
CULTURAL EVOLUTION: A GENERAL APPRAISAL

JEAN GAYON

ABSTRACT. The first objective of the paper is to propose a classification and characterize the major approaches to the modes of cultural evolution: (1) Research programs on the origins of the cultural capacity of the human species. (2) Description and explanation of cultural change with the help of concepts or models inspired by the schemes of population genetics. (3) Research on parallel evolution of genes and culture. (4) Narrow coupling between biological evolution and cultural evolution, or the “gene-culture coevolution paradigm.” These four modes of cultural evolution make sense at a different time-scale (respectively: more than 100 000 years; less than 100 years; greater than 1000 years; less than 1000 years). The second section of the paper provides an evaluation of the various programs, from various points of view: methodological, ethical, and epistemological.

KEY WORDS. Evolution, culture, cultural evolution, population biology, gene-culture coevolution, race, naturalism.

1. INTRODUCTION

Over the last three decades, studies of cultural evolution have developed in a spectacular way. In this paper, I will propose a classification of its major modes. Before presenting this classification, I would like to formulate three general remarks.

My first remark bears upon the very expression “cultural evolution.” The association of the words “evolution” and “culture” no longer has the meaning it had in the context of anthropology at the turn of last century. Cultural evolution no longer refers to an interpretation of the history of culture according to a law of progress that implies a hierarchy of human cultures. In other words, in the expression “cultural evolution,” “evolution” does not refer to “evolutionism,” as it did for sociologists or anthropologists a century ago. It refers, instead, to contemporary evolutionary biology, with its characteristic emphasis upon genetics and population biology.

My second preliminary remark is that the modern field of cultural evolution involves a rather large number of disciplines in biology and

human sciences, such as human paleontology, prehistory, ethology, behavioral ecology, neurophysiology, psychology, linguistics, the cognitive sciences, physical and cultural anthropology, sociology, economy, and epistemology. An evolutionary approach to culture raises specific problems in each of these disciplines, yet cultural evolution defines a set of common problems and concepts that cross these disciplines.

A final preliminary observation: connecting evolution and culture has strong ideological and epistemological implications. First, some of the questions raised by cultural evolution are redolent of the older problem of the race/culture relationship. Second, the methodological decision to study culture from an evolutionary point of view raises the problem of the relationship between the human and the natural sciences or, to put it more crudely, the problem of naturalism. These ideological and epistemological issues involve powerful emotions, which channel the possible theoretical choices of those who confront the problem of cultural evolution.

In reality, the theoretical structure of the field of cultural evolution is mainly defined by the symbolic limits that scholars feel it is acceptable to cross or not to cross. The next section of this paper proposes a hypothesis about the theoretical structure of the field of cultural evolution as it exists today. I will present four theoretical modes of cultural evolution. This section will be essentially descriptive. I will first describe the most consensual programs, and then move to more controversial ones. The last section of the paper will consist in a philosophical evaluation.

2. FOUR THEORETICAL MODES OF "CULTURAL EVOLUTION"

(1) The first type of cultural evolution refers to studies on the origins of the cultural capacity of the human species: when and in what circumstances did it appear, and what are its biological bases? This question comes before any speculation about the effective diversity of cultures. The postulate here is that the members of the human species share a genetic heritage that makes them able to assimilate, modify and transmit all that is commonly counted as essential to "cultural behavior" in humans: symbols, language, cognitive categories, theory of mind, techniques, ethical rules, etc. The problem is to provide a precise list of universal cultural aptitudes, to identify their genetic and psychological bases, and to reconstitute the environmental circumstances within these aptitudes appeared and were maintained in the course of evolution. Answering this sort of question requires employing different disciplines. In order to assess what is specific to human beings in terms of culture, animal psychology, ethology and anthropology must come into play. One must recall here that culture is not specific to humans. Many species have produced local cultures consisting in the transmission through learning and imitation of behavioral

items unique to a particular population. This phenomenon has been abundantly studied in the case of birds and primates. As Daniel Sperber says, what is specific to the human species is that culture structures all aspects of human behavior in all circumstances. In other animals, culture intervenes occasionally and only for certain kinds of behavior¹. Another task is to explain the present biological bases of human cultural capacities. Neurophysiology, embryology, genetics, and the cognitive sciences have something to tell us about this problem. Finally, human cultural capacity must be put in the historical perspective of evolution. From this point of view, a particularly important question is to determine the ecological conditions in which human cultural attitudes emerged. Our knowledge is rather limited on this subject, but philosophers have been very interested in it. A good deal of studies in evolutionary epistemology and evolutionary ethics have stressed the idea of that human knowledge and action is strongly channeled by the kind of ecological and ethological constraints which prevailed in former times in the phylogeny of the human species, constraints that may or may not still exist today. Gerhard Vollmer and Franz Wuketits have written a lot on this subject.

The research program that I have just characterized is upstream, relative to the present diversity of human cultures. Since it is mainly concerned with the biological universals that made possible the existence of humans as "cultural animals," it leaves open the question whether evolutionary biology can help us understand the dynamics of cultural change. As I see it, this program is neutral to the question of the coupling or decoupling between the *present* biological evolution of the human species and its *present* cultural history. This is why it is the most consensual program.

In such a research context, "cultural evolution" means "evolution towards culture." Another important characteristic of this program is its historical scale: the order of magnitude of human evolution towards culture is 100 000 years. Perhaps a little less, perhaps much more (one million years and beyond).

(2) The second theoretical mode of cultural evolution is at the opposite of the previous one in terms of time scale. It consists of the various attempts that have been made over the last three decades to describe and explain cultural change with the help of concepts or models inspired by the schemes of population genetics. Here the methodological postulate is that of a deep analogy between genetic and cultural transmission and, as a consequence, between genetic evolution and cultural evolution. The analogy is constructed in the following way. Population genetics relies upon the existence of discrete replicating units, genes, which sometimes mutate, and diffuse within and between populations due to processes such as

natural or sexual selection, random drift and migration. Similarly, the evolutionary theory of cultural change admits the existence of cultural items, which are typical behavioral or cognitive events. These items are replicable through learning or imitation within a network of social communication. Words or typical phrases, grammatical rules, the conventional expression of emotions, moral codes, the categorization of colors, technical or administrative routines are classical examples of replicating cultural items. These items are transmissible either “vertically”, that is to say, from parents to children (for instance family names in European languages are vertically transmitted) or “horizontally” (for instance the diffusion of information through the media). Just like genes, cultural items can mutate, and these mutations can diffuse within and among populations through processes that are formally analogous to those which control the diffusion of genetic items: selection, random drift, migration. In fact, French or English family names, which are transmitted only through males, diffuse or go extinct according to a random process. Most of them, actually, will be extinct in the long run. Scientific hypotheses or industrial routines diffuse as a consequence of severe selective processes. On the basis of such analogies, in the 1960s a handful of philosophers, social scientists and biologists began to transpose some models of population genetics into the domain of cultural change. This program has been developed in a systematic way in various domains: epidemiology of ideas, diffusion of technical innovations, theory of scientific change, linguistics and economy. In 1981, Lucas Cavalli-Sforza and Marcus Feldman published an important book entitled *Cultural Transmission and Evolution: A Quantitative Approach* ². At the same time, this style of thinking became quite popular in economics under the name of “evolutionary economy.” Though evolutionary economy is not traditionally presented as a part of cultural evolution, it can be interpreted as being part of a similar project of explaining the history of human behavior with the help of evolutionary tools³. Other examples of the transposition of population genetics models to the social sciences could be given ⁴. Philosophers themselves have repeatedly discussed the subject in their reflections on evolutionary epistemology and evolutionary ethics.

Several features of this program, which we may call the “analogical program” should be emphasized. First, this analogical program is in good agreement with the development of quantitative methods in the social sciences. Second, the transfer of models from population biology does not imply at all that cultural phenomena are reduced to or explained by evolutionary biology. The style of reasoning is purely analogical. Third, the rate of change of the phenomena described by these models is extremely rapid in comparison with the phenomena described by population biology. This is easy to understand. The replication of genes depends

on the reproduction of organisms. In the domain of cultural change, replication is much faster because “generations,” insofar as we can still use this word for the periodical reproduction of cultural items, does not in most cases imply the physical reproduction of individuals who transmit the cultural items. In the majority of cases, the transmission is “horizontal.” For instance, the replication of a word, or a sentence, is nothing more than its reproduction in an act of human communication: a conversation, a course at school, a personal act of reading a certain text. The extremely high rate of replication of cultural items has an important consequence that has been clearly stated by David Hull⁵. Although cultural items may be replicated rapidly in huge numbers, the most puzzling thing is their extreme stability or, in other words, their low rate of mutation. The high rate of replication and diffusion of cultural items is the key factor for understanding that the global dynamics of change can be largely non-intentional, although the individual events of replication and mutation are most often intentional. For instance, a scientist may well behave intentionally when (s)he transmits a hypothesis, and even more if s(he) modifies it. But the fate of the hypothesis in the scientific community will not be an intentional phenomenon. The best idea in an individual brain does not go far if it is not appropriated by other brains and integrated in social networks where it diffuses for all sort of motives, which are sometimes rational, sometimes not.

To sum up, the second mode of cultural evolution that we have just characterized makes sense on a very small historical scale, one that is generally in the order of magnitude of one generation of human beings, sometimes a little more, most often much smaller. Furthermore, this mode of cultural evolution is “evolutionary” only in an analogical sense, that is in the sense that evolutionary change and cultural change can be sometimes described with the help of models and concepts that are supervenient relative to the particular social or biological phenomena to which they apply.

(3) The third mode of cultural evolution involves a closer relationship between the biological sciences and the sciences of culture. It consists in showing that in certain cases the genetic evolution of human populations and their cultural transformation are parallel. This notion of parallelism should not be confounded with the notion of analogy that I used formerly. Parallel evolution of gene pools and culture means that in a given population these two features are correlated. Let me illustrate this idea through the famous work of the population geneticists Cavalli-Sforza and Piazza. Relying upon a revival of historical linguistics, and upon their own work on the origin and dispersal of modern humans (that from 100 000 or 150 000 years to the present day), these population geneticists have tried to show

that there is a remarkable correspondence between the great linguistic families postulated by certain scholars (Greenberg, Rulén), and the phylogenetic tree of human populations based upon genetic data. This thesis was first defended in 1988⁶, and has been presented in a number of publications⁷. The striking claim in these studies is that languages and genes seem to tell the same story, at least at a very large historical scale. Cavalli-Sforza does not say that gene differences explain linguistic references. His claim is that the same causes account for the parallel history of gene pools and languages. From a genetic point of view, populations differentiate when they are reproductively isolated because of some kind of barrier (geographic or social). Similarly, languages differentiate when cultural exchanges decrease or disappear. Therefore the linguistic tree and the genetic tree resemble each other because they reflect a same story of reproductive fissions. This example is probably not unique. Parallel evolution of the gene pool and the cultural pool is likely to occur when the transmission of cultural items is strongly constrained by the structure of reproductive exchange.

The parallelism between cultural evolution and genetic evolution does not necessarily imply a causal interaction between the two modes of evolution for given traits. A common cause may suffice to explain the parallelism. This common cause can itself be extrinsic (e.g., a geographic barrier) or cultural. In fact, if one of the series causally acts upon the other, it is likely that the cultural evolution causes a correlated change in the gene pool. The linguistic space is a constraint that heavily affects the reproductive space of a human population, and therefore its genetic evolution. The temporal scale of this third theoretical mode of cultural evolution studies is intermediate. This is slow in comparison with historical times, but significantly rapid at the scale of prehistoric times (greater than a thousand years).

(4) A fourth theoretical option is that of a tight coupling between biological evolution and cultural evolution. This is the choice made by Edward O. Wilson, and, more widely, by human sociobiology. This association is not surprising. The central hypothesis of sociobiology is that, in all species, social behavior is designed by natural selection. No wonder that Wilson applied this hypothesis to the species where social behavior attains an exceptional degree of complexity, the human species. Nevertheless, it was only in 1981, after the publication of his *Sociobiology*⁸ (1975) and his pamphlet *On Human Nature*⁹ (1978) that Wilson really dealt with the problem of cultural evolution. He did this in a book that was rather different from the two previous ones, *Genes, Mind and Culture*¹⁰. Written with a young physicist well-trained in mathematical modeling, Charles Lusmden, this book is particularly difficult to read in detail, both because its overtly

mathematical apparatus and because its rather abstruse style. The argumentation is subtle and the detail is often recondite. However, the general theses of the book are radical. Wilson and Lumsden elaborate a general "theory of gene-culture coevolution." The authors do not claim to have provided direct empirical proofs of the coupling between cultural evolution and biological evolution of human populations. They nevertheless build a theoretical framework which, according to them, establishes at least the logical possibility of this coupling and its strong likelihood. Whatever one may think of this book, it is a landmark in the sense that it offers a radical thesis about cultural evolution.

Like other authors, Lumsden and Wilson admit the epidemiological representation of cultural change, that is to say the idea that cultural items diffuse within populations through learning and apprenticeship. They give these cultural items the name of "culturgens". This term is deliberately ambiguous; it designates transmissible behaviors that generate culture¹¹. These typical transmissible behaviors are by definition acquired through learning and apprenticeship, but Lumsden and Wilson admit the theoretical possibility that the probability of the use of a given culturgens can be biased by epigenetic rules that are themselves controlled by genes. This amounts to refusing the common idea that cultural items are in all circumstances transmitted in a purely cultural way. Wilson formulates this idea at the beginning of his book. There he criticizes the "promethean-gene hypothesis," according to which the genetic evolution of the human species generated culture, but only in the sense of a general capacity to evolve by culture. Thus, according to this common conception, "a group of promethean genes has freed the human mind from the other genes¹²." To this conception shared by a majority of social scientists, Wilson opposes the slogan that he had already used in his book *On Human Nature*: "Genes hold culture on leash." This principle means that not all cultural histories are possible. Any culture must be compatible with a reasonable adaptation to the surrounding environment. For Wilson, the hypothesis of a purely cultural transmission is not likely because it would imply that human populations have been and are unable to distinguish in a given environment cultural items which are adapted and cultural items which are not.

The general conclusion of the book is that gene-culture coevolution is an inevitable property of the human species. In other words, the emergence of culture has not put an end to the biological evolution of the human species. Rather, culture constitutes a major element of a continuing biological evolution. Cognitive and social behaviors, which increase the adaptive value of human populations, tend to be reinforced by epigenetic constraints, which are themselves controlled by genes. Making use of Waddington's concept of genetic assimilation, which is a genetically orthodox interpretation of Lamarckian effects, Lumsden and Wilson pro-

vide an estimation of the period of time that is necessary for the genetic fixation of a culturgen in a human population: fifty generations, or approximately one thousand years. The argument that leads to this result is intricate. The authors admit that it is only a theoretical speculation, not corroborated by any direct evidence. However this estimation is a good symptom of Wilson's ambition of bringing cultural history under the control of evolutionary theory.

In such a program, it is clear that it is not the general aptitude of humans for culture that is explained by evolutionary biology, but the origin and development of cultural diversity itself. Wilson's formula must be taken literally: genes and culture "coevolve." I have taken Wilson's work as an example of the gene-culture coevolution program. In fact, Wilson's work was not either the first nor the best on this subject. Research on the gene-culture coevolution has been more diversified than Wilson's writings suggest. This kind of research is particularly interesting when it is not reduced to a mathematical-ideological speculation, as is too often the case in Wilson, and provides empirical data ¹³.

3. EVALUATION

It is now time to evaluate "cultural evolution" in its various modes. My comments will be threefold: comparison of the four programs; special comments on the hardest program (gene-culture coevolution), and comments on the overall "naturalistic" mood of the four programs.

(1) Let us recapitulate and compare the four modes of cultural evolution in contemporary research. The first program aims at explaining the emergence of culture as an all-encompassing environment for humans, with the common tools of evolutionary biology. This program has nothing special to tell us about cultural change in historical times. This is why I qualified it as the "evolution towards culture program." This program is concerned only with the series of past events that led the human species to acquire its cultural capacity, on the basis of specific biological devices and in response to particular environmental conditions. In contrast to this first program, the three other programs that I have analyzed assume some sort of relationship between cultural change and genetic evolution. The weakest mode consists in transferring models from population biology to the study of cultural change. This mode does not imply more than a formal analogy between the two domains. A stronger hypothesis consists in admitting that in some cases, there is evidence of a parallel evolution of culture and gene pools: in this case, the notion of cultural evolution implies more than a mere analogy. The general idea is that the history of cultures and the genetic history of human populations are sometimes drawn by

common causes, entailing correlated changes, though the particular changes that are observed need not be causally responsible for each other. Finally, the gene-culture coevolution hypothesis is the strongest. It admits that the genetic and the cultural evolution of human populations are not only correlated, but causally related to each other.

From a methodological point of view, we should note that the first three programs (evolution towards culture, analogy, parallelism) are independent of each other, and neutral with respect to the fourth program (coevolution). On the other hand, the coevolutionary program is strongly dependent on the other three programs. Any biologist or social scientist who admits the gene-culture coevolution as a legitimate subject of enquiry is committed to the three first modes of cultural evolution studies. Wilson is an example, but this could also be said of many other scholars with quite different ideological backgrounds. Luca L. Cavalli-Sforza and Marcus Feldman, who certainly do not share Wilson's views about human nature, have also developed studies that make them representative of the coevolution program¹⁴. The coevolution program is in fact the one that takes the expression "cultural evolution" in its literal sense.

(2) My second comment deals with the fourth program. The idea of gene-culture coevolution meets resistance among many biologists and social scientists. It has also generated an intense and passionate debate in the general public. There are several reasons for this, and they are quite different. I will mention four of them.

A first opposition comes from the social sciences. Social scientists are often opposed to the introduction of quantitative and explanatory methods in their domain. Not all social scientists agree on this point. In fact, they all disagree on this point. Some of them think that the social sciences are fundamentally hermeneutic sciences: their task is not to explain, but to interpret human actions. Other social scientists share the opposite view, saying that social phenomena do not require a scientific methodology different from that utilized by the natural sciences. In this context, the gene-culture coevolution paradigm provides the hermeneutic camp with a ludicrous case of what should not be done.

A second reason for opposing the coevolution paradigm comes from those who emphasize the autonomy of culture. The idea of the autonomy of culture is deeply rooted in the history of twentieth century anthropology, which led to the well-known separation between cultural and physical anthropology. Claude Lévi-Strauss, though he was a major representative of cultural anthropology and a major advocate of this discipline, has been nevertheless rather critical about the total dissociation of the two anthropological disciplines. In a famous talk at the UNESCO in 1971, that provoked a scandal, he said that this dissociation was characteristic of the "meta-

physical" age of modern anthropology. In other words, modern anthropology was not yet a positive science: "For approximately ten years, we have begun to realize that we thought of the relation between organic evolution and cultural evolution in terms that Auguste Comte would have called metaphysical¹⁵." Correlatively, Claude Lévi-Strauss invited geneticists and anthropologists to develop a "positive collaboration" and look for phenomena that would help understand how "the cartographic distribution of biological phenomena and the cartographic distribution of cultural phenomena shed light on each other¹⁶." As Lévi-Strauss added, biological evolution and cultural evolution have often functioned in modern science as substitutes of the older philosophical mind-body problem.

Field naturalists have put forward a third motive of oppose to the notion of gene-culture coevolution. Today, a number of specialists of the natural history of humans invoke an ecological paradigm as an alternative to the genetic paradigm. Jarred Diamond has been a major spokesman of this school of thinking. In his book *Guns, Germs and Steel: The Fate of Human Societies*¹⁷, Diamond defends the hypothesis that the major tendencies of human history since the beginning of the Neolithic Era are explained not by mysterious genetic predispositions of some peoples, but by strong environmental and geographical constraints: availability of vegetable and animal species able to be domesticated, and geographical obstacles to migration of humans and their domesticated species. This remarkable book illustrates a sort of reverse sociobiology. Incidentally, Jarred Diamond designates himself as a "sociobiologist", but one who fights for an alternative paradigm.

A fourth source of reluctance towards the gene-culture coevolution paradigm lies in the resemblance between this modern view and the older debate over the race/culture relationship. It would be wrong and unfair to suggest that Wilson held a deliberately racist attitude. One would not even think of suspecting authors such as Cavalli-Sforza of this, despite the fact that his methodological positions on the problem of coevolution are quite similar to those of Wilson. Nevertheless, any evaluation of the coevolutionary paradigm should take into account this aspect of the problem. There is no reason to condemn this form of scientific enquiry a priori. But one should be cautious about the use and abuse that can be made by a kind of science that is most often highly speculative, and whose practical impact is mainly constituted today by its interference with the race problem.

Personally, I think that research programs relying on the gene-culture coevolution paradigm should be encouraged only insofar as they deal with the most modest forms of culture. By this, I mean these forms of culture that are most likely to interact with the biological aspects of human populations: diseases, nutrition, elementary technical competences, and affective dispositions. Those aspects are both reasonably accessible to

empirical methods and useful if we want to construct a better world for all human beings.

(3) I will now conclude by saying a few words on naturalism. Philosophically speaking, naturalism is the intellectual horizon that lies behind all studies on cultural evolution. In contemporary philosophy, naturalism is not a metaphysical doctrine. We no longer live in the world of Spinoza or Diderot. We no longer live in a world where naturalism was a synonym for atheism and materialism. Contemporary naturalism is more a methodological doctrine than an ontological doctrine. Its central core is the heuristic postulate that there is no *a priori limit* to naturalistic explanations. By "naturalistic explanation," modern naturalistic philosophers mean explanation with the help of the most efficient form of knowledge that we have today at our disposal, a form of knowledge inspired by the methods and concepts of the natural sciences: physics, chemistry, biology. Being a naturalist today means that one adheres to the idea that everything that exists, including mental states and social phenomena, are accessible to empirical investigation and to explanation, not only interpretation.

Such a methodological attitude is compatible with metaphysical doctrines such as atheism and materialism, but there is no necessary relationship between methodological and metaphysical naturalism. Methodological naturalism is the conviction that human sciences and philosophy should rely more than they do on the theories and methods of the natural sciences for solving their *own* problems. This is obviously a cognitive preference, but it is also an empirical matter. Methodological naturalism is not good in itself. It is a heuristic preference that has to be judged on the basis of its empirical success. This is the way, I think, to properly evaluate current studies of cultural evolution.

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- 7 See for instance L. Luca Cavalli-Sforza, *Gènes, peuples et langues*, Paris, Odile Jacob, 1996; L. Luca Cavalli-Sforza, P. Menozzi, A. Piazza, *The History and Geography of Human Genes*, Princeton, Princeton University Press, 1996.
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- 9 Edward. O. Wilson, *On Human Nature*, Cambridge, Harvard University Press, 1978.
- 10 Edward. O. Wilson and Charles J. Lumsden, *Genes, Mind and Culture*, Cambridge, Harvard University Press, 1981.
- 11 *Ibid.*, Chap. 1.
- 12 *Ibid.*, p. 1.
- 13 See for instance William H. Durham, *Coevolution: Genes, Culture, and Human Diversity*, Stanford (California), Stanford University Press, 1991.
- 14 Marcus W. Feldman and L. Luca-Sforza, "Cultural and biological evolutionary processes, selection for a trait under complex transmission," *Theoretical Population Biology* 9 (1976): 238-259.
- 15 « Depuis une dizaine d'années seulement, nous commençons à comprendre que nous discutons du rapport entre évolution organique et évolution culturelle dans des termes qu'Auguste Comte eût appelés métaphysiques » (Claude Lévi-Strauss, « Race et culture » [conférence prononcée à l'UNESCO en 1971], reproduit dans *Le regard éloigné*, Paris, Plon, 1983).
- 16 « [Il convient de développer une] collaboration *positive* entre généticiens et ethnologues, pour rechercher ensemble, comment, et de quelle façon les cartes de distribution des phénomènes biologiques et des phénomènes culturels s'éclairent mutuellement » (*Ibid.*).
- 17 Jared Diamond, *Guns, Germs and Steel: The Fate of Human Societies*, New York and London, Norton, 1997.