper processes of directed cognition. The rules comprise the restraints that the genes place on development (hence the expression ‘epigenetic’), and they affect the probability of using one cultorgen as opposed to another” (p. 7). Even then, there remains a hole in the middle of the argument. If, for example, one takes the long fourth chapter, which offers detailed mathematical modeling of the way in which cultorgen distributions will change, given that individuals have certain probabilities of switching from a given cultorgen to another, one would need to know what are the relative roles of genes and cultures in fixing the transition probabilities. But the determination of the relative roles is precisely the problem of determining the actual dynamic of biocultural coadaptive evolution.

To put it in more general language, what we need to know more about is the actual process—or the mechanism, as Cavalli-Sforza and Feldman put it—leading from genes to culturgens: “What we suffer from is inadequate knowledge of the mechanisms of human behavior. A consequence of this ignorance is the confounding that occurs between imposition and independent choice, between genetic and cultural transmission, or between cultural transmission and cultural selection” (*Cultural Transmission and Evolution*, p. v). However, their book also fails on this particular and central issue of the interaction between genetic and cultural evolution, but at least their failure is self-confessed: “Another volume,” they say, “will take account of individual, inherited differences in learning ability” (p. vii).

While we wait for another volume, the rest of us also need to focus rather urgently on this problem, not least for the political and social reasons alluded to at the outset. We have increasingly sharp and clear understandings of the process of genetic evolution; we have increasingly sophisticated understandings (including those from historians, who are often completely ignored in this discussion) of the nature of cultural change and continuity. What we lack is a comparable understanding of how the two interlock and both modify and enable each other. What we need to do is to generate testable hypotheses about the process of biocultural evolution—accepting Solomon H. Katz's definition (in itself, incidentally, a hypothesis) of biocultural evolution as a reciprocal feedback process between human biology and behavior, in which biological needs and cultural responses tend to reach a dynamic equilibrium with environmental resources over time.

In an introductory comment at the symposium, Katz unpacked that definition in the following way: "Biocultural evolution consists of a series of interactions among: the biological information resident within individuals and populations in the form of the genetic constitution (i.e., the DNA); the cultural information which is the sum of the knowledge and experience which a particular society has accumulated and is available for exchange among its members; and thirdly, a human central nervous system, which is of course a biologically based system, whose principal evolved function with respect to this model is to facilitate the communication or storage of individually and socially developed knowledge and awareness."

In attempting to come to grips with the urgent but extremely complex problems of the relation and interaction between genes and culture, the authors in this issue, who participated in the symposium, were well aware that they could not study the whole of everything in the time allotted. For that reason the topic of aggression and cooperation was chosen because it provides a specifically sharp focus on the issues of genetic and cultural interaction, and thus on what it is that we are attempting to understand. People and societies are both cooperative and aggressive. Why? On what occasions is one rather than the other adopted? Is it the case that our aggressive and violent behaviors are genetically programmed to such an extent that we must either express them or else suffer all sorts of neurotic (or worse) consequences? Or are they learned and reinforced in social groups in ways which could be unlearned in a subsequent generation if they are no longer of adaptive use, or if indeed they become counteradaptive? Or is it a mixture of both? If this is the case, what are the relative contributions, and how (if at all) can they be determined?

In the first paper, Paul MacLean looks at the fundamental evidence coming from recent research on the formation of what he calls the "triune brain." His argument is that the three levels of the brain, laid down during the course of evolution, have left their traces on human behavior. However, each level modifies the previously available behaviors, so this is far from being an argument for structural-behavioral determinism. Nevertheless, it is obvious that the construction of the brain is genetically programmed, so this argument equally lends support to the biological foundations of aggressive behavior. Nevertheless, MacLean emphasizes not only the possibility but also the realization of the transcendence of the layers of behavior, which he explores through a kind of archaeology of attitudes.

The second paper looks with equal attention at the manifestation of this transcendence of primitive behaviors in complex societies. Paul Heelas adopts an anthropological perspective to show how explanations of aggressive and

violent behaviors occur at two opposite and mutually exclusive extremes: those which lay emphasis on the innate, genetically coded behavior (which becomes virtually inevitable, since it belongs to the human program), and those which lay emphasis on the acquisition of such behaviors in cultural and social circumstances. Heelas points out that identical evidence and data have been used to point in exactly opposite directions, and he also draws attention to the strategies which have then been adopted to reconcile this evident contradiction. He then moves on, through particular examples, to suggest how theories of gene-culture coadaptation will have to cope with this complexity. While emphasizing that these are very early days for such an enterprise, he draws attention to the urgency of the exercise because of the necessity in all societies to manage violence.

The management of violence theme is taken up in the next paper by Garrett Hardin. He accepts the thesis of the first two papers that violence is natural, at least in a semantic sense but in fact with more actuality than that. Against a well-known and popular theory that justice is fairness, he argues that fairness is a misleading guide and that evolution and survival demand a much more realistic and clearheaded understanding of the nature of the natural, which undoubtedly includes and will include violent, aggressive, and threatening behavior.

But then it is natural to ask, To what goals can one realistically address oneself and one's policies? That is the question taken up by Ward Goodenough. His paper also is written in, and out of, the context of the insights and evidence arising in anthropological research. Having outlined three common ways in which the tension between competition and conflict have been interpreted, he accepts Hardin's argument that conflict is a natural human phenomenon and suggests that only through better understanding and a willingness to accept the implications of that understanding can we hope to learn to manage our own nature more adroitly. He then isolates some key and consistent components in that understanding and ends with the subtle but important point that the scale and amplification of the forms of violence are precisely a consequence of evolutionary success. In other words, the more successfully the human species has built on its evolutionary advantages and gains, the more it has thrown up complex possibilities in the exercise of violent and aggressive behaviors, without which it would not have reached its present commanding position.

The final paper by Kenneth Boulding amplifies and illustrates precisely that point, drawing attention to the extreme complexity of the notion and exercise of violence in societies. This paper gives varied examples of the ways in which, in what appear to be straightforward cases of violent or nonviolent behaviors, there is in fact accompanying ambiguity. Yet Boulding, like the others, emphasizes the pragmatic urgency of a refusal to be defeated—or for that matter, naive—in the face of the almost overwhelming difficulty of understanding how the genetic programs and the social-cultural expressions of behavior interact. He thus echoes Goodenough's appeal that the attempt to gain insight and understanding should not be left to academic symposia alone: there must be a corresponding interaction between research-based investigation and political participation and decision-making.

The fact remains that the endeavor to gain a more widely accepted and clearer understanding of gene-culture coadaptation, even in the case of this one single example of violent and aggressive behaviors, is still very much in its infancy. At least the articles in this issue make a strong case that single, simple

explanations (however complicated their form of expression) which lay stress on either the genetic or the cultural are misleading. Indeed they already have led to unhappy mistakes or worse in social and international policy. Only by attempting to deal with problems such as aggression and violence in all their biological-cultural complexity can we hope to reach long-term solutions that will help sustain an era of greater cooperation and peace on our planet.

John W. Bowker

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