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

recommend this monograph to researchers and students.

If the book is to be criticized, then one should mention that the literature citations end in the fall of 1965, three years before the book appeared. This apparent delay in publication is hard to understand. Only a few addenda are given. Thus a large body of literature that deals with new and fascinating aspects of insect endocrinology is entirely omitted. For example, discussions concerning concepts of hormonal (neurosecretory) control of metabolism or of hormone action on the cellular and subcellular levels during ecdysis are incomplete and will have to be revised. Furthermore, only a few of the leading findings from the years prior to 1958 are mentioned, and no literature is quoted for those years. Apparently space limitations necessitated this omission. The reader who is interested in these early original contributions to insect endocrinology is referred to other monographs.

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Weatherglasses

English Barometers, 1680–1860. A History of Domestic Barometers and Their Makers. NICHOLAS GOODISON. Potter, New York, 1968. xiv + 354 pp., illus. $15.

The barometer, an instrument for the measurement of the weight of air which was invented more than three centuries ago, not only has served as a tool of the scientist, but also has been applied domestically to prognosticate the alterations of the weather.

In a comprehensive work entitled *The History of the Barometer* published in 1964 (reviewed in *Science*, 8 May 1964, p. 727), W. E. K. Middleton considered the barometer as a purely scientific instrument and provided a detailed history of its evolution and technical development. Goodison, on the other hand, presents the instrument from the point of view of its design and its domestic use in England, although he includes a brief history of the mercury barometer from its invention to the advent of the aneroid barometer in the second half of the 19th century. His work deals in detail with its commercial manufacture and with the English clockmakers and mathematical instrument makers who produced mercury barometers from 1680 to 1860, and provides adequate consideration of the barometer's technological development throughout this period.

The work is divided into three parts, of which the first consists of a clear statement of the principle and functions of the mercury barometer and a survey of its production by English makers. A second section is devoted to biographical sketches of the 50 most important English makers, arranged alphabetically and illustrated with fine reproductions of trade cards and other materials and excellent, often full-page, photographs of instruments. The final section provides a briefer listing of approximately 1700 lesser makers and dealers. These last two sections in particular are useful not only to those interested in the history of the barometer but also to scholars and students concerned with the history of horology and of mathematical instruments in England.

This volume is distinguished by the many photographs of outstanding quality made expressly for it, of which several are in color, and a number of clear drawings which explain technical features. The material is clearly presented and carefully documented throughout. Goodison's work supplements Middleton's history and is in itself a most useful reference work on English mercury barometers as well as clocks and instruments for the three centuries covered.

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Functional Formulation

Statistical Continuum Theories. MARK J. BERAN. Interscience (Wiley), New York, 1968. xvi + 424 pp., illus. $17.50. Monographs in Statistical Physics and Thermodynamics, vol. 9.

As anyone who knows the subject even remotely will be aware, statistical theories have played an increasingly dominant role in continuum theory in the past few decades. An attempt to present this aspect of continuum theory in a systematic manner is therefore welcome.

The book opens with a short chapter of discussion of the type of problems one encounters in statistical theories. This is followed by a chapter of definitions and mathematical preliminaries in probability theory and the theory of functionals. In the third chapter, functional equations for various physical problems are derived, and moment equations are obtained from them. These moment equations are also derived directly from the governing differential equations. Furthermore, perturbation techniques and the method of the cumulant neglect hypothesis are introduced in order to terminate the infinite set of moment equations, and variational principles for finding effective physical constants are presented. Next, four chapters are devoted to the theory of partial coherence, the theory of heterogeneous materials, flow through porous media, and turbulence.

This book is intended primarily to acquaint the reader with the problems one faces when one tries to formulate a continuum problem from a statistical point of view. In particular, it will enable research workers in any one of the variety of disciplines in which statistical formulations are used to learn something about the others. As the author points out in his preface, the functional formulation used in the early chapters "provides a unifying approach since if a statistical problem is formulated in terms of functionals, the basic presentation of the problem is similar in many fields." However, existing knowledge of functionals is quite limited, and hence their use "has not yet proven very fruitful in solving statistical problems." Thus once the problem to be solved is formulated, the associated hierarchy of moment equations must be derived and whatever approximate techniques are at hand must be used to solve it.

The level of the book is apparently that of advanced graduate students in engineering or physics. The topics dealt with are treated with clarity and in considerable depth.

On the debit side, this book lacks exercises for students; hence it will not be suitable for use as a standard textbook. Furthermore, some of the examples given are not well chosen. For example, the calculation of effective constants in the chapter on the theory of heterogeneous materials is presented only for the static case, and the more interesting dynamic case, abundant in literature, is neglected.

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