

1. The Scientific Background

For the place vacated by Paley's theological and metaphysical explanation has simply been occupied by that suggested to Darwin and Wallace by Malthus in terms of the prevalent severity of industrial competition, and these phenomena of the struggle for existence . . . have thus come to be temporarily exalted into a complete explanation of organic progress.

Patrick Geddes, "Biology," Chambers Encyclopedia (1882).

I too was struck . . . with the remarkable likeness between [Darwin's] account of plant and animal life and the Malthusian theory. Only I came to a different conclusion from yours: namely, that nothing discredits modern bourgeois development so much as the fact that it has not succeeded in getting beyond the economic forces of the animal world.

F. Engels to F. A. Lange, March 29, 1865, Vladimir Adoratskii, ed. The Selected Correspondence of Karl Marx and Friedrich Engels (1942), pp. 198-199.

My views have been often grossly misrepresented, bitterly opposed and ridiculed, but this has been generally done, as I believe, in good faith.

Charles Darwin, Autobiography, ed. George Gaylord Simpson (Collier ed.; New York, 1961), p. 62.

One

"I have received in a Manchester newspaper, rather a good squib," Charles Darwin wrote to the geologist Charles Lyell, shortly after the appearance of the *Origin of Species*, "showing that I have proved 'might is right' and therefore that Napoleon is right, and every cheating tradesman is also right." Although Darwin ridiculed the charge, it would not go away. "It is splendid that Darwin again discovers among plants and animals his English society with its division of labour, competition, opening up of new markets, 'inventions' and Malthusian 'struggle for existence'," wrote Karl Marx to his associate Engels in 1862: "This is Hobbes's *bellum omnium contra omnes*." In his *Dialectics of Nature* (ca. 1873-1883) Engels reproduced the charge almost exactly: "The whole Darwinian theory of the struggle for life is simply the transformation from

society to organic nature of Hobbes' theory . . . and the bourgeois economic theory of competition." From a quite different quarter, a variation of the same assertion came later in the century. "Over the whole of English Darwinism," wrote Friedrich Nietzsche, "there hovers something of the suffocating air of over-crowded England, something of the odour of humble people in need and in straits."¹

As the debate over social Darwinism developed, however, most early observers tended to exonerate Darwin himself. Ultra-Darwinists or pseudo-Darwinists twisted and misrepresented the *Origin of Species* and his remarks in *The Descent of Man*. Since Darwin meant pigeons not people in referring to struggle, all applications to human society were nonsense. Historians likewise assumed that Darwin's scientific theory was neutral as to its social applications and was therefore capable of supporting quite opposite ideologies.²

The notion that the *Origin of Species* was really or inherently conservative in underwriting Manchesterian economics or Napoleonic militarism nonetheless persisted. Although Darwin could not be held personally responsible, the historian James Rogers argued, natural selection was *not* simply "another discovery in the natural sciences misused to rationalize social preconceptions." Malthus, after all, inspired Darwin's concept of the struggle for existence; and the members of Darwin's circle assumed that his theory was relevant to human society, at least in a general way. Moreover, Darwin shared with Malthus certain assumptions that led him to accept Herbert Spencer's alternative formulation of natural selection—the survival of the fittest. Since *fittest* inevitably connoted *best*, this translation linked struggle and survival to the doctrine of progress. This unfortunate marriage set tongues wagging. Rogers continued, as partisans of industrial competition and *Machtpolitik* made struggle the engine of progress. The result was a harsh social Darwinism that Darwin was the last to want. "Spencer's phrase in Darwin's theory," he concluded, "consequently reinforced the Social Darwinian's tendency to think of the struggle for existence in social rather than biological terms."³

In fact, Darwinism was neither neutral nor inherently conservative. On this point the reform Darwinists were correct: their theory that human control must replace the laws of nature was the accurate reading of Darwin's theory. In the words of the psychologist-historian Howard Gruber:

It would be entirely in harmony with [Darwin's] thinking to insist that the struggle for survival of the human species must be, in the years to come, a struggle to develop social forms that enhance cooperation and rational, long-term planning for collective ends rather than shortsighted, individualistic efforts for private gain.⁴

This conclusion was implicit not only in Darwin's social speculations but those of Thomas Henry Huxley and Alfred Russel Wallace, fellow biologists who best understood the revolutionary aspects of the new view of nature. Scientists and laymen alike often misrepresented the *Origin of Species*. But the most common distortions involved, not the facile application of such concepts as struggle for existence and natural selection, but the muting of these very ideas. Early interpreters in particular blurred the difference between Darwin and other evolutionists, and subordinated his theory to older concepts of natural law.

These distortions in turn were a measure of the complexity of the scientific revolution of which the *Origin of Species* was a part. Two aspects in particular demand attention: (1) developments in geology, thermodynamics, and biology that by the 1850s marked the culmination of the mechanists' quest for a law-bound universe; and (2) the separate histories of the transmutation of species, the struggle for existence, and natural selection—the principal elements of Darwin's theory.

The scientific background has special bearing on Darwin's reception in the United States. Translated as evolution, pure and simple, Darwinism was received sympathetically and accepted within a relatively brief time. But scientists and laymen alike, claiming to accept Darwinism, effectively downplayed critical parts of the *Origin*. Darwinism did not breed theories of social struggle and selection in part because these aspects of Darwin's work were hotly disputed and widely ignored. The few who best understood the new theory studiously avoided applying concepts of struggle and selection to contemporary society. In contrast to older natural-law theorists—including the followers of Herbert Spencer—Darwin, Huxley, and Wallace insisted that men must find guides to social policy elsewhere than in nature. In short, the early Darwinians were not social Darwinists; likewise, many so-called social Darwinists (such as Spencer) were not Darwinians.

Two

On the eve of the publication of the *Origin of Species*, "science" seemed to have routed "special providences" from the universe once and for all. The *mechanical philosophy*, born in the scientific revolution of the seventeenth century, successively transformed the natural sciences into recognizably modern shapes—astronomy, physics, and finally chemistry, with the overthrow of the phlogiston theory at the close of the eighteenth century. During the next sixty years, developments in geology, physics,

and biology etched more deeply the mechanists' image of a universe in which nothing happened spontaneously, a cosmos as regulated and decorous as the Victorian parlor. This climate shaped Darwin's theory and its reception.

Discoveries in geology, culminating in the so-called Uniformitarian-Catastrophist debate of the 1840s, were especially crucial since Darwin himself became personally involved. This debate was long in the making. In the seventeenth century, Descartes and Leibnitz proposed that the earth had evolved from a molten mass. A century later, G. L. L. Buffon, drawing on more detailed knowledge of the fossil record, worked out a cooling scheme, while continuing to adhere to the notion that a special agency had at some point deposited the fossils on a universal ocean floor. Challenging this view, James Hutton's *Theory of the Earth* (1795) maintained that the forces operating in the past were identical to those working in the present. This view became the fundamental tenet of the Uniformitarian position. Synthesizing this previous work, Sir Charles Lyell's *Principles of Geology* (3 vols., 1830-33) launched a debate that continued for two decades.

The argument turned on two key issues. First, concerning geological causes, the Uniformitarians held not only that similar agencies operated at all times (rain, rivers, earthquakes) but that the quantity and intensity of these forces did not vary from one epoch to another. Catastrophists, led by Adam Sedgwick and William Whewell, believed, in contrast, that vast discrepancies in the geological record argued for the operation of extraordinary, perhaps even supernatural, forces in certain epochs. Second, concerning evolution, Lyell denied that geology could discern development in any particular direction. That is, until the appearance of Darwin's work, he was frankly antievolutionary. Catastrophists in opposition held, in Sedgwick's words "that there has been a progressive development of organic structure subservient to the purposes of life."⁵

Lyell's antievolutionary position, as Walter Cannon has observed, was no mere "logical pécadillo," but the essence of the theory. Uniformitarianism was, in Cannon's words, "an anti-evolutionary creed, postulating repetition rather than cumulative development as the net result of eons of geological time." Nor was the issue simply a disagreement over the evidence. While the Uniformitarians presented a broad challenge to the Biblical account of the Creation, Catastrophism easily slipped into a defense of religious orthodoxy—as for example in the conclusion of one partisan that his account would "compel us to conclude, that the earth can alone have been fashioned into a fit abode for Man by the ordinance of INFINITE WISDOM." When in later years Lyell capitulated to Darwin's

theory, he confessed with some feeling: "It cost me a struggle to renounce my old creed."⁶

Although Darwin was an early recruit to the Uniformitarian creed, he finally broke from its leading tenet. Without recounting his role in these geological debates, it is important to note both the nature of his debt to the Uniformitarians and his departure from their position. His most general debt, as Maurice Mandelbaum has noted,⁷ was to the entire debate itself—since the geologists, in stressing the fossil record, directed attention to living as well as nonliving forces. Furthermore, Darwin accepted from Lyell what Cannon has described as "the method of accounting for large changes by summing up small changes over immense periods of time,"⁸ an intellectual predilection rather than a fixed procedure. This method in turn disposed Darwin to accept Lamarck's account of the mechanism of evolution through direct adaptation to the environment and with it to accept his idea that the accumulation of changes worked to some pattern. This final point marked Darwin's departure from the Uniformitarians, since evolution through natural selection at least implied some sort of cumulative development within the geological and biological record, if not necessarily a progressive one.

In physics, the law of the *conservation of force* (energy) as propounded in the 1840s, provided further basis for assuming immutable continuity within nature. Announced in Hermann von Helmholtz's *Über die Erhaltung der Kraft* (1847), and later extended in the work of Lord Kelvin, J. R. von Mayer, and James P. Joule, the laws of the conservation of energy and matter put the seal on the notion that nothing was lost in nature. Nor were seemingly new elements the result of special interventions. In the long run, as Alfred North Whitehead wrote in *Science and the Modern World* (1925), this theory undermined assumptions concerning the ultimate permanency of matter that were the basis of mechanistic materialism.⁹ So also, as the American philosopher Charles S. Peirce noted, later developments in thermodynamics suggested, as did Darwin himself, that the laws of nature were statistical rather than mechanical, that is were approximations concerning probabilities rather than fixed rules from which one could deduce certain consequences.¹⁰ But in the climate of the mid-nineteenth century, thermodynamics reinforced the idea that the universe was governed by immutable laws of cause and effect, which it was the business of science to uncover.

The advances in thermodynamics became important in debates over biological evolution in large part because Herbert Spencer made conservation of force the starting point of his *First Principles* (1861) and the basis of his conviction that a Synthetic Philosophy could trace the operation of similar laws in the natural, biological, psychological, and social spheres.

Since the time of Newton the lessons of physics or astronomy provided both a guarantee of cosmic order and also a vocabulary for expressing it. In nineteenth-century America, it continued to do so, as demonstrated in the characteristic statement that the "laws of trade" were as "immutable" as those of "gravitation." Defining *force* to suit his own purposes, Spencer translated Darwinian biology into the language of physics.

Finally, developments within biology itself contributed to the mechanistic conception of universal law. The *Origin of Species* was in fact one of three works in the 1850s to establish what Walter Wilson has termed the *law of genetic continuity*, wherein all life is seen to derive from previous life. A second was Rudolf Virchow's *Die Cellularpathologie* (1858), which demonstrated that all cells derive from preceding cells. A third was the writing of Louis Pasteur, who in disproving the doctrine of spontaneous generation likewise showed that organisms derive from pre-existing organisms. These simultaneous announcements, an observer noted later in the century, provided biology with an equivalent of the law of conservation in physics. Gone were the special providences that in the history of biology had worn various guises—from the "Will of the Deity" to "Vis Creatrix." Thanks to the revolution of the 1850s, the study of life, no less than the rest of the universe, was put on a thoroughly naturalistic basis.¹¹

The identification of evolution with mechanistic causation—whether material or spiritual—speeded Darwin's acceptance in America, while impeding appreciation of the theory's implications. Interpreting natural selection within the general framework of the *redistribution of matter and motion*, the Spencerians (as will appear in the next chapter) obscured the difference between this doctrine and the Lamarckian mechanism of change through direct action of the environment.

The Cosmic Theists, led by the scientist Asa Gray (1810-1888), similarly interpreted the *Origin* within a framework of spiritual mechanism, whereby God stood behind and ultimately determined the evolutionary process. "It is not surprising that the doctrine of the book should be announced as atheistical," Gray wrote in his initial review of the *Origin*. "What does surprise and concern us is, that it should be so denounced . . . on the broad assumption that a material connection between the members of a series of organized beings is inconsistent with the idea of their being intellectually connected with one another through the Deity, i.e. as products of one mind, as indicating and realizing a preconceived plan." Although admitting that Darwin left readers in the dark concerning his views of "philosophy and theology," Gray suggested that the *Origin* merely updated Paley in postulating a "watch which sometimes produces better watches,