to note in the evening paper that the Ford Motor Company has apparently rediscovered the Stirling external combustion engine as worthy of research as a possible replacement for the internal combustion device. Could this lead to research support for further work on small rodents, I wonder?

The last chapter starts with remarks about Jonathan Swift's intuition—before energy metabolism was heard of—of having the Lilliputian emperor adequately guess Gulliver's lunch needs and then talks about how much LSD to give an elephant. Possible doses range from 0.4 to 8 milligrams with some caution against the also-mentioned 80 and just condemnation of the 297 actually used in an experiment. In a letter to the editor of *Science* (**139**, 684–85 [1963]), Paul D. Harwood rightly described that last dosage as an "elephantine fallacy." The elephant so treated died within minutes, and Schmidt-Nielsen very succinctly tells us why and what all we may need to consider if we must indeed experiment with LSD on elephants.

I picked this last item and the one about the Stirling heat engine to illustrate the range of urbane erudition in a book essentially intended as supporting reading for undergraduate students in physiology. I wish I had had it to read when I took physiology, and I recommend it to fellow biologists of all ages as one of the better buys of its kind, especially since it is also issued as a paperback.

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## Tierleben in English

**Grzimek's Animal Life Encyclopedia.** English edition. BERNHARD GRZIMEK, Ed. Van Nostrand Reinhold, New York, 1972. Vol. 10, Mammals I. 628 pp., illus. Vol. 13, Mammals IV. 566 pp., illus. Each volume, $29.95; the set (13 volumes), $325.

Zoo keepers throughout the world know Bernhard Grzimek as the director of the Frankfurt Zoological Garden; long interested in the conservation of African wildlife, he serves as trustee of the Tanzanian National Parks and oversees the operations of the Michael Grzimek Laboratory (named for his son) of the Serengeti Research Institute at Seronera; and he holds an appointment as professor at the Liebig University of Giessen, Germany. With all these commitments, one wonders how he could undertake the imposing task of acting as editor-in-chief of this series. He has worked with over 200 specialists throughout the world serving as editors and contributors. The first edition, in German, appeared in 1968; a special staff of 11 has produced the present English edition.

As one might expect, the treatment accorded the various phyla of animals bears no relation to their numbers in the wild. The emphasis is placed on the larger, more exotic, spectacular, and familiar forms. This is quite natural, for these are the ones commonly seen in captivity and the ones about which we know the most. The series is to consist of 13 volumes. Of these, volume 1 will deal with the "lower animals," volume 2 with insects, and volume 3 with mollusks. The other ten volumes will all concern the vertebrates—three are to cover the fishes, amphibians, and reptiles, three the birds, and four the mammals.

The first two volumes to appear are volumes 10 and 13, the first and, oddly, the last of the sequence dealing with the mammals. Volume 10 is devoted to the monotremes, marsupials, insectivores, and most of the primates. The first chapter considers mammals in general—their anatomy, physiology, ways of life, evolution, and distribution. Thereafter they are discussed by natural groups (families, genera), with details of their behavior, ecology, and relationships. Maps indicate their geographical range, small sketches depict distinctive anatomical features, special symbols designate extinct or endangered species and subspecies. The volume is handsomely and generously illustrated in color, with accurate paintings or photographs of most species discussed, as well as phylogenetic charts and habitat scenes. An appendix includes a systematic classification of Recent mammals, a dictionary of common names (in English, French, German, and Russian), a selected list of references to the literature, and an index. The general format of volume 13 and the manner of treatment are the same as in the earlier volume. Covered are the ungulates or hoofed mammals of the orders Perissodactyla, in part (tapirs, rhinoceros), and Artiodactyla (pigs, hippopotamuses, camels, deer, giraffes, antelopes, cattle, sheep, and goats). Typographical and other errors in both volumes appear to be remarkably few.

A fascinating amount of material is here assembled, and it is authoritative and well presented. The encyclopedia will be an invaluable reference work not only to the personnel of zoological parks but to biologists and naturalists generally. My only complaint is its bulk —these volumes measure 10 by 7 by 3 inches and weigh 4½ pounds each. The use of a lighter stock, and the elimination of the wide inner margins and side headings, would have made them far more compact. As it is, they should well withstand the heavy use they are bound to receive.

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## The Biochemistry of Disease

**Free Radical Mechanisms in Tissue Injury.** T. F. SLATER. Pion, London, 1972. xii, 284 pp., illus. £4.80. Pion Advanced Biochemistry Series, 1.

A central concern in understanding disease is the mechanisms involved in cell injury. The study of cell injury has been largely the province of the pathologists, who have provided an extensive catalog of terms to describe aberrant morphological features of the injured, dying, and dead cell. Investigation of the significance of these structural alterations and the functional changes associated with them is of much more recent vintage, representing an area of overlap for biologists, biochemists, and pathologists. The need for model systems to mimic naturally occurring disease became very apparent when more than a descriptive account of the illness was sought. A very reproducible multifaceted liver injury model, the carbon-tetrachloride-induced rodent liver necrosis, was developed by Cameron and coworkers at University College Hospital. With this system the first modern steps in biochemical analysis of cell injury were taken by Cameron's students Judah, Christie, Gallager, and Rees, and concomitantly the first attempt was made to explain the role of the inciting agent in chemical and physical terms.

Of all the model systems of hepatic change, probably carbon tetrachloride injury and its effects have been most extensively studied. The use of the symmetrical saturated haloalkane suggested a high order of probability that a detailed understanding of its noxious nature could be developed. This material is dehalogenated, be the process of dehalogenation active or passive, enzymic or nonenzymic. It is now evident that this process most likely oc-