A NATURALISTIC THEORY OF ARCHAIC MORAL ORDERS

by Donald T. Campbell

Abstract. Cultural evolution, producing group-level adaptations, is more problematic than the cultural evolution of individually confirmable skills, but it probably has occurred. The "conformist transmission," described by Boyd and Richerson (1985), leads local social units to become homogeneous in anadaptive, as well as adaptive, beliefs. The resulting intragroup homogeneity and intergroup heterogeneity makes possible a cultural selection of adaptive group ideologies.

All archaic urban, division-of-labor social organizations had to overcome aspects of human nature produced by biological evolution, due to the predicament of genetic competition among the cooperators. The universal norms found in archaic moral systems are seen as curbs to this human nature, reinforced by beliefs in invisible sanction systems and rewarding and punishing afterlives (as in heaven or reincarnation). Perhaps the ubiquity of lavishly wasteful royal funerals is to be explained as contributing to this function.

Keywords: archaic civilizations; cultural evolution; genetic competition among the cooperators; human survival; sociobiology; supernatural beliefs.

Not only do I dedicate this essay to Ralph Burhoe, I want also to put some of the responsibility for its awkward, ambivalent form on him. I know that he is fond of the first two preambles. We first used them in a seminar with Edmund Perry, around 1970, and I have reworked them for oral presentations at IRAS, CASIRAS, and Star Island conferences that Ralph has involved me in since. The closest they come to having been published previously is as cited by Ralph Burhoe (1971, 144).

Zygon is a journal in which it is appropriate to present unresolved

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ambivalence on the alternative worldviews of traditional religion and modern agnostic science. Such ambivalence belongs in these pages, along with the more typical unifying resolutionary essays, but it should be better done than in this awkward document, with its many preambles and abrupt shifts in tone of voice from reverent to iconoclastic. My apologies, but right now this is the best I can do.

Preamble 1: An Ambivalent Invitation to Religious Believers. This paper is a part of a larger program based upon an acceptance of a blind-variation natural-selection version of biological evolution, and an analogous process of social evolution. As such it has inevitable, if complex, relevance to questions of religious faith. If you regard the current grounding of religious faith as so seriously undermined that desperate remedies are justified, even if they risk the patient's life, this might be a message for you. For in this program, I argue on evolutionary grounds that it is just as rational to follow religious traditions which one does not understand as it is rational to continue breathing air before one understands the role of oxygen in bodily metabolism. I argue that if modern psychology and social science disagree with religious tradition on ways of living, one should, on rational and scientific grounds, choose the traditional recipes for life, for these are the better tested. (The social sciences are not able to experiment with the important issues they deal with and wrongly get credit for an authority comparable to that of the physical sciences.) I argue as did Pascal, but on evolutionary grounds, that "the heart has its reasons which Reason does not understand" and that it is *rational* to follow an evolved heart in such matters. And I argue that those priests who narrow the precious tradition which they transmit to that pittance which they themselves can understand and agree with are neglecting their duty and are guilty of hubris or pretensions of omniscience.

Such sentiments may sound comforting to those who want firmer grounding for what their religious intuitions tell them is true so desperately that they are willing to welcome support even from agnostic science. But such grounding is treacherous and undermining of the traditional sources of faith. Only if these wellsprings are already dry should one risk the shift to this profoundly different worldview.

A thesis such as mine can probably be religiously constructive only for those of us for whom the precious message is now hidden because it is presented in words we no longer believe, or in words we no longer understand. For such of us, however, radical experiments in translating must be tried.

Preamble 2: Programmatic Goals as a Missionary to Fellow Social Scientists. I want to disseminate a scientific understanding of the restraining, inhibitory, counterhedonistic, and repressive content in religious, ethical, and moral teachings: Modern developments in the study of vertebrate evolution and human social evolution (the genetics of altruism, etc.) suggest that complex social interdependence among vertebrates requires cultural inhibitions of the selfish (for self and offspring) behavioral tendencies that genetic competition among the cooperators is continually selecting. Contrary to this, most psychologists and other social scientists regularly side with impulse and pleasure seeking, against traditional restraints, and mistakenly do so in the name of science. Because of the great prestige of science, deserved for some sciences but not in this area, this ubiquitous hedonistic advocacy greatly undermines traditional values.

I also want to increase the epistemic humility of social scientists vis-à-vis the truths behind religious teachings. Popper, Polanyi, Quine, Toulmin, Kuhn, and Feyerabend have convinced us of the message of Hume and Kant: All knowing is presumptive, indirectly and incompletely corroborated at best. The language of science is inextricably figurative and metaphoric, never the language of the *Ding an Sich*. Sophisticated scientists may at times acknowledge this for their own field, but they tend to epistemic arrogance when contrasting scientific and religious truths. Since they no longer believe in what they suppose to be the literal referents of religious words, they lose sight of the possibility of great truths for which there is no literal language, which must be metaphorically or figuratively expressed, if to be communicated at all. They hold up for religion the requirements of a direct realism, a literal veridicality, now recognized as impossible for science.

One way of achieving that epistemic humility would be to try to translate religious truths into modern metaphors. It seems desirable that sympathetic social scientists study those religious scriptures, parables, commandments, prayers, affirmations, sermons, etc. that are suspected of having a message worth preserving, and attempt to restate them in metaphors consistent with the scientific world image. Many will deal with human nature, and these should be relatively easy to translate. Others will present supraindividual social system truths, and for these we as yet have no generally accepted social science concepts. (Others will deal with truths our puny social sciences have as yet no glimmer of. Still others will deal with physical and biological truths, etc.)

The sympathetic social scientist will have less trouble with ethical truths dealing with human interaction. The greatest trouble will be

in translating truths expressed in "God language." In this regard, I have a particular suggestion, quite compatible with the use of linguistic analytic philosophy by modern theologians, and with books such as Gilkey's *Naming the Whirlwind* (1969). This can be called *quasi ostension*. With modern epistemology, it recognizes ostensive definitions as equivocal and partial, but yet necessary. The suggestion is to use partial descriptions of God, stated in reverse, as quasi-ostensive definitions. Thus, "God is good" becomes "Good is God." Scientific atheists or agnostics can perhaps be convinced that they do not know Who the God is Whom they reject, and have only learned the belief they negate through such processes as are being made explicit here. If they can affirm a belief in ideals of goodness, in terms of which all existing human beings and human institutions fall short and can be criticized, then even though they do not know the full details of the ideal, they can sincerely join in with many important religious prayers and affirmations by substituting the word *Good* for *God*. Similarly, "God is love" becomes "Love is God." So, too, for "God is the sum total of all of the causal forces in the universe," "God is truth," "God is the selective system that shaped man," etc. One can probably identify a dozen important quasi ostensions which most atheists and agnostics sharing Tillich's ultimate concern could give assent to. Accepting each does not, of course, imply accepting the hypothesis that all have the same referent. Even without this, however, a considerable body of religious truths and religious experience might be saved.

Many "God sentences" have as a major import a warning against a human worshiping himself or herself as God. This is a translation I expect social scientists to accept. It is only fair to note, however, that this program endangers the profound therapeutic value, for gifted persons neurotically threatened by their own extreme narcissism, that comes from affirming a belief in the incredible (as exemplified in the lives of T.S. Eliot and Albert Schweitzer). However, for average educated persons, incredibility is now alienating them from the total message, and this is the larger problem. Moreover, incredible languages will no doubt remain available for those with intuitions gifted enough to recognize their therapeutic need.

Such efforts at translation are a part of social-evolutionist efforts, dating back at least to Herbert Spencer, to provide a socially effective naturalistic code of ethics doing without supernatural transcendent authority. We need to regard it as an unproven conjecture needing study that the social efficacy can be achieved without the transcendent belief. Legal approaches to social control cannot be effective in the absence of support from internalized individual self-monitoring.

But an effective superego or conscience may not be achieved by simply preaching scientific analyses proving that everyone would be better off if everyone abided by restraints and social duties. Even if convincingly conveyed, this message would still leave it in the rational best interests of any individual to be a "free rider" or to cheat on the system. Further analysis could conceivably convince us that awe-inspiring indoctrination is needed, to the degree, at least, as that which produced morally committed persons such as ourselves.

Preamble 3: Hypothetically Normative Scientific Mediational Ethics. Let us choose (a few of us, at least) some ultimate value-package, without attempting to logically or empirically justify the choice. For example, we might choose *the continuance of human life under humane conditions*. Once having made that choice, we can then use our scientific theories as to the nature of humanity and the world to generate *contingent mediational ethics*. How should we live so as to further this ultimate goal? I contend that this is what we are doing when we seem to derive "ought" from "is." This orientation has the advantage of explaining the emergence in our generation of *new moral oughts*, such as avoiding nuclear war, zero population growth, and ecological conservation. These new sins, values, and oughts, and the righteous moral fervor with which they are preached, cannot be explained as due to the wisdom embodied in biological or cultural evolution, for such wisdom is always wisdom about the past environments adapted to. But these new moral values are loyal to the *goals* of those past adaptations, implementing these goals through the use of our scientific projections into the future, rather than through legitimating as eternally valid formerly adaptive moralizings in their traditional forms (Campbell 1979).

Thus, we could recognize the past wisdom in biologically based kin-altruism and still find that a scientific analysis of our social predicament in large-scale modern societies made such nepotism sinful. We might decide that the culturally evolved moral orders of the past served to curb individual selfishness in favor of group cooperation and yet also decide that the associated group solidarity in the form of ethnocentric loyalty and out-group hostility is a greater threat to *human survival under humane conditions* than is individual selfishness.

Thus, our respect for tradition, and for the wisdom achieved by both biological and cultural evolution, stops short of *normative biologism* or *normative sociologism*. (To this extent, we avoid the "naturalistic fallacy.") The wisdom so produced is wisdom about past worlds. Scientific analysis of our present world, and scientific

projections into likely future worlds, may lead us to find past commandments (e.g., "Be fruitful and multiply") now sinful. It is likely, however, that many so-called past virtues remain virtuous, and that our cultural-evolutionary analysis will help us understand both the past functions and present functionality of many moralizing preachments.

These first three preambles share the perspective in my 1975 presidential address to the American Psychological Association, entitled "On the Conflicts between Biological and Social Evolution and between Psychology and Moral Tradition." In less formal meetings I used to deliver that message under the title "On the Shadow of Eternal Truth in Well-Winnowed Religious Superstitions." This orientation persists in the present essay, although its overall spirit is somewhat more iconoclastic and somewhat less comforting to the worldview of a traditional religious believer. In part, this change has been brought about by Boyd and Richerson's (1985) great *Culture and the Evolutionary Process*.

Preamble 4: Sociobiology. So many who share the concerns of this symposium also have a developed evaluative orientation, pro or con, toward the sociobiology movement. For this reason, it is desirable that I warn in advance of my own complex orientation to it.

Most sociobiologists and evolutionary theorists of morality (e.g., E.O. Wilson 1978; Alexander 1987; Richards 1987) attribute our intuitions about moral norms to *biological* evolution. I instead attribute them to *cultural* evolution and find that many of these norms focus on curbing behavioral tendencies produced by biological evolution. Most sociobiologists see cultural evolution as selecting only for behavior patterns that promote individual biological inclusive fitness. Boyd and Richerson (1985) and I are nearly alone in positing that cultural evolution can override biological evolution and lead individuals to do things that are biologically stupid in terms of *individual* inclusive fitness.

This disagreement with the majority position in sociobiology should probably be considered as internal disagreement within the sociobiology movement. Certainly I join the sociobiologists in giving central attention to self-sacrificial altruism, the difficulties in accounting for it without invoking group selection, and the rejection of group selection in the biological evolution of vertebrates. (I differ again in positing that for the social insects a biological *selection by functioning social unit* [nest or colony selection] is required, and that kin-selection models need such augmentation [Campbell 1983]. I

posit for the cultural evolution of religious beliefs, ideologies, and moral norms a nonbiological selection by functioning social unit.)

Preamble 5: Individualisms: Methodological, Descriptive, Normative. The issue of methodological individualism continues to be vigorously discussed in every philosophy of science. As an a priori, I have long rejected it (Campbell 1958). Descriptively, it fails at the level of social insects, were we to take the worker ants and soldier ants as individuals, but not if we take fertile queens as individuals. For human societies, I regard the descriptive issue as not yet settled but am open to the unhappy conclusion that political units such as nations have self-preservatory "purposes" that are inexplicable as composites of individual attributes. I regard such an outcome as quite compatible with a normative individualism that regrets this state of affairs.

Preamble 6: Extending to the Moral Order Naturalistic Explanations, Replacing "the Argument from Design." Prior to Darwin, the argument from the evidence of design to the existence of the Designer used mainly biological examples (e.g., Ray 1691; Paley 1802; Westfall 1958). Darwin did not deny the existence of design (indeed, he provided much more evidence of it), but he explained the origin of design in a way that removed the need for a supernatural Designer. Within the scholarly community, the acceptance of Darwin's theory of natural selection is so widespread that the use of biological evidence in an argument for God from the evidence of design has almost disappeared. In recent naturalistic theology, evidence from physics is now the most frequently used basis. But I surmise that, for intellectuals who retain supernatural religious belief, an implicit *argument from the design of the moral order* is involved. Their intuitions about moral oughts are compelling, and the truth and origin of these oughts are so hard to explain naturalistically. Rather than forgo these moral intuitions, rather than deny their authority, one believes in a God that ordained them. "If God is dead, all immoralities become permissible," to paraphrase Dostoevsky and Nietzsche. Somehow, in an ambivalent Promethien impulse, I would like to extend Darwin's achievement, to explain naturalistically the design of the moral order.

Some Puzzles in the Sociology of the Beliefs of Archaic Civilizations

Complex division-of-labor protocivilizations seem to have emerged independently the world over: ancient Egypt, Sumer, and Babylon;

along the Yangtze and Yellow rivers in ancient China; along the Indus and Ganges rivers in ancient India; along the desert rivers in ancient Peru; among the Maya, Olmecs, and Aztecs in Mexico. These civilizations were characterized by the full-time division of labor for priests, rulers, skilled craftsmen, and often soldiers. These specialists did not produce their own food but were fed by others. Nonspoiling foodstuffs were always present, and usually state-owned granaries. "Cities," in the form of residential concentration (and often apartment house living), were characteristic. For this reason, I use the term *city-state* as a shorthand, even though it is not technically correct in all cases. It is on the moral orders of these city-states that I focus. I find in them several puzzles that seem to me to be solved by Boyd and Richerson's "conformist, frequency-dependent cultural transmission" (1985). All but one are puzzles of uniformity.

1. All of these protocivilizations were accompanied by political centralization, coordination, leadership, and hierarchical downward-command structures headed by a single person. All were well-organized tyrannies, or despotisms.

2. Although independently socially evolved, all of these archaic city-states ended up with a very similar set of moralizing preachments. All preached the value of *duty to the political organization* and its customs. All preached the duty of self-sacrificial military heroism in defense of the state. All preached within-group honesty. All preached against self-interested deviations from duty (covetousness, jealousy, etc,).

3. All supported their moralizing preachments with a *supernatural cosmology* that provided authority and sanctions for these preachments. (Why were not the force of custom plus interpersonal reinforcements sufficient without such cosmologies?)

4. The details of these supernatural cosmologies were extremely *heterogeneous*, differing widely from city-state to city-state. (This is the puzzle of diversity. All others in this list are puzzles of uniformity.) This heterogeneity of cosmologies argues in favor of the multiple independent invention of these archaic city-states. The accompanying cosmologies are ideologically and functionally so central that they would have diffused along with the division-of-labor package, were diffusion to be the explanation of the similarities.

5. Compared to the supernatural beliefs of their acephalous predecessor societies, the pantheons and cosmologies of the archaic city-states were more incredible (as judged from a modern secular viewpoint) rather than less so. While we can recognize in these archaic city-states a general cultural advance toward modern

civilization, they were more superstitious, more credulous, than their predecessor cultures. Did they believe their supernatural cosmologies, or were these perceived as myth and poetry? I judge that they were believed as invisible physical realities comparable to today's beliefs in magnetism, gravity, electromagnetic waves, atoms, genes, etc., that is, as invisible but physically real sources of observable physical effects.

6. Ubiquitous in these religious cosmologies were rewarding and punishing heavens, hells, and reincarnations. These uniformly extended individual hedonic calculations beyond one's own biological lifetime. (One must not infer popular religion from the writings of isolated philosophers such as Lao Tse.) Folk Buddhism from the Qin and Han dynasties, which first unified China, on through the subsequent dynasties of classic China taught of supernatural bookkeepers keeping minute records on each person's behavior, of sixteen specialized hells for specific sins, followed by punishing or rewarding reincarnations (Eberhard 1967). I would of course feel more supported in my dogmatic generalization if there were clear-cut evidence of still earlier Chinese beliefs in rewarding and punishing afterlives. Thayer (1989) discourages this hope.

7. Also ubiquitous were wasteful royal funerals, containing provisions for a royal afterlife. The commonsense, materialistic, calorie-counting, economic optimizing of modern sociobiology (fused in anthropology with optimal foraging strategy) has no tools to explain such wastefulness. Fully useful horses, soldiers, wives, weapons, jewels, and money were interred and made useless by the royal heirs who directed the funeral. Were this a culturally isolated occurrence, no functional explanation would be called for, but archaeological findings continue to expand such evidence, tempting the generalization that they characterized *every* archaic city-state. The economic and biological wastefulness is undeniable. Inevitably, it was a selective force continually selecting *against* such customs. Their ubiquity requires a still stronger overriding functionality, which I posit lies in their affirmation of the reality of the afterlife. The functionality of extending individuals' hedonic calculi beyond their biological lives probably needs no arguing, for the survival of the social group as an entity, and perhaps also for the combined biological inclusive fitness of the members (although not an individual's inclusive fitness).

A Belated Disclaimer. While I believe in these seven empirical puzzles, I have no scholarship to offer in secondary sources (to say nothing of primary ones) to establish them. Even if these were well-established generalizations, they would still be but hypotheses.

If I, with the help of Boyd and Richerson, put forward a plausible hypothetical solution to them, it will be at best a speculative "solution." I remind myself of the White Knight in *Through the Looking Glass*. "But I was thinking of a plan / to dye one's whiskers green, and always use so big a fan / that they could not be seen." I offer a "solution" to a problem I have needlessly created. Above you have the green whiskers. There follows the fan.

I do feel that the social scientists of my generation should take more seriously the human capacity for religious belief, and the content of such belief. The sociology of knowledge so-called (in actuality, the sociology of socially sanctioned belief) should be extended from its eighteenth- or nineteenth- and twentieth-century preoccupations back to the Egyptian beliefs about Ra. The anthropological sociobiologists of today have dropped collecting beliefs (except about kinship) in favor of the number of persons/hours in the hunting party, the calories consumed, and the calories gathered. They need to revive the old traditions of collecting beliefs and see these as a part of their sociobiological (as well as anthropological) agenda.

Genetic Competition among the Cooperators

Central to sociobiology today is the dogma of individual selection, and the problem for innate self-sacrificial altruism (and complex social group coordination) which it presents. The dogma in the sociobiology of social vertebrates is that individual selection dominates over group selection. Group selection no doubt occurs, but its effects are undermined by individual selection. For example, individuals may sometimes have genes that lead to effective, group-survival-enhancing, self-sacrificial altruism. The chances of survival of the group as a whole are improved because of their presence. But the net benefits of this group selection are greatest for the nonaltruists. For the altruists, their group-selection gains are reduced by the risks they run. No such costs, but only the benefits, accrue to the nonaltruists. Thus the relative frequency of nonaltruists increases in the group in future generations. This obstacle to the biological evolution of self-sacrificial altruism has been noted since Haldane in 1932. Group selectionist arguments persisted nonetheless. It was Williams (1966) who persuasively revived Haldane's arguments. I summarize the problem by the phrase "genetic competition among the cooperators."

The social insects provide a contrast with vertebrate sociality that serves to dramatize the problem. The ants, bees, and termites are more social than any vertebrate, save urban humankind. They

communicate and cooperate more effectively. Their soldiers are more unambivalently brave. Their workers more unambivalently dutiful. These cooperators are sterile. "Genetic competition among the cooperators" has been eliminated, and because of this, selection for the effectiveness of the organized social unit is *not* undermined by individual selection. This fascination with the ultrasociality of the social insects and the role of sterility is old-fashioned, from 1880 to 1930. (See Campbell 1975a.)

I should warn of my unorthodoxy at this point. The dogma of *only individual selection* is currently so strong that the leading theorist of social evolution, William Hamilton (e.g., 1964), denies any role to selection-by-colony (nest) for the social insects. For this, and subsequent discussion, the reader needs two technical concepts, for which I offer nontechnical definitions. *Inclusive fitness* refers to the individual organism's "fitness" defined in terms of the proliferation of that individual's genes in future generations, whether achieved by the individual's own fertility or by that of close relatives sharing those genes. (I find that I use this term as a substitute for *self-interest,* as a sociobiological expansion of self-interest to include nepotism.) *Kin-selection* refers to the furthering of inclusive fitness through the fertility of kin. To oversimplify Hamilton, the sterile worker furthers her own inclusive fitness by increasing the fertility of her mother or sisters. For Hamilton, such kin selection is *sufficient* to explain caste sterility in the social insects. In contrast, while I join those who regard kin selection as a prerequisite to the ultrasociality of the social insects, I do not find it sufficient. Colony or nest selection is also essential. So important is the point that I borrow from some previous documentation:

> E. O. Wilson (1968, p. 41) says, "In fact, colony selection in the social insects does appear to be the one example of group selection that can be accepted unequivocally." Boorman and Levitt (1980) explicitly define group selection so as to exclude the social insects: "Mating does not normally take place between reproductives produced by the same social insect colony. Insect colonies are therefore not reproductively closed populations and accordingly cannot be treated as demes for the purposes of group selection. In turn, this means that group selection is largely ruled out as an explanation of most cases of insect sociality (pp. 13–14)." However, they do not mean to rule out selection by cooperating social unit. In fact they also say, "If selection is mostly at the colony level, workers can be altruistic to the remainder of the colony (p. 41)." While they do not explicitly mention that "net selection primarily at the colony level" can only take place when selection at the individual worker level has been eliminated, it is probable that they would agree.
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> J. B. S. Haldane, the most explicit founder of the individual-selectionist emphasis, was clear on the special case of the social insects in his founding book: "In general, qualities which are valuable to society but usually shorten the lives

of their individual possessors tend to be extinguished by natural selection in large societies unless they possess the type of reproductive specialization found in social insects. This goes a long way to account for the much completer subordination of the individual to society which characterizes insects as compared to mammalian communities [Haldane, 1932, p. 130]" (Campbell 1983, 21).

The individually selectionist orthodoxy is being challenged (e.g., D.S. Wilson 1983; Sober 1984; Wilson and Sober 1989). But I am *not* challenging it for the vertebrates. For the vertebrates, genetic competition among the cooperators (with the resulting severe limitations on biologically based cooperation and self-denial) set the problem that moral norms have been socially evolved to solve (a partial, incomplete solution). For the social insects, however, the scenario involves biological evolution by means of colony selection.

Our study of the social insects reveals to us the great obstacles to complex social coordination produced by genetic competition among the cooperators. The social insects have achieved ultrasociality by the drastic route of sterility among the cooperators. We are the only vertebrates that achieve ultrasociality. (If one regards the African naked mole rats as an exception, note that they, like the social insects, achieve this by sterility among the cooperators.) The problem is so great that we should be tolerant of "drastic" efforts to solve it, such as the implausible (though believed by me) application of one of Boyd and Richerson's (1985) models that follows.

Anadaptive Cultural Transmission and Two Types of Adaptive Cultural Evolution

We need as a background an *an*adaptive model of cultural evolution. This should probably be more like a model of nonadaptive genetic drift than a Hardy-Weinberg equilibrium in which character frequency remains constant in successive generations (Beatty 1987a, 1987b). Adjacent generations in a contiguous lineage are more similar than noncontiguous ones. This proximal similarity is achieved by cultural borrowing from the previous generation. Across generations, trait frequencies and cultural forms change in a meandering way that should not be interpreted as "adaptive" to a systematic selective environment. Against this background, we can distinguish two forms of possible cultural adaptation.

The first is exemplified by the cultural evolution of tools, weapons, knowledge of the materials upon which the tools operate, and knowledge of the materials from which tools and weapons are made. This form is characterized by the fact that individuals can

generate variations on the culturally received form, and to some extent can confirm the efficacy (satisficing, not optimizing) of the received forms and their variants. It is the cultural transmission extension of individual learning.

The basic recipe for evolutionary adaptations is haphazard variation, selection, and blindly loyal transmission. All of the fit is achieved by selection. The variations show no foresight. They are "chance," "random" (but not in a technical, mathematical sense), "haphazard," "blind." The only requirement is heterogeneity. Unforesighted but systematic sweep processes, as in radar, provide such heterogeneous exploration of possibility space. The retention of surviving variations (the genuinely adaptive plus the anadaptive and maladaptive variations not yet weeded out) are retained and reproduced with blind loyalty, the maladaptive and the adaptive equally loyal, although selection reduces the frequency of the maladaptive. In biological evolution (chromosomal, eukaryotic) recombination and mutation produce the variations, differential survival the selection, and the duplication of the genes in mitotic and meiotic cell division the blindly loyal reproduction. Viewed from the dynamic laws of biochemistry, the incredibly loyal duplication of the genes is more remarkable than the occurrence of those occasional imperfections that constitute mutations. The gene-repair mechanisms which are involved also repair dysfunctional genes and functional ones without discrimination.

For both types of cultural evolution, there is an analogue to this blindly loyal retention. Uniquely flaked spear points remained constant for tens of thousands of years, testifying to the strength of cultural orthodoxy even for useful and individually confirmable objects. My mention of continuity with individual learning should not be interpreted as inconsistent with this. Cultural evolution has as its raw material of variations not only chance deviations from the inherited orthodoxy, but also the products of vicarious blind-variation-and-selective-retention processes at the individual level, such as vision (Campbell 1956, 1974a) and creative thought. These vicarious processes are not of entailed validity but depend upon the imperfect validity of their presumptions. These "intelligent" sources of variation are indeed often adaptive for the wrong reasons.

I judge that the adaptiveness of cultural evolution at this "individual" level is undeniable. Even during the Dark Ages, after the fall of Rome, when the size of the largest European cities was reduced to one-tenth of its prior maximum, the lethality of weapons steadily increased.

All adaptive processes require powerful retention mechanisms for the cumulation of already achieved adaptions, as a base upon which fringe variations are explored. Blind cultural conformity is individually adaptive for this type of cultural evolution, increasing individual biological inclusive fitness.

For the theory that follows, we must posit that the individually adaptive products are so valuable that a general tendency toward blind conformity has a *net* individual inclusive fitness advantage, even though many of the results of that conformity are *individually* disadvantageous. Readers should be warned that this is one of the most vulnerable parts of the theory.

Group-Level Cultural Adaptations. For our theory of archaic moral orders, we also need to posit group-level adaptiveness in cultural evolution. This is much more problematic, and for several reasons, to be specified below.

Let me illustrate from some classic small-group experiments, initiated by Alex Bavelas (see Guetzkow 1961). Sets of six persons were provided with communication links of contrasting form: circle, hub-and-spokes, and fully connected. Each member was given a few playing cards, and the group was to assemble the single best poker hand from the total of their cards. The spokes pattern was clearly superior to the fully linked and the circular pattern. This held true even where the hub, or communication clearinghouse position, was occupied by the least competent person. When fully connected groups played repeated rounds, there was spontaneous disuse of some links, resulting in a spokes pattern. This organizational pattern is an attribute of the group (unattributable to individuals in isolation) and with a group-level adaptiveness in this experimental ecology.

For the central theory of this paper, we must posit such a group-level selection not only for moral norms, but also for religious-political ideologies. *Adaptive* cultural evolution at this stage is much more problematic than for "individual" cultural evolution for many reasons: (1) There are, on the group level, fewer "units" and fewer "degrees of freedom" (proportionally to the size of the group). The basic statistical theory of adaptive evolution requires large numbers of quasi-independent units, and shared, consistent, selection pressures. (2) The time units of trait exhibition and selection are longer and fewer. (3) Complex, multiattribute "objects" of selection for cultural complexes make it much less likely that a specific attribute be selected. In contrast, the selective pressures on the form of a spearhead are much more focused. (4) For those beliefs and organizational forms that are beneficial for the group as a whole,

but costly for individual inclusive fitness (producing self-sacrificial altruistic behavior), there is individual-level selection pressure operating against the adaptive group selection. There are no doubt other obstacles. I should doubt that cultural evolution at the group-attribute level had taken place were it not for the great obstacle to ultrasociality which I judge genetic competition among the cooperators to be, and were it not for the seven central puzzles of archaic city-states.

THE BOYD AND RICHERSON MODEL: INTRAGROUP HOMOGENEITY

Of the many important features of Boyd and Richerson's great *Culture and the Evolutionary Process* (1985), I will make use of only one: conformist frequency-dependent nonlinear (multiple parenting) transmission ("conformist transmission" for short). Like their major predecessors (e.g., Ginsberg 1944; Waddington 1960, reviewed by Campbell 1965a), Boyd and Richerson note that cultural evolution makes use of cross-lineage borrowing (they call it *multiple parenting*) in sharp contrast with biological evolution (save for a few isolated exceptions). Under conditions of ecological diversity and migration, they find that it would be optimal for the learners to adopt the majority (or plurality) position of the mentors (i.e., the "conformist" version of frequency-dependent cultural transmission). (Their demonstration of advantageousness assumes individually beneficial traits.)

Add to conformist transmission the condition of stable small groups semiisolated from each other. In a dozen generations, these groups will be moved to internal homogeneity on all traits. Chance pluralities on neutral traits will become polarized into near unanimities. In different groups the chance pluralities will be in different directions, in a cultural analogue of genetic drift.

Several things can be noted about this outcome. Cultural unity on a trait need not be interpreted as a product of adaptive selection. Cultural differences between nearby tribes need not be interpreted as adaptations to different ecologies. This is a great emancipation for the believer in cultural evolution. Previously (e.g. in my 1965 model) my anthropology friends would challenge me. "In our people, twins are put to death at birth. In the neighboring people, twins are given special treatment and reared for shaman roles. Both live in the same mosquito-ridden yam culture. Are you going to claim that this can be explained as different adaptations?" (Nancy Leis and Philip Leis, personal communication.) Cultural evolutionists have been at least as much burdened by excess adaptationism as the sociobiologists

criticized by Gould and Lewontin (e.g., 1984). Indeed, such excesses in the interpretation of culture have been the major reason for the rejection of the older functionalism in sociology and anthropology.

The new functionalism which I advocate attempts to avoid this excess adaptationism by requiring for each functionality which is posited a plausible selection process at the organizational level of the function (Campbell 1974a, 1990). This new restrained functionalism is greatly helped by the nonfunctional, or afunctional, explanation of intracultural uniformities which the Boyd and Richerson (1985, esp. chap. 7) model provides. This new functionalism does, however, still retain the concept of "latent" functions (functions not obvious to those who practice and transmit the custom, or rationalized by them in other ways), even though it was the concept of latent function that so relaxed the self-critical discipline of the old functionalists, making it possible for them to treat *every* feature of archaic and contemporary societies as functional. Now with Boyd and Richerson's help, functional theorists are forced to distinguish between "accidental" cultural uniformities and "selected," or functional, ones. This distinction requires that a plausible theory of selection at that functional level be provided. The functional level upon which this essay focuses is that of the coordinated social group.

Parenthesis on Reciprocal Altruism. At this point, I interrupt my presentation of the Boyd and Richerson model for an important aside. These "neutral" homogeneities within groups, in the context of sharp differences between nearby groups, almost certainly have a function whatever the specific content of the homogeneity, and even if this function was not involved in the selection for the difference. Trivers (1971) in one of sociobiology's most important papers has presented the concepts of "reciprocal altruism" and "moralistic aggression." Reciprocal altruism is also the key to Axelrod's influential book (1984) on the evolution of cooperation. For Trivers and Axelrod, the tendency to form reciprocally altruistic cliques (whose members on successive occasions trade off in being altruistic to the other) is explicable in terms of purely individual considerations. The reciprocal altruist pairs or cliques are precarious, and vulnerable to selfish defection. For them to emerge requires long-lived individuals, who are likely to encounter the same specific others again and again, and who have the capacity to identify and remember the specific others. Given these conditions, an innate readiness to form such cliques could emerge. Trivers posits that under such conditions there would also evolve an innate tendency to "moralistic aggression" against partners who violated reciprocity. (A problem

remains for the individual-selectionist position, which needs resolution by computer simulation. "Moralistic aggression" involves blind, destructive rage, apt to be destructive for both the recipient and the moralizer.)

It has been pointed out (Campbell 1979, 42–43; Brewer 1981) that a culturally inherited membership in such a reciprocal altruist pact would reduce the risks involved in negotiating a new one. It would be in the biological inclusive fitness interests of the biological parents to force such culturally inherited membership upon their offspring. All group uniformities on trait-specifically-neutral features would be useful signs of comembership in such a reciprocal altruist pact. *Easily perceivable* homogeneities in dialect, dress, rituals, and scarification would be particularly useful. Thus the Luo of Kenya knock out two front teeth of their men, while the adjacent Kipsigis enlarge a hole pierced in their ears to a two-inch diameter. Moralistic aggression becomes death-to-traitors in this functional explanation of the roots of tribal ethnocentrism.

If we turn the phrase from "reciprocal altruism" to "clique selfishness," we note that the internally altruistic groups are exploiting unorganized persons, or organized out-groups. Here is an area in need of clarification. Some presentations of reciprocal altruism read as though it would be to each person's inclusive fitness advantage if all humanity were in a single reciprocal altruist pact, and that its only problem would be that of preventing anonymous free-riders. Olson's pioneering study (1968) provides formal models and cites experimental studies showing that small groups are much more likely to achieve mutually altruistic cooperative relationships. But this does not provide a rationale for the focal role of anti-out-group polarization which is so ubiquitous in human sociality. The concept of "clique selfishness," emphasizing the exploitation of out-groups, comes closer. Each ingroup can plausibly accuse the other group of clique selfishness and use this accusation to mobilize their own in-group solidarity.

From this point of view, the accidental in-group homogeneities produced by conformant cultural transmission play a role comparable to that of the unique nest and hive odors of ants and bees. They provide signals as to who is to be admitted and who excluded. The complexity and integration of the in-group cooperative system seem to require sharp group boundaries. As a result, the in-group homogeneities (and, therefore, the sharpness of the intergroup differences) are no doubt sharpened beyond what conformant transmission would produce, further enhancing the possibilities for cultural group selection, to which we will turn.

This discussion of reciprocal altruism has been presented as a diversion from the Boyd and Richerson theory. But it may be an essential addition. If cultural group selection produces group functional, self-sacrificial altruism, as we shall argue it does, then this produces an individual selection pressure against it, which would tend to eliminate the conformant cultural transmission tendencies which produced it. The math modeling and computer simulations which Boyd and Richerson (1985) report have not yet covered this feature. The plausibility of their model would be strengthened by the explicit additions of individual-selectionist supports. The social inheritance of membership in a reciprocal altruist clique is one of them. To repeat, it would be in the individual inclusive fitness advantage of parents to force upon their biological offspring conformity to such a group.

Kin selection is the other individual-selection route to quasi altruism. The reciprocal-altruist cliques are most advantageous when they are composed of close relatives and when individuals are less closely related to members of other nearby cliques. But status as a relative is predominately learned. The Boyd and Richerson homogeneities on neutral traits become a symptom of kinship. Thus conformist social transmission, and the in-group uniformity it produces, receives individual-selection support from kin selection also.

Cultural Group Selection in Cultural Evolution

Boyd and Richerson (1985) point out that it is this internal-group homogeneity and intergroup variability which set the stage for group selection, were any of the traits involved to provide a group-level advantage. This is a central concept for the Type 2,cultural evolution, of group attributes, ideologies, organizational traditions, etc.

It is important to emphasize that this is an organized (or at least face-to-face) social group (rather than some nominal group, type, species, etc.). It is also important to emphasize that this is a selection of culturally transmitted attributes, not biological. (For biological evolution, this paper—at least tentatively—accepts the dogma of individual selection's dominance.) Groups (social organizations) can "die," with all of their biological individuals joining other groups, becoming converted to other ideologies and organizational structures. Defeated groups can retain continuity of biological personnel but adopt a new religion or political structure. The selective process could be pure emulation by unsuccessful groups of the successful. Or it could be the forcible imposition of the victor's culture upon the

vanquished. Biological extinction of weak groups, as well as excess biological fertility of successful ones, could also further the selective reproduction of ideologies, but these alternatives are not essential. The "group selection" posited is a selection of culturally transmitted beliefs, social-organizational structures, religious ideologies. It is not a "group selection" of genes.

Where selection occurs at several organizational levels, the levels operate *in part* as competing organizations. "Selfish DNA," reproducing itself without regard for whole animal functionality, is in rivalry with whole animal optimization (even though this rivalry may be kept in limits, as in a species-specific parasite that threatens the extinction of its host. But in spite of such limits, the parasite and host are rival systems, with disjunctive optima. So, too, selfish DNA and whole animal. So, too, individual biological person and social group are—to some degree—in competition. Dawkins (1976) made famous the conception of "the selfish gene" (*not* referring to selfish DNA). In my judgment, he confused the unit of retention (the gene) with the unit of selection, and it is only the units of selection to which should be attributed purposes, including selfishness. Vis-à-vis individual interests, we need to keep in mind a "selfish group" concept and recognize that effective selection at that level is selection for organizational and institutional self-perpetuation, at the expense of the individual if need be (and within limits).

Systematic Selection Pressures in the Group Selection of Ideologies. John Bowker (1973) has combined a high degree of sophistication in modern evolutionary theory with a rather orthodox Christian theology. He argues that, if God existed as a part of the environment during the course of human evolution, then the human mind would be selectively attuned to that reality (as it may well be to quasi-Euclidean geometry and quasi-Newtonian mechanics). I want to accept the general mode of the argument, but disagree if Bowker sees it as justifying the specifically Christian origin myth, theology, and claims for revelation.

Considering the dozen independent evolutions among archaic human city-states, and the dozen times among the social insects that the syndrome has emerged of stored nonspoiling foodstuffs, full-time division of labor (including social roles that are well fed but gather no food), and professional soldiers in a ubiquitous role, I have argued (Campbell 1965a, 1974b, 1983) for the existence of common "laws of sociology" as the part of the ecological niche of all twenty-four cases, insect and human.

It would be nice to be able to derive such laws from general

principles, and then find them confirmed in the observations. But even in biology, discovery of the ecological niche often follows the discovery of the puzzling animal or plant form. Such confounding of theory and evidence is at least as great a problem in the present arena. However, conceptually, one might develop, on systems-analysis grounds, a model for human social behavior to optimize individual inclusive fitness in a central range of human environments. Consider a parallel analysis of optimal individual behavior for maximizing coordinated social organizations persisting in form and continuity over many individual lives. Compare these two models of human behavior. On many traits, the models will agree. Other traits will only appear in one model and will not be opposed by the other. But on some traits, the models will call for incompatible behavior. If these analyses are appropriately general, then symptoms of universal conflicts should appear in all archaic city-states. We propose that the ubiquitous features appearing in all archaic moralizings are the symptoms of this conflict. Note that sociobiology presents a model of vertebrate social behavior optimizing individual inclusive fitness. Note also that the recurrent image of sinful, temptation-ridden human nature in worldwide moral systems is in remarkable agreement with the sociobiologist's picture.

With regard to the shared moralizings of archaic states, it seems to me plausible that any conformant transmission event that ended up containing part of the universal moral norm package would have some systematic tendency to be selected, however slight, and that the ubiquitous common set of moral norms is in general what is under selection pressure. Ideologies will be selected not for their own content, but incidental to their support of these norms. It seems that there are many specific cosmologies, origin myths, and pantheons that will support the moral norms. There seems to be little shared selection pressure on the specific content, explaining the great heterogeneity of such beliefs.

If we use universality as a symptom of recurrent selection pressures on content, then there seems to have been a ubiquitous contribution to organizational survival value in the belief in suprahuman invisible authority, gods, or a God. The word *supernatural* does not serve my analysis as well as the word *transcendent*. Such beings, or one Supreme Being, are to be taken as real, as the invisible but real causes of visible physical effects, comparable to our beliefs in invisible causes such as gravity, magnetism, wind, and sunshine (i.e., "natural" rather than "supernatural"). The Boyd and Richerson theory of adaptive conformist transmission requires this credulity, as do the group-level effects.

Explaining the ubiquity of invisible, transcendent authority is of course much more complex than the above paragraph explains, even within the limited cultural-evolutionary framework here employed. Swanson's brief, provocative *The Birth of the Gods* (1960) is, in general, supportive of the latent-functionalism of this paper. But it offers a nonfunctional explanation for the ubiquity of the hierarchies of gods, and of one Supreme God. These pantheons, he argues, are metaphors for cultural-evolutionary truths at the organizational level for which there exists no "literal" language. The local human political organization is used as a source of metaphor. The functional ubiquity lies at the political level, along the lines used to illustrate "group-level cultural adaptations" (above). The ubiquity of high and highest gods may be thus explained, without arguing the functionality of the theology *per se*.

Biological evolution has, presumably, selected our erogenous sense organs, our hedonistic sweets and bitters, pleasures and pains, in such a way as to increase genetic inclusive fitness in the original ecology of our evolution. It has no doubt also selected for the tendency for more long-term rational hedonic calculation, which weighs future rewards and punishments against present temptations. If cultural evolution through credulous believing can lead individuals to extend this hedonic calculus to include rewards and punishments in an afterlife (heaven, reincarnation), this supports obedience to commands even in the face of death, and obedience to prohibitions on pleasures even in the absence of observers and sanction systems.

What I am arguing is functional augmentation, not necessary requisite. In modern military activities, for example, much risking of death can be explained on the basis of nontranscendent threats and exigencies, the real presence of unobserved monitors, etc. But augmenting these with life-transcending sanction systems supports obedience in a wider range of settings, in ways that could lead to more effective collective action. Hence, where the Boyd and Richerson belief-homogenization processes have produced such beliefs, the groups holding them may have functioned more effectively, their ideologies more imitated by other groups, etc.

Wasteful royal funerals may not be quite as ubiquitous in archaic city-states as I have claimed. But they are certainly too frequent and too independent to be explained by accidental belief-homogenization and nonfunctional diffusion. Such a focal syndrome would, of course, be the more selected option if it had several latent advantages, so I need not seek a singular explanation. I will focus upon two functions that are plausibly related to overcoming the social-organizational

problems created by the biological human nature produced by the genetic competition among cooperators.

The explanatory principles central to this essay seem useful only for the archaic city-states. The fact that burials showing belief in an afterlife (and belief in real, invisible ghost ancestors and other spirits) no doubt already existed in the simpler egalitarian predecessor societies cannot be explained by the scenario I offer. Other selective advantages must be found to explain these. But these precursors may have provided useful seeds for exaptation into city-state ideologies where they were selected by different functions.

These elaborately wasteful royal funerals usually had details testifying to the ruler's belief in an afterlife. They presumably not only expressed this shared belief but also increased its credibility among the local population. Thus my first functional explanation is dependent upon the more obvious functionality of belief in after-death rewards and punishments.

The second possible function seems unrelated to the first, but not therefore incompatible. Covetous envy is biologically natural but is a tendency undermining the division of labor, as is evidenced by the ubiquity of antienvy moral preachments in division-of-labor societies. Envy is exacerbated by the unjust share of collective products which those occupying "communication clearinghouse" roles are able to achieve for themselves and their offspring. (My moral preference for egalitarian democracy is, I hope, not undermined by recognizing its rootedness in envy.) Conceptualizing rulers as divine, as a different order of being, and ceremonializing this difference in wasteful royal funerals, may help reduce such envy.

I recognize these explanations to be weak. What I will persist in seeking are functional explanations. These seem to me most likely to be found in social-organizational functions, rather than in individual-person functions. I am in too much sympathy with the optimal-foraging-strategy-sociobiological anthropologists to accept the "function" of "surplus disposal" often offered. This includes a tentative rejection of an endemic need in complex societies for disposal of either surplus products or surplus labor. However, a seasonal need to keep a large labor force organized and occupied when its directly functional agricultural activities were not possible may provide one function for pyramid building.

REFERENCES

Alexander, R. D. 1987. *The Biology of Moral Systems*. New York: Aldine.
Axelrod, R. 1984. *The Evolution of Cooperation*. New York: Basic.
Beatty, J. 1987a. "Natural Selection and the Null Hypothesis." In *The Latest on*

the Best: Essays in Evolution and Optimality, ed. J. Dupré. Cambridge, Mass.: MIT Press.

———. 1987b. "Dobzhansky and Drift: Facts, Values, and Chance in Evolutionary Biology." In *The Probabilistic Revolution.* Vol. 2, *Ideas in the Sciences,* ed. L. Kruger, G. Gigerenzer, and M. S. Morgan. Cambridge, Mass.: MIT Press.

Boorman, S. A., and P. R. Levitt. 1980. *The Genetics of Altruism.* New York: Academic Press.

Bowker, J. W. 1973. *The Sense of God: Sociological, Anthropological, and Psychological Approaches to the Origin of the Sense of God.* Oxford: Oxford Univ. Press.

Boyd, R., and P. J. Richerson. 1985. *Culture and the Evolutionary Process.* Chicago: Univ. of Chicago Press.

Brewer, M. B. 1981. "Ethnocentrism and Its Role in Interpersonal Trust." In *Scientific Inquiry and the Social Sciences,* ed. M. B. Brewer and B. E. Collins. San Francisco: Jossey-Bass.

Burhoe, R. W. 1971. "A Scientific View of the Role of Religion." In *Science and Human Values in the 21st Century,* ed. R. W. Burhoe. Philadelphia: Westminster Press.

Campbell, D. T. 1956. "Perception as Substitute Trial and Error." *Psychological Review* 63:330–42.

———. 1958. "Common Fate, Similarity, and Other Indices of the Status of Aggregates of Persons as Social Entities." *Behavioral Science* 3:14–25.

———. 1960. "Blind Variation and Selective Retention in Creative Thought as in Other Knowledge Processes." *Psychological Review* 67:380–400.

———. 1965a. "Variation and Selective Retention in Socio-cultural Evolution." In *Social Change in Developing Areas: A Reinterpretation of Evolutionary Theory,* ed. H. R. Barringer, G. I. Blanksten, and R. W. Mack. Cambridge, Mass.: Schenkman.

———. 1965b. "Ethnocentrism and Other Altruistic Motives." In *The Nebraska Symposium on Motivation.* Vol. 13, ed. D. Levine. Lincoln: Univ. of Nebraska Press.

———. 1974a. "Evolutionary Epistemology." In *The Philosophy of Karl R. Popper,* ed. P. A. Schilpp. LaSalle, Ill.: Open Court.

———. 1974b. " 'Downward Causation' in Hierarchically Organized Biological Systems." In *Studies in the Philosophy of Biology,* ed. F. Ayala and T. Dobzhansky. London: Macmillan.

———. 1975a. "On the Conflicts between Biological and Social Evolution and between Psychology and Moral Tradition." *American Psychologist* 30: 1103–26. Reprinted 1976 in *Zygon: Journal of Religion and Science* 11: 3 (September).

———. 1975b. "The Conflict between Social and Biological Evolution and the Concept of Original Sin." *Zygon: Journal of Religion and Science* 10:234–49.

———. 1979. "Comments on the Sociobiology of Ethics and Moralizing." *Behavioral Science* 24:37–45.

———. 1983. "The Two Distinct Routes beyond Kin Selection to Ultra-sociality: Implications for the Humanities and Social Sciences." In *The Nature of Prosocial Development: Interdisciplinary Theories and Strategies,* ed. D. L. Bridgeman. New York: Academic Press.

———. 1990. "Levels of Organization, Downward Causation, and the Selection-Theory Approach to Evolutionary Epistemology." In *Scientific Methodology in the Study of Mind: Evolutionary Epistemology,* ed. E. O. Tobach and G. Greenberg. Hillsdale, N. J.: Lawrence Erlbaum.

Dawkins, R. 1976. *The Selfish Gene.* New York: Oxford Univ. Press.

Eberhard, W. 1967. *Guilt and Sin in Ancient China.* Berkeley: Univ. of California Press.

Gilkey, L. 1969. *Naming the Whirlwind: The Renewal of God-language.* Indianapolis, Ind.: Bobbs-Merrill.

Ginsberg, M. 1944. *Moral Progress.* Glasgow: Jackson.

Gould, S. J., and R. Lewontin. 1984. "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Program." In *Conceptual Issues in Evolutionary Biology,* ed. E. Sober. Cambridge, Mass.: MIT Press.

Guetzkow, H. 1961. "Organizational Leadership in Task-oriented Groups." In *Leadership and Interpersonal Behavior,* ed. B. Bass and L. Petrullo. New York: Holt, Rinehart & Winston.

Haldane, J.B.S. 1932. *The Causes of Evolution.* London: Longmans Green.

Hamilton, W.D. 1964. "The Genetical Evolution of Social Behavior." *Journal of Theoretical Biology* 7: 1-52. Reprinted 1971 in *Group Selection,* ed. G.C. Williams. Chicago: Aldine.

Olson, M. 1968. *The Logic of Collective Action.* New York: Schocken.

Paley, W. 1802. *Natural Theology: Or Evidence of the Existence and Attributes of the Diety, Collected from the Appearances of Nature.* London.

Ray, J. 1691. *The Wisdom of God Manifested in the Works of Creation.* London.

Richards, R.J. 1987. *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior.* Chicago: Univ. of Chicago Press.

Sober, E. 1984. *The Nature of Selection: Evolutionary Theory in Philosophical Focus.* Cambridge, Mass.: MIT Press.

Swanson, G.E. 1960. *The Birth of the Gods.* Ann Arbor: Univ. of Michigan Press.

Thayer, M.L. 1989. "Ideas of Death and Afterlife in Pre-Buddhist China." M.A. thesis, Department of Asian Studies, Seton Hall University.

Trivers, R.L. 1971. "The Evolution of Reciprocal Altruism." *Quarterly Review of Biology* 46(4):35-57.

Waddington, C.H. 1960. *The Ethical Animal.* London: Allen & Unwin.

Westfall, R.S. 1958. *Science and Religion in Seventeenth-Century England.* New Haven, Comm.: Yale Univ. Press.

Williams, G.C. 1966. *Adaptation and Natural Selection.* Princeton, N.J.: Princeton Univ. Press.

Wilson, D.S. 1983. "The Group Selection Controversy: History and Current Status." *Annual Review of Ecology and Systematics* 14:159-87.

Wilson, D.S., and E. Sober. 1989. "Reviving the Superorganism." *Journal of Theoretical Biology* 136: 337-56.

Wilson, E.O. 1968. "The Ergonomics of Caste in the Social Insects." *American Naturalist* 102:41-66.

———. 1978. *On Human Nature.* Cambridge, Mass.: Harvard Univ. Press.