Book Reviews

Critical Years in Geology

Charles Lyell. The Years to 1841: The Revolution in Geology. LEONARD G. WILSON. Yale University Press, New Haven, Conn., 1972. xiv, 554 pp. + plates. $17.50.

With the appearance of this first installment of a projected three-volume biography of Charles Lyell, Leonard Wilson fully justifies the high expectations his project of more than a decade has engendered and the history of geology reaches a new level of maturity. More than a biography, the first volume, covering the years of Lyell's rise to the head of his profession and the genesis and establishment of his doctrine of uniformitarianism, is a thoroughly detailed history of geology in the critical years of the early 19th century. Moreover, it is the intellectual history of the movement that was to culminate in Charles Darwin's *Origin of Species*.

A singularly fortunate youth, Charles Lyell was of a genuinely sanguine disposition, handsome, intelligent, rich (but not too rich), a gentleman but close enough to the family's yeoman origins for Scottish seriousness of purpose. His virtues and abilities were so gracefully combined as to make him, in spite of not inconsiderable ambitions and small vanities, a personality attractive even across the years and generations. All went well for young Charles Lyell once he had survived the curious Spartan rituals of an English childhood. At 22 he finished at Oxford and went to London to read law. He was already fellow-elect of the London Geological Society and the Linnean Society, but he had to read law for seven more years before reaching the Royal Society.

Lyell's great achievement was the three-volume *Principles of Geology*, the first volume of which appeared in 1830. Wilson's detailed account of the friendships, the travels, the studies, and the observations which transformed the reluctant barrister into the leading geologist of his time is a fully dimensioned history of a complex of ideas. The *Principles* began with a history of geology so skillfully constructed as to have molded our conception of the development of geology to this day, not excepting that of the biographer or, for that matter, this reviewer. It was an Anglocentric view designed as a kind of axiomatic substrate from which the remainder of the *Principles*, developing Lyell's uniformitarianism, would be the inexorable and inevitable conclusion. The doctrine of present causes was the radicalism espoused by Charles Lyell, and he considered it a revolution in geology just as Cuvier, who preceded him, published his own catastrophist views under the doubly significant title of *Révolutions du Globe*. Lyell may have been uniformitarian in his theory of the earth, but he was unquestionably as much catastrophist as Cuvier in his view of intellectual history. He was confirmed in his confidence of his own revolutionary role by the extraordinary progress made by geology in the decade of preparation for the *Principles*. Yet when Lyell left Oxford in 1819 the fundamental changes in geology which were to bring about the transformation to an indubitable classical stage had already occurred. The maps of Cuvier and Brongniart and of William Smith had been published and the means (specifically the principle of faunal succession) were at hand for the extension of this subdivision of Werner's geological column to the rest of the world. Not until 1829 did Lyell and Murchison find fossils in France to convince them that faunal assemblages rather than lithology must be the guides to the order of the strata, but Lardner Vanuxem for one was already in print with these observations in America. Abraham Gottlob Werner was the straw man in Lyell's history. Werner's theory, Wilson writes, was "false." As Wilson shrewdly observes, it would have been impolitic for Lyell to turn directly against his real opponents, his former master William Buckland and the other powers of the geological establishment. Evidence is here, if the reader chooses to challenge the biographer, that Lyell's uniformitarian ideas were neither so new nor so relevant to the emerging secular history of the world as to justify the designation revolutionary.

In spite of these serious reservations about the aptness of the subtitle of this volume, there is no question of the influence of Lyell. Wilson has written an internalist history of ideas. His principal concern is rightly with history of science, but he has not therefore chosen to neglect the reconstruction of that remarkable proto-Victorian world in which Lyell's thought emerged. The *Principles* was regarded as a revolution in geology because of the remarkable personality of Lyell, the sheer force with which he pushed his ideas. (It must have struck the old guard as unmitigated gall, but then it was difficult not to succumb to Lyell's open enthusiasm. Darwin's wife, Emma Wedgwood, was one of the few who found Lyell dull [p. 459].) In the critical decade after Oxford, Lyell managed to meet nearly every active geologist in Europe, to see their collections and to discuss their work. He followed up his calls with letters and exchanges of specimens. He worked to involve his friends in society affairs, nominating them for fellowship, electioneering, and so on. He learned Italian to understand the geology of Italy, central to his development, and was one of the few English geologists to do so. He taught himself German, and even began Spanish. The *Principles* itself was a propaganda masterpiece, for which part of the credit belongs to the guiding hand of the publisher, John Murray, with whom Lyell planned the strategy of publication as if on campaign. The final result was the triumph of Lyell, if not always of uniformitarian doctrine.

It was Lyell who established the subdivisions of the Tertiary, and he earned his place in the geologic pantheon for this if nothing else. But here too, as the details of this volume show, it was largely a question of a campaign, of travels and meetings and absorption of ideas which, combined in the appropriate setting (the third volume of the *Principles*), proved irresistible. The shoulders of those others on which Lyell stood to see so far are made apparent for the first time in this biography, and the reader might therefore choose to temper his admiration for Lyell. Lyell's fertility of mind is un-

deniable, however. Everything was explained by the doctrine of present causes and often most successfully. (Lyell's accounting for climatic change was the only accepted explanation until very recently.)

Of the many topics included in Wilson's 16 rich and informative chapters, Lyell's views on education and his comments on the state of the universities are particularly suggestive for those of us who confront parallel problems. He included these views in his *Travels in North America*, written after his two triumphant tours. Volume 1 ends with 1841 and the Lyells packing for the first of these trips. We look forward to Wilson's account of Lyell's reaction to the exuberant infant republic. We look forward also to further development of the critical relationship of Lyell to the species question and to Charles Darwin. Not least in interest will be the reactions of Lyell and the evolution of his character under the stress of the remarkable success of Darwin, for the reception of Darwin's *Origin* was determined in great measure by the social and polemical climate which Lyell and his uniformitarian doctrine had established, a climate which now has been recreated for us by Leonard Wilson.

CECIL J. SCHNEER
Department of Geology,
University of New Hampshire, Durham

Aspects of Biology

Challenging Biological Problems. Directions toward Their Solution. The American Institute of Biological Sciences 25th Anniversary Volume. JOHN A. BEHNKE, Ed. Oxford University Press, New York, 1972. x, 502 pp., illus. $10.95.

The American Institute of Biological Sciences celebrated the 25th anniversary of its foundation in 1972. Its officers decided to mark this event by the publication of a rather special type of volume. They point out that "Speculation has played a major role in the advancement of science. But its contribution is often not fully appreciated." They therefore set about organizing "a volume of perceptive speculation about ways to solve some of our most interesting and critical biological problems."

But which are the most interesting and critical problems? They wisely decided not to attempt to emulate the prodigious feat performed by Philip Handler and his team from the National Academy of Sciences, who took the whole of the life sciences as their province in *Biology and the Future of Man*. It would, however, clearly have been inappropriate for a body as broadly based as the AIBS to select any one discipline, or even a few related ones, within the whole field of biology. One solution might have been to select from across the whole board problems that are challenging because of their potential impact on the well-being of mankind in the next few decades. However, this is not what the officers of the AIBS decided to do. Instead, they called upon the formidable resources of their organization. Nominations of problems and potential authors were solicited from the AIBS officers, members of the *BioScience* editorial board, and the members of the editorial committee for the book, as well as a wide spectrum of prominent biologists. This brought in a list of 125 problems, from which they finally selected 17; to these they decided to add four chapters dealing with communication in biology, the ethical social, and economic climate for the life sciences, and graduate education. Finally, since the AIBS has a genuine interest in students at all levels, they set about obtaining some contributions from authors who had not yet been awarded their doctorates. This again involved a massive search operation. Letters were sent to 3000 life science departments, and from the resulting haul of fish of all sizes and shapes three were chosen.

This account of the structure and genesis of the book will, I hope, not merely give the prospective reader some essential information about its character, but will convince him that it is essentially impossible to review. One can tell a priori that it will contain a large number of articles on interesting topics written by authors of well above average caliber. And one would expect that the student contributions will be very superior examples of that category of biological literature. Both expectations are amply justified. I can imagine very few biologists who will not find something of genuine interest in the book. Equally, it is difficult to imagine any biologist who will be able to rustle up an interest in everything it contains.

The best a reviewer can do is to give some indication of which areas of biology are, and which are not, touched on, with perhaps a few indications of the manner in which they are treated. Perhaps, in view of the present fashion in biology, the reader will not be surprised to learn that five out of the 17 biological problem areas, and all three of the student contributions, are basically concerned with ecology; and two more contributions, on the regulation of human populations and on evolutionary biogeography viewed from plate tectonic theory, are on the borderline of this subject; and still another, on the integrative approach to biological classification, is not too far away. Of the rest, four are in the general region of cell biology—on cellular mechanisms of learning, abnormal growth, membrane permeabilities, and the aging process. There are two on the importance of cyclic properties, both as timing mechanisms and, in one of the most theoretical articles in the book, as a basis for the integration of whole organisms. There is one article in the area of animal behavior, on aggression; and Joshua Lederberg contributes another of his admirably clear, balanced, and well-thought-out discussions of the whole area of eugenics and genetic engineering. The articles more oriented toward science policy include a short statement of the future challenges for the AIBS; a discussion of the problems of communication in the biological sciences in an era of information overload, and reviews of the present prospects for graduate education in biology and for the profession as a whole in the United States as it is today. Finally, there is an article by the always provocative Kenneth E. Boulding, with the title "Economics as a not very biological science," which might perhaps have had as a subtitle "Biological science as not very good economics."

I will not attempt to list all the topics that are omitted, but perhaps one might mention some old friends whose faces do not show up here, or who appear only as a tail wagged by some other dog. Neurobiology, immunology, evolution theory, recent discoveries about the unexpected complexity of eukaryotic chromosomes, are among those whose voices—I suppose some may claim usually too strident—are here scarcely heard at all.

As to treatment, I must first repeat that all these articles are written by well-esteemed authors. At least in the areas where I feel at least a modest competence to judge, they all have something quite interesting to say. Of course, the articles are not intended