

Book Reviews

Protozoans

The Biology of Amoeba. KWANG W. JEON, Ed. Academic Press, New York, 1973. xviii, 628 pp., illus. \$34. Cell Biology.

Because amoebae are so extensively used in teaching and research a volume reviewing their basic biology is a welcome addition to the literature. The present compendium consists of 21 chapters on the biology of the "large free-living amoebae," and the author list is studded with names of individuals well known as specialists to anyone even slightly acquainted with the original literature. Each chapter provides an effective general background to its subject, and chapters on related subjects are somewhat coordinated to decrease overlap. History, taxonomy, morphology, fine structure, behavior, amoeboid movement, endocytosis, effects of chemical and physical agents, and biochemical and physiological studies are covered.

Amoebae have been especially important for studies on effects of enucleation, renucleation, nuclear-cytoplasmic relationships, amoeboid movement, and endocytosis, and as examples of cells. Amoebae have served these purposes well because the large size of some species makes microsurgery easy, permitting enucleation and renucleation with nuclei from other strains or species, and fusion of individuals or parts of individuals treated in different ways or of different species. Thereby, information not easily obtained with other types of cells has become available. An example is the interesting finding that both proteins and RNA move out of, and into, the nucleus of an amoeba. Much new information on amoeboid movement is presented, but there is still not complete agreement as to its mechanism. However, some fascinating new data are presented on the molecular biology of amoeboid movement. Among the curious historical facts is that amoebae escaped the watchful eye of Leeuwenhoek and were first described by Rösler von Rosenhof in 1755. A good review is presented of the classification of amoebae, with the provocative information that *Pelomyxa palustris* lacks mitochondria, endo-

plasmic reticulum, Golgi-like bodies, and cilia-like bodies (the "9+2 organelle"), suggesting that it is something less than a true eukaryote; although it has a nucleus it forms no mitotic apparatus of spindle fibers during division. One almost wants to seek the next step down—an amoeba without a true nucleus, though none has been described. An absorbing account is given of the possible genealogy of amoebae and their evolution.

The Biology of Amoeba has some minor defects: some chapters are largely catalogs and do not make effective use of the information presented; references at the ends of the chapters lack titles, a sacrifice to economy, but one that makes the bibliography of little interest to peruse by itself; glossy paper makes for good reproductions of photographs but presents some difficulty in reading. Although there are some other shortcomings, by and large *The Biology of Amoeba* accomplishes its objective of presenting clearly the large mass of old and new information (emphasis is on the last ten years, with much unpublished work included). The book is well designed, with attractive format and excellent illustrations, including some striking scanning electron micrographs. The volume will thus be of great value to any student or research worker who may wish to use amoebae or compare them with the cells he is studying.

ARTHUR C. GIESE

Department of Biological Sciences,
Stanford University,
Stanford, California

NGF

Nerve Growth Factor and Its Antiserum. A symposium, London, Apr. 1971. ELEANOR ZAIMIS and JULIE KNIGHT, Eds. Athlone, London, 1972. xii, 274 pp., illus. £7.50.

"The discovery, about 20 years ago, that 'more than 90 per cent of the population of sympathetic nerve cells can be increased up to sixfold, or, conversely, wiped out, by supplying a pro-

tein or its antiserum to newborn animals,' was so extraordinary," Zaimis remarks in her introduction to this book, "that for many years it was viewed by a great number of scientists, at least in Great Britain, with some disbelief. In 1964, however, we were able, with Professor Levi-Montalcini's advice and using her antiserum, to demonstrate to the Physiological Society the first immunosympathectomized rats produced in this country. . . . Scientists all over the world have not only confirmed the results of Professor Levi-Montalcini and those of her colleagues but have also produced a number of additional and striking observations on the nerve growth factor (NGF) and its antiserum."

The book contains 12 papers on chemical and biological properties of NGF, 8 on NGF-antiserum effects, and 3 on technical problems in the assay of NGF and its antiserum. Purification and chemical characterization of NGF are reviewed by several leading research groups: C. A. Vernon *et al.* of University College London, E. M. Shooter *et al.* of Stanford University, and R. Levi-Montalcini and the Angeletti of Washington University and the Consiglio Nazionale delle Ricerche in Rome. The first two groups of authors consider NGF to involve a complex group of related proteins, but the third maintains that a single protein accounts for the nerve-growth-promoting activity of mouse submaxillary gland (which has been a principal source of NGF). The complete amino acid sequence of this "2.5S NGF" protein has recently been determined by R. H. Angeletti *et al.* The active NGF molecule appears to be "a dimer of molecular weight 26,518, composed of two identical subunits of molecular weight 13,259," and Levi-Montalcini notes that "elucidation of its primary and secondary structure . . . [should soon make it possible] to identify the biologically active group of this small protein molecule and its mechanism of action at the molecular level. The NGF compares favorably with hormones such as insulin and the growth hormone in one important respect; its field of action is much more specific and its target sensory and sympathetic nerve cells . . . have distinct and unique differentiative characteristics which enable us to detect the successive morphological stages of the growth response" (see also Frazier, Angeletti, and Bradshaw, *Science* 176, 482 [1972]). In view of the serious differences which