from six countries. Most of these investigators, including the editor, have turned their attention to studies of this tissue within the last decade.

The monograph is not a compilation of papers presented at a symposium. There is, however, considerable overlap of coverage and unequal quality among the chapters. In some cases one will find a useful and comprehensive survey of the literature, and such chapters provide an excellent reference source for workers in the field. In this regard it is perhaps regrettable that only four of the 13 chapters provide the full titles of papers cited.

The main concern in the monograph is with the various morphological and biochemical attributes of brown adipose tissue which endow it with the potential to play a thermogenic role. Among the points covered that support such a role the following may be cited. First, the distribution of this tissue in various species; it is most abundant (3 to 7 percent of body weight) in hibernators and in neonates, especially those that are born lacking the fur coat that insulates the adult. Second, the tissue possesses a rich vascular network and is extremely rich in mitochondria—attributes that are necessary to permit the extremely high oxygen uptake of which the tissue is capable. Third, it has a rich sympathetic innervation and a high norepinephrine content which can serve to trigger the ignition of the oil burner to produce heat. Studies in vitro and in vivo support the role of catecholamines as stimulators of oxygen consumption. Fourth, biochemical evidence indicates that the tissue's fat stores (50 percent of wet weight) serve as fuel. Production of fatty acids and glycerol accompanies the stimulation of oxygen consumption by catecholamines. Presumably this involves the release of cyclic adenosine monophosphate and the activation of the tissue's lipase.

Still not resolved to everyone's satisfaction, however, is the question how this tissue generates heat. Increased oxygen consumption in nearly all tissues is geared to a demand for adenosine triphosphate as a source of energy rather than primarily to the generation of heat. Does brown adipose tissue fail to generate ATP when stimulated to respire rapidly, or does it possess some mechanism that permits ATP or some high energy precursor to be used rapidly and wastefully so as to achieve heat production? The present views on this question are well presented in this treatise along with the current biochemical information that must be taken into consideration in reaching a final answer to it.

ERIC G. BALL
Department of Biochemistry, Harvard Medical School, Boston, Massachusetts

Zootoxicology

Poisonous and Venomous Marine Animals of the World. Vols. 2 and 3, Vertebrates. BRUCE W. HALSTEAD, with sections on chemistry by Donovan A. Courville. Government Printing Office, Washington, D.C., 1967–70. Vol. 2, xxxii, 1070 pp., illus.; vol. 3, xxvi, 1006 pp., illus. $50 for the set of three volumes.

The publication of the third volume on marine zootoxicology brings to a close this rather massive contribution (some 3100 pages in all), which first began publication in 1965 with the appearance of the volume on invertebrates. The three volumes, published jointly by the United States Air Force, Army, and Navy, are a first and greatly needed attempt to bring together all important information on dangerous marine animals. (The first volume was reviewed in *Science*, 12 May 1967.)

The second volume deals with poisonous fishes (those that produce biotoxication when ingested but have no specific poisonous glandular organ). The third volume includes venomous fishes, as well as fishes with specific poisonous glandular organs unassociated with venom apparatus (ichthyocrinotoxic fishes), poisonous sea turtles, venomous sea snakes, and poisonous mammals. A glossary, a general index, and finally addenda and errata for the three volumes are appended in volume 3. The organisms discussed are arranged more or less according to their phylogenetic relationships, and each is treated in a rather standard format usually including information, when available, on the history of research, the biology of the dangerous organism, the morphology and microscopic anatomy of the tissue and organs involved in the mechanism of intoxication, and the clinical symptoms, treatment, prevention, and pathology of intoxication. Comments on or sometimes rather thorough discussions of the toxicological, pharmacological, and chemical aspects of the poisons are also included.

The volumes are well illustrated, an attempt being made to illustrate all poisonous marine animals known. To achieve this Halstead has had to rely on extensive use of illustrations from ichthyological literature as well as many excellent to poor color photographs from a variety of sources. The resulting illustrations vary in quality and in some cases will be difficult for a physician or toxicologist to use as a means of identification. The physician and toxicologist should also be aware that the scientific names used for many of the fishes will be subject to future changes. Taxonomic problems in tropical marine shore fishes, including the majority of the fishes covered in this book, have only begun to receive adequate treatment in recent years.

The major purpose of these volumes, to summarize modern knowledge on poisonous and venomous marine animals, is amply accomplished, and the severe limitations of our knowledge of this area of biology and medicine are well shown. In reading through this work one is impressed with how little as well as with how much is known about the subject. The books will long remain a valuable source of information for all concerned with tropical marine biology and medicine.

STANLEY WEITZMAN
U.S. National Museum of Natural History, Washington, D.C.

Hazardous Agents

Chemical Mutagens. Environmental Effects on Biological Systems. L. FISHBEIN, W. G. FLAMM, and H. L. FALK. Academic Press, New York, 1970. xiv, 364 pp., illus. $18.50. Environmental Science.

Microbial geneticists and molecular biologists have employed chemical mutagens for several decades as tools for the elucidation of basic genetic structure and function. In contrast with x-irradiation, the genetic hazards of which have long been appreciated, there has only recently been a realization that there are potential public health hazards due to chemical mutagens. This awareness has fortunately been paralleled by the recent development of practical, sensitive, and relevant methods for detecting and measuring effects of chemical mutagens in vivo and in vitro in mammalian systems and by microbial and other ancillary nonmammalian systems.

Chemical Mutagens takes a broadly

interdisciplinary approach, and the subject is dealt with in a clear and scholarly manner. Molecular biologists, toxicologists, pharmacologists, and regulatory officials concerned with public health will find much of value in it. The first section contains chapters on basic genetics, mode of action of chemical mutagens, repair of genetic damage, and methods of testing. The second section deals comprehensively with individual chemical mutagens, the data concerning which are also usefully summarized in tabular form. The authors make no attempt to present detailed protocols of test systems for chemical mutagens, restricting themselves to a discussion of the background and principles involved. From a practical standpoint, clearer distinctions between the presumptive human relevance of data derived from in vitro and in vivo systems and from nonmammalian and mammalian systems might have been helpful. However, these aspects of the subject will be complemented in a forthcoming book on *Environmental Chemical Mutagens*, edited by Alexander Hollaender, in which greater emphasis will be given to the specifics of mutagenicity testing.

The text is well illustrated by tables and figures and the references are comprehensive and up to date.

SAMUEL S. EPSTEIN
Children's Cancer Research Foundation, Boston, Massachusetts

The Use of an Instrument

Practical Electron Microscopy for Biologists. GEOFFREY A. MEEK. Wiley-Interscience, New York, 1970. xx, 498 pp., illus. $22.

Principles and Techniques of Electron Microscopy. Biological Applications. Vol. 1. M. ARIF HAYAT. Van Nostrand Reinhold, New York, 1970. xvi, 412 pp., illus. $19.50.

Today's novice in electron microscopy is fortunate in having at his disposal a number of texts and manuals purporting to guide him through the intricacies of microscope operation and specimen preparation. This plethora of advice has come into being only in the last decade or so and suggests the end of the adolescence of electron microscopy. However, current offerings either tend toward the conglomerate approach of discussing not only the fundamentals of microscopy but also photography, specimen preparation (of all kinds), and micrograph interpretation or lean heavily toward optics and theoretical principles underlying microscopy at a relatively advanced level. With approaching maturity a division of labor is appropriate and is indicated by these two new texts, one of which restricts itself entirely to specimen preparation and the other of which is devoted to a presentation of the fundamentals of optics and microscope instrumentation for the novice.

Practical Electron Microscopy for Biologists by Meek is, as its title implies, directed primarily to the elucidation of the operation of the electron microscope supported by enough theory (in qualitative terms) that the operator will have a basic understanding of the principles underlying electron microscopy, the supposition being that such a grounding in fundamentals is a prerequisite for intelligent operation of the instrument and, most important, that superior end products and greater productivity will be the result of such operation. The validity of this assumption may be questioned by some, but it enjoys rather widespread if uncritical acceptance. To accomplish its goal the book is divided into three sections that may be briefly described as: instrumentation, operation, and specimen preparation. The first section discusses the principles of optics, magnetic electron lenses, image formation, vacuum and electronic technology, and the role of these elements in a functioning microscope. Included as well are an abbreviated survey of the features of currently available commercial instruments and suggestions concerning instrument selection. Step-by-step operating instructions, performance measurements, maintenance, and the significance of expected developments in electron microscopy are presented in the second section. The third and shortest section of the book directs its attention to specimen preparation by techniques the author describes as "cook and look" (histological) and "grind and find" (particulate).

Although some sections (those on vacuum and electronic systems, for example) may seem too extensive for the nontechnically inclined operator and too superficial for those who wish to carry out rudimentary maintenance on their own instruments, the level of presentation is fairly uniform throughout and is quite suitable for the intended audience: research workers or students in the biological sciences without a foundation in physics or engineering. The step-by-step descriptions of operating procedures offer useful hints and guidance that will fill many of the gaping holes in some microscope instruction manuals but may well be superfluous in view of the completeness of others. Definitely a practical manual, the book points out to the reader many of the minor routines and pitfalls he must be acquainted with in order to uniformly obtain acceptable results from his instrument. Occasionally the author's instructions seem rather arbitrary (most noticeably in the chapters on photographic procedures, instrumental maintenance, and particulate specimen preparation) and should perhaps be interpreted as personal preference rather than rules of necessity.

Recent reports in the literature suggest that dark field microscopy may assume greater importance than the author prophesies, but there certainly is value in being made at least cursorily aware of the variety of techniques and approaches currently being used in microscope laboratories throughout the world.

Fortunately the author keeps his priorities clear and deals in only a limited fashion with techniques for specimen preparation: this subject is dealt with extensively in *Principles and Techniques of Electron Microscopy*, volume 1, by Hayat. In Hayat's book, preparative procedures are presented in much the same fashion as in Kay's *Techniques for Electron Microscopy*. By excluding all topics except preparative procedures for biological specimens and by devoting two volumes to the task (a second volume is to follow), the author will probably present the most extensive compilation of procedures available. Although a genuine effort has been made to provide a fundamental basis for some of the procedures mentioned, the paucity of applicable principles in this area restricts much of the presentation to the reporting of empirical techniques garnered from the literature or the author's laboratory. Nevertheless, anyone willing to search through the many offerings will doubtless find something useful and suitable for his particular problem.

Both of these books may be recommended: Meek's as a primer on microscope operation for the novice and Hayat's as a compendium of techniques that may serve as a reference work for the researcher and student.

C. RICHARD ZOBEL
Department of Biophysical Sciences, State University of New York, Buffalo