water hydraulics. Nevertheless, it is interesting to note that Polubarinova-Kochina's book also reflects some provincialism. Of more than 300 literature citations, less than 10 percent are of non-Russian origin, and most of these are such well-known classics as Prandl's work on fluid mechanics and Carslaw and Jaeger's work on heat conduction. There are no references to current literature published in non-Russian journals. Despite this limitation, the book is a highly important reference work in which the different approaches used in familiar problems together with a number of unique solutions to new problems will be of great interest to ground-water specialists in this country.

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Dana's System

The System of Mineralogy of James Dwight Dana and Edward Salisbury Dana. Yale University, 1837–1892. vol. 3, *Silica Materials.* Revised and enlarged by Clifford Frondel. Wiley, New York, ed. 7, 1962. xii + 334 pp. Illus. $7.95.

The System of Mineralogy of James Dwight Dana, first published in 1837, has had a long and deservedly illustrious career. The volume, a foremost authoritative reference source throughout its long history, was one of the more famous products of American science during the 19th century. Clifford Frondel of Harvard, co-author of volumes 1 and 2 of the seventh edition (with the late Charles Palache and Henry Berman), renders a further service to mineralogy as the sole author of volume 3.

The great proliferation of mineralogical studies after the appearance of the fifth edition (1868), which were precipitated by the introduction of sophisticated optical measurements to mineralogy, led to the rigorous and critical system of condensation and abbreviation devised by Edward Salisbury Dana, the author of the sixth edition (1892). The format of that justly famous edition had, necessarily, to be changed somewhat for this edition, because the intervening years witnessed an even more striking period of discovery and understanding that resulted from the increasingly widespread use of x-ray diffraction. The volume of data on minerals had grown so large by the time work commenced on the seventh edition that it was decided to publish the system in three volumes. Volume 1, *Elements, Sulfides, Sulfosalts, Oxides*, appeared in 1944, and volume 2, *Halides, Nitrates, Borates, Carbonates, Sulfates, Phosphates, Arsenates, Tungstates, Molybdates*, in 1951. The initial plan was to cover both silica and silicate minerals in volume 3, but the volume was restricted to the silica minerals alone. Two additional volumes are now proposed to cover the silicates, thus bringing this edition to a total of five volumes.

Despite the crystal chemical classification that, in this edition, replaces the older chemical system of the sixth edition, the sixth edition's critical selection of referable topics and its convenient condensation of data were retained as guiding principles in volumes 1 and 2. With the advantage of a more restricted range of compounds to discuss, Frondel has followed a stated intent to produce an "entirely rewritten and greatly enlarged" volume 3 by rejecting the brevity of the previous volumes. He has produced an interesting but somewhat unbalanced volume that retains the necessary dictionary arrangement of information but which also provides extensive discussions of the vast amount of work done on morphological variations, twinning, crystal physics, compositional variations, and varietal forms of quartz. Two hundred and fifty pages are devoted to quartz alone, a remarkable increase from the ten pages of the sixth edition; this reflects not only a great expansion of the topics selected for discussion, but also the vast amount of work done on quartz, much of it stemming from the widespread use of quartz oscillator plates.

The vital role of x-ray diffraction in mineralogy is emphasized more strongly than in volumes 1 and 2, and complete x-ray powder diffraction tables are included for the first time. A complete list of the interplanar spacings for quartz, and of their diffraction angles for Cu, Co, Fe, and Cr radiations, indicates the widespread use of quartz as an internal measurement standard in x-ray diffraction studies. It is unfortunate that the necessary thermal expansion data were not included so that this valuable table could be equally useful at temperatures other than 25°C.

Volume 3 is easy and interesting reading that will appeal to many scientists as well as to professional mineralogists. Although the extreme emphasis given to quartz results in imbalance and its length reduces its usefulness as a ready reference source, volume 3 is an extensive and impressive compilation that must be on the bookshelf of every serious mineralogist.

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British Scientists

Charles Lyell (*British Men of Science*, vol. 1. Sir Gavin de Beer, General Editor). Sir Edward Bailey. Doubleday, Garden City, N.Y., 1963. x + 214 pp. Illus. $3.95.

Sir Charles Lyell wrote the best and still the most rewarding of geological textbooks, *Principles of Geology* (3 vols., 1830 to 1833). Now Sir Edward Bailey, one of the best known of British geologists, has written a thoughtful and entertaining biography of Lyell that puts the great man in context, with respect to Lamarck, Hutton, Darwin, Chambers, Agassiz, and others.

Lyell also wrote *Travels in North America* (1845), *A Second Visit to the United States of North America* (1849), and *The Geological Evidences of the Antiquity of Man* (1863), but the eleven editions of *Principles*, the final one in 1872, were his glory. Darwin took the first edition with him on the "Beagle" and became one of the thousands caught by its spell and educated by its thoroughness and clarity.

Lyell's marshalling of the evidence for the enormous length of geologic time profoundly affected Darwin, but Lyell himself was a reluctant organic evolutionist. Bailey makes clear Lyell's early coolness toward Lamarck and the slowness with which he accepted Darwin's evidence for evolution. Lyell, who was born near the Highland Border, was one of the first to acclaim Agassiz's recognition, in 1840, of the effects of Pleistocene glaciers and glacier-dammed lakes in and near the Highlands. His fellow members of the Geological Society of London were violently hostile and so shook his first confidence that he became a partial doubter himself and helped hold back for 20 years the recognition by Britons

of the full implications of continental glaciation during the Pleistocene.

Bailey's own reminiscences have special values. He knew men who knew both Lyell and Darwin. Bailey could also write (p. 28) "When I think of Lamarck my mind goes back to the battle of the Somme. I had noticed some bricks in the side of a trench, the only relic of the village of Bazantin, northeast of Albert. Someone unknown paused beside me: 'This,' he said, 'was the birthplace of Lamarck'; and on he went."

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Darwin and the Antipodes

The Evolution of Living Organisms. A symposium to mark the centenary of Darwin's *Origin of Species* and of the Royal Society of Victoria, held in Melbourne, December 1959. G. W. Leeper, Ed. Melbourne University Press, Victoria; Cambridge University Press, New York, 1962. 459 pp. Illus. $22.50.

This book, the latest, and likely the last, portion of the long harvest of books celebrating the centennial of Darwin's great classic, consists of 36 articles by 42 authors. Although most of the contributors are Australians and New Zealanders, Gavin de Beer and T. S. Westoll from England and Ernst Mayr from the United States participated in the symposium and contributed to the volume. Mayr's paper, "Accident or design: The paradox of evolution," the opening one at the symposium, was a tribute to Oscar Tiegs.

The articles are quite disparate; some are reviews or discussions of fields of study or of general problems, and others present original data with relatively little comment. That some are singled out for mention is not an indication of superior merit.

Darwin did not observe evolution happening; he inferred that evolution must have happened. It is a rather better guess than most "would-have-beens" that to behold evolution actually taking place would have pleased Darwin enormously. In "Evolution made visible," F. M. Burnet summarizes the observations on evolution taking place in poliomyelitis, influenza, and myxomatosis viruses and in their human and rabbit hosts in Australia and elsewhere. M. J. D. White and L. E. Andrew can justly claim that they have "seen" the operation of natural selection in the populations of the grasshopper *Moraba scurra*, although there selection mostly maintains a status quo. F. H. W. Morley, C. I. Davern, V. E. Rogers, and J. W. Peak observe changes produced by natural selection in different environments in the introduced pasture plant, subterranean clover (*Trifolium subterraneum*). A known mixture of 13 clones of this plant was sown on a series of plots in localities that have different climatic and soil conditions, and rapid changes in the composition of the mixture were recorded, different clones being most successful under different conditions. C. A. Fleming did not exactly witness species forming in the lamellibranch genus *Bassina*, and neither did I. M. Mackerras in the Tabanid flies or A. R. Main in the Australian frogs, but their elegant papers are probably as close as we can come to proving this by inference from observational and experimental data in true Darwinian tradition.

Another group of papers are concerned with experimental studies of the mechanisms that bring about evolution. A. S. Fraser's lively, contentious "Survival of the mediocre" claims that the genetic models of population structure used by Fisher, Wright, Haldane, and others "are gross oversimplifications." What has been disregarded is the genetic variability due to balanced polymorphism and to epistatic gene interactions, and especially to the phenomenon of developmental canalization. A very thoughtful paper by J. LeGay Brereton raises the fundamental but difficult question "Can evolution work at the group level?" and concludes that "there is evidence that it can, for how else could behavior which is disadvantageous to the individual but of advantage to the group have evolved?" Some interesting data on the "self-regulation" of experimental populations of the beetle *Tribolium* are presented, and data on populous birds, mammals, and isopods are discussed.

The two concluding papers, by D. J. Carr and S. G. M. Carr and by L. D. Pryor, essay various approaches to the formidable problem of the systematics of the Australian tree genus *Eucalyptus*. A recent revision recognizes 522 species names, but, even though "with some application, foresters quickly learn to recognize the facies of the species in their districts," it is becoming clear that species in *Eucalyptus* is simply not the same biological phenomenon which it is in, say, *Drosophila* or birds or, presumably, in most of the living world. This may be a source of vexation to some minds addicted to order and simplicity, but it is this kind of "disorder" which led Darwin to conclude that species are not fixed entities but products of evolution.

The gracious article by Gavin de Beer manages deftly to pay well-deserved compliments to his Australian hosts by citing Darwin's praise of the Australia of 1836, praise which is fully applicable to the Australia of 1960.

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Biology of the Chordates

The Life of Vertebrates. J. Z. Young. Oxford University Press, New York, ed. 2, 1962. xv + 820 pp. Illus. $10.

The many admirers of J. Z. Young's book, *The Life of Vertebrates*, will welcome the second edition of that excellent text, which was generally acclaimed at its first publication for its felicitous blending of anatomy, physiology, ecology, and phylogeny into an integrated and comprehensive account of the biology of the chordates.

The revision retains the format and plan of the first edition. As Young says in his preface, "I thought it better that the book should continue to show the idiosyncrasies and interests of the author." These interests, as the book itself attests, are remarkably wide-ranging. The past 12 years have been fruitful ones in many areas of vertebrate zoology and much of this progress is reflected in the present edition. Many sections have been rewritten, and new material has been added which incorporates such recent advances as Enami's work on the teleost urohypophysis and Bone's on the nervous system of Amphioxus, as well as various contributions in sensory physiology, and new discoveries in primate paleontology, to select but a few examples. The taxonomy has, in a number of instances, been revised to accord with current authoritative usage. A number of errors that crept into the first edition have been corrected.

Several exceptions may be recorded (these may be scored against the first