Chemistry

Heterocyclic Compounds with Three- and Four-Membered Rings. Parts 1 and 2. Arnold Weissberger, Ed. Interscience (Wiley), New York, 1964. pt. 1, xii + 646 pp.; pt. 2, xii + 528 pp. Illus. $65.

The contributors to part 1 of this two-volume treatise cover the chemistry of compounds containing three-membered rings: "Ethylene oxides" by A. Rosowsky (523 pp.), "Aziridines" by P. E. Fanta (51 pp.), "Ethylene sulfides" by D. D. Reynolds and D. L. Fields (47 pp.), and "Oxaziranes" by W. D. Emmons (22 pp.). The papers in part 2 treat the four-membered rings: "Thietane and its derivatives" by Y. Etienne, R. Soulas, and H. Lumbroso (81 pp.); "β-Lactones" by Y. Etienne and N. Fischer (155 pp.); "Trimethyleneimines" by J. A. Moore (92 pp.); "Four-membered rings containing two heteroatoms" by W. D. Emmons (5 pp.); and "Oxetanes" by S. Searles, Jr. (85 pp.). These essays include 116 pages of references. There is also an author index (48 pp.) and a subject index (55 pp.).

To price such a work at $65 means that only libraries can afford it, and that should have prompted the editor and publishers to devise ways to lower the cost, in particular to save wasted pages. In the present work these items promoted extra pages: duplication of author index and alphabetized references; use of full hexagons in formulas where C_6H_5 or XC_6H_4 would have sufficed; use of unnecessary bonds in formulas, thereby ultimately requiring extra lines for an equation; too generous spacing around equations; and great empty spaces in tables. The authors did try to curtail their presentations to the extent permitted by citing pre-existing reviews, but, because the goal was full coverage, considerable duplication was inevitable. The viewpoint is commendably critical throughout.

The largest chapter by far, and a very readable one, is Rosowsky's on ethylene oxides. Etienne and Fischer's discussion on β-lactones and ketene dimers is particularly interesting. Unfortunately, the joy of reading every chapter is marred by too many distractions on the printed page. For example, [H] is generally used over the arrow of an equation to portray reduction, but on page 543 it seemingly is used to indicate oxidation. On the same page, aziridine is stated to add to "various alkenes," but no actual alkene is listed in the examples.

Repeatedly, two-word expressions have been written without spacing. The following are typical examples: haloketone (for halo ketone) and, similarly, hydroxyketone, epoxyketone, aminoketone, diazoketone, haloacid, hydroxyacid, thioacid, haloester, aminoester, bromoester, chloroester, cyanoester, iminoalcohol, epoxyalcohol, epoxyether, hydroxyketals, phenylisocyanate, and cyclopentylthiocyanate. Unsuitable terms include *n*-butanethiol (for 1-butanethiol), *tert*-butanol (for *tert*-butyl alcohol), diimidoether for bis(imido ester), 2-butyl for *sec*-butyl or 1-methylpropyl, and phosphorous (p. 547) for phosphorus.

Another error is exemplified by "formate ester" (p. 1039), which should be "formic ester" or simply "formate." Correct usage appears in a few places, as isocyanic ester (p. 804), maleic ester (p. 45), and acetoacetic ester (p. 834); but generally the incorrect style is preponderant. This includes the use of phosphate ester for phosphoric ester, sulfate ester, and sulfite ester; toluenesulfonate ester or tosylate ester for toluenesulfonic ester, phosphonate ester, and carbonate ester; and sulfite salt for sulfurous salt, and thiocyanate salt.

A serious trespass on rules—the disregard of functionality in the selection of names—should be noted. Several amines, amides, alcohols, and ketones were named as hydrocarbons: for example, 1,3-diaminopropane, 2-hydroxynorbornane, 1-acetylcyclohexane. "Arylation" is hardly a suitable term (p. 545) when the "aryl" groups refer only to triazine, purine, pyrimidine, and quinoline. Quite unsupported by rules are the names dichloropentaerythritol (p. 1032) and dicyanobromopentaerythritol; we never say "trichloroglycerol" for 1,2,3-trichloropropane. These are but some of the distractions that I encountered.

In spite of the above criticisms, my general impression is that this is a job well done. Fact and interpretation are well interwoven, and completeness seems to have been achieved. I noted only two serious omissions: (i) the chapter on ethylene oxides contains no mention of epoxy resins or other industrial applications of epoxides, and (ii) in the discussion of trimethyleneimine and β-lactams Ugi's superior synthesis of β-lactams from isocyanides, aldehydes, and β-amino acids is not cited. This work is recent (1960 to 1962), but the chapter does include references to work published in 1963.

The monograph deserves wide reading, not only by workers in these areas but also by organic chemists generally. This follows since the compounds discussed are essentially aliphatic in spite of their heterocyclic classification.

CHARLES D. HURD
Department of Chemistry, Northwestern University

Nuclear Reactor Technology

Principles of Radiation Protection. G. Eaves. Gordon and Breach, New York, 1964. 185 pp. Illus. $8.25.

This book is one of the Nuclear Reactor Technology Series, edited by J. F. Hill, head of the Post-Graduate Education Centre of Great Britain's Atomic Energy Research Establishment at Harwell. The series is intended to serve as a set of textbooks for general courses in nuclear engineering at technical colleges and for part of the standard reactor course at Harwell. However, the author has not restricted himself to just those topics of interest to reactor engineers and physicists, but has dealt with the subject in a general manner.

Since the treatment is nonmathematical (with the exception of a few places where an illustrative problem is essential to understanding the topic), the book can serve only as an introduction. In his preface the author, G. Eaves, says that the book "is intended mainly for those who wish or need to know something about radiation protection in a general way, either as background to their work, as in the case of the engineer or physicist engaged in work on reactors, or as an easy introduction to the more advanced texts quoted in the bibliography." I think he does achieve this limited objective, but, with the possible exception of the bibliography, the book will be of little help to one who wishes to enter the radiation protection field.

The first chapter provides a general look at biology. Then comes a treatment of the interaction of radiation with matter, after which we have a chapter on radiation damage to biological systems. Chapter 4 is on units and quantities, and chapter 5 covers radiation detection and measurement.

Chapter 6 is an analysis of radiation hazards, chapter 7 discusses maximum permissible levels, and chapter 8 is an outline of radiation protection methods.

The remaining seven chapters briefly cover remote handling and shielding, containment, transport of active material, waste disposal, ionizing radiation and the law, emergency procedures, reactor hazards and design, and planning for radiation protection. Short appendices are devoted to atomic energy legislation (British, of course), toxicity of radioelements, shielding calculation, surface finishes, and a summary of methods of radiation detection and measurement. There is also a general bibliography.

Without examining the companion books in the series, it is difficult for me to judge how good a picture of the field the budding reactor engineer would get, but I think the picture would be adequate. This book is accurate, and it is clearly written. My chief criticisms are that the title is perhaps overly ambitious, and that the non-British reader will find that many of the literature references are not readily available. And some of the material—for example, that on legislation—is generally inapplicable. I was a little surprised to note that the journal *Health Physics* is not cited in the bibliography. To sum up, I feel the book is a good one for its intended purpose, but that it will not be very useful as a general reference.

J. B. H. KUPER
Brookhaven National Laboratory, Upton, New York

Bryology

The Mosses of Michigan. Henry T. Darlington. Cranbrook Institute of Science, Bloomfield Hills, Mich., 1964. xii + 212 pp. Illus. $12.

In spite of laments from biogeographers that state boundaries rarely if ever relate significantly to floristic and faunistic distributional patterns, state floras and faunas continue to be published. Occasionally there are sound reasons for their publication. A manual of the mosses of Michigan can probaby be justified. The moss flora of Michigan may well be the best known of any state flora, thanks to the activities of such able bryologists as Nichols, Steere, Fulford, Sharp, and Crum and to the activities of the many students at the University of Michigan and its summer field station at Douglas Lake. The largest center of bryological activity in North America continues to be the summer program in bryology at the University of Michigan Biological Station, and the present book should serve as an indispensable aid to the many students of mosses who study there. In addition, because the moss flora of Michigan is representative of the entire Great Lakes region and of much of Eastern North America, the book will be useful over a wide area of the United States and Canada.

A short preface that strains to justify the study of mosses on economic and ecological grounds (isn't it enough that they exist?) precedes an introduction which gives an interesting account of bryological exploration of Michigan, a list of collectors, a physiographic and climatic description of the state, the life history of a moss, and some brief remarks on how to collect mosses and how to prepare specimens. A generic key to all of the known genera in Michigan is followed by the systematic treatment. Brief and, happily, nonrepetitive diagnostic descriptions are given for each order, family, genus, and species. Under each family there are keys to both genera and species. Habitat and substrate information are included for each species and localities are cited by county and collector. The failure to indicate where the specimens are located will not be appreciated, however, by the critical student of plant geography who may wish to examine material of rare and critical species.

The book is remarkably free of errors. It was carefully edited, and much of it rewritten, by Howard Crum (National Museum of Canada) who brought the nomenclature up to date, checked the authorities, tidied up the keys, and otherwise made the book acceptable. Nearly all the species are illustrated by line drawings taken directly from older manuals, mainly those by Braithwaite, Sullivant, and Limpricht. The illustrations are reproduced superbly, and in most instances they have been chosen wisely.

This will be a very useful book. In many ways it is one of the best of the several state moss floras. The typography is attractive, and the text is organized in a way that is pleasing and useful. It was obviously written to be used to identify mosses and to summarize the known collections in the state. To this end it will serve admirably. No synonyms are given, and reasons for merging or segregating species are omitted. The beginning student will have the pleasing but ephemeral sensation that there were never any taxonomic problems with respect to Michigan mosses, or else that they have all been solved, and the less discerning beginner could easily become a "manual laborer."

LEWIS E. ANDERSON
Department of Botany, Duke University

Evolution of Man

The Basis of Human Evolution. Bertram S. Kraus. Harper and Row, New York, 1964. xii + 384 pp. Illus. Paper, $4.75; cloth, $6.50.

There ought to be an understandable general discussion of the evolution of man and his closest relatives, and Kraus has attempted to write it. His viewpoint is not biased by any special theories of the origin of man. He presents facts and a variety of possible interpretations, but, unfortunately, little seems to be known about primate evolution. The reader, while left with an appreciation of the problems and the techniques of physical anthropologists, may be dumbfounded that so much work has settled so few questions.

The book begins with descriptions of the processes of evolution and of certain scientific techniques now used in its study. This is followed by a discussion of primate, and particularly of human, evolution, and ends with an examination of the effects of modern culture on these processes. Kraus's sentence and paragraph structure are excellent. Words flow smoothly at all points. In a particularly enjoyable section (starting on page 182) he discusses the difficulties that beset humans because we impose a bipedal gait on organ systems that evolved in our quadrupedal ancestors. However, the ability to write fluently has not been coupled with the ability to write lucidly. Undefined terms course by in a stream that occasionally becomes torrential. A number of the figures and tables are barely mentioned in the text, and those that are discussed are not