CHAPTER 2

Evolving Natural Categories:
Darwin's Unique Legacy

The evolutionary world is a world in motion, in stark contrast with the static world of Hippocrates and the chain of being. At the very center of evolutionary thought is a view of the classification of living things so radically different from earlier views that it turns them upside down.

Though empirical investigation made a major contribution to the development of evolutionism, the Darwinian revolution cannot be understood as the simple result of such activities. Darwin's own view of the organic world seems to rest on a systematic inversion of the structure of earlier views, an inversion that then served as the source of his hypotheses for empirical investigation. Any approach that claims to be evolutionary must share certain elements of Darwin's vision of the world in motion. Many putatively Darwinian views do not.

The scholarship on Darwin and Darwinism is enormous and rich. The intense debates about the dating and sources of ideas are pursued by experts with lifelong commitments to the study of Darwin's texts. Radical reperiodizations of Darwin's thinking are currently taking place, particularly in light of the information contained in his notebooks.
Evolving Natural Categories

(Gruber, ed., 1974; Herbert, ed., 1980). The young Darwin had developed the whole theory of classification and evolution much more fully than anyone reading The Origin of Species would think. Darwin's representation of himself as a mere accumulator of data that inexorably led him to the theory of evolution is now being questioned.

Despite the appreciation of Darwin's own work and general agreement on the revolutionary impact of evolutionism on biological, social, and moral thought, one crucial element is widely mentioned but still tends to be undervalued. Darwin proposed a radical revision in our understanding of taxonomic classifications in biology and in the theoretical meaning of the various taxa within the system. Substituting genealogical for formal principles of classification, Darwin reorganized the system of classification to reflect descent with modification and to emphasize the productive role of variation in evolutionary processes.

Culture and Classification

The study of systems of classification is a major component of modern sociocultural anthropology. Beginning early with the study of the alternative means by which people in other cultures classify the world into “kin” and “nonkin” (thereby structuring their social relations in crucial ways), more recently passing on into the study of totemic classification systems (Douglas 1966), and finally into the study of ethnoclassification (Berlin and Kay 1969), anthropologists have devoted immense energy to the analysis of systems of classification. In particular, structuralist and semiological approaches to the analysis of cultural systems as systems of classification have yielded fascinating results in the hands of Claude Lévi-Strauss, Mary Douglas, Edmund Leach, and many others. One of the most important results of these anthropological analyses is an increasing awareness of the close linkage between systems of classification and systems of morality. Any alteration in the major
classifications of a cultural system nearly always imply alterations in moral systems as well. Put another way, there are no morally insigniﬁcant classiﬁcations.4

Seen in this light, the explosive reaction to Darwin, including the bitter questioning of his moral character, is not surprising. By proposing a revolution in the system of biological classiﬁcation, evolutionism demolished part of the foundation of existing moral systems. This conﬂict accounts for the persistence of the essential/populationist debate in biology that Ernst Mayr (1982) so adroitly documents.

No evolutionist has stated the case better than Darwin did. It was his particular genius to have linked the question of evolution tightly to the issue of classiﬁcation. But Darwin is no culture hero. He was wrong about many things, inconsistent about others; signiﬁcant social biases marred his work. Many commentators, including Karl Marx, have claimed that Darwin's view of the evolutionary process was strongly conditioned by his social experience and position; that he was, in a word, an apostate for the capitalist order. Clear lines of evidence can be cited to show that Darwin held imperial social, racial, and sexual biases, though one becomes impressed by the moderation of his positions on these issues as one reads the works of many of his contemporaries.

Darwin was very much a man of his era, sharing many of its ideological biases. Yet no one has ever made the case for evolution better or with a clearer recognition of the immense scope of the intellectual revolution it proposes. In Darwin's key texts we are able to see clearly the revolution in classiﬁcation that evolutionism implies. Perhaps better than any of his contemporaries and despite his ideological biases, Darwin believed that political and moral conclusions could not be derived directly from the study of evolution, a view exceptional even now.

Precisely because Darwin's works are so important, virtually every aspect of them has been subjected to close scrutiny. Much of this territory is hotly contested. Darwin's theories themselves, his social biases, his religious beliefs (or lack of them), and many other aspects of his writing and character are debated by experts. Little can be said about Darwin that will not be repudiated by someone. Such is his fate.
Evolutionary Categories

Darwin's Major Works

The evidence Darwin used was available to all, and many of the
conceptual structures were also in wide circulation. The secret of Dar-
win's success goes beyond his theoretical and empirical innovations.
After all, both Darwin and his colleague Alfred Russel Wallace had
come up with the theory of evolution. But it was through the writing
of The Origin of Species that Darwin began the reversal of the pre-
dominant Western system of describing nature and the construction
of the theory of evolution out of that reversal. My emphasis on the
reversal accounts for the highly selective reading of Darwin presented
here. I make no claims regarding Darwin's personal intentions. I do not
know the thought process by which Darwin constructed his works.
Rather I emphasize the internal logic of his system of thought as it
supports the theory of evolution. The test of this kind of approach is
simply how well it accounts for the structure, emphasis, and data
arrayed in the works.

The Origin of Species

Virtually everyone knows the story of the writing of The Origin of
Species: the voyage on the Beagle, the coincidence of Darwin's and
Wallace's views on evolution, the great stir Darwin's book created,
and Darwin's subsequent problems and doubts. These issues are left
aside here to concentrate on some of Darwin's statements about clas-
sification of plants and animals. Here his views contrast starkly with
those of his predecessors and with those of many of his supposed
followers as well.

The very title bears close scrutiny: The Origin of Species by Means
of Natural Selection; Or the Preservation of Favoured Races in the
Struggle for Life. The book is about the origin (in the sense of pro-
ductive principle and genealogy), not the character, behavior, mor-
phology, or embryology of species. It is about the origin of species,
that is, how the categories of living things in the world of observation
have come into existence—a process until then explored by the idea

...
of special creation, which organized species into a chain of being, the species then being acted upon by humoral/environmental forces. The term "natural selection" is used because the causal agent in speciation is not God or any other supernatural principle that at some time in the remote past created eternal categories; it is the continuous operation of blind material laws.

The restatement of the subject—Or the Preservation of Favored Races in the Struggle for Life—brings up an ambiguity that runs through Darwin's work and that of most other nineteenth-century thinkers: the terms "species" and "race" are often used interchangeably. In Darwin's case, the use of the term "race" is important because in ordinary speech "race" conveys a strong sense that genealogical principles are the primary ones that give rise to and define species boundaries. Species are separate categories of things in the world. To call them races is to emphasize the genealogical lines stretching from past to present and set the scene for the idea of descent with modification.

The "struggle for life" notion points to reproductive competition under specific environmental conditions as the mechanism by which natural selection operates. It is not a providential hand that chooses but blind physical laws, and the struggle never ends. Thus Darwin titled his book well, for the title summarizes his theory.

The book itself, despite Darwin's continual reference to it as an essay written in haste, has a coherent internal structure that supports the argument well. It is divided into three major sections, each dealing with a specific set of issues.

The first section is devoted to an exposition of the mechanisms that produce variation, competition, and ultimately speciation by means of natural selection. Darwin begins this section strategically by discussing variation under domestication. Since humans have induced speciation quite often by manipulating the environments and reproduction of plants and animals, how can we believe that species boundaries are absolute and fixed? Darwin also points out that species under domestication are highly variable. It is this variability that permits us to breed plants and animals as we do.

Variation is the cornerstone of Darwin's world view, and thus he begins with it. Where others saw uniformity and clear-cut species...
boundaries, Darwin saw ranges of variation. Much of his observa-
tional life was spent in cataloguing variation, a phenomenon that not
only was theoretically important for him but clearly fascinated him
in its own right. This focus commensurately with the pre- and non-
evolutionary views of the world, in which fixed natural categories of
things succeed themselves from generation to generation, with no
change other than some preordained progress or fateful degeneration.

Having made his argument about variation and selection in the world
of everyday human experience, Darwin then moves outward to the
undomesticated world, showing that a similarly great amount of var-
iation exists in all living things. Examples abound, drawn from every-
where. Variation is the first step in the argument for evolution.

Darwin then introduces the “struggle for life.” Outside the domes-
ticated world there are no plant and animal breeders to act on varia-
tion. Darwin argues that different variants are differentially capable
of reproducing successfully in the diverse environments in which they
are found. Those better able to reproduce proliferate and the others
fade away. This view is complemented by the naming and develop-
ment of the concept of natural selection.

In Chapter 1, humans were the selectors. Now Darwin opens up
the possibility that blind natural forces act as selectors on the im-
mensely number of variants among plants and animals. This process of
natural selection gradually changes the amount of species of plants
and animals until new and different species come into existence, all
genealogically linked to their predecessors. He closes the section with
a chapter on “laws of variation,” in which he claims that a theory
based on variation and natural selection will yield a coherent inter-
pretation of the history of life on earth.

The second section strategically poses the major objections that could
be advanced to compromise his general argument. Here Darwin’s ca-
pabilities as a scientific thinker become particularly manifest as he
first conceptualizes the opposing views and then systematically under-
cuts them. He casts down the gauntlet in scientific fashion: this is the
theory; here are all the objections to it; none of the objections is cri-
pling, so until an unanswerable objection can be formulated, the theory
stands.

In the third section Darwin arrays geological, geographical, and
morphological evidence in support of the theory of evolution. With each body of evidence goes the suggestion that much more evidence could be adduced. The recapitulations of the whole argument at the end of the book shows, among other things, just how well planned the "essay" was. Throughout the book the movement is measured and self-conscious: argument, counterargument, proof, recapitulation.

Often using little and tenuous evidence, Darwin succeeded in making a forceful argument that species arise continuously by natural processes, thereby demolishing the cornerstone of the pre-evolutionary views of nature. Darwin did not create an unrecognizable world of nature. Rather he took the world of nature as people observed it and explained its structure in a way that was odious to a significant part of his audience.

It is helpful to flesh out the argument about evolutionary classification put forward here with some of Darwin's specific statements. The Origin of Species begins with a criticism of the view of species as immutable and separate:

Until recently the great majority of naturalists believed that species were invariable productions, and had been separately created... Some few naturalists... have believed that species undergo modification and that the existing forms of life are the descendants by true generation of pre-existing forms... [Darwin (1859) 1958:17]

An emphasis on genealogical relationships (what Darwin called "true generation"); is the key to his argument against separate creation. Occasionally this emphasis on genealogical relationships leads him to appeal to the old language of "blood," as in the following case: "... looking to the domestic dogs of the whole world, I have... come to the conclusion that several wild species of Canidae have been turned, and that their blood, in some cases mingled together, flows in the veins of our domestic breeds" (p. 39). He contradicts the notion of separately created species by conjuring up genealogical relations between wild and domesticated dogs. If such genealogical relations exist, and the wild comes before and gives rise to the tame, then species are generated out of each other.
Later Darwin links variation with speciation, in this case by speaking of domesticated species: "The key is man's power of accumulative selection: nature gives successive variations; man adds them up in certain directions useful to him. In this sense he may be said to have made for himself useful breeds" (p. 48).

This is a frontal attack on special creation. Nature itself is the producer of variation. In the pre-evolutionary view, nature merely reflected the initial order made by the creator. Humans produce species by acting on this variation, hence "natural" species through selection. Such actions would be impossible in a world of hermetically sealed separate species. For Darwin, variation is not deviation from the ideal form of the species, it is the source of all species. Darwin sums up this argument by stating:

Changed conditions of life are of the highest importance in causing variability, both by acting directly on the organisation, and indirectly by affecting the reproductive system. . . . Over all these causes of Change, the accumulative action of Selection, whether applied methodically and quickly, or unconsciously and slowly but more efficaciously seems to have been the predominant Power. [P. 57]

Thus by the end of his initial chapter Darwin has put most of the major elements of his argument into play. Beginning with the world of everyday observations of domesticated plants and animals and their variations, he moves outward toward larger principles. If humans, by controlling reproduction, can create species by selecting for certain variants, then species are not immutable. It is then conceivable that other agencies (such as the environment) could also select among the variants within an existing species and ultimately cause the creation of new species. If this argument is accepted, separate creation and the chain of being disappear.

The central obstacle left for Darwin to overcome is the proof that variation and selection occur outside of the domesticated species directly subject to human agency. He turns to this task with vigor.

The argument begins with a strong emphasis on the arbitrariness of species boundaries. Darwin states: "... I was much struck how entirely vague and arbitrary is the distinction between species and varieties" (p. 65). Then he elaborates the argument:
Certainly no clear line of demarcation has as yet been drawn between species and sub-species... or, again, between sub-species and well-marked varieties, or between lesser varieties and individual differences. These differences blend into each other by an insensible series; and a series impresses the mind with the idea of an actual passage.

Darwin's view of the empirical world centers on variability, complexity, and classificatory ambiguity. He radically reverses the view of nature as a linked chain of sharply separable species with no motion other than self-replication. In place of fixed species Darwin inserts "an insensible series." In place of clear categories he interjects the arbitrariness of species boundaries. And in place of a series of similar but variant organisms he posits a historical, evolutionary relationship.

To counter the existing view of the natural world, Darwin attacked the dominant classificatory scheme. Rather than seeing species as eternal categories that empirically vary around the perfect expression of the species' inherent character, he makes variation the real and eternal feature of nature, converting species into momentary historical embodiments of these variations. In this massive reversal he subverts special creation and the chain of being at the same time. He creates a view of nature that is the opposite of the dominant one.

This argument logically leads him to the next questions: What agency causes the appearance of various species out of the multiplicity of variation observed in nature? Why is nature simply not an incoherent teeming of life? Many thinkers have attempted to reinsert the hand of God into the theory of evolution at this point by arguing that the whole process of variation and selection is providentially guided. Darwin did not take this path. Instead he insisted that the origin of species must be understood solely as a historical process with a beginning, operating according to coherent principles, but without an intrinsic direction or goal.

Defining the struggle for life, he says:

Owing to this struggle, variations, however slight and from whatever cause proceeding, if they be in any degree profitable to the individuals of a species, in their infinitely complex relations to other organic beings and to their physical conditions of life, will tend to the preservation of
such individuals, and will generally be inherited by the offspring. The offspring, also, will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle... by the term Natural Selection, in order to mark its relation to man's power of selection. But the expression often used by Mr. Herbert Spencer of the Survival of the Fittest is more accurate... [P. 74]

Variation, complexity, multiplicity, and competitive advantage are the cornerstones of Darwin's view.

Why could God not create such a world? Darwin does not, in fact, dispute the existence of God, but he deeply distrusts human understanding of nature. Darwin's view of the physical limitations of the human mind and its capacity for experience in relation to the complexity and vastness of the physical universe makes him deeply suspicious of simplistic conceptions of the creator.

... so profound is our ignorance, and so high our presumption, that we marvel when we hear of the extinction of an organic being, and so do we not see the cause, we invoke catastrophes to desolate the world, as ancient men saw the destruction of the floods of Noah... The one who believes that each species was independently created, will, I presume, assert that each species has been created with a tendency to vary, both under nature and under domestication, in this particular manner, so as when to become striped like the other species of the genus, and that each has been created with a strong tendency, when crossed with species inhabiting distant quarters of the world, to produce hybrids resembling in their stripes, not their own parents, but other species of the genus. To admit this view is, as it seems to me, to reject a real for an unreal, or at least for an unknown, cause. It makes the works of God a mere mockery and deception; I would almost as soon believe [with] the old and ignorant cosmogonists, that fossil shells had never lived, but had been created in stone to mock the shells living on the seashore. [Pp. 82, 155-56]

By emphasizing the diversity and complexity of the natural world, Darwin stresses a point he makes repeatedly in the Origin and later, in more detail, in The Descent of Man.

Darwin is very careful to argue that natural selection itself does not induce variation. Were he to admit that it did, variation would be
easily reduced to a mere incident in natural selection, with evolution following directly from environmental requirements. As it is, his emphasis is just the opposite. There is hugely more variation available in the world than is operated on by selection. Variation is produced by principles that Darwin did not in fact understand, but he was certain that the cause was not the process of selection itself. Living nature’s prime characteristic is production of variation; the production of temporary categories (species) is a subsequent step. The world moves dialectically from variation to selection to variation. Selection creates coherent classes of organisms.

Darwin, argues that the crossing of varieties is a law of nature itself. If the chain-of-being argument were correct, then logically the best examples of a species would fertilize themselves. But Darwin’s observations lead him to believe that it is a general law of nature that no organic being fertilizes itself for perpetuity of generations; but that a cross with another individual is occasionally indispensable. On the belief that this is a law of nature, we can understand several large classes of facts which on any other view are inexplicable. [P. 101]

Reproduction is mixing of variants.

Darwin reverses separate creation by considering the variations to be real and continuous and the species to be only momentary manifestations. He then argues that species breed in such a way as to produce rather than to reduce variation. Thus variation, not the fixity of species, is the “law of nature.”

Darwin has chosen his words well, breaking the old meaning of “law of nature” from its mold as a description of a fixed order. He moves on a chain of rhetorical links from variation to domestication, breeding, and natural selection. At each juncture he challenges others to explain these facts better. Nature is a complex set of processes, a history with no goal. This is what Darwin’s chart of species change emphasizes. [See Figure 2.]

When Darwin discusses the geological record, he strongly states his historical view of nature as an eternal motion against the view of nature as consisting of a set of fixed, uniform categories. The constancy in nature is a constancy of motion:
Figure 2: Darwin's diagram of the evolutionary process (Darwin [1859] 1958)
Major Western Views of Nature

We can clearly understand why a species when once lost should never reappear, even if the very same conditions of life, organs and structures, should recur. For though, the offspring of one species might be adapted . . . to fill the place of another species in the economy of nature, and thus supplant it; yet the two forms—the old and the new—would not be identically the same, for both would almost certainly inherit different characters from their distinct progenitors, and organisms already differing would vary in a different manner. [P. 315]

The uniformity of causes imposes order in nature, but these causes work only through time. Each successive moment in the history of life is different from all other moments. This is a direct attack on the standard view of special creation.

Darwin shows his awareness that the issue of classification is the central one in evolutionary theory when he points to "the difficulties which are encountered in the view that classification either gives some unknown plan of creation, or is simply a scheme for enunciating general propositions and of placing together the forms most like each other" (p. 287). He points out that classifications are a complex mix of morphological and functional criteria; that embryological affinities not obvious in adult members of species are important in classification; and that geographical distributions have also been important. Darwin insists, however, that there is only one correct overarching principle of classification. It must be followed, with all other principles subordinated to its requirements:

I believe that the arrangement of the groups within each class, in the subdivision and relation to each other, must be simply genealogical in order to be natural; but that the amount of difference in the several branches or groups, though slight in the same degree in blood to their common progenitor, may differ greatly, being due to the different degrees of modification which they have undergone; and this is expressed by the forms being ranked under different genera, families, sections, or orders. [P. 391; emphasis his]

Note that he says the arrangement must be "genealogical in order to be natural." Nature is defined as a historical process, and all classifications that are to aid in clarifying this natural process must be based on historical relationships. Darwin does not deny that classification
can be done on numerous grounds, but he does deny that any but a
genealogical classification can be used as the basis of an evolutionary
analysis.

There is no question that the reaction to The Origin of Species was
appropriate. The shock, excitement, and outrage were fully earned by
such a frontal attack on the basis of existing views of nature. The
Origin is a polemic. Despite its often ponderous apparatus of facts
and its flat language, its central structure is provided by a reversal of
the Western view of nature, supported by an appeal to scientific ap-
praisal of the "facts," to the value we attach to the scientific method
and rational analysis.

The principal issue he did not attack directly was that of human
evolution. The only reference to it is the famous cryptic line "Much
light will be thrown on the origin of man and his history" (p. 449).
But no one could doubt what Darwin had in mind. If special creation
and the chain of being had given humans a privileged place in nature,
then a repudiation of those views must also alter the human position.
It did, though his full statement of the point was not published until
1871, under the title The Descent of Man and Selection in Relation to
Sex.

The Descent of Man and Selection in Relation to Sex

The Descent is a remarkable work both for the currency of its ar-

guments and for the relative obscurity into which it has fallen. While
The Origin is available in a variety of popular editions, until 1981
the Descent was for a long time available only in expensive facsimiles.
Thus its readership has been quite limited, though the general public
has made best-sellers of other books on the same general topic (Lee-

Evolutionary analysis applied to humans and the theory of sexual
selection appear together in the Descent because Darwin believed that
natural selection was much relaxed in the human case. In its place,
sexual selection, heightened by human cultural capacities for its elab-
oration, is seen as a prime force. Darwin uses sexual selection to ex-
plain, among other things, the phenotypic diversity of human "races."

At each point in the long argument, humans are shown to be influ-
enced by the same forces that are at work in the rest of the natural world. Thus the Descent closes out the hope that a unique realm of natural laws might be preserved that would maintain the special dignity of human beings.

Darwin emphasizes human variability just as strongly as he emphasized the variability of nonhuman life in the Origin. "The variability or diversity of the mental faculties in men of the same race, not to mention the greater differences between men of distinct races, is so notorious that not a word need here be said. So it is with the lower animals" ([1871] 1974:26).

After making some remarkable, contemporary-sounding comments to the effect that humans are like domesticated animals in our variability, in the way selective forces affect us, and in that we are a highly diverse, wide-ranging species, he argues that human superiority is a direct result of our success in the struggle for existence:

"Man in the rudest state in which he now exists is the most dominant being man and the higher mammals in their mental faculties. . . . As no classification of the mental powers has been universally accepted, I shall arrange my remarks in the order most convenient for my purpose; and will select those facts which have struck me most with the hope that they may produce some effect on the reader."

Regarding social living, Darwin argues that social habits and social control depend on the animal's ability to sense the approval and disapproval of others. He writes:

"Man in the rudest state in which he now exists is the most dominant animal that has ever appeared on this earth. He has spread more widely and conquered more thoroughly than any other species. This is not, however, due to his intellectual faculties, to his social habits, which had been in aid and defined his future, and to his superior structure. The supreme importance of these advantages has been proved by the final ascertainment of the battle for life. Through his powers of intellect, articulate language has been evolved; and so, too, the wonderful advantages that man has thereby acquired."

After these generalities, Darwin focuses the argument on each of these traits in turn: intellectual faculties, social habits, body structure.
approval of its conspecifics. He calls this capacity "sympathy" and claims that it also evolved by natural selection. All social animals have it, but humans have it in a higher degree. Darwin thus erases the line between humans and nonhumans.

In the course of his argument Darwin explores the notion that different environments act as spurs to different kinds of cultural systems, especially the idea that challenging environments stimulate great activity and industriousness. He advances a number of eugenic arguments as ways of seeing natural selection at work on the populations of "civilized" societies, though his position is moderate by comparison with Francis Galton's hard line ([1869] 1962). According to Darwin, the instinct of sympathy—the instinct to act in accordance with our understanding of the effect our actions will have on other people—is the basis of our social existence. It prohibits us from taking positive eugenic measures against the weak.

After delivering the judgment on the animal affinities and genealogy of humans for which Darwin is so famous, he attempts to replace absolute human superiority with a sense of the majesty of life itself:

Thus we have given to man a pedigree of prodigious length, but not, it may be said, of noble quality. The world, it has often been remarked, appears as if it has long been preparing for the advent of man and this, in one sense is entirely true, for he owes his birth to a long line of progenitors. If one single link in this chain had never existed, man would not have been exactly what he now is. Unless we willfully close our eyes we may, with our present knowledge, approximately recognize our parentage; nor need we feel ashamed of it. The most humble organism is something much higher than the inorganic dust under our feet; and no one with an unbiased mind can study any living creature, however humble, without being struck with enthusiasm at its marvelous structure and properties. [P. 161]

When Darwin takes up the vexed question of race, he remains true to his principles. He begins by returning to the general argument that the question of race must be very ambiguous if even species boundaries are fuzzy. He then states that the question whether the races are species or not cannot be solved in the absence of a general definition of species that is accepted by all biologists. Lacking such a definition, he argues that...
although the existing races of man differ in many respects... yet if their whole structure be taken into consideration, they are found to resemble each other closely in a multitude of points. Many of these are so appropriate or of so singular a nature, that it is extremely improbable that they should have been independently acquired by originally distinct species or races. The same remark holds good with respect to the numerous points of mental similarity between the most distinct races of man. The great variability of all the external differences between the races of man, likewise indicates that these cannot be of much importance; for if important, they would long ago have been either fixed and preserved, or eliminated. In this respect man resembles those forms, called by naturalists protean or polymorphic, which have remained extremely variable, owing, as it seems, to such variations being of an indifferent nature, and to their having thus escaped the action of natural selection. [Pp. 174, 193]

To account for the great differences among the races, Darwin turns to the principle of sexual selection. He views the development of highly distinctive morphological and behavioral characteristics primarily as means of attracting mates.

The work concludes with the following summary:

The main conclusion here arrived at, and now held by many naturalists who are well competent to form a sound judgement, is that man is descended from some less highly organized form. The grounds upon which this conclusion rests will never be shaken, for the close similarity between man and the lower animals in embryonic development, as well as in innumerable points of structure and constitution, both of high and of the most trifling importance... are facts which cannot be disputed. They have long been known, but until recently they told us nothing with respect to the origin of man. Now when viewed by the light of our knowledge of the whole organic world, their meaning is unmistakable. The great principle of evolution stands up clear and firm, when these groups of facts are considered in connection with others, such as the mutual affinities of the members of the same group, their geographical distribution in past and present times, and their geological succession. It is incredible that all these facts should speak falsely. He who is not content to look like a savage, at the phenomena of nature as disconnected, cannot any longer believe that man is the work of a separate act of creation. [Pp. 480-1; emphasis mine]
The brutality of his last line is stunning. The choice we are left with is to be primitives and believe in special creation or to be civilized and try to make do with evolution and find new sources of species pride.

At the very end the book adopts an uneasy balance between a view of our social obligations to educate people as far as possible (because increasing intellectual awareness necessarily improves moral judgment) and Darwin's laissez-faire view of society as an arena of free social competition. The book contains many tensions of this sort. There are lapses into racist doctrines; there is a good deal of overt and covert sexism; eugenics is toyed with. Yet by comparison with such contemporaries as Spencer and Galton, Darwin was very cautious on these issues—more ready than they to accept responsibilities for the protection of the weak than to use evolutionary doctrines to justify the suppression of the poor and the dehumanization among us, and less willing to derive his ethics from the study of biology.

Evolving Natural Categories

My contentions are simple, perhaps even uncontroversial. I have argued that Darwin was a true scientific revolutionary. If one takes the view of nature (and of humans) that supports the theory of special creation and the concept of the chain of being and reverses all their central postulates, one comes up with a view very much like Darwin's. Whether or not Darwin consciously engaged in such an inversion in immaterial. What matters is that conceptualizing Darwin's work this way permits us to understand its revolutionary impact and to set the minimum requirements that any view of humans that claims to be evolutionary must meet.

The theories of special creation and the chain of being demanded acts of creation that give rise to all categories of living things. These categories have definite natural boundaries. What variation there is among them is due solely to the influence of environments and, in the case of humans, to sin. Nature has no history, if history is conceived as a continual, open-ended causal process. As most an idea of progress or
degeneration can be inserted in an attempt to make history dynamic without doing violence to the idea of special creation.

The special-creation view requires a fixed, absolute hierarchy of separately created species. The order of hierarchy is set by the sequence of creation laid out in Genesis. At the end of the sixth day of creation there is a day of rest. A radical break occurs when Adam and Eve are expelled from the Garden of Eden; now secular historical time begins. But this secular time has no capacity to bring about any alteration in the separately created categories. Each and every creature in every successive time period is simply the reincarnation of its species as that species was originally created. (See Figure 3.) To the extent that there is a genealogical relationship between time periods, it simply stretches back to the first created individual of the species. Any variability observed in any of the time periods is seen as deviation from the created ideal, deviation caused by environmental effects or by degeneration.

In this view, the core element is the idea that plants and animals breed true. As a first principle, humoral/environmental theories assert that there are direct physical principles of causation that operate in harmony throughout the physical universe. The second principle is that a first creation had to occur in a specific environmental context and this creation gave rise to the species constitutions that thereafter have passed through time almost intact. Reproduction in this view means copying. The environmental and genealogical principles interact by special creation, giving rise to the genealogical lines that are acted on by the environment to cause deviation from the norm. Variation here is equated with deviation. There is no link back between variation and the creation of species. The development of acquired characteristics can be incorporated in such theories only by means of radical internal inconsistency.

The fixity of these natural categories is the basis for moral judgments as well. Genesis and the chain of being not only show that creation is a one-time, orderly act; they also argue that the levels of existence are ranked, with humans at the pinnacle. Human relations with nonhuman nature and with our own biological existence are orchestrated by the hierarchy of the original creation. There is no historical dynamic, no change, no possibility whatever of evolution.
Figure 3: The chain of being view of the history of life
Darwin attacks all of this scheme. In his view there is no single act of creation. The living world is in continual flux. Everything rests, all variations intergrading into each other. The emergence of natural categories (species) is an outcome of the interplay between chance variation and the selection processes that act on that variation in the "struggle for life." Species continually emerge out of this flux, as it were, and eventually disappear. Their historical contribution, however, is real. Every step in the genealogy of a current species bears the mark of its evolutionary history. The process as a whole is going nowhere in particular; it is simply going on. This history of life is the history of coming into being and extinction of species, nothing more and nothing less.

In the Darwinian view, the principal observation is the primacy of variation and speciation. For Darwin the first principle is the genealogical one. Each genealogical line produces spontaneous variations. These variations often mix with related lines. Here reproduction is equated with mixing and the production of variation.

The second principle is environmental, for the environment acts on the variations to select among them. In this case genealogy produces the variance and the environment selects among variants in a dialogue that causes continual speciation and extinctions. There are no fixed categories in nature.

The Darwinian revolution is apparent when Darwin’s view is compared with the special creation view (which is after all what Darwin was doing). Both explanations have a beginning. Special creation begins when God said, “Let there be light”; the evolutionary view begins with the first emergence of some unicellular (or simpler) form of life. In both, in any time period, the various taxa can be ranked according to their formal complexity. In the special-creation view, however, the most complex taxa, humans, has dominion over the earth, while in the evolutionary view, higher taxa are simply higher taxa and no more.

The relationships between the time periods in the two views are quite different. After the initial creation in the Genesis view, each successive time period basically reexpresses the initial categories, except for certain extinctions (as in the Flood). By contrast, the relationship
In the special-creation view, the deity precluded the possibility of speciation. Different environments work on fixed species to create variance in each generation's expression of the ideal category. In the evolutionary view, by contrast, variation is continuously produced by nature itself. The action of the environment on the variance actually produces the species, the natural categories.

For the special creationists, only the categories given by God's design are real. Each generation simply reincarnates them. For Darwin, only the facts of variance and selection are real (in the sense of being constant features of life on the planet). Species are simply the transitory embodiments of the results of this opportunistic, statistical process.

Even the observer's point of view is not absolute. Darwin argued that all perception is relative to the material structures that do the perceiving. Thus even our knowledge of evolution is conditioned by the structure of our own perceptual apparatus, itself a product of evolution. The special creationists, by contrast, must believe that perception of the absolutes in the design that lies behind the world of variable appearances is possible and that the human mind is capable of it.

Thus evolutionism not only demotes humans to kinship with the other animals but also eliminates our absolute godlike perceptual distance with regard to the everyday world of existence. The "facts" of observation and history are all we can deal with, our greatest hope is
to understand where we come from. In place of a world of bounded natural categories and clear moral interpretations, evolutionism places only awe and curiosity.

The Minimum Standards for an Evolutionary View of Living Things

Darwin's views created an enormous stir in the scientific community, and many subsequent thinkers have proclaimed themselves to be ardent evolutionists. But not all evolutionists agree about the implications of Darwin's ideas, and some genuinely non-Darwinian ideas have found their way into the biological and social sciences, as Mayr has pointed out (1982). For this reason, it is necessary to set certain minimum standards that a theory must meet if it is to be considered evolutionary.

In order to be evolutionary, a theory must embody the following propositions:

1. Variation is a ubiquitous feature of all living things. It is continually and normally produced spontaneously.
2. Selection is the result of interaction of specific sets of environmental conditions with the variations in species of plants and animals. Selection is the force that gives rise to and alters the categories of living things.
3. The interaction between variation and selection results in adaptation or extinction. Adaptation is always relative to particular organisms and specific environments. Adaptation is never permanent.
4. All forms of life are ultimately related to each other by genealogical connections.
5. There are no nonmaterial forces at work in the evolutionary process, nor are there any "pull" factors in evolution.
6. There is no radical dichotomy between culture and nature, for in one there are no radical dichotomies between any things in nature at all. Species are ranges of variation that intergrade into each other at the margins.
Though Darwin's works can be used to set standards for evolutionary thinking, they are by no means free of problems. Darwin lacked knowledge of the mechanics of heredity and concocted the theory of pangenesis to support his argument. His stress on the absolute, slow uniformity of the pace of the evolutionary process was probably too extreme.

His views about society turned out to be innocuous, though they were by no means outrageous in comparison with those of many of his popular contemporaries. His view of society as a natural and fair competitive arena and his thoughts on male dominance and eugenics now appear painfully naive and even hateful.

Of course evolutionary controversies continue. The phenotype/ genotype distinction, the units of evolution—especially above the species level and below the individual level (i.e., biochemical processes)—the question of whether or not adaptation leads to optimum solutions, and the old conundrum about the direction of evolution are issues that continue to call forth heated debate. Yet what impresses one most in reading the literature produced by such contemporary evolutionary biologists as Ernst Mayr, Sewall Wright, Richard Lewontin, and Stephen Jay Gould is the degree to which Darwin's basic vision remains viable well over a century after its first public expression.

The controversies in modern evolutionary biology are important and lively. While some tenets of evolutionary thinking are agreed upon, mechanisms and interpretations are hotly debated. Exclusive attention to these contested issues in recent decades has led attention away from some larger questions about the acceptance of evolutionism, questions that only recently have begun to surface again.

The literature on racism and eugenics has been shown to contain numerous attempts to claim the support of evolutionary theory and other scientific views for a variety of oppressive doctrines (Chase 1975-76). The continuities between pre-evolutionary and current views on these issues are depressingly apparent and are well known. But other kinds of continuations exist.

Recently evolutionary biologists who approach the problem in very different ways have began to argue that elements of pre- and non-evolutionary thinking are much more important in modern biology than current practitioners imagine. Mayr, in The Growth of Biology-
Major Western Views of Nature

 calle Thought (1982), distinguishes between “essentialist” thinking (what I have described as humoral/environmental theories) and “population” thinking (evolutionary reasoning). Mayr contends that the rise of evolutionism involves the replacement of essentialism by population thinking. The conflict between these two views, however, is of long standing in the Western intellectual tradition, and it continues to plague modern evolutionary biology. Though Mayr’s agenda in contrasting these two traditions is somewhat different from mine, his view of the history of biology clearly supports my characterization of the differences between pre- and non-evolutionary views of nature and evolutionary ones.

Another major trend in recent biological thought is the critique of “adaptationism.” This critique has not been connected to the historical and interpretive issues I am emphasizing, but I am convinced that it can and should be. The adaptationist critique is most closely associated with Gould and Lewontin, who criticize certain contemporary biologists for introducing an adaptationist view into their evolutionary thinking:

... the adaptationist program, or the Panglossian paradigm... is rooted in a notion [of] the near omnipotence of natural selection in forging organic design and fashioning the best among possible worlds. This program regards natural selection as so powerful and the constraints upon it so few that direct production of adaptation through its operation becomes the primary cause of nearly all organic form, function, and behavior... An organism is atomized into ‘traits’ and these traits are explained as structures optimally designed by natural selection... After the failure of part-by-part optimization, interaction is acknowledged via the dictum that an organism cannot optimize each part without imposing expenses on the others... The adaptationist program can be traced through various styles of argument...

(1) If one adaptive argument fails, try another...
(2) If one adaptive argument fails, assume that another must exist...
(3) In the absence of a good adaptive argument in the first place, attribute failure to imperfect understanding of where an organism lives and what it does...
(4) Emphasize immediate utility and exclude other attributes of form... (Gould and Lewontin 1979:584-87)
Evolving Natural Categories

From these premises Gould and Lewontin go on to argue that these fallacies in action result in the telling of “adaptive stories” that are immune to test.

Gould and Lewontin are combating a form of biological reasoning that reproduces important elements of the pre-evolutionary design arguments. Perfect adaptation as an assumption belongs nowhere in evolutionary biology. It does, however, fit into the concepts of nature found in the design view, the special-creation theory, and some applications of humoral/environmental theory. Fixed species, clear natural categories, and perfect adaptations are the antithesis of evolution.

To see biological science as telling stories about a world in which all the organic parts are at an adaptive optimum is not to use biological science at all, but to reintroduce technology and theology into the study of the organic world. It is quite consistent with general attempts to domesticate Darwinism’s randomized, liminal world in motion and render it less fearsome.

Together the works of Mayr, Gould, and Lewontin show that even within modern evolutionary biology, significant strains exist. The conflict between evolutionary and nonevolutionary views of nature has not come to an end with the “modern synthesis.”