

# Evolution and Anthropology: A Centennial Appraisal

*The Anthropological Society  
of Washington*



WASHINGTON, D. C.

1959

**LIBRARY**  
**UNIVERSITY OF UTAH**

## TABLE OF CONTENTS

	Page
DARWIN AND THE EVOLUTIONARY THEORY IN BIOLOGY .....	1
ERNST MAYR	
THE EFFECT OF DARWIN'S THEORY OF EVOLUTION ON PHYSICAL ANTHROPOLOGY .....	11
T. D. STEWART	
PHYSICAL ANTHROPOLOGY: AN APPRAISAL .....	26
J. S. WEINER	
BEHAVIORAL EVOLUTION AND THE EMERGENCE OF THE SELF .....	36
A. IRVING HALLOWELL	
LANGUAGE AND EVOLUTION .....	61
JOSEPH H. GREENBERG	
ARCHEOLOGY AND THE EVOLUTIONARY THEORY .....	76
ROBERT J. BRAIDWOOD	
THE STATUS OF EVOLUTIONARY THEORY IN AMERICAN ARCHEOLOGY .....	90
WILLIAM G. HAAG	
THE CONCEPT OF EVOLUTION IN CULTURAL ANTHROPOLOGY .....	106
LESLIE A. WHITE	
EVOLUTION IN SOCIAL ORGANIZATION .....	126
GEORGE PETER MURDOCK	
THE ROLE OF EVOLUTIONARY THOUGHT IN ANTHROPOLOGY .....	144
CLYDE KLUCKHOHN	
LITERATURE CITED .....	158

*Printed in the United States of America  
By THEO. GAUS' SONS, INC., Brooklyn, N. Y.*

**441855**

can only be properly discerned and discriminated by being relegated to their places in philosophy. The whole progress of science depends primarily upon this relation between knowledge and philosophy. (1881, p. 121)

On behalf of the members of the Anthropological Society of Washington, I should like to express appreciation to the program committee and especially to Lawrence Krader, its chairman and original inspiration, for arranging the program that forms the basis for this volume. We wish also to thank the contributors both for the stimulating lectures they delivered and for their cooperation in meeting deadlines for the manuscripts. It has been a real pleasure to deal with them all, and whatever value this volume may have is a reflection of their efforts.

BETTY J. MEGGERS, *Editor*

The Anthropological Society of Washington  
Washington 25, D. C.  
October 1, 1958

## DARWIN AND THE EVOLUTIONARY THEORY IN BIOLOGY

*Ernst Mayr*

The centennial of an important scientific theory is an appropriate occasion to look backward and forward. When celebrating the 100th anniversary of the publication of Darwin's theory of evolution through natural selection, we may ask ourselves what the impact of this theory has been on the biological sciences and whether or not it explains all the puzzles of organic evolution. The year of publication of Darwin's *Origin of Species*, 1859, is rightly considered the year in which the modern science of evolution was born. It must not be forgotten, however, that preceding this zero year of history there has been a long prehistory, described, for instance, by Osborn (1905) in his volume *From the Greeks to Darwin*. Yet, in spite of a widespread belief in evolution, much published evidence on its course, and numerous speculations on its causation, the impact of Darwin's publication was so immense that it ushered in a completely new era.

It seems to me that the significance of the scientific contribution made by Darwin is threefold:

a. He presented an overwhelming mass of evidence demonstrating the occurrence of evolution.

b. He proposed a logical and biologically well substantiated mechanism that might account for evolutionary change, namely natural selection. Muller (1949, p. 459) has characterized this contribution as follows:

Darwin's theory of evolution through natural selection was undoubtedly the most revolutionary theory of all time. It surpassed even the astronomical revolution ushered in by Copernicus in the significance of its implications for our understanding of the nature of the universe and of our place and role in it. . . . Darwin's masterly marshalling of the evidence for this [the ordering effect of natural selection], and his keen-sighted development of many of its myriad facets, remains to this day an intellectual monument that is unsurpassed in the history of human thought.

c. He replaced typological thinking by population thinking.

The first two contributions of Darwin's are generally known and sufficiently stressed in the scientific literature. Equally important but almost consistently overlooked is the fact that Darwin introduced into the scientific literature a new way of thinking, "population thinking." What is this population thinking and how does it differ from typological thinking, the then prevailing mode of thinking? Typological thinking no doubt had its roots in the earliest efforts of primitive man to classify the bewildering diversity of nature into categories. The *eidōs* of Plato is the formal philosophical codification of this form of thinking. According to it there are a limited number of fixed, unchangeable "ideas" underlying the observed variability, with the *eidōs* (idea) being the only thing that is fixed and real while the observed variability has no more reality than the shadows of an object on a cave wall, as it is stated in Plato's allegory. The discontinuities between these natural "ideas" (types), it was believed, account for the frequency of gaps in nature. Most of the great philosophers of the 17th, 18th, and 19th centuries were influenced by the idealistic philosophy of Plato, and the thinking of this school dominated the thinking of the period. Since there is no gradation between types, gradual evolution is basically a logical impossibility for the typologist. Evolution, if it occurs at all, has to proceed in steps or jumps.

The assumptions of population thinking are diametrically opposed to those of the typologist. The populationist stresses the uniqueness of everything in the organic world. What is true for the human species,—that no two individuals are alike,—is equally true for all other species of animals and plants. Indeed, even the same individual changes continuously throughout his lifetime and when placed into different environments. All organisms and organic phenomena are composed of unique features and can be described collectively only in statistical terms. Individuals, or any kind of organic entities, form populations of which we can determine the arithmetic mean and the statistics of variation. Averages are merely statistical abstractions, only the individuals of which the populations are composed have reality. The ultimate conclusions of the population thinker and of the typologist are precisely the opposite. For the typologist, the type (*eidōs*) is real and the variation an illusion, while for the populationist the type (average) is an abstraction and only the variation is real. No two ways of looking at nature could be more different.

The importance of clearly differentiating these two basic philosophies and concepts of nature cannot be overemphasized. Virtually every controversy in the field of evolutionary theory, and there are few fields of science with as many controversies, was a controversy between a typologist

and a populationist. Let me take two topics, race and natural selection, to illustrate the great difference in interpretation that results when the two philosophies are applied to the same data.

*Race.* The typologist stresses that every representative of a race has the typical characteristics of that race and is different from all representatives of all other races by the characteristics "typical" for the given race. All racist theories are built on this foundation. Essentially it asserts that every representative of a race conforms to the type and is separated from the representatives of any other race by a distinct gap. The populationist also recognizes races but in totally different terms. Race for him is based on the simple fact that no two individuals are the same in sexually reproducing organisms and that consequently no two aggregates of individuals can be the same. If the average difference between two groups of individuals is sufficiently great to be recognizable on sight, we refer to such groups of individuals as different races. Race, thus described, is a universal phenomenon of nature occurring not only in man but in two-thirds of all species of animals and plants.

Two points are especially important as far as the views of the populationist on race are concerned. First, he considers races as potentially overlapping population curves. For instance, the smallest individual of a large race is usually smaller than the largest individual of a small race. In a comparison of races the same overlap will be found for nearly all examined characters. Secondly, nearly every character varies to a greater or lesser extent independently of the others. Every individual will score in some traits above, in others below the average for the population. An individual that will show in all of its characters the precise mean value for the population as a whole does not exist. In other words, the ideal type does not exist.

*Natural selection.* Population thinking is an absolute necessity for an understanding of the nature of races. A full comprehension of the difference between population and typological thinking is even more necessary as a basis for a meaningful discussion of the most important and most controversial evolutionary theory, namely, Darwin's theory of evolution through natural selection. For the typologist everything in nature is either "good" or "bad," "useful" or "detrimental." Natural selection is an all-or-none phenomenon. It either selects or rejects, with rejection being by far more obvious and conspicuous. Evolution to him consists of the testing of newly arisen "types." Every new type is put through a screening test and is either kept or, more likely, rejected. Evolution is defined as the preservation of superior types and the rejection of inferior ones, "survival of the fittest" as Spencer put it. Since it can be

shown rather easily in any thorough analysis that natural selection does not operate in this described fashion, the typologist comes by necessity to the conclusions:

- a. that natural selection does not work, and
- b. that some other forces must be in operation to account for evolutionary progress.

The populationist on the other hand, does not interpret natural selection as an all-or-none phenomenon. Every individual has thousands or tens of thousands of traits in which it may be under a given set of conditions selectively superior or inferior in comparison to the mean of the population. The more superior traits an individual has, the greater the probability that it will not only survive but also reproduce. But this is merely a probability, because under certain environmental conditions and temporary circumstances, even a "superior" individual may fail to survive or reproduce. This statistical view of natural selection permits an operational definition of "selective superiority" in terms of the contribution to the gene pool of the next generation.

I have devoted so much space to the presentation of the populationist viewpoint because the modern evolutionary theory can only be understood in the light of population thinking. A typologist can never understand it.

The question is sometimes asked whether or not it is justified to apply the term "Darwinism" to the modern evolutionary theory. When one reads Darwin's works, one is amazed at how modern his thinking is in some ways. Nevertheless, some of his views are completely antiquated, as for instance those on speciation and on the origin of genetic variability. Barzun (1941) points out correctly to what extent Darwin hedged on many controversial issues and how easy it is to quote him on both sides of an argument. As a result, the term Darwinism may mean something very different to a Russian, a German, a Frenchman, or an Englishman. Lysenko proclaimed himself a Darwinian because he shared Darwin's Lamarckian views. Some modern French evolutionists tend to consider mutationism (DeVries) as Darwinism and to label as Lamarckism any evolutionary theory that considers the environment an important evolutionary factor (even as a selective agent). When we compare modern evolutionary theory with the original conceptual structure of Darwin, we find that many of Darwin's ideas have been eliminated and many new ones added. It avoids a good deal of confusion not to designate the currently held interpretation of evolution as Darwinism or Neodarwinism. Simpson (1949) and others have therefore rightly insisted that the term

"Darwinism" be replaced by "the synthetic theory" to indicate the multiple roots of the new theory.

#### ASPECTS OF MODERN EVOLUTIONARY RESEARCH

Evolutionary research in biology has proceeded in several different areas. The current thinking on evolution is most easily presented by making a quick survey of the findings in these various areas, with special reference to anthropology.

1. The fact of evolution. To establish this fact was the principal endeavor of Darwin and the early evolutionists. It was soon established so firmly that no serious biologist has questioned it for more than 50 years. That even man is the product of evolution is likewise acknowledged so universally that no further word needs to be added.

2. The establishment of phylogenies. The search for common ancestors, the tracing of phyletic lines, in short, phylogenetic research, is considered by many evolutionists, particularly in continental Europe, as synonymous with the study of evolution. Actually it is only one of many areas of evolutionary research. The phylogeny of *Homo sapiens* is, by now, well established in its broad outlines, and the possible pathway of human phylogeny has been narrowed down considerably in recent years. This is essentially the result of three developments:

- a. New fossil finds, particularly Miocene primates in Africa and the South African *Australopithecines*;

- b. The realization that the extreme arboreal specializations of living anthropoids are a relatively recent development and were not necessarily present in the common ancestor of man and the pongids; and

- c. The replacement of archetypal interpretation of phylogeny by an interpretation based on a mosaic type of evolution. According to this interpretation, it is not necessary to consider a form like *Australopithecus* with its mosaic of human and anthropoid characteristics as an aberrant sidebranch. A mixture of primitive and advanced characters may occur in any phyletic line. *Australopithecus* could be directly in the line of human ancestry or at least near it. It is important to realize that much of the recent re-interpretation of hominid phylogeny is due as much to conceptual re-orientation as to new fossil discoveries.

3. The third major area of evolutionary research deals with the origin of discontinuities, or the multiplication of species. This is an important branch of the evolutionary science and one that has made great progress since Darwin. It is now almost universally acknowledged that geographic speciation is the only form of speciation occurring among higher animals. It has been established, furthermore, that nearly all species of animals

show some degree of geographic variation, and that the more isolated a population is geographically, the more strongly it will tend to deviate from the characteristics of the main body of the species.

These concepts of the new systematics permit a great simplification of hominid phylogeny. They force a new evaluation of fossils. Instead of being considered merely as anatomical types, fossil forms must be placed in a framework of time and space. Each fossil hominid was, when still alive, a member of a population. One must ask in each case: what were the geographical, ecological, and genetic relations of this population to other hominid populations? On the basis of such considerations (Mayr, 1950) it appears possible, if not probable, that since the time of *Australopithecus* there has not been at any time more than a single biological species<sup>1</sup> of hominid on the earth. It has been proposed to combine the numerous nominal species of fossil hominids into two polytypic species, *Homo erectus* for Pithecanthropus, Sinanthropus and their relatives, and *Homo sapiens* for the later hominids. All the known facts are consistent with this interpretation of the fossil evidence. Peking Man and Java Man will then have to be interpreted as two geographically and chronologically separated subspecies of *H. erectus*. Neanderthal would be a European subspecies of *H. sapiens* (with nominate *sapiens* living somewhere in Asia or Africa prior to its invasion of western Europe).

The indications as far as they exist at present are that no hominid population has been isolated sufficiently long, since early Pleistocene, to have broken away completely from the gene flow of the *Homo erectus-sapiens* line and to have acquired reproductive isolation. In other words, there has been no speciation in the genus *Homo*, only phyletic evolution.

4. The fourth major area of evolutionary research deals with the "material of evolution." This is the domain of genetics. It is now clearly established that chemical constituents of the chromosomes are the carriers of inheritance. The Deoxyribosenucleic acid (DNA) component is of major importance, if not the exclusive genetic material. Genetic changes, "mutations," are due to structural changes in the molecules of these chemical constituents and to changes in their interactions. Phenotypes produced by such mutations differ from the phenotypes of the original genotypes in their viability (in various ways) and serve as the material of evolution. It would be exceedingly difficult to visualize a mechanism by which the environment could induce directly a structural change in the DNA molecules that would result in the production of a superiorly adapted

<sup>1</sup> The word species is here defined biologically as "a group of (actually or potentially) interbreeding populations which is reproductively isolated from other such groups."

phenotype and more specifically in the appropriate response to a temporary need. Nor is there any evidence that this occurs. Indeed, there is no need for such an induction within the framework of the synthetic theory of evolution. Infinitely variable natural populations are of such evolutionary plasticity that natural selection can mold them into almost any shape.

The study of man has contributed little to the branch of evolutionary research that deals with the material of evolution. However, it gives satisfaction to know that everything that has been learned about human genetics is in every respect consistent with the genetic theory developed on the basis of other organisms, be they mice, *Drosophila*, corn, or neurospora.

5. The fifth area of evolutionary research deals with rates of evolution. Contributions to this branch of the science of evolution have been made particularly by the paleontologists. They have found that some phyletic lines evolve rapidly, others slowly. Indeed periods of rapid and of slow evolution may succeed each other in a single line.

This is beautifully demonstrated by the evolution of the height of the skull in man. During the evolution of *Homo erectus*, it increased at an almost unprecedented rate. With the attainment of the *H. sapiens* level this development came to a sudden and almost complete standstill. Such changes in evolutionary trends are very awkward to those who believe in orthogenesis and other mysterious or vitalistic forces. The adherent of the synthetic theory of evolution is less disturbed. A change in rate of evolution indicates to him a change in selection pressure, or else a change in population structure that would make the populations less apt to respond to natural selection. So many factors influence the rate of evolutionary change that one can not generalize. Each case must be analyzed for its special characteristics. The study of evolutionary rates is a branch of the science of evolution that has been undeservedly neglected. One solution, though frequently proposed, is almost certainly wrong: that rates of evolution are controlled by rates of mutation. Indeed, there may not be any correlation whatsoever between the two phenomena.

6. As the sixth branch of the evolutionary field, I shall list "causes and modes of evolution." Actually this is a whole bundle of subjects for which no logical subdivision has been proposed so far. The basic question underlying this area of research can be phrased as follows:

Can the orderly and adaptive emergence of such wonderful organs as the human brain, the vertebrate eye, or any other physiological or ecological adaptations be reconciled with the haphazardness and randomness of such phenomena as mutation, genetic recombination, fertilization, and survival of pre-adult stages? The modern evolutionist believes that it can. Indeed, the process of natural selection (statistically, not typologically

interpreted) can turn the accident into orderliness, since as R. A. Fisher (1930) has put it, natural selection "generates the improbable." It would lead too far to follow up this thought in detail. There is still much thinking, observing, and experimenting to be done, but all the evolutionary facts are consistent with the hypothesis.

#### PROBLEMS OF EVOLUTIONARY THEORY

Discussion of the phenomenon of evolution has suffered in the past from too much purely deductive analysis of philosophical generalities. A much better approach to generalizations is the one chosen by us, namely, to examine at first special problems of evolution such as the reconstruction of phylogenies, the origin of the material of evolution, speciation, and evolutionary rates. This gives us the proper background for the analysis of some of the basic problems of the evolutionary theory.

At this point it may be helpful to delimit the concept "organic evolution" more precisely. It refers to a change in genetic properties from generation to generation, owing to differential reproduction. It is clearly a group phenomenon. The change of an individual during its lifetime is not organic evolution. Several discussions of evolution in the current non-specialist literature indicate that the non-recognition of evolution as a group phenomenon is the greatest of all sources of confusion. The fact that there may be "goal-striving" or "purposiveness" in an individual does not permit us to conclude by analogy that there is likewise goal-striving in an evolutionary line. Any author who uses findings from the ontogeny of an individual to prove one or another evolutionary theory proves thereby that he completely misunderstands the working of evolution. To extrapolate from the individual to the evolutionary "type" and its fate is, of course, still another manifestation of typological thinking.

→ On the other hand it is quite legitimate to apply evolutionary concepts to certain group phenomena that are not, strictly speaking, genetic in nature, as for instance the evolutionary change of language and other cultural attributes of man. Concepts like "isolation," "mutation," "gene flow," "selective advantage" have their close and legitimate analogies in many of the phenomena studied by the cultural anthropologist.

Before concluding my remarks I would like to take up one final subject: "Purpose and plan in evolution." It is here that the greatest amount of doubt and confusion seems to prevail among non-biologists. The degree of confusion is perhaps best illuminated by a quotation from a recent article by the psychologist MacLeod (1957, p. 478): "What is most challenging about Darwin, however, is his re-introduction of purpose into the natural world." Nothing could be more misleading than this

statement. There is a world of difference between purpose and fitness. Purpose is a teleological concept, something *a priori*. Fitness is an *a posteriori* concept. A structure, a mechanism, a function or a behavior adds to fitness, because ancestral individuals with this attribute had greater reproductive success. Nothing succeeds like success. If we use the term "purpose" at all in biological discussion, we must do so only in a *posteriori* connotations. We may loosely say that the purpose of bird migration is to permit birds to escape the inevitable fate of death during winter. Yet, as soon as we study the evolution of bird migration we realize how misplaced the word "purpose" actually is. Bird migration is the result of the survival of individuals with an increased migratory urge and of the gradual increase in the frequency of "migration genes" in the gene pool of the population. There is not an ounce of purposiveness in this strictly opportunistic development guided by natural selection.

We can use this example as a model for the study of any evolutionary trend, labelled as "purposive." Every individual in any species of plant or animal differs in most of its attributes from the average of the species in a plus or minus direction. Each deviation may have a positive or negative selective value. These selective values are determined by the nature of the physical and biotic environment in which the given individual finds itself. With each generation there would be an increase of the plus characteristics, if it were not for the fact that the environment itself changes continuously, and for various genetic reasons (mutation, heterosis, etc.). What actually happens during selection is a matter of considerable complexity, but the details do not concern us here. What is important is that the genetic constitution of population, as analyzed by population genetics, reveals a genetic, and hence evolutionary, plasticity that provides almost unlimited evolutionary potentialities. If there is a selective premium on perfection of the eye, as among nocturnal birds of prey (owls), there is enough variability to supply the material for the achievement of this perfection. But there is no purpose involved. Not a single individual among the owl populations, exposed to selection, has the purpose of developing a better eye, and if he did it would not help him a bit.

Another example, illustrating the working of natural selection, is that of the plant galls. Most people are familiar with the peculiar thickenings that may develop on the stems or leaves of oaks, roses, goldenrods and other plants, and which serve as the cradle of various species of gall insects. These plant galls have played a great role in the speculations of certain philosophers in recent generations. The phenomenon has been labelled as "purposiveness in the service of others," or in German "Fremd-dienliche Zweckmässigkeit." It has been asked, what supernatural power

induces the plant to construct such a perfect domicile for the benefit of its parasite?

The approach indicated by this question is unscientific and altogether sterile. A casual analysis, on the other hand, shows that two selection pressures are involved, one on behalf of the insect for better protection and one on behalf of the plant against disfiguration by galls. It is obvious that of these two opposing selection pressures, the one for more efficient galls is by far the stronger. This is directly a matter of survival, while the presence of a few or even a great many galls on a tree is not apt to affect its survival appreciably.

After these examples, let me get back to the major theme. A casual analysis of even the most complex adaptive phenomena shows that there is no need to take recourse to theories of purposiveness or to any other finalistic or vitalistic theory. No phenomenon has ever been found in organic nature that cannot be interpreted within the framework of the modern, synthetic theory of evolution. And the most important element of the modern theory is the role played by natural selection, a role clearly envisioned by Charles Darwin. If we celebrate the centennial of the publication of the theory of evolution through natural selection, we do this not merely for historical reasons. We do it because natural selection has remained, since Darwin, the most important component of the theory of evolution and has become the cornerstone of the modern, synthetic theory of evolution.

## THE EFFECT OF DARWIN'S THEORY OF EVOLUTION ON PHYSICAL ANTHROPOLOGY

T. D. Stewart

Physical anthropology began to be an organized field of study just about the time Darwin published *The Origin of Species* in 1859. The two events had no connection except that they were parallel expressions of scientific progress. Although Darwin's new idea had numerous implications regarding man's evolution and differentiation into races, not everyone immediately perceived their full extent because Darwin was content at first to limit his reference to man to a single statement: "In the future I see open fields for far more important researches. . . . Much light will be thrown on the origin of man and his history" (1886, p. 428). This suggestion was seized upon immediately and developed by various science writers, especially Haeckel in Vienna and Huxley in London, but not until 1871 did Darwin summarize his own ideas in his *Descent of Man*. Thus the full impact of the new theory of evolution on anthropological thinking came a dozen years after the idea was introduced into general biological thinking.

The distinction between man and the rest of the animal kingdom, which appears in the mode of presentation of the Darwinian theory, reflects the mid-nineteenth century "climate of opinion." Haeckel (1879, p. 100) explained that:

For many years [before 1871] it was even asserted that Darwin had no intention of applying his theory to Man, but that he shared the prevalent opinion, that an entirely peculiar place in creation must be assigned to Man. Not only men unversed in science, including very many theologians, but even educated naturalists, asserted with the greatest ingenuousness, that the Darwinian Theory in itself was not to be combated, and was entirely correct, for it afforded an excellent means of explaining the origin of various species of animals and plants; but that the theory was in no way applicable to Man.

Darwin himself only hints at the storm he had stirred up when he says in the introduction to *The Descent of Man*: