The Philosophical Foundations of Darwinism[1]

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EVERY PERIOD in the history of civilized man was dominated by a definite set of ideas or ideologies. This is as true for the ancient Greeks as for Christianity, the Renaissance, the Scientific Revolution, the Enlightenment, and our modern times. It is a challenging question to ask what the source is of the dominating ideas of our present era. One can ask this question also in different terms. For instance, which books have had the greatest impact on current thinking? Inevitably, the Bible would have to be mentioned in the first place. Up to 1989, when the bankruptcy of Marxism was declared, Karl Marx's *Das Kapital* would clearly have been in second place, and it is still the dominating influence in many parts of the world. However, Darwin's *On the Origin of Species* (1859) must surely be mentioned in the next place. I hope to be able to show that this position is justified not only because Darwin more than anyone else was responsible for the acceptance of a secular explanation of the world, but also because he revolutionized our thinking about the nature of this world in surprisingly many other ways.

Darwin's Method

Darwin was first and foremost a naturalist. His favorite method was also that of the naturalist. He made a series of observations and developed a conjecture from this evidence. He considered this approach to be the inductive method, and recorded in his autobiography that he considered himself a true follower of Bacon. However, some students of Darwin's work, for instance Ghiselin (1969), thought that this approach was better considered to be hypothetical-deductive. Indeed, Darwin sometimes used this method. Actually, perhaps the closest to

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the truth would be to say that Darwin was a pragmatist and used whatever method he thought would bring him the best results. Darwin was a very keen observer, and there is no doubt that observation was his most productive approach. However, he was also a most skillful experimenter and, particularly in his botanical researches, he conducted numerous experiments.

Time

The most widely used method in the physical sciences is the experiment. However, in his evolutionary studies Darwin had to cope with a factor that is irrelevant in most of the physical sciences except in geology and cosmology, the time factor. One cannot experiment with biological happenings in the past. Phenomena like the extinction of the dinosaurs and all other evolutionary events are inaccessible to the experimental method and require an entirely different methodology, that of the so-called "historical narratives." In this method one develops an imaginary scenario of past happenings on the basis of their consequences. One then makes all sorts of predictions from this scenario and determines whether or not they have come true. Darwin used this method very successfully in his biogeographical reconstructions. Which former land bridges, for instance, are supported by current distributions and which others are not?

The importance of the method of historical narratives has long been overlooked by philosophers. It is, however, an indispensable method whenever one deals with the consequences of past events. Considering the productiveness of this method, it is surprising how much it has been neglected by the historians of science. How much, for instance, have Buffon, Linnaeus, Lamarck, and Blumenbach made use of historical narratives?

In my title I referred to the philosophical foundations of Darwin's thought, and elsewhere in my writing I have referred to Darwin as one of the great philosophers. This is not a widely adopted point of view. Actually, he was one of the great philosophers of all time, but his philosophy of biology differs so fundamentally from the philosophies based on logic, mathematics, and the physical sciences that its philosophical nature was traditionally overlooked.

Evolution is for any student of nature such an obvious phenomenon, that its almost universal rejection up to the middle of the nineteenth century is somewhat of a riddle. As the geneticist Dobzhansky so rightly said, "Nothing in biology makes sense except in the light of evolution," as is surely correct for all of nonfunctional biology. To be sure there have been proponents of evolution before Darwin, begin-

ning with Buffon, and even a well thought out theory of evolution by Jean Baptiste Lamarck, but all laypersons, and even almost all naturalists and philosophers still accepted a stable, constant world in 1859. With evolution staring everybody in the face, why was it nevertheless, on the whole, so unacceptable up to 1859? What was it that prevented the acceptance of the seemingly obvious?

It is my considered conclusion that the components of the early nineteenth-century *Zeitgeist*, certain fundamental ideologies and concepts, were what prevented an earlier acceptance of evolutionism. Let me now discuss some of these factors.

Fundamentalism

A literal acceptance of every word in the Bible was the standard view of every orthodox Christian. Everything in this world, as we see it, was created by God. Natural theology added the conviction that at the time of creation God had also instituted a set of laws that would continue to maintain the perfect adaptation of a well-designed world. Darwin challenged all three major components of this belief. He claimed, first, that the world is *evolving* rather than remaining constant; second, that new species are not specially created but derived from common ancestors; and third, that the adaptation of each species is continuously regulated by the process of natural selection. In Darwin's theories, there is no need for divine interference or the action of supernatural forces in the whole process of the evolution of the living world. Darwin's revolutionary proposal was, thus, to replace the divinely-controlled world by a strictly secular world, run according to the natural laws.

Amazingly, Darwin's proposal of an evolving world owing to common descent, was almost at once after 1859 accepted by the greater majority of naturalists and philosophers. This was true not only for England, but also broadly for the Continent, particularly for the German-speaking countries and for Russia. Almost overnight, the idea of evolution had become acceptable even though the controversy over the causes of evolution continued for another eighty years. Darwin himself was largely responsible for the rapidity of this shift, owing to the overwhelming amount of evidence for evolution present in the *Origin*. Indeed, Darwin had done even more, and this is usually not mentioned in the Darwin biographies. He presented some fifty or sixty biological phenomena easily explained by natural selection, but quite impervious to any explanation under special creation, and equally inexplicable to so-called intelligent design.

Darwin's theory of common descent was so rapidly accepted because it supplied an explanation for the Linnaean hierarchy of kinds

of organisms and for the findings of the comparative anatomists. However, the theory of common descent also led to one conclusion that was quite unpalatable to most of his Victorian contemporaries. It postulated that man's ancestors had been apes. If the humans had descended from apes, then they were not outside the rest of the living world but actually part of it. This was the end of any strictly anthropomorphic philosophy. Darwin did not question the unique characteristics of *Homo sapiens* and neither do the modern evolutionists. Zoologically, nevertheless, man is nothing but a specially evolved ape. Indeed, all modern investigations have revealed the incredible similarity between man and such an ape as the chimpanzee. I gather that we share 99 percent of our genes, and many of our proteins, for instance hemoglobin, are identical. It has become obvious in recent years that in a philosophical study of man dealing with such questions as the nature of consciousness, intelligence, and human altruism, one can no longer ignore the origin of these human capacities in our anthropoid ancestors. This is true even though through evolution mankind has acquired many unique characteristics and capacities.

Essentialism

But let us now turn directly to an analysis of the philosophical foundations of Darwin's theorizing. With evolution so obvious to any student of living nature, why did it take so long before this obvious fact became acceptable? Darwin's most original and most important new concept was that of natural selection. Why were not only the philosophers, but even the biologists, so hostile to this theory for such a long time? It is my claim that the conceptual framework of the period and, in particular, the almost universal acceptance of typological thinking—what Popper called essentialism—was responsible. This kind of thinking was first introduced into philosophy by Plato and the Pythagoreans, who postulated that the world consisted of a limited number of classes of entities (*eide*) and that only the type (essence) of each of these classes of objects had reality, all the seeming variations of these types being immaterial and irrelevant. The Platonian types (or *eide*) were considered to be constant and timeless, and were sharply delimited against other such types. Such typological thinking was universally adopted by the physical scientists because all the fundamental entities of matter, such as the nuclear particles or the chemical elements, are indeed constant and sharply delimited against each other.

Darwin rejected such a description for organic diversity. Instead he introduced a mode of thinking we now refer to as *population thinking*. No two individuals in a bio-population, including identical twins, are

actually identical. This is true even for the six billion individuals of the human species. It is this variation among the uniquely different individuals that has *reality*, while the statistical mean value of this variation is an abstraction. This view was a totally new philosophical concept, crucial for the understanding of the theory of natural selection. How novel this concept was, appeared when Darwin himself sometimes slipped back into typological thinking. This was the reason he failed to solve the problem of the origin of new species. Population thinking is of tremendous importance in daily life. For instance, the failure to apply population thinking is the major source of racism. Many of Darwin's associates, such as Charles Lyell and T. H. Huxley, never adopted population thinking and remained typologists all their lives. Consequently they were unable to understand and accept natural selection. Typological thinking is so firmly rooted in our thinking that it is not surprising it took eighty years before the concept of natural selection was finally universally adopted in the 1930s.

What continues to be overlooked by philosophers and policymakers is how drastic the shift from typological to population thinking is. No typologist will ever be able to make a constructive contribution to the solution of the problems of race and inequality. By developing the concept of bio-populations, Darwin made a fundamental contribution to modern thinking, even though he himself was not always consistent in its adoption.

Finalism

Let me now turn to another dominant concept in philosophy in the first half of the nineteenth century. When the philosopher Immanuel Kant, in his *Philosophy of Judgment*, tried to develop a philosophy of biology on the basis of the physicalist philosophy of Newton, he failed embarrassingly. Finally he concluded that biology is different from the physical sciences, and that we must find some philosophical factor not used by Newton. Indeed, he thought he had found such a factor in Aristotle's fourth cause, the final cause. And so Kant ascribed to teleology not only evolutionary change (not really recognized by him as such), but also everything else in biology that he was not able to explain by Newtonian laws. This had a rather adverse effect on German nineteenth-century philosophy, because an unsupported reliance on teleology played an important role in the philosophies of all of Kant's followers.

It was Darwin's great achievement to be able to explain by natural selection, all the phenomena for which Kant had thought he needed to invoke teleology. The great American philosopher Van Quine, in a conversation I had with him about a year before his death, told me that he

considered Darwin's greatest philosophical achievement to consist in having refuted Aristotle's final cause. The purely automatic process of natural selection, producing abundant variation in every generation and always removing the inferior individuals, can explain all processes and phenomena that, prior to 1859, could be explained only by teleology. At the present we still recognize four teleological phenomena or processes in nature, but they can all be explained by the laws of chemistry and physics, while a cosmic teleology, such as that adopted by Kant, does not exist.

The Role of Chance

Determinism was a ruling philosophy prior to Darwin. As Laplace had boasted, if he knew the exact location and motion of every object in the universe, then he would be able to predict every detail of the future history of the world. There was no room in his philosophy for chance or accident. Darwin also paid strict lip service to such determinism. He accepted the standard belief of his period that every chance process in the universe had a cause. But the Newtonian laws of physics were not sufficient to explain genetic variation. So Darwin made use of the then universally accepted principle of an inheritance of acquired characters. Domestic animals, he said, are more variable than wild ones because they have a richer diet, and the changes thus produced are inherited. For him all mutations are the result of an observable cause. It was not until the 1890s that the concept of spontaneous mutations was introduced into biology by DeVries.

Darwinian variation, not being based on Newtonian natural laws, was not acceptable to the contemporary philosophers. Such variants were considered chance phenomena or accidents. The physicist-philosopher Herschel referred to natural selection contemptuously as the law of the higgledy-piggledy. He was not alone in this criticism; the Cambridge geologist Sedgwick and other critics of Darwin chided him for invoking chance as an evolutionary factor. Again and again Darwin was asked, how can you believe that such a perfect organ as the eye originated by chance? We still lack a thorough analysis of the history of the gradual acceptance of chance in scientific explanation. Now that it is realized that chance in evolution is part of the two-step nature of the process of natural selection, the processes of selection or elimination during the second step of natural selection can make use of the positive contribution made by random variation at the first step.

At about the same time, the middle of the nineteenth century, the importance of chance was also discovered in the physical sciences, and Darwin's sponsorship of chance was soon no longer criticized so severely.

When a modern author speaks of chance variation, he does not deny the existence of molecular causal forces, but he denies the claim that such genetic variation is a response to the adaptive needs of an organism. Such a response never occurs, and genetics has shown that there is no inheritance of acquired characters. In spite of his uncertainties Darwin certainly was one of the great pioneers in making the chance nature of many biological phenomena an acceptable concept.

Laws

Theories in the Newtonian philosophy of science were usually based on laws. Darwin on the whole accepted this view. And so we find that he uses the term "law" very freely in the *Origin*. Any cause or event that seemed to occur at all regularly was called by him a law. However, I rather agree with those modern philosophers who deny the legitimacy of referring to evolutionary regularities as laws, because they do not deal with the basics of matter as do the laws in physics. They are invariably restricted in space and time, and they usually have numerous exceptions. This is why Popper's falsification principle usually cannot be applied in evolutionary biology, because exceptions do not falsify the general validity of most regularities.

If one concludes that there are no natural laws in evolutionary biology, one must ask, on what can one then base biological theories? The view now widely adopted is that theories in evolutionary biology are based on *concepts* rather than laws, and this branch of science certainly has abundant concepts on which to base theories. Let me just mention such concepts as natural selection, struggle for existence, competition, biopopulation, adaptation, reproductive success, female choice, and male dominance. I admit that some of these concepts can perhaps be converted, with a little effort, into pseudo-laws, but there is no question that such laws are something very different from the Newtonian natural laws. As a result, a philosophy of physics based on natural laws turns out to be something very different from a philosophy of biology based on concepts.

Darwin himself was quite unaware of this difference although it was he, perhaps more than anyone else, who introduced the new practice of theory formation on the basis of concepts rather than of natural laws.

Let me now try to summarize Darwin's contributions to the thinking of modern men. He was responsible for the replacement of a world view based on Christian dogma by a strictly secular world view. Furthermore, his writings led to the rejection of several previously dominant world views such as essentialism, finalism, determinism, and

the suitability of Newtonian laws for the explanation of evolution. He replaced these refuted concepts with a number of new ones of wide-reaching importance, also outside of biology, such as biopopulation, natural selection, the importance of chance and contingency, the explanatory importance of the time factor (historical narratives), and the importance of the social group for the origin of ethics. Almost every component in modern man's belief system is somehow affected by one or another of Darwin's conceptual contributions. His opus as a whole is the foundation of a rapidly developing new philosophy of biology. There can be no doubt that the thinking of every modern Western man has been profoundly affected by Darwin's philosophical thought.