of experience in heterocyclic chemistry. As in his *Heterocyclic Chemistry* (which I would highly recommend), large parts of this book can be read almost like a novel. It is well organized each chapter has an individual table of contents, and there are two complete indices (subject and preparations), a very complete bibliography (some 2000 entries up to September 1965), and an excellent summary of the book (which also points out the most pertinent differences between the two editions) in the introduction.

JOHN G. FOSS
Department of Biochemistry and Biophysics, Iowa State University of Science and Technology, Ames

Algal Cytology

The Chromosomes of the Algae. MAUD B. E. GODWARD. St. Martin's Press, New York, 1966. 222 pp., illus. $11.

The rapid advances in recent years relating to the nuclear cytology of algae have prepared the way for this much-needed volume. It is appropriate that the editor and a major contributor to this work is M. B. E. Godward, who, with former students, has done much to expand our knowledge in this field. Six other specialists, S. Puiseux-Dao, G. F. Leedale, J. D. Dodge, M. Roberts, L. V. Evans, and P. S. Dixon, have collaborated with Godward to give expert cytological treatment to six algal classes. Omitted from consideration in the book are the classes Myxophyceae, Xanthophyceae, Chrysophyceae, and the Bacillariophyceae. Surprisingly, the order Charales has also been omitted from discussion, although considerable chromosomal information is available for this group.

The individual contributions to this volume are, for the most part, succinctly written and are reasonably adequate in their coverage. The fact that they are not altogether consistent in format is not particularly distracting. The general and specific features of nuclear cytology, including lists of chromosome numbers, are considered for each of six algal classes. Information on cultural and cytological methods is presented for most of the algal classes under consideration. In addition, Godward presents a brief account of the effects of radiation, colchicine, and gibberellins on algal cells.

The illustrations are generally excellent and well reproduced. Magnifications are noted, with a few exceptions. The index is serviceable, although some algal species listed in the tables (but not in the text) are not indexed. Typographical errors are not excessive.

The lists of chromosome numbers appear to be nearly complete except for the Chlorophyceae. Some of the omissions can be noted by referring to volumes 1 and 2 of the *Index to Plant Chromosome Numbers* (University of North Carolina Press). It would have been useful if references had been given to all published reports of chromosome counts for a species, as well as to all early reports on chromosome numbers despite their questionable validity.

This is a fine book with relatively few shortcomings. As the only available book exclusively treating the nuclear cytology of algae, it supplies a wealth of information in a condensed and comprehensive form. It can be enthusiastically recommended for the stimulation of the specialist as well as the beginning student interested in the cytological diversity of the algae.

LARRY R. HOFFMAN
Department of Botany, University of Illinois, Urbana

Marine Fauna

Marine Invertebrates of Scandinavia. Vol. 1, Tunicata-Ascidiacea. R. H. MILLAR. Universitetsförlaget, Oslo, 1966. 123 pp., illus. $6.

Several years ago the various departments in the Norwegian natural history museums decided to cooperate in the publication of a series of systematic descriptions of the entire fauna of the Norwegian coast. A large amount of material had been collected along this extensive coastline with its numerous fjords. Much of this needed to be reclassified in line with recent systematic revisions, and it was found in addition that there were still extensive sections from which little had been recorded. With the assistance of grants from the Norwegian Research Council for Science and the Humanities, additional collecting was undertaken. Thirty-five specialists from all over the world were asked to be responsible for the identifications and taxonomy in each of the major groups. To each was delegated the responsibility of preparing a volume summarizing his particular group as it was represented in the collections. This was to be the basis for the classification of future additions to the museums, and it was assumed that the summaries would be of considerable value to specialists in other parts of the world.

As the work progressed the geographic limits were extended first to include the other Scandinavian countries and the North Sea and finally to include the whole of the North Atlantic region from the Strait of Dover north along the east coast of Great Britain, across to Iceland and the northeastern coast of Greenland, through the polar basin, and south along the Scandinavian coast, with the whole of the Baltic Sea. It is believed that this extensive marine region forms a unit area which may be compared with the two more southerly faunas of the east and west Atlantic.

The first volume to be completed in this ambitious series of handbooks covers the reasonably well-defined subclass of Tunicata, the Ascidiacea, which are sessile in the adult stage. It is interesting that although there have been a number of well-known specialists in the Tunicata among Scandinavian zoologists, the task of completing this first volume has fallen to a taxonomist from the United Kingdom, R. H. Millar, deputy director of the Marine Laboratory at Millport in Scotland. He has done much important work on ascidian morphology and systematics. His monograph, volume 30 in *Discovery Reports* (1960), dealing with material collected in the South Atlantic and Antarctic is especially noteworthy.

The present volume sets a high standard for those to follow. It begins with a brief descriptive introduction to the structure and development common to both simple and compound ascidians, with a table of definitions of anatomical terms used. This is followed by a classified list of all the species found, with a key to the families. The ordinal divisions and the arrangement are those of Berrill (1950), in which the subclass Ascidiacea is divided into two orders, the Enterogona, including the suborders Aplousobranchiata and Phlebobranchiata, and the Pleurogona, including one suborder, the Stolidobranchiata. Berrill's arrangement has been slow to gain acceptance, but it was used by Millar in his *Discovery* monograph and now seems to be on the way to general adoption. The remainder of the volume contains systematically arranged descriptions of 85 species found in the North Atlantic region. Under

each genus and species heading there is listed the source of the original or amended designation, with the location of the type species if known. A brief and generally adequate description of each species is given, with notes on depth and distribution in the North Sea and the North Atlantic. For each species are included one or more line drawings, indicating external appearance and the arrangement of organs in the zooid removed from the test, and two distribution charts, one showing the precise locations from which the museum specimens have been taken, and the other the general locations from which specimens have been reported.

This little volume is an exceptionally valuable handbook for all marine zoologists who collect ascidian material from anywhere in the world. It should make it possible to identify most of the common species of the North Atlantic without further references. Many of the doubtful or less common species which are not listed can be placed as to genus by comparison with the descriptions given. In addition, the book will be of great assistance in the currently important attempt to work out accurate distributional data for sessile marine species and their yearly or seasonal changes. Millar's *Ascidiacea* will be needed by all university and museum libraries, and by all zoologists interested in ascidian species anywhere in the world.

H. H. PLOUGH
Department of Biology, Amherst College, Amherst, Massachusetts

Radiation

The Middle Ultraviolet. Its Science and Technology. A. E. S. GREEN, Ed. Wiley, New York, 1966. 404 pp., illus. $15.75

The title of this book is misleading. A balanced treatment of the basic science and technology relating to the generation and detection of middle-ultraviolet radiation and to its interaction with gases, solids, and liquids has not been attempted. The book is primarily for the space scientist; the radiation source is the sun, the attenuating media are the atmospheres of the planets, many of the instruments are for flight. The wavelength region of 1700 to 3400 Å has received most emphasis, but no rigid limits have been imposed.

The first chapter is an informative historical account of the airborne spectroscopic studies which extended knowledge of the intensity distribution of the sun's radiation to wavelengths shorter than 2000 Å. In the next three chapters, properties of the principal atmospheric constituents are discussed: included is a summary of certain quantitative calculations for N_2 and O_2. The background radiance of the earth in the middle ultraviolet is the subject of chapters 5 and 6, and in chapter 7 consideration is given to the general problem of atmospheric attenuation of radiation along slant paths. A brief introduction to the subject of air pollution and some thoughts on the use of ultraviolet spectroscopy as a means of identifying trace pollutants form chapter 8.

In the foreword (by Stanley S. Ballard), it is noted that this book contains an "unusual mixture of topics and subjects" which results "in a treatment that is far from uniform." This comment, applicable to the first part of the book, is further justified by the second. Here are chapters in which rocket exhaust plumes, atmospheric entries and chemical perturbations, and electron impact excitations are discussed in addition to aspects of planetary and astronomical spectroscopy. Several of these chapters, for example, those entitled "The ultraviolet spectroscopy of planets" and "Ultraviolet technology," are useful summaries of extensive fields. The latter chapter deals with the techniques employed in the spectral region 1000 to 4000 Å. It includes concise descriptions of radiation sources, filters, detectors, diffusers, and so on, and is a most welcome inclusion.

This compilation, in its entirety, will probably appeal to few. However, sections will be well received. The book is clearly printed, well bound, and contains many references.

R. BRYAN CAIRNS
GCA Corporation, Bedford, Massachusetts

Positional Astronomy

Principles of Astrometry. With Special Emphasis on Long-Focus Astrometry. PETER VAN DE KAMP. Freeman, San Francisco, 1967. 239 pp., illus. $6.50.

You might summarize my impression as "beware of titles unless you pay attention to subtitles." Its author is a master of long-focus astrometric techniques, and this magnificent little book well lives up to its title-plus-subtitle.

The book is divided into three sections, the second of which contains the heart of the matter. This second section must be read and savored, for it tells us how to wring greater and greater accuracy from very stubborn material by using great care in obtaining and measuring the material. The author underplays the value of the Turner coefficients and prefers to use dependence methods. The latter are computational artifices derived from the former, and the reader must pay strict attention to the condition under which the two give the same results. This condition is emphasized on page 104 in the book. It is apparent in this section that the work of Schlesinger and Hertzsprung of the early 1900's forms the basis of the present-day methods and that van de Kamp and K. Strand are the modern apostles.

The first section picks out those parts of spherical astronomy essential for the purpose of the book. It is very well arranged, and chapter 4, "Systematic patterns in proper motions," is a most important inclusion. The third section might well be considered an appendix, for it consists of two brief chapters dealing with errors and least squares.

The technical aspects of the book are selectively, but excellently, referenced. There is no recourse to the modern escape mechanisms of "unpublished note" or "private communication." Many little interesting details about observing and reduction techniques are slipped in and, to my knowledge, appear in print for the first time. This alone makes the book a valuable addition to the literature. Some people may criticize the use of "old-fashioned" mathematical notation, but such notation insures that everyone can read it.

Astronomers have long suffered from a dearth of textbooks on specialized topics. This volume helps to fill the void in one area. It can be used at the undergraduate level, or along with V. V. Podobed's *Fundamental Astrometry* and selected papers in the literature in a one-semester graduate seminar. The book is recommended to the professional and student alike and will no doubt be in every astronomer's personal library for handy reference. It will be especially useful to astronomers who do not work in astrometric areas.

LAURENCE W. FREDRICK
Leander McCormick Observatory, University of Virginia, Charlottesville