

topic can only point out research needs and some of the reasons why we have been so lax about initiating many lines of inquiry. It is obvious that much more research is necessary before we can understand today's student drug use, and we must anticipate that the drug scene will keep changing in response to both chemical and social pressures. Nowlis makes clear that we must respond to today's problems with means that anticipate that new facts, new problems, and new viewpoints will have to be openly examined and incorporated into tomorrow's policy-making processes.

This unsettling book deserves a place in the library of anyone interested in student drug use. It does not presume any particular background knowledge. It does not always fill in detail on elementary matters, but it provides balanced and fairly extensive references for all topics that are discussed.

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Invertebrate Phylum

Studies in the Structure, Physiology and Ecology of Molluscs. Proceedings of a symposium, London, 1967. VERA FRETTER, Ed. Academic Press, New York, 1968. xx + 378 pp., illus. \$15. Symposia of the Zoological Society of London, No. 22.

The first Symposium of the Zoological Society of London was held in 1959 and dealt with hormones in fish. Subsequent symposia have covered both specialized and general topics in zoology, and the published proceedings are good reference sources. This can also be said for the volume under review, which is one of two recent ones in the series to be concerned with a single invertebrate phylum, the other being on echinoderm biology. In this volume on the Mollusca, there is a special emphasis on the gastropod molluscs (classically, the snails and slugs), and some 13 of the 17 papers are concerned mainly, if not exclusively, with members of this class.

Within its taxonomic confines, the subject matter is fairly diverse, ranging from physiology to paleontology. Neurophysiology, on which there are five papers, receives the most coverage. This part of the volume can be recommended to the general neurophysiologist as a reference to some of the recent

work on molluscan neuropharmacology. Three papers from the University of Southampton group are directed toward elucidation of the chemical transmission systems in the "brain" of the land snail *Helix*. There is also a paper on the ultrastructure of the neurosecretory cells in the brain of the pond snail *Lymnaea*. A fifth paper, on the central nervous system of *Lymnaea*, appears only as an abstract, with a journal reference to the complete work. A similar case is that of a chapter on excretion in molluscs, which is a five-page discussion of the major problems in this area based on a review published in still another journal. This discussion is very worthwhile, but inclusion of the updated review would have enhanced the value of this volume in making it a more complete reference work.

Most works on molluscan biology include a discussion of shell formation, and this one is no exception. The two chapters on this subject present both unique and new approaches. In one, on shell regeneration in *Helix*, evidence is presented for the existence of proteinaceous granules, formed especially in the Golgi vesicles of hepatopancreas cells, which are transported to the shell and act as primary crystallization centers for calcium carbonate. These "b-granules," as they are called, may also contribute to the hardening of the shell protein. A theory to account for the electrochemical deposition of calcium carbonate in bivalves is presented in the second chapter on this subject. This theory is related to the recent theory for the piezoelectric deposition of calcium in bone. Some good points are made, such as the requirements for alkaline conditions to precipitate calcium carbonate, but the article is otherwise vague about critical points and is difficult to follow.

The more exotic gastropod molluscs also receive some coverage. There is an excellent review of the bivalved gastropods, a group whose systematic position became clear only after the discovery of a new species in 1959 off the coast of Japan. These are slug-like sacoglossans restricted to an association with the alga *Caulerpa*. The interesting hypothesis is presented that the higher Sacoglossa escaped the nutritional confinements of their association with this alga during evolution by the acquisition of symbiotic zooxanthellae. There is also a study of the behavior of the nudibranch *Melibe*, which feeds with an elaborate oral veil rather than with a radula.

Other topics treated range from the paleontology of the land Mollusca of the British Isles to the ultrastructure of molluscan muscle. Thus, in general the reader is left with the feeling that he has received a good sampling of research in molluscan biology and that he has learned a great deal about the subject, irrespective of his own specialization. The main use of the book will be as a reference for specialists. It should also prove useful to those persons who are interested in the use of molluscs as experimental animals in more general areas. The book is well edited, and the illustrations are good. It is indexed by subject matter, author, and species. The systematic index is very valuable.

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Insect Physiology

Endocrinologie des Insectes. PIERRE JOLY. Masson, Paris, 1968. vii + 344 pp., illus. 96 F. Collection les Grands Problèmes de la Biologie, Monographie 7.

This monograph on insect endocrinology (the first in the French language) follows a series of comparable books and reviews by Wigglesworth (1954, 1963), Flugfelder (1958), and Novak (1959, 1966). It is the published version of the author's course on the subject given at the University of Strasbourg and covers all aspects of insect endocrinology. The chapters on molting, metamorphosis, and gonadotropic hormones form the core of the book; these are accompanied by chapters on endocrine gland morphology, diapause, metabolism, color change, and sex differentiation. Many tables and schemata and about 140 figures are used to illustrate the essentials of today's knowledge. As a basis for an understanding of physiological phenomena, the author points out repeatedly the physiomorphological changes that occur in the endocrine glands. The chronological events (time tables) of molting and metamorphosis are schematically represented for many species. The details of nearly all known facts of insect endocrinology have been included, and controversial reports are objectively treated. I could not find any omission of important details. The approach is broad and comprehensive and thus introduces the student and researcher to a field that has been growing very rapidly. On the whole I would