tissue. The complexities of making such measurements and the results obtained are fascinating even to someone who feels slightly faint at the sight of blood. Methods of determining the light optical properties of very small crystals are described in considerable detail by C. P. Saylor. This reader finished the article feeling that he could go down to the laboratory and carry out successful measurements, although illustrations of the procedures with an actual example would have added to the interest of the article. The third article on optical microscopy, by R. D. Allen, J. S. Brault, and R. M. Zeh, deals with image contrast and phase-modulated light methods in polarization and interference microscopy. This article begins with a fairly complete discussion of the physical basis of polarizing and interference microscopy, but unfortunately it finishes with a series of photographs of the semicommercial equipment constructed in the authors' laboratory. Not a single micrograph or any other experimental data obtained with this technique are included. Thus readers not familiar with the technique will spot little to attract their interest as they browse through this section of the book.

The resolution limit of the transmission electron microscope is the subject of a long review by E. Ruska, one of the inventors of this instrument. He begins by pointing out that the original estimate of 2.2 Å given in 1932 for the resolution of the electron microscope was very close to the values predicted today because, except for the introduction of astigmators to correct for mechanical asymmetry, modern lenses are essentially no better than the original ones. Ruska then goes on to present a quantitative analysis of all the factors affecting the resolution of both nonperiodic structures and crystal lattice images. Methods largely developed at the Fritz-Haber Institute to overcome the specimen-contamination problem receive considerable attention. Many readers would get more from this article if the various analytical expressions relating to resolution were also presented in graphical form. Probably the most interesting review is that by R. C. Valentine on the response of photographic emulsions to electrons. This short article contains a great deal of information on optimum exposure and development of practical interest to all electron microscopists. The one surprising omission is any reference to the exposure of color film by electrons. I had hoped to find the explanation of rather puzzling observations obtained with color film. The final article, entitled "The struggle to overcome spherical aberration in electron optics," is by Albert Septier, who makes it very clear that the struggle has been and continues to be a difficult one.

This first volume is a very promising beginning to what could become the standard vehicle for reviews on microscopy. The burden of its success will rest with the editors. In the present volume the interval between the completion of the manuscripts (late in 1964 or early in 1965) and the general availability of the published volume seems somewhat longer than necessary, and one hopes it will be shorter in future volumes.

R. M. FISHER
United States Steel Corporation Research Center, Monroeville, Pennsylvania

Heterocyclic Compounds

The Acridines. Their Preparation, Physical, Chemical, and Biological Properties and Uses. ADRIEN ALBERT. St. Martin's Press, New York, 2nd ed., 1966. 616 pp., illus. $32.50.

Here is a book written by a man with an obvious love and enthusiasm for his work. The style of writing is pleasant and the range of topics broad enough to provide something of interest for all chemists. Unfortunately the price, which seems excessive, will discourage the book's entrance into most personal libraries.

Albert begins with a discussion of the ready interconvertibility of the acridines, acridones, and acridans and then considers in detail the many general and specialized methods for preparing compounds in these three oxidation states. He concludes this part of the book with a very practical discussion of how to choose good synthetic methods and gives "hints on the manipulation and purification of acridines."

As a physical chemist, I found the second part of the book of special interest. Albert's principal topics are surface properties, ionization, dipole moments, and spectral properties of acridines. His discussions are on the usual level found in organic chemistry textbooks, and in general he tries to give the reader some insight into the basis of the various physical properties by presenting many examples, with occasional generalizations to summarize the facts. The ionization of acridines is covered in considerably more detail than one might have expected, but their state of ionization plays a crucial role in their important bacteriostatic properties. Spectra are discussed in terms of Platt's notation, and the application of electronic spectra to structure determination is emphasized. A 15-page table and some 20 spectra summarize the electronic spectra of acridines up to 1965. The third part of the book deals with the chemical properties of the ring systems whose preparations were described in the first chapters.

The next section is devoted to the biological properties and uses of the acridines. It contains chapters on clinical properties, relationships between physicochemical and biological properties, acridine-nucleic-acid complexes, pharmacology, and toxicology. Albert's history of the development and use of these drugs make fascinating reading, but I think the clinical discussions (which even include detailed prescriptions) should have been condensed. In fact the entire section on the biological properties (about one-sixth of the book) should perhaps have been made into a separate monograph. In spite of Albert's quite successful (and always interesting) attempts to relate the biological and chemical properties of the acridines, I believe the biological and chemical portions of the book will generally appeal to distinctly different classes of readers. The fifth and final section of this monograph is entitled Dyes and Reagents, but it is also a catchall for many miscellaneous topics —for example, chemiluminescence and solar energy cells.

I was pleased to see that this edition of *The Acridines*, unlike the first, uses Graebe's numbering system (which is also used by *Chemical Abstracts*)—it must have been a difficult change for the author to make. Albert's comments on the various numbering systems (pp. xi–xii), and in particular on those for the benzacridines, point up the desirability of a nomenclature which incorporates chemistry as well as geometry.

In general I would recommend this book (or books, since it is almost two in one) for browsing to all chemists with an interest in biochemistry or heterocyclic organic chemistry. It presents a vast amount of interesting miscellaneous information concerning acridines, as well as valuable generalizations based on Albert's many years

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