

Book Reviews

Private Thoughts of Lyell on Progression and Evolution

Sir Charles Lyell's Scientific Journals on the Species Question. LEONARD G. WILSON, Ed. Yale University Press, New Haven, Conn., 1970. lxii, 572 pp., illus. \$17.50. Yale Studies in the History of Science and Medicine, No. 5.

Medawar has called the scientific paper a fraud because it pretends that conclusions are reached in the orderly and inductive way in which they are reported. As this Baconian myth is shattered by historians, philosophers, and practicing scientists (T. S. Kuhn, N. R. Hanson, and P. B. Medawar, for example), our interest rises in tentative probes and private thoughts, in the invention of hypotheses, in the imaginative leaps that Peirce characterized as "abduction." It may be that the nature of scientific genius will be apprehended least in published work, more in letters, and most of all in the uninhibited private jottings of the great. With this perspective, we must rejoice in Leonard Wilson's discovery and publication of Lyell's seven journals on the species question, for these record the candid thoughts of one of Victorian England's finest writers and keenest intellects during the crucial years (1855–1861) that surrounded Darwin's *Origin of Species*.

This is an attractive volume, with generous editorial notes and an excellent introduction that discusses Lyell's intellectual background and activities during these years without indulging in speculation on the deeper meaning of his entries. I congratulate Wilson most of all for his decision to publish the journals in their entirety, with all the repetition and "triviality" which, in his words, "cry out to be omitted." Had he excised, we would, for example, have lost from the first journal long lists of species names and shell characters of insular land snails. Yet, to students (I am one) of these animals, nothing records Lyell's dilemma better than this early attempt to explain by creationist

tenets the very attributes of island diversity that he ascribed later to evolution.

My criticisms are very minor. I wish that the editorial notes about ideas and objects were as complete as those about people. We learn the identity of obscure lieutenant-colonels and Italian geologists, but are not told what Whewell's argument was "in regard to other planets and their inhabitants" (p. 177); nor do we learn the true identity of an upper Green Sand "whale" (p. 200), which was surely not a whale, since the Green Sand is Cretaceous in age. The introduction contains some small errors: *Anoplotherium* is an artiodactyl, not a pachyderm (p. xx); Cuvier did not believe that entire faunas were destroyed in his catastrophes (p. xxi); the opossum is not the only living New World marsupial (p. liii). (Also, when I see "nominalists" written as "nominal lists" [p. 328] I am amused that our modern technology of dictation has brought us full circle to the medieval scribe who wrote homonyms to his reader's elocutions.)

In his first entry, dated 28 November 1855, Lyell refutes the idea that limb rudiments of a snake imply derivation from a functional quadruped: "the arguments against such variability of species are too powerful to allow us to believe in such an hypothesis" (p. 5). Five months later, he heard Darwin's views on the origin of species during a visit to Down (p. 54). When he closed the notebooks in 1861 and began to write *The Antiquity of Man*, he had accepted the fact of evolution, though not all of Darwin's explanation for it. Although the journals do record a shift in Lyell's views on evolution, we err if we read Lyell's thoughts only in the light of Darwin's insight. For then we would have to ask why Lyell, though he discusses evolution so much, discusses Darwin's theory comparatively little,

and why the subjects that agitated Darwin (domestication, geographic variation) are slighted by Lyell in favor of musings on the status of man and the first appearance of mammals. The answer is that the species question obsessed Lyell for reasons related to his own world view, one different from Darwin's and one, moreover, that he had argued with his lawyer's skill and passion through nine editions of *The Principles of Geology*, dating from 1830. The honesty of this splendid man is recorded not, as many have said, in his acceptance of evolution (his ambiguous creationism had always been a source of discomfort to him), but of an implication he drew from evolution (and Darwin, curiously, did not) that caused him to abandon one of his most cherished notions—that life does not show progressive improvement through time. The particular importance of these journals lies in their span of the critical years between 1851, when Lyell delivered his last attack upon progressionism (Presidential Address to the Geological Society of London), and 1862 when he wrote in *The Antiquity of Man* that the idea of progress through time was "an indispensable hypothesis . . . [which] will never be overthrown."

"Uniformitarianism," the catch phrase that we associate with Lyell's outlook, is an ambiguous term with many meanings. Rudwick has discerned at least four in the first edition of Lyell's *Principles* (1830–1833): (i) geologic events had natural rather than supernatural causes; (ii) they were produced by causes still in operation, not by forces that had ceased to act; (iii) change usually occurred gradually, not via "catastrophes" or "paroxysms"; and (iv) the earth had been in something close to a steady state during its history—land and sea had changed position, some species had disappeared, others been created, but the mean condition of the earth and the mean complexity of life had remained the same. To these uniformities, Lyell allowed one exception—the late appearance of man: "I have advocated . . . a uniform system of change to which Man forms an exception and which was uniform among other reasons because thereby alone could Man interpret it" (p. 87). The primary opponent of this fourth uniformity from 1830 to 1859 was not evolution, but the "unphilosophical" (that is, unscientific) "progressionism" of Agassiz, Cuvier, Miller, and Sedgwick. These men held that the history of life had been marked

by episodes of creation following geological upheavals (i and iii), that creation had ceased with the appearance of man (ii), and, most vitally, that each successive creation had been characterized by increasing excellence in its products, leading finally to man (iv).

How difficult, then, was it for Lyell to accept evolution? He was loath, at first, to abandon the fixity of species. He argued (p. 84), by the little-bit-pregnant logic, that most "species" might only be varieties, and that fewer true species required far fewer creative acts. He stated repeatedly that the birth of a genius to normal parents was as wondrous and abrupt as the creation of a new species. But when he overcame his reluctance to accept unlimited variability, evolution fit very well with the first three types of uniformity: it was natural, gradual, and operating at present. In fact, it overcame the one real anomaly that had inhered in Lyell's system: the continuing creation, however rare, however evenly spaced, of species through time. For, in many places, Lyell emphasized his discomfort with creation, "a perpetual intervention of the First Cause" (p. 106) "[Evolution is] the only [theory] which even pretends to bring the successive changes under a law or within the dominion of science" (p. 246). "It would be more natural to suppose an ass to give rise to a striped offspring with the other characters of a zebra than that a zebra should come into being out of nothing" (p. 173).

Yet Lyell's greatest reluctance to embrace evolution arose from his view (not shared by Darwin) that it implied the progressive development of life through time, that is, that it controverted the fourth sense of uniformity. In the *Principles* he had attacked Lamarck more for the progressive development that his perfecting tendency entailed than for his evolutionism. The journals pursue this theme: "We seem to be drifting towards the Lamarckian theory by . . . arguments in favor of a successive chronological elevation in the scale of being, the advocates of which protest against the transmutation of species" (p. 185). It is in the context of progressionism that evolution is discussed throughout the journals; what they really record is Lyell's abandonment of his most cherished fourth uniformity, not, primarily, his acceptance of evolution. This is why he discusses the Darwinian mechanism so little and the status of man so much.

By 1860, Lyell was ready to accept

evolution, but not for the reason we might suppose—not because Darwin had convinced him of natural selection; it is not that simple. Lyell, to be sure, preferred Darwin's mechanism to the crude, inexorable progression of life that the theories of Lamarck and Chambers entailed. Yet he never accepted natural selection as a sufficient explanation for evolution. His objection, in fact, was a common one that echoed up to the 1930's: he saw how selection could eliminate the unfit, but not how it could create the fit. He compared selection to only two members of the "Hindoo Triad"—to Vishnu the preserver and Siva the destroyer, but not to Brahma the creator (p. 369). He decried Darwin's "deification" of selection and wrote to him: "My only objection is . . . to your assigning to [natural selection] more work than it can do and not guarding against confounding it with the Creative power to which . . . the capacity of ascending in the scale of being must belong" (p. 498). Rather, Lyell embraced evolution in 1860 because he had come to accept as probable the *fact of progression* in the history of life. To explain this fact, however, he wanted no part of the *progressionism* that refuted his first three uniformities. He could abandon his fourth uniformity, cite evolution as the cause of progress, and thereby affirm all other aspects of uniformitarianism. Lyell accepted evolution because it allowed him to preserve as much as possible of his older world view after he had, with commendable candor, admitted the collapse of one of its central tenets.

Thus, in *The Antiquity of Man* (1862), Lyell accepted the fact of progress in the history of life. He had maintained throughout the journals that the coexistence of man with extinct mammals would force him to consider *Homo sapiens* as a late and natural product of a system in progressive development; for he could no longer view man as a very recent and special addition to a world in steady state. Of man's antiquity he was now convinced by the discovery of artifacts in many areas of Europe. Other bastions of his nonprogressionism were falling. He had long argued that the discovery of a few Mesozoic mammals implied the possibility of their existence throughout fossil history. But no Paleozoic mammals were found, and all Mesozoic forms were primitive preplacentals. Moreover, he could not argue that the Mesozoic "marsupials" had lived on an isolated,

ancient "Australia," for they came from many times and places and had to be representative of their era. One could, of course, reverse the argument and say that Lyell came to accept progression because he had been convinced of evolution. This I doubt. Lyell saw an inevitable link between evolution and the fact of progression. He would not have embraced evolution had he not come to doubt the fourth uniformity that had shaped so much of his thinking.

For their subject matter alone, these journals will interest all geologists and evolutionary biologists. But this is not their main fascination, for they allow us to watch a first-rate mind at work as he reassesses and abandons, rather late in life, a bulwark of his former system. To those of us who can comprehend genius only through its display in another man, this is a rare privilege indeed. For Charles Lyell was an exemplar of excellent science: discerning; profound; perhaps, though I hope not, even prophetic: "In no modern community would a teacher go on like Socrates for 50 years inculcating truths distasteful to the higher power. It might be impossible now even at Boston in New England" (p. 365).

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Almost There

The Coming of the Golden Age. A View of the End of Progress. GUNTHER S. STENT. Published for the American Museum of Natural History by Natural History Press, Garden City, N.Y., 1969. xiv, 146 pp., illus. \$4.95.

It is often pointed out that the experimenter is a part of his experiment, and that the task of science is to remove any bias contributed by him to the observations or conclusions. When on the other hand we do concern ourselves with the preconceptions and involvement of the experimenter or his audience, we are dealing with the history of science. The ranking scholar-historian of bacteriophage genetics dwells in this book upon his heartfelt conviction that man is reaching his limits of understanding in genetic biology and argues the existence of analogous limits to man's reach for scientific, social, and artistic advance generally. Stent believes that a widening sense of