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Hayek contra Pangloss on Evolutionary Systems

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Abstract. Some analysts have criticized Friedrich Hayek's theory of cultural evolution for implying that the rules, customs, norms, and institutions that emerge from the evolutionary process are necessarily efficient or desirable in all cases. This charge is unfounded. The present article defends Hayek versus his critics in two ways: First, it restates Hayek's own objections to the idea that cultural evolution produces optimal outcomes. Second, it shows, through an analogy with biological evolution, that Hayek's theory need not imply any such conclusion. Contrary to a widely held misconception, biological evolution does not produce organisms that are perfectly adapted to their habitats; insofar as cultural evolution shares common features with biological evolution, cultural evolution may be expected to display similar types of suboptimality or mal-adaptation. Insights from the theory of biological evolution also help to illuminate some areas of controversy with regard to Hayek's theory of cultural evolution, including: Hayek's advocacy of gradual change; the question of what selective forces drive the process of cultural evolution; and the alleged conflict between group selectionism and methodological individualism.

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1. Introduction

Nearly all of the political and economic doctrines of Friedrich Hayek have drawn heated criticism from one quarter or another, but few have attracted so much critique and rebuke, from authors of diverse persuasions, as his theory of cultural evolution. The idea that the morals, customs, habits, conventions, and even laws of modern civilization may owe their origin to a lengthy process of variation, competition, and selection has a long—and sometimes unsavory—history in intellectual thought, and Hayek was by no means its first exponent. He may, however, be credited with reviving the concept as a serious tool for social theory and normative judgment in the latter half of this century, and his most evolutionarily oriented works, *the Fatal Conceit* (1988) and *Law, Legislation and Liberty* (1973, 1976, 1979), have served as a lightning rod for renewed discussion of the merits and flaws of evolutionary theory in the social sciences.

Among the most frequently repeated charges lodged against Hayek's theory of cultural evolution is that Hayek, like the Social Darwinists, has committed the Panglossian fallacy: he has suggested or implied that social evolution must necessarily produce the best of all possible worlds, a world in which "whatever is, is desirable," or (to put the economists' spin on it) "whatever is, is efficient."[2] John Gray (1989: 98), for instance, claims that "Hayek frequently affirms that the sheer persistence of a tradition or a form of life suggests that it must possess some general utility." Martin De Vlieghere (1994: 293) characterizes Hayek as contending that "only those cultural attainments can survive and spread that are beneficial. So, the very longevity of an institution proves its value. . . ." According to Stefan Voigt (1992: 465, n.20), Hayek commits the naturalistic fallacy in his support of evolved institutions: "The currently existing institutions (the 'is') have emerged because they have

been more viable than other institutions, from which Hayek concludes that they ought to exist."

In the economists' camp, Joseph Stiglitz (1994: 275) argues that "those who appeal to the evolutionary process [e.g., Hayek and Armen Alchian] also claim too much: There is no reason to believe that evolutionary processes have any optimality properties. . . ," and he goes on to say, "It seems nonsensical to suggest that we should simply accept the natural outcome of the evolutionary process." James Buchanan, an author usually friendly to Hayekian themes, nonetheless perceives Hayek as being adamantly opposed to all reform of evolved institutions. "We may share much of Hayek's skepticism about social and institutional reform, however, without elevating the evolutionary process to an ideal role," says Buchanan (1975: 194, ch. 10, n.1). "Reform may, indeed, be difficult, but this is no argument that its alternative is ideal." Sociologist Bjorn Hallerod (1992: 34) is notably less sympathetic. He argues that "Hayek ends up in a situation where every existing form of society is a good society or otherwise it would not exist," which means that Hayek must find even Nazism acceptable.

The critiques have been severe and sometimes overstated, but they are in substance correct: evolutionary systems cannot be characterized as unambiguously efficient or desirable (however these terms might be defined) in their effects. Where Hayek's critics err is in directing these criticisms at Hayek. Hayek's theory can be faulted in a variety of ways, but Panglossianism is not one of them.

My intention in this article is two-fold: first, to restate for the record Hayek's rejection of the idea that cultural evolution necessarily produces optimal results; and second, to elaborate some of the reasons why his theory need not imply any such thing. I will conclude by explaining how a better understanding of suboptimality in evolutionary systems can illuminate some areas of controversy that have arisen with regard to Hayek's theory.

The second goal will be pursued via an extended analogy with biological evolution. This approach may require some justification. It is my impression that many opponents of cultural evolution theories assume Panglossian implications because of a conscious or unconscious analogy with biological evolution, which is widely—and incorrectly—perceived as a process that produces optimal fitness in organisms relative to their habitats. Gray (1989: 98), for example, states as an objection to Hayek's theory, "we have nothing in society akin to the mechanism of natural selection of genetic accidents in Darwinian theory which guarantees the survival of useful social practices," as though he believes biological natural selection does make such a guarantee. My response, then, proceeds by showing that, even if the analogy between biological and cultural evolution is close (and the analogy does seem closer to me than many analysts would like to admit), biological evolution does not and cannot produce optimal results in all cases. Insofar as cultural evolution shares common features with biological evolution, it, too, will be subject to inefficiency.

Although Hayek often tries to distance himself from the analogy with biological evolution, he apparently does so not mainly because he doubts the analogy's validity, but because he wishes to eschew the errors of the Social Darwinists. Hayek repeatedly emphasizes that Darwin's theory of biological evolution was inspired by the evolutionary thinking of the moral and social theorists who preceded him (particularly David Hume, Adam Smith, and the other Scottish moral philosophers).[3] After Darwin, Hayek (1979: 154) laments, "those

'social Darwinists' who had needed Darwin to learn what was an older tradition in their own subjects, had somewhat spoiled the case [for cultural evolution] by concentrating on the selection of congenitally more fit individuals," rather than on the selection of rules and practices adopted by groups. Hayek hastens to point out the differences between cultural and biological evolution that make it the case that rules and practices are far more significant than individuals in the process of cultural evolution. Specifically, he notes that "cultural evolution *simulates* Lamarckism"; that cultural traits can be acquired "from an indefinite number of 'ancestors,"' not merely from one's parents; that learning as a mode of transmission makes cultural evolution occur more quickly than biological evolution; and that cultural evolution is more likely to be subject to group selection (1988: 25). Nonetheless, Hayek recognizes that while their specific mechanisms differ, all forms of evolution share common features. Although the "literal use" of Darwinian theory leads to "grave distortions" when focused upon individuals rather than rules, "the basic conception of evolution is still the same in both fields," he says (1979: 23). Biological and cultural evolution "both rely on the same principle of selection: survival and reproductive advantage. Variation, adaptation and competition are essentially the same kind of process, however different their particular mechanisms, particularly those pertaining to propagation."[4] Again, to the extent that cultural and biological evolution are united by kindred processes, they can be expected to exhibit similar characteristics, including their capacity to produce efficient and less-than-efficient outcomes.

In much of this article, I will be purposely vague about the definition of efficiency. Even within economics, efficiency has been defined in a variety of ways, from strict Pareto efficiency to wealth maximization. The standards by which the efficiency of rules and institutions are judged sometimes differ from the standards employed to judge efficient activity within given rules and institutions; for example, when Hayek speaks of the efficiency of rules, he usually seems to have in mind the degree to which rules promote the utilization of knowledge and the coordination of plans. Biologists typically employ the concept of "reproductive fitness," by which they mean the capacity of traits to increase the probability of an organism surviving long enough to reproduce as effectively as possible subject to environmental constraints. In general, all such concepts of efficiency are related to the idea, broadly conceived, of "doing the best you can given certain constraints," and fortunately, the point I wish to make does not require any greater specificity. I will contend that, whatever specific definition of efficiency may be adopted, an evolutionary system could not be expected to achieve it in all cases, although some brands of efficiency may be more easily approached than others.

2. F. A. Hayek: No Panglossian

By all indications, Hayek was fully aware of the "all's for the best" charges that might be leveled against his theory. He was particularly concerned with the tendency of some social theorists to reject all evolutionary theories of culture out of hand because of the errors of Social Darwinism. His disclaimer is therefore worth quoting at length:

> Bertrand Russell provides a good example in his claim that "if evolutionary ethics were sound, we ought to be entirely indifferent to what the course of evolution might be, since whatever it is is thereby proved to be the best". . . . This objection, which

> A. G. N. Flew . . . regards as "decisive," rests on a simple misunderstanding. I have no intention to commit what is often called the genetic or naturalistic fallacy. I do not claim that the results of group selection of traditions are necessarily "good"—any more than I claim that other things that have long survived in the course of evolution, such as cockroaches, have moral value (Hayek 1988: 27).

Nor does he claim that the products of cultural evolution should be immune to criticism or change; again, it is best to quote Hayek directly:

> It would be wrong to conclude, strictly from such evolutionary premises, that whatever rules have evolved are always or necessarily conducive to the survival and increase of the populations following them. . . . Recognizing that rules generally tend to be selected, via competition, on the basis of their human survival-value certainly does not protect those rules from critical scrutiny (Ibid.: 20).

Notably, Hayek believes that the cultural selection process selects for survival and reproduction of groups (a questionable hypothesis that will be considered later), yet *even by that criterion of efficiency*, the resulting rules cannot be assumed to be efficient. It would be particularly odd, then, for those rules to be efficient according to some other standard, such as neoclassical economic efficiency or classical liberal value judgments.

The above quotations appear in Hayek's latest work, but they do not represent retrenchments in the face of criticism of Hayek's previous works; the same message appears repeatedly in his earlier works. In the *Constitution of Liberty*, for instance, we find Hayek admitting,

> These considerations, of course, do not prove that all sets of moral beliefs which have grown up in a society will be beneficial. Just as a group may owe its rise to the morals which its members obey, . . . so may a group or nation destroy itself by the moral beliefs to which it adheres (Hayek 1960: 67).

Of course, this statement could be interpreted as merely a view of selectionism-in-progress, in that "bad" moral views are characterized as leading inevitably to their own demise. The point, however, is that Hayek does not perceive the process as finished: at any point in time, including the present day, we may find undesirable rules and customs that have not been weeded out by selective forces, at least not yet. Hayek never eschews the modification and reform of rules; he simply points out that any such revision of particular rules must necessarily take place in the context of a complex of other rules that are taken as given for the time being: "This givenness of the value framework implies that, in our efforts to improve them, we must take for granted much that we do not understand" (Ibid.: 63).

In *Law, Legislation and Liberty*, Hayek again emphasizes the need for reform of established rules—this time in the context of a narrower evolutionary system, the common law.

> The fact that law that has evolved in this way has certain desirable properties does not prove that it will always be good law or even that some of its rules may not be very bad. It therefore does not mean that we can altogether dispense with legislation (1973: 88).

Indeed, Hayek (Ibid.: 89) even admits the possibility that general principles of justice (embodied in the remainder of the body of law) may " require the revision not only of single rules but of whole sections of the established system of case law."

These are not the statements of a Panglossian. But neither do they suffice to shield Hayek's theory from the charge that it implies that whatever exists is the best of all possible worlds; Hayek's objections notwithstanding, his theory may have implications beyond his words. The question is, does an evolutionary theory unavoidably lead to Panglossian conclusions? In answering this question, we can gain insights by taking a closer look at the well-developed evolutionary theory of another field: biology.

3. The Flaws of the Adaptationist Paradigm

Evolutionary biologists have, unfortunately, contributed in part to the misconception that evolutionary systems must yield optimal results. Particularly in the early days of biological evolutionary theory, biologists could be found using Spencer's phrase "survival of the fittest," and that phrase has proved more than a little misleading. Biologists of the "pan-adaptationist" stripe have perpetuated the idea that all traits of all extant organisms may be construed as optimizing those organisms' fitness relative to the environment. Even modern biologists occasionally slip into this way of thinking; consider the following passage from biologist Ledyard Stebbins:

> . . . all modern species and races of organisms have existed as successful populations, well adjusted to their environment, for thousands or millions of generations. We would expect, therefore, that all mutations that might improve the organism's reproductive fitness to its particular environment would have occurred at least once during this long period. If so, they would have been incorporated by natural selection in the gene pool (Stebbins 1977: 58).

From statements like this one, it would be easy—but wrong—to draw Panglossian conclusions. Although extreme adaptationism reigned for a while in the biological literature, most biologists (including Stebbins) now reject pan-adaptationism (Vromen 1995: 95f.).

Two highly problematic assumptions are required to justify evolutionary theories of the pan-adaptationist variety. The first is the "t goes to infinity" assumption: evolutionary processes are presumed to have reached the ultimate result that would obtain if the processes continued for an infinite period of time. The paradigmatic example is the anecdote about 100 monkeys (actually, just one would do) pounding on typewriters for an unlimited amount of time: sooner or later, one of the monkeys will type out the entirety of *Gone With the Wind*. If the t-goes-to-infinity assumption is taken seriously, the logic is inexorable; every combination of letters (or gene/trait combinations, or cultural taboos) will eventually appear. Everything that *can* happen *will* happen, so an appropriate selection mechanism will presumably capture the best of all possible worlds. In real-world processes, however, infinite time is never the case, at least not from the perspective of an analyst observing the products of evolution at any given point in time. From our perspective, evolution is an ongoing process, and we should not be surprised to find incomplete—and suboptimal—adaptation. The assumption of infinite time bypasses considerations of process altogether.

Indeed, it is tempting to argue that, once infinite time is presumed, the optimal result is implicit in the initial conditions, in much the same way that the solution to a system of equations is implicit in the equations themselves. I will resist that temptation, however, because a second assumption is necessary for that conclusion: a stable, exogenous environment against which selection takes place. The environment is, of course, the standard on the basis of which adaptation (and optimality) is usually measured; in most theories, the environment is actually the selective mechanism. When the environment is stable and exogenous, the adaptive "target" remains fixed, and infinite time assures the process will eventually achieve it. But with a moving target, even infinite time cannot force a conclusion of optimal adaptation. As J. Maynard Smith (1994: 97) has pointed out, "Optimization is based on the assumption that the population is adapted to the contemporary environment, whereas evolution is a process of continuous change. Species lag behind a changing environment." In other words, one cannot assume perfect tracking of environmental changes by changes in the genome of resident species. Even if time were infinite, the protean nature of the environment would restrict the relevant adaptation time for any organism to the interval between changes in its environs.

The endogeneity of the environment complicates the matter even further, by raising the possibility that the definition of a "good" mutation may depend crucially upon prior mutations. The appearance of a new, desirable trait in a species causes changes in the environment, and those changes alter the selective pressures impinging on the species—possibly rendering other prevailing traits non-adaptive. One puzzling consequence of such a path-dependent process is that fitness may not be transitive: trait *B* might supersede trait *A*, and *C* supersede *B*, and then *A* supersede *C* (Wesson 1991: 141). If changes in the traits of an organism can shape the environment as well as be shaped by it, the very idea of optimal adaptation gets murky because it is unclear that a steady-state relationship between organism and environment will always occur.

The twin assumptions of infinite time and stable environment underpin the usual case for optimality in evolutionary systems. When they are relaxed, we can understand a variety of actual phenomena in such systems as being non-adaptive or mal-adaptive, rather than dream up *ad hoc* justifications of how such phenomena might be optimal (as modern biologists have unfortunately tried to do in many cases[5]). This is true even when "adaptiveness" or "efficiency" has been defined specifically in terms of the environment that acts as a selective mechanism upon traits and organisms. That is, even if we specifically tailor our definition of efficiency to fit the direction of the evolutionary forces at work, we still cannot realistically expect perfectly efficient outcomes. *A fortiori*, we should not expect an evolutionary system to yield efficient outcomes with respect to some other brand of efficiency defined independently of the selective forces at work (except, perhaps, purely by coincidence).[6]

In what follows, I will explain some of the most widely recognized types of less-than-perfect adaptation in biological evolution. In addition to mentioning specific cases of such suboptimalities in biology, I will also provide some examples of how similar suboptimalities might occur in cultural evolution. Where possible, I draw my examples from Hayek himself. These examples should, however, be taken with a grain of salt: they are intended as suggestive, not definitive. A convincing case for why any one of the examples given

indeed constitutes an example of suboptimal adaptation would probably require an article of its own.

3.1. Errors of Omission, Errors of Commission

Naturalists regularly encounter organisms with traits that defy attempts at explanation in terms of adaptation to prevailing environmental conditions. Often the best explanation for such traits comes from an examination of the organisms' phylogenetic histories (even though optimality would imply that current conditions alone should provide sufficient explanation). Apparently, selective forces are not always strong enough to remove all unnecessary or harmful traits from a genome in a finite period of time. The best examples are the so-called "vestigial structures" that appear in numerous species, including human beings. Vestigial structures in humans include the vermiform appendix (may have been a gizzard in our ancestors), ear muscles (needed for directional hearing), and caudal vertebrae (used to be a tail).[7] None of these features provides any apparent selective advantage any longer, and appendices often require removal when they pose a positive danger to human life; they are actually mal-adaptive. These traits constitute errors of omission: they are features that selective forces have failed to eliminate.

It is not terribly difficult to imagine possible analogs in cultural evolution. Although Hayek often fails in his works to explain *why* the processes he describes may not always yield optimal results, he seems to have recognized the persistence of no-longer-adaptive traits as one possible reason. In *Law, Legislation and Liberty*, Hayek notes that mankind maintains multiple layers of rules, "according as [sic] traditions have been preserved from the successive stages through which cultural evolution has passed. The consequence is that modern man is torn by conflicts which torment him and force him into ever-accelerating further changes" (1979: 159). Hayek harks back to the conflict between new and old rules in *the Fatal Conceit* (1988: 18f.) when he attributes the collectivist desire to implement altruism society-wide to a misapplication of the morals of the small group (which evolved very early in humanity's cultural history) to the extended order called civilization (whose rules developed later, and often in conflict with the prior set of rules).

Biology also provides various cases in which traits that would clearly be beneficial are conspicuously absent. Smith cites the *sula bassana* gannet, which lays only one egg at a time, even though it would be capable of raising (and the environment capable of sustaining) two young at a time. A related gannet in very similar conditions does, in fact, lay two eggs at a time (Smith 1994: 98). Why, then, doesn't the *sula bassana*? Two answers seem plausible: first, that the environment has changed recently in a more favorable direction and the gannet's genome has not caught up yet; or second, such a mutation may have appeared one or more times but been eliminated by accident (say, because the one chick with the mutation happened to fall out of the nest and die before reproducing). The second scenario would constitute an error of commission, a case of selective forces accidentally eliminating a desirable trait. In either scenario, the fact remains that evolution has not placed all adaptive traits in the current genome.

Again, it is not difficult to imagine analogs in cultural evolution. Of course, many suggestions of "beneficial traits we haven't adopted" may be nothing more than the wishful

thinking of social reformers or cultural entrepreneurs, but this observation does not mean that truly beneficial but unused or untried cultural traits cannot exist. Hayek admits this possibility with a particular example: "The institutions of property, as they exist at present, are hardly perfect; indeed, we can hardly yet say in what such perfection might consist. Cultural and moral evolution do require further steps if the institution of property is in fact to be as beneficial as it can be" (1988: 35). Some might argue that property rules and other customs and conventions are perfect as they are, but a belief in the idea of cultural evolution certainly would not warrant such a conclusion. There is every reason to believe that cultural evolution can produce errors of omission and commission just as does biological evolution.

3.2. Linkages and Pleiotropism

Students of biological evolution have long been familiar with the fact that traits often travel together in packs, even when there is no apparent adaptive advantage to the traits appearing together. This may occur, for instance, when two or more genes are located very close to each other on a chromosome so that it is unlikely that they will be separated during crossing-over (the process in sexual cell division whereby chromosomes exchange sections, thus creating a greater variety of gene combinations). It may also occur in organisms in which crossing-over does not take place, such as in male fruit flies and some bacteria; in cases like these, the entire chromosome is the smallest unit of selection. In such situations, it becomes possible for non-adaptive or mal-adaptive traits to tag along with traits of high adaptive value, a phenomenon P. W. Hendrick calls "genetic hitchhiking" (Dodson and Dodson 1985: 212).

Linkages between traits may also occur when a single regulator gene (a gene that activates or otherwise regulates the activities of other genes) turns a number of genes "on" or "off" as a group. If some of those genes confer substantial advantages, the unfortunate effects of other genes in the group may be outweighed. Some biologists suspect that a small number of mutations in regulator genes may have yielded the vast phenotypic differences that separated human beings from their ape-like ancestors; as Robert G. Wesson (1991: 272) puts it, "Hairlessness, tender skin, and exceptional intelligence seem all to be parts of an evolutionary package, elements of which are evidently unadaptive." Similar linkages may occur because of a pleiotropic gene, a single gene that causes multiple effects. An example of a pleiotropic gene is the gene for sickle cell anemia, which, in addition to its well-known harmful effects, provides some degree of protection against malaria (Stebbins 1977: 126).

It might be argued that some linkages are unavoidable, and it is therefore optimal for an organism to have linked traits so long as the good outweighs the bad (since optimal means only the best of all *possible* worlds). This is probably true of pleiotropic genes, and possibly true for regulator-complexes. Linkage by proximity, on the other hand, is clearly a matter of historical accident. The relevant question is, do these traits need to be connected? Are there no other formations or combinations of genes that could separate good from bad effects? If the answer is no, then the existing situation must be considered suboptimal.

Cultural analogs leap to mind. It is clear enough that many ideas and practices travel in groups, even though they could theoretically be separated. Religions, for example, are

complex structures that comprise multiple beliefs and mores. One might expect a religion to persist if it provided sufficient selective advantages to outweigh any disadvantages involved. On this subject, Hayek argues:

> Customs whose beneficial effects were unperceivable by those practising them were likely to be preserved long enough to increase their selective advantage only when supported by some other strong beliefs; and some powerful or magic faiths were readily available to perform this role (1988: 138).

Fantastic beliefs about the nature of the world might, therefore, piggyback on beneficial religious practices. Such beliefs could be disadvantageous because they impede the acquisition of more accurate and scientific models of nature, yet survive because they facilitate useful modes of behavior. (What constitutes a selective advantage or disadvantage in cultural evolution is, of course, an open question—one that will be partially addressed later.)

Another case of linkage in cultural evolution might arise from the fact that the growth of government power could have both beneficial and harmful consequences. As Hayek observes,

> Those [governments] that gave greater independence and security to individuals engaged in trading benefited from the increased information and larger population that resulted. Yet, when governments became aware how dependent their people had become on the importation of certain essential foodstuffs and materials, they themselves endeavoured to secure these supplies in one way or another (1988: 44).

Consequently, security of trade routes and abuse of power have tended to travel together, although whether they can ever be separated is an open question.

3.3. Evolution by Chance and Evolutionary Trends

Evolutionary change can also take place simply by chance, particularly in small, isolated populations. In a small population, the death of a single individual can have large repercussions in terms of gene frequencies. Over several generations, these random effects can drive out genes and reduce the variability of the population's genome (Sober 1994: 486). Random genetic changes can also accumulate over time with almost no effect, until a marginal mutation, such as the emergence or disappearance of a regulator gene, causes substantial changes to take place all at once. Most importantly, chance selection explains why adaptive mutations could appear yet fail to spread. Stephen J. Gould and Richard Lewontin (1994: 82) observe that "new mutations have a small chance of being incorporated into a population, even when selectively favored. Genetic drift causes the immediate loss of most new mutations after their introduction." In short, chance can provide the basis for the activation of complexes of linked genes and magnify the incidence of errors of commission.

A well-known, though trivial, cultural example of this phenomenon is the shrinking of the pool of surnames within small villages in New England, Wales, and elsewhere (Stebbins 1977: 127f.). When a new settlement was established by a small number of founders, the chance death of a single person could substantially reduce the frequency of the victim's

surname in the population, even though the surname itself had no selective impact. Whether there exist non-trivial examples of chance selection in cultural processes depends in part on the level at which selection takes place. If group selection (as opposed to individual selection) is an actual phenomenon—as Hayek believed it to be—then some form of cultural drift should become more likely as groups become larger in size and fewer in number. To the extent that the entire world may be considered a single community, the relevant population has only a single member, and drift could therefore be quite dramatic. (The debate about levels of selection is a live issue in biological evolution as well as in cultural evolution that will be discussed more fully later.)

Biologists have also observed that selective processes can sometimes lead to the persistence and enlargement of trends; that is, a kind of evolutionary multiplier effect may cause the same mutation to occur again and again. Suppose gene *A* creates cellular conditions under which mutation *B* is likely to occur. Then an organism with gene *A* will tend to have progeny that carry both gene *A* and mutation *B*. If *B* has a selective advantage, then the progeny will be likely to survive and create progeny of their own that carry gene *A* and mutation *B twice*. And the next generation may have gene *A* and mutation *B thrice*. The phenomenon occurs because the same forces that favor a trait (mutation *B*) must also favor the genetic conditions that make the trait likely to occur in the first place (gene *A*). Possible examples include the multiplication of legs on the millipede and the growth of the brain in humans (Wesson 1991: 194). A possible example of trend persistence in cultural evolution, which seems in keeping with Hayek's previously cited suggestions about the abuse of government power, is that the forces which favor groups that solve certain coordination or public good problems may also favor the growth of institutions or attitudes that allow for these social solutions to be reached. (The institutions or attitudes that allow the solutions to be reached are analogous to "gene *A*"; the solutions themselves are analogous to "mutation *B*".) Selective forces may therefore reinforce cultural attitudes that favor an increase in social control, even though only specific forms of social control yield a selective advantage.

3.4. Multiple Adaptive Peaks

Finally, biologists have also recognized the possibility that an organism may follow multiple routes in its adaptation to an environment. It is by no means certain that all routes must lead to the same end point; there may be different end points that represent the highest adaptability of an organism along the different paths. Such end points are referred to as "multiple adaptive peaks" (Gould and Lewontin 1994: 84). Which path is "chosen" may depend crucially on the order in which mutations occur. A beneficial mutation may arise early on in the phylogenetic history of a species and be incorporated into its genome. Then, subsequent mutations' "fitness" will depend on how well they fit with the organism's new genome. Thus, an early mutation may place an organism on a path to one adaptive peak rather than another as a result of historical accident.

A number of economists have observed the evident connection between the idea of multiple adaptive peaks and the game-theoretic concept of a coordination game. (Many of these economists owe much to J. Maynard Smith, who pioneered the use of game-theoretic tools in biology.) Viktor Vanberg (1986: 93) has used game theory to offer a sharp critique of

Hayek's theory of cultural evolution, noting that "once a coordination rule is established in a group, it cannot be assumed that a shift to a more beneficial rule can, in general, be brought about by a spontaneous, invisible-hand process." To put that in biological terms, switching from one adaptive peak to another is an extremely unlikely phenomenon, even if one peak is demonstrably superior to the other. If a species reaches an adaptive peak that is not sufficient to preserve the species in the relevant environment, it seems more likely that it will go extinct than switch to a different evolutionary path. If, on the other hand, a suboptimal peak is sufficient for species survival, then the species could persist indefinitely in a less than optimal state.

Despite Vanberg's criticism, Hayek seems to have been aware of the possibility of multiple adaptive peaks; indeed, Hayek's cultural relativism (which may seem inexplicable to those who interpret Hayek as a Social Darwinist) is intimately related to the concept. Hayek does not deny the fact that some cultures have developed in completely different directions from that of Western civilization and yet somehow managed to survive:

> There are, undoubtedly, many forms of tribal or closed societies which rest on very different systems of rules. All that we are here maintaining is that we know only of one kind of such systems of rules, undoubtedly still very imperfect and capable of much improvement, which makes the kind of open or "humanistic" society possible where each individual counts as an individual and not only as a member of a particular group, and where therefore universal rules of conduct can exist which are equally applicable to all responsible human beings (1976: 27).

Hayek deliberately argues, therefore, from the context of the adaptive route taken by Western civilization, and he argues for internal improvement within that system.

Hayek also recognizes the possibility that, even within a given tradition, path dependency may result in suboptimal consequences for particular subsets of that tradition. In the common law, for example, he points out that "The development of case-law is in some respects a sort of one-way street: when it has already moved a considerable distance in one direction, it often cannot retrace its steps when some implications of earlier decisions are seen to be clearly undesirable" (1973: 88). In situations like these, we find Hayek once again arguing for the occasional corrective reform, which would be unnecessary in a perfectly self-correcting (or instantaneously optimal) evolutionary system.[8]

4. Broader Implications for the Theory of Cultural Evolution

Biological evolution does not provide any justification for the belief that evolutionary processes necessarily lead to optimal results. But neither does it support the opposite conclusion, that evolutionary systems exhibit no desirable or efficient qualities whatsoever. Outrageously mal-adaptive traits have a high likelihood of being weeded out of the gene pool, and the organisms we observe in the natural world have clearly inherited remarkably sophisticated and effective structures and behaviors that allow them to survive and reproduce. The adaptiveness of at least a large number of traits observed in existing organisms has never been in question; what is in question is whether such traits represent the best solutions possible in all cases, and whether every single trait must serve some adaptive purpose.

As Wesson has observed, "It is only necessary, however, that any particular characteristic be sufficiently functional to permit the species to survive. If there is an optimal shape of leaf for certain conditions of light and humidity, or webs for snaring flies, and so forth, most species are far from it" (1991: 154). The challenge for biologists, then, is to discern which traits took hold for truly adaptive reasons, which traits emerged for other reasons, and how such emergence took place.

The challenge for the evolutionary social scientist, I claim, is much the same. If evolutionary theory told us that all existing laws, customs, conventions, and mores were optimal adaptations to the conditions of human life, there would be little left to do but look around and describe what is already known to be best. But since evolutionary theory does not justify that conclusion, the social scientist's task is more difficult: he must attempt to identify which cultural norms possess truly adaptive qualities, which cultural norms emerged and persisted for non-adaptive reasons (and which may even have mal-adaptive effects), and how these norms came into being.

Evolutionary theory can, therefore, provide a sound basis for both advocacy of reform (when structures appear mal-adaptive or detrimental in some way) and for the defense of tradition (when the traditions seem to produce desirable results on net, or when they may be indispensable to the ongoing system as a whole). (Of course, to engage in such internal criticism, one would have to approve, normatively, of whatever standard of "efficiency" is implicit in the selective forces at work—which Hayek appears to do.) That we should keep "good" traditions and change "bad" ones might seem truistic, but some of Hayek's critics have accused him of inconsistency in so arguing. De Vlieghere (1994: 294), for instance, calls Hayek's advocacy of piecemeal reform "lip-service" because it is "in contradiction with his Darwinian theory" which devalues the contributions of reason. Similarly, Barbara M. Rowland (1987: 54) says that Hayek "inconsistently" draws the conclusion "that people can learn from studying the valuable role evolved institutions have played in advanced societies" so that reforms will fit smoothly into the evolved order. But as we have seen, Hayek's reformist and traditionalist tendencies present no contradiction; they are perfectly consistent if viewed from an appropriate evolutionary perspective.

These statements should not be taken to imply, however, that Hayek's theory of cultural evolution has no flaws or drawbacks. Indeed, the criticisms and doubts about Hayek's theory are too numerous to state here.[9] I will instead show how the biological metaphor and a recognition of the possibility of suboptimality in evolutionary systems can help us to address some unresolved issues associated with Hayek's approach.

4.1. Gradualism

One conclusion that Hayek has drawn from his evolutionary analysis is that gradual or piecemeal change ought to be preferred to radical or wholesale change. At first, this conclusion appears to fit in with the evolutionary paradigm nicely. In the biological sphere, Stebbins states, "If an organism is well adjusted to its environment, slight changes in its genetic makeup may alter it better to modifications of that environment, but drastic alterations of one or a few characteristics are almost certain to make it function more poorly under any environment" (1977: 60). In Hayek's view, ill-advised reformers who wish to

jettison rules or conventions whose functions are not immediately clear or whose systemic implications are not understood may seriously threaten the stability of an interdependent system. Hayek therefore advises that all reforms be judged within the context of a complex of other rules taken for the time being as given.

While all these points are well taken, Hayek's plea for gradualism cannot be taken as a universal rule—at least, not on the basis of evolutionary arguments alone. The potential existence of multiple adaptive peaks indicates that a system very different in all respects from the status quo could, conceivably, have more desirable qualities. In order for such a peak to be reached, radical changes might be required. For Hayek to argue against such wholesale reform, he must (and does) muster other arguments that he has elaborated elsewhere. For instance, in his case against socialism, Hayek might like to say that evolutionary considerations alone should be sufficient to relegate socialism to the dustbin of bad ideas. And evolutionary arguments do carry him part of the way to that conclusion, inasmuch as they lead the analyst to consider the functional properties of institutions such as several property and security of contract. But it is not inconceivable, *prima facie*, that the status quo represents but one of many adaptive paths. In order to make the case against socialism, Hayek must also rely on a variety of other tools such as economic theory to demonstrate that socialism could not, in fact, achieve the results its proponents suggest.[10]

Hayek also grounds his argument for gradualism on a strong epistemological challenge: people whose civilization has evolved along one path may simply lack the knowledge necessary to identify viable alternatives that differ substantially from the status quo. That other adaptive paths are conceivable does not imply that ignorant human beings can see what they are and implement them. To theorize that evolution could have led to a different and possibly superior outcome is fine, but to say precisely what that outcome would have been is an act of the imagination, and trying to realize an imaginary outcome in the real world is to engage, not in evolutionary theory, but in rational constructivist design. When proposed changes differ only marginally from the status quo, the imagination can (perhaps) be relied upon for some valid judgments; but in the case of massive system-wide changes, the demands placed on human knowledge are far higher.[11] It was exactly that sort of hubristic endeavor to which Hayek applied the term, "the fatal conceit."

4.2. The Dual Selective Mechanism of Cultural Evolution

There is a great deal of confusion, in both Hayek's work and the literature on cultural evolution in general, about the exact means by which selection takes place in cultural evolution. It is often unclear whether the emergence of cultural norms is a matter of individual and collective choice or purely a product of impersonal environmental factors. An understanding of how evolutionary systems may fail to yield optimality can shed light on this matter.

An evolutionary system consists of two fundamental features: units of selection, and a selective mechanism. The selective mechanism consists of those forces in the system which allow for the differential survival and reproduction of the units of selection. Units of selection are structures or entities that have the capacity to replicate themselves (that is, to reproduce) under certain conditions. In biology, the most fundamental units of selection are

genes (out of which higher level structures such as organisms and species are formed). But if genes are the most basic units of selection in biology, what are the corresponding units of selection in cultural evolution? The smallest units are, in fact, cultural traits or features with the capacity to be adopted, consciously or unconsciously, by human beings. Richard Dawkins dubbed these entities "memes." In his words,

> Examples of memes are tunes, ideas, catch phrases, clothes fashions, ways of making pots or of building arches. Just as genes propagate themselves in the gene pool by leaping from body to body via sperm and eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation (Dawkins 1976: 206).

If memes are indeed the smallest such units, then the psychology and preferences of individuals may constitute significant selective forces, inasmuch as these factors determine which memes can successfully "infect" human minds. "We do not have to look for conventional biological survival values of traits like religion, music, and ritual dancing," Dawkins argues, "though these may also be present" (Ibid.: 214).

The simplest way to grasp this point is to conceive of cultural evolution as a massive hitchhiker trait. The mutations that created the ability of the human brain to imitate, learn, and evaluate obviously had substantial adaptive qualities for the human species, and for that reason they tended to be selected. But such a brain is capable of far more than enhancing an organism's survival and reproduction; this sort of brain can also desire, imagine, and create. The complex of mutations that created the human mind set in motion myriad effects, only a fraction of which necessarily possessed biologically adaptive qualities; the rest just came along for the ride. Biologist Philip Kitcher observes, "All that natural selection may have done is to equip us with the capacity for various social arrangements and the capacity to understand and to formulate ethical rules" (1994: 440). In so doing, natural selection created the conditions for another kind of evolution, cultural evolution, that is only peripherally related to biological factors. The entire process of cultural evolution may be accurately characterized as a playing out of the full implications of a particular genetic configuration—the human brain—that emerged from the process of biological evolution.

Consequently, human culture may be regarded as responding to a dual selective mechanism. On the one hand, the reproductive capacities of units of cultural transmission (memes) are subject to a selective process in terms of their plausibility, attractiveness, utility, and ease of imitation—as determined by the human minds that consciously or unconsciously adopt them. These standards may or may not have anything to do with the memes' capacity to help or hinder the survival and reproduction of human beings in their environments. On the other hand, which cultural traits human beings adopt will often have indirect impacts on human survival and reproduction, and natural selection of an environmental variety will necessarily come into play if the impacts are sufficiently positive or negative. I will refer to selection of the former variety as "psychological selection," and to selection of the latter variety as "environmental selection." I should note that what I am calling environmental selection is the sole selective mechanism at work in biological evolution, while both forms of selection are at work in cultural evolution.[12]

Like any evolutionary process, cultural evolution does not exhibit a strictly linear chain of causality. The feedback generated by selective forces (in this case, psychological and

environmental selection) means that the reason a trait comes into being may differ from the reason a trait persists. Cultural traits come into being because humans are equipped with brains capable of imagining and conceiving of different rules, practices, and ideas. But of the many cultural traits that may come into being, only some will survive both psychological and environmental selection. (Similarly, in biological evolution many traits can come into being via mutation and recombination, but only some will survive the process of selection.)

The two selective mechanisms of cultural evolution need not always work in the same direction. Sometimes they will reinforce each other; other times they may conflict. It is even possible that some cultural traits may run contrary to the apparent demands of environmental selection, because of the overwhelming influence of psychological factors. Cavalli-Sforza and Feldman provide a fascinating example: the decline of birth rates among European women after the onset of industrialization. If child-bearing were a purely genetic disposition passed from mother to daughter, a disposition to limit one's child-bearing would tend to die out in an environment wherein raising more children were possible. Those mothers with a disposition to bear more children would pass that disposition to more future mothers, while those with a disposition to bear fewer children would pass that disposition to fewer future mothers. The fact that the European birth rate diminished indicates that some form of cultural transmission of dispositions had to have been at work; only then could horizontal (intra-generational) and oblique (from one generation to non-offspring members of the next) transmission of dispositions have taken place. That is, the ability of European women to learn a new disposition rather than inherit an old one made a drop in the birth rate possible.[13]

But how could this environmentally mal-adaptive meme have survived the process of environmental selection? The answer lies in recognizing the dual nature of cultural selection. Evidently, the disposition to limit one's pregnancies became psychologically (and financially) appealing to women after industrialization took place in Europe; as a result, the disposition to have more children suffered from a magnified "death" rate, since large numbers of women were abandoning it. Successful memes must survive at this psychological level of selection before the environmental level of selection can even become operative. On the environmental level, the disposition to restrict one's pregnancies might have been expected to lead to its own demise *if* its net effect had been to reduce the number of the disposition's adherents in each generation. But the European population was still, on the whole, rising because of improvements in sanitation, food provision, and other factors. As a result, a meme yielding lower birth rates was enabled to survive despite the selective advantage of higher birthrates in the context of environmental selection.[14]

Perceiving cultural evolution as responding to a dual selective mechanism allows the idea of spontaneous order, a concept to which Hayek devoted a considerable amount of attention, to be more fully integrated into the theory of cultural evolution. A spontaneous order such as a market-based economic system does not respond to or serve the specific, unitary ends of a society; rather, it serves the multiplicitous and largely unknown ends of all the individuals whose transactions create the order. This sort of order is an "abstract order of the whole which does not aim at the achievement of known particular results but is preserved as a means for assisting the pursuit of a great variety of individual purposes" (Hayek 1976: 5). It is not at all clear why an order that serves individuals' multifarious purposes should survive

in an evolutionary system in which survival and reproduction of groups is the only criterion for natural selection (as Hayek sometimes implied). One of the advantages of a spontaneous order is its capacity to mobilize information that is dispersed among many individuals in the order. Among the pieces of information transmitted (or summarized) by this sort of order, in addition to information about technologies and resource supplies, are the subjective tastes and preferences of the participating individuals. The need for such information would be inexplicable if group survival and reproduction were the only selective forces at work; the tastes of individuals would be precisely irrelevant. It is only because there is another type of selection involved—the satisfaction of the psychological demands of human minds—that information about tastes and preferences might be relevant to an adaptive process.

4.3. Group Selection and Methodological Individualism

In explaining his theory of cultural evolution, Hayek embraces the concept of group selection: the idea that cultural traits and behavioral features are naturally selected on the basis of advantages and disadvantages they create for the groups of people who practice them. A number of authors have found Hayek's group selectionism troubling, and Vanberg (1986) argues that group selection conflicts with Hayek's professed methodological individualism. Since the idea of group selection is "theoretically vague, inconsistent with the basic thrust of Hayek's individualistic approach, and faulty judged on its own grounds," Vanberg (1986: 97) contends that group selection ought to be jettisoned to save methodological individualism. Geoffrey Hodgson (1991) agrees with Vanberg that there is a conflict between the two doctrines, but recommends instead that methodological individualism should be abandoned (or at least modified) in order to keep group selection. Some of the insights from the foregoing discussion of the dual selective mechanism of cultural evolution may help to resolve the Vanberg-Hodgson debate.

Vanberg defines methodological individualism as "the guiding principle that aggregate social phenomena can be and should be explained in terms of individual actions, their interrelations, and their—largely unintended—combined effects" (Vanberg 1986: 80). Group selection conflicts with methodological individualism, Vanberg argues, because it attempts to explain cultural norms in terms of the functional roles they play for groups rather than their emergence through individuals' behavior. He proceeds to argue that group selection is a troublesome and flawed concept even in biology, because it is unclear how "altruistic" behavior patterns that benefit groups could possibly survive in the presence of selective pressures that favor "selfish" behavior by individuals. Vanberg says that it seems to be the "dominant opinion among biologists" that the conditions necessary for true group selection "rarely exist in nature" (Ibid.: 69). Interestingly, Vanberg also maintains that methodological individualism was a factor in the development of the theory of biological evolution because it supported a shift "from the species as the theoretical unit to the individual organism as the central unit of analysis" (Ibid.: 80).

Hodgson argues cogently that Vanberg has misconstrued the biological literature on the debate over units of selection. The biological " reductionists" on whom Vanberg relies for support do not contend that the *individual organism* is the most basic unit of selection in the evolutionary process. Reductionists like Richard Dawkins contend, on the contrary,

that selective forces ultimately operate on the smallest units of selection, *genes*. The misleadingly labeled group selectionists, on the other hand, argue that natural selection operates on higher level structures as well. Genes come in complex groups called individual organisms, organisms come in groups called populations, populations comes in groups called species, and so on; and all of these structures, the group selectionists believe, may be subject to weeding and culling by evolutionary forces. "In other words," Hodgson says, " selection operates simultaneously on different types of unit, depending on the time-scale and the type of selection process" (1991: 69). The real debate in biology, then, is not selection of individuals versus selection of groups, but selection of genes versus selection at multiple levels of a hierarchy. To the extent that Vanberg relies on the support of biological reductionism to support methodological individualism, his argument collapses because there is no particular reason to focus on individuals. " Simple reduction to the individual level is unacceptable because the same arguments concerning reduction from groups to individuals apply equally to reduction from individual to gene. To avoid this double standard, one must either accept multiple levels of selection, or reduce everything to the lowest level [i.e., genes] in the manner of Dawkins . . . and Williams" (Ibid.: 71).

Although Vanberg's use of reductionist argumentation is vulnerable to Hodgson's critique, the case for methodological individualism is stronger. In most of his analysis, Vanberg implicitly portrays individuals as units of selection in the evolutionary process. If this were the theoretical basis for methodological individualism, then methodological individualism would indeed be threatened by Hodgson's clarification of the levels-of-selection debate. But the earlier discussion of the dual selective *mechanism* of cultural evolution suggests that the individual human is not merely a unit of selection; the individual human is actually part of the selective mechanism that influences the survival and reproduction of cultural traits (or memes). And it is this fact, I will argue, that is crucial in the case for methodological individualism. In addition, it dissolves the alleged conflict between methodological individualism and group selection, allowing the concepts to co-exist in the same theory.

For the social scientist interested in the process of cultural evolution, the relevant explananda are the cultural norms (including beliefs, rules, behavioral regularities, and institutions) that emerge from that process. In order to understand why some memes have survived and prospered while others have grown rare or disappeared, he must direct his attention to the selective forces that have imposed differential death rates on various cultural practices and beliefs. That means asking, first and foremost, how and why some practices and beliefs were adopted in the first place by human beings and others were not. In other words, it is necessary to enquire into the effects of psychological selection, the first prong of the dual selective mechanism. Then, the analyst must explore the systemic effects that would result from the adoption of certain norms. Such effects might include changes in the constraints that influenced individuals' adoption of those norms in the first place, in which case another round of psychological selection could occur, and the same process could be iterated indefinitely. The systemic effects of norms might also include changes in the capacity of individuals and groups to serve their physiological needs, resulting in population growth or population loss; that is, the second, environmental, prong of the dual selective mechanism could come into play.

It might appear that allowing for two selective mechanisms, instead of just psychological

selection, represents a break from methodological individualism. But there is no contradiction here: the tenets of methodological individualism do not require that social phenomena be explained without reference to the constraints that impinge on individuals' actions. If environmental constraints affect the survival of individuals (and the groups composed of them) in such a way that the norms they practice and the things they believe have a reduced probability of being absorbed by other individuals (either outsiders or subsequent generations), then the environmental prong of the dual selective mechanism is consistent with a methodological approach that explains social outcomes in terms of the actions, choices, and behaviors of individuals.

Notably, in this account individuals are not units of selection upon which selective forces operate, except insofar as an individual may be perceived as a conglomeration of multiple memes and genes. What is essential for a methodologically individualist account of the evolution of cultural outcomes is that individuals constitute a filter (i.e., a selective mechanism) through which memes must pass before they can begin to have systemic effects. Vanberg is correct to chastise Hayek for giving too little attention to this filtering process in his later work: Hayek regularly refers to the unexpected prosperity of groups that "happened to change them [cultural rules] in a way that rendered them increasingly adaptive" (Hayek 1988: 20) while giving little detail about how the individuals in those groups might "happen" to adopt such changes. Vanberg is also correct, therefore, to draw attention to the question of how, for instance, groups of individuals might happen upon appropriate rules for escaping Prisoners' Dilemma-type situations. It is also clear, however, that groups that did—somehow—find solutions to that kind of dilemma (e.g., tit-for-tat or "grudger" strategies) would create advantages for their members over the members of other groups that did not discover similar solutions. In other words, if a set of beneficial social rules can survive the gauntlet of psychological selection, then groups of individuals who adopt those rules will be favored by environmental selection. It is worth pointing out that the psychological gauntlet may not be as difficult to clear as Vanberg suggests, since individuals may be guided as much by an instinct to imitate as by rational optimization. (Hayek contends that that kind of rationality is a product, not a predecessor, of cultural evolution (Ibid.: 21).) Of course, any strategy that survived psychological selection would still have to be capable of surviving environmental selection as well. (That is, it would have to be an "evolutionarily stable strategy," to borrow J. M. Smith's terminology.)

Finally, I should be explicit about how this discussion relates to the issue of group selection. Without necessarily agreeing with the group selectionist hypothesis, it is easy enough to see that group selection is at least not incompatible with methodological individualism, once it is recognized that methodological individualism does not depend upon individual organisms being the (sole) unit of selection. With the methodological issue out of the way, the debate between Vanberg and Hodgson largely disappears. Like the biologists from whom they draw support for their respective positions, Vanberg and Hodgson apparently agree that group selection is a conceivable phenomenon; they merely disagree about its empirical relevance in the world. Opinion on this matter seems to have converged on the position stated by Sober:

> Group selection acts on a set of groups if, and only if, there is a force impinging on those groups which makes it the case that for each group, there is some property of

> the group which determines one component of the fitness of every member of the group.[15]

There remains a debate as to how often these conditions hold, in both biological and cultural evolution. But Vanberg's coordination games and Prisoners' Dilemmas present fine examples of how these conditions could, at least in principle, apply to certain real-world situations faced by human beings. There seems to be some basis, therefore, for Hayek's focus on group selection in his evolutionary theory.

5. Concluding Remarks

The critics of theories of cultural evolution have often chided cultural evolutionists for their alleged belief that "whatever is, is desirable." Although some theorists of cultural evolution (like the Social Darwinists) have in fact reached such conclusions, Friedrich Hayek was not one of them. Repeated statements by Hayek indicate that he did not regard cultural evolution as a perfect process.

Nor does an evolutionary approach justify or imply such a conclusion. The well-developed field of biological evolution provides innumerable examples of how an evolutionary process may fail to produce perfectly adapted organisms. The assumptions of infinite time and constant environments could sustain the idea of perfect adaptation, but these assumptions are untenable. In a real-world evolutionary system, whether of the biological or cultural variety, one should therefore not be surprised to find errors of omission and commission, "hitchhiker" traits, chance selection, trend persistence, and path dependence.

Indeed, such "suboptimal" phenomena in the phylogenetic history of mankind may be responsible for the very existence of cultural evolution. Trend persistence and chance, as well as adaptive selection, led to the formation of a powerful human brain capable of imitation, learning, and cognitive thought. That brain produced multiple effects, only some of which could be considered adaptive on a purely biological level. The other traits merely tagged along, and among those traits was the capacity for desires and preferences—often for things with no discernable adaptive value whatsoever, such as fine art and literature. The very persistence of cultural traits that are non-adaptive (or even mal-adaptive, in the sense of counteracting the demands of environmental selection) constitutes a fantastic error of omission; human beings are constantly engaged in a multitude of costly, energy-consuming activities that add nothing to the reproductive fitness of the species. The species can remain in existence because the biological advantages of having powerful brains—such as providing food, shelter, and clothing—are sufficient to justify the biological burdens of having those brains.

Those burdens include the vast majority of what we call "culture" (and few people would consider them burdens in a pejorative sense of the word). The process of cultural evolution may usefully be treated as responding to two masters. One is environmental selection, meaning the process by which certain cultural traits may lead to the demise or proliferation of those who hold them because they inhibit the production of food, cause the population to shrink, etc. The other is psychological selection, meaning the process by which some cultural traits dwindle and others spread because of their appeal, utility, plausibility, and

capacity for imitation by human minds. Both sets of selective forces are, of course, highly imperfect; both are subject to all of the adaptive limitations imposed by finite time, trait linkage, path dependence, and so on.

When a two-fold selection criterion is fully and explicitly incorporated into Hayek's theory of cultural evolution, the theory can more easily be squared with Hayek's theory of spontaneous order. The idea of a dual selective mechanism also provides a ready defense against the charge that his theory conflicts with the principles of methodological individualism. Stripped of all Panglossian implications, real or imagined by critics, Hayek's theory of cultural evolution may provide a powerful tool for the analyst searching for a critical theory of social development and the growth of institutions.

Notes

1. The author wishes to thank Roger Koppl, Mario Rizzo, an anonymous referee, and participants at the Austrian Economics Colloquium at New York University for their useful comments and suggestions.
2. In Voltaire's novel *Candide*, the eminent Dr. Pangloss maintained that we live in the best of all possible worlds. "It is proved," he said, "that things cannot be other than they are, for since everything is made for a purpose, it follows that everything is made for the best purpose." (Voltaire 1947 [1759]: 20).
3. Hayek (1960: 59); Hayek (1973: 23); Hayek (1979: 154); Hayek (1988: 23f.).
4. Hayek (1988: 26). Indeed, Hayek argues that the same principles are applicable to the study of *all* complex orders: "We understand now that *all* enduring structures above the level of the simplest atoms, and up to the brain and society, are the results of, and can be explained only in terms of, processes of selective evolution. . . " Hayek (1979: 158).
5. See Gould and Lewontin (1994: 78f.).
6. Examples of types of "efficiency" defined independently of the selective forces at work might include conformity to an aesthetic standard, or consistency with an ideological viewpoint such as classical liberalism.
7. Dodson and Dodson (1985: 213).
8. The fact that detrimental path dependence is possible in an evolutionary system does not necessarily mean it is common. Some of the most famous examples of detrimental path dependence in economics, such as the alleged inferiority of the QWERTY keyboard, have turned out to be unfounded. See Liebowitz and Margolis (1990).
9. See Kley (1994) for examples.
10. This does not mean that a socialist system could not be created in the first place, only that it could not work the way its proponents suggest it would. As noted earlier (in section 3.1), an evolutionary system is capable of a form of retrogression when no-longer-adaptive traits have been superseded but not weeded out. Hayek attributes the collectivist impulse behind socialist schemes to a misapplication of small group morals to the extended order that evolved later.
11. The Eastern European economies that are attempting to transform themselves into market economies after the socialist experiment may face similar problems of trying to implement a "jump" from one path to another. They have the advantage, however, of knowing from observation of existing market economies that a market economy is at least possible (an advantage not shared by the socialists early in this century, who tried to engineer a jump to a purely hypothetical socialist economy).
12. My distinction between psychological and environmental selection parallels Cvalli-Sforza and Feldman's distinction between "cultural" and " Darwinian" selection, which they define as follows: ". . . cultural selection refers to the acquisition of a cultural trait, while Darwinian selection refers to the actual test by survival and fertility of the advantages of having or not having the trait" (Cavalli-Sforza and Feldman 1981: 16). I have chosen not to adopt their terminology because their use of the word "cultural" might be misleading. I use the word "cultural" to refer to *all* traits that are not transmitted genetically, and I use " psychological" and "environmental" to refer to the selective forces that impinge on cultural traits.

13. See Sober (1994: 482-4).

14. It has been suggested to me that simple cost-benefit analysis would be sufficient to explain the drop in European birth rates. But this explanation begs the question: the whole issue is *which* costs and benefits may be considered. The environmental (i.e., strictly biological) costs and benefits clearly pointed toward *more* child-bearing (since better sanitation, food, etc., made children easier and cheaper to sustain). A lower birth rate could only have arisen from "cost-benefit analysis," then, if some psychological costs and benefits could also come into play.

15. Quoted in Hodgson (1991): 70.

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