James Hutton: Uniformitarianism Versus Evolution

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Dr. James Hutton, of Edinburgh, Scotland, known variously as the "Founder of Modern Geology" or the "Father of Modern Geology," was born in 1726 and died in 1797. After many years spent in field-work, reading, and contemplation, he, in 1785, presented his paper, "Theory of the Earth, or an Investigation of the Laws Observable in the Composition, Dissolution, and Restoration of Land Upon the Globe" (Hutton, 1788) before the Royal Society of Edinburgh. This paper, which he, in 1795, expanded into a book (Hutton, 1795) contained the first comprehensive theory of earth history in large part acceptable to modern geologists.

Before Hutton's theory is discussed, something should be said about the sciences of geology and biology at his time. In geology catastrophism was in vogue. The writers of this school speculated wildly upon the early history of the earth. They usually held to the Biblical time scale and attributed the changes of the past to earth convulsions and floods. By Hutton's time these writers, by their excesses, had created, among many educated men, a contempt for "theories of the earth," as such writings were usually called.

In biology the idea of the fixity of species held sway. True, the Comte de Buffon had suggested the possibility of evolution with regard to

some species; but no evidence was known which could cause many to consider such a novel idea as evolution.

Something should also be said about Hutton's religious views. He appears to have been influenced by Deism, a philosophy which limited God's activity to the creation of the world and the fixing of its physical laws. In popular terms, it was the doctrine of an absentee-God, who has left the earth to run its course in accord with his preset directions.

In Hutton's view the observable geologic operations of the earth are largely of an erosive or destructive nature; yet it is obvious that, if the continents are to be preserved, there must be a counterbalancing constructive activity. Upon examining the materials of the earth he concluded that a large part had originally been sediments from previous lands. These had undergone consolidation and had been raised from the bottom of the sea to the positions they now occupy. He believed that the earth's internal heat had been responsible for both of these operations— it had fused the sediments and then had raised them by its expansive force.

His firm belief in order led Hutton to the view that the present geologic agents of change, acting in the same manner and with essentially the same intensity as at present, have operated throughout the observable geologic past and have been responsible for all geologic change. Furthermore these agents have been part of a cycle of earth changes in which new continents are formed from the sediments of the old in the manner previously described, preserving at all times a proportion of land to water sufficient to support life as we know it. This theory of the uniformity of natural operations was the ancestor of the "uniformitarianism" of Charles Lyell.

Hutton believed that the primary purpose of this world was the support of life and that nature's operations ought to be examined with this end in view. Since any violent action of nature would be destructive to life and thus violate the natural purpose, he denied that such catastrophes had taken place. His theory, he felt, was the simplest and involved the least exertion of "superfluous power" of any consistent with the evidence. His cycle of earth changes was, in his mind, of positive benefit to life, as erosion provided the soil necessary for plant growth.

The theory of uniformity, entangled with the idea of purposeful design in nature, was one of two major factors which influenced Hutton against evolution. In his book he says, "There are, indeed, varieties in those (fossil) species compared with the present animals which we examine, but no greater varieties than may perhaps be found among the same species in the different quarters of the globe. Therefore, the system of animal life, had not been different from that which now subsists, and of which it belongs to naturalists to know the history" (Hutton, 1795, v. 1, p. 176). This appears to be the only explicit statement he made on the subject of evolution. He acknowledges the recent origin of man, however.

His general view of the world as a perpetual machine inclined Hutton against permanent change in any of its major elements. Life was the highest achievement of nature. He believed that the perfect adaptation of life to its environment was the best demonstration of design in nature. Since the Huttonian system allowed no radical changes in the overall environment, how could life have been created different from its present condition—that is, not fully adapted to its environment? Hutton, therefore, believed that the world had been created a going concern, essentially as it is today.

The second major factor deciding Hutton against evolution was the state of the biological and paleontological sciences in his time. There

existed little evidence for evolution. Most naturalists had not yet been convinced that species had become extinct. A species known only in fossil form might yet be found living in some unexplored part of the earth. Hutton did not have an extensive knowledge of fossils, and he was not greatly interested in their classification. He recognized that particular fossils occur only in certain strata, though without attaching any great significance to the fact. It has been suggested that Hutton's failure to grasp the importance of fossils as stratigraphical indexes stemmed from his lack of interest in fossils and the fact that the fossiliferous rocks in Scotland are so disturbed and the outcrops so isolated that there is no long succession of beds as in southern England (Eyles and Eyles, 1951).

John Playfair, who wrote a book explaining the Huttonian theory, differed from Hutton on the question of the extinction of species. Because of the discoveries of mammoth bones in Siberia and of mammoth and mastodon bones in Ohio, he admitted that life is subject to change. He acknowledged that species and perhaps genera had become extinct and that fossil shells did not closely resemble existing forms. He speculated that change in the animal kingdom might be a part of the order of nature (Playfair, 1802, pp. 469-70).

Curiously, Hutton proposed a theory of natural selection, applied only to variations within a species, which had similarities with that of Darwin. In his unpublished *Principles of Agriculture* he wrote: "To see this beautiful system of animal life (which is also applicable to vegetables) we are to consider, that in the infinite variation of the breed that form best adapted to the exercise of those instinctive arts, by which the species is to live, will be most certainly continued in the propagation of this animal, and will be always tending more and more to perfect itself by the natural variation which is continually taking place. Thus, for example where dogs are to live by the swiftness of their feet and the sharpness of their sight, the form best adapted to that end will be the most certain of remaining, while those forms that are least adapted to this manner of chase will be the first to perish; and the same will hold with regard to all the other forms and faculties of the species by which the instinctive arts of procuring its means of substance may be pursued" (Bailey, 1948-49). This quotation was not published until 1949.

Although Hutton denied evolution, the Huttonian uniformitarian approach, advocated in the nineteenth century by Lyell, made possible the acceptance of evolution by undermining the Biblical chronology and the estimates of the age of the earth which it influenced. Charles Darwin applied to evolution the Huttonian principle that all geologic change has been effected by the accumulation of small increments of change over a long period of time.

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