foreshortening by the rectification process has to be seen to be believed. For example, it is instructive to compare field F3 in the atlas, or in Supplement No. 1, with field F10 in the rectified atlas. What appears to be a single crater foreshortened (Struve) proves to be two overlapping craters (now named Struve and Russell). The rectified view also reveals a new crater tangent to Struve, and this is named after Eddington.

The rectified views become very fuzzy at the limb, but it is surprising how close one must get to the limb before this becomes objectionable.

In summary, this atlas is a piece of magic. The master magicians who have produced it deserve the gratitude of astronomers, astrogeologists, and (eventually) those who will someday stand on the terrain shown on these remarkable photographic charts.

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FRANK K. EDMONDSON
Goethe Link Observatory,
Indiana University

Low Temperatures

Cryogenics. Michael McClintock. Reinhold, New York; Chapman and Hall, London, 1964. xii + 270 pp. Illus. $10.75.

For the scientist or engineer not already well acquainted with the subject, this is a fine introductory account of the uses of low temperatures.

In a text that examines the motives as well as the methods of low temperature physicists and engineers, the author has made good his claim that "mathematical statements have been included only when they illuminate rather than substitute for physical explanations," but he has also managed to pack in a surprising amount of basic physics and physical metallurgy. A well-balanced view of the entire field of cryogenics has been achieved by the careful selection of topics for discussion, with examples of the basic technology (refrigeration, insulation, and thermometry), unique low temperature phenomena (liquid helium and superconductivity), physical properties of materials at low temperatures (mechanical properties of solids, magnetic phenomena, and thermal and transport properties of materials), and practical uses (the applications of cryogenics). Each chapter contains a useful bibliography, and there is an entirely adequate index—which is in itself an ABC of cryogenic diversity, with entries from "A.I. (artificial insemination) Dewar" to "Zeroth Law of Thermodynamics."

This is not a book to which one would go for details of experimental techniques or for basic cryogenic data, although there are many line drawings, graphs, and tables (not to mention an appendix) of considerable illustrative value.

C. F. MATE
Department of Physics,
Ohio State University

Symposium Papers

Boron-Nitrogen Chemistry. A symposium held at Durham, North Carolina, in April 1963. Kurt Niedenzu, Ed. American Chemical Society, Washington, D.C., 1964. x + 330 pp. Illus. $7.50.

In April 1963 an international symposium on boron-nitrogen chemistry was held at Duke University. Thirty-two contributions presented at that meeting are now recorded in *Boron-Nitrogen Chemistry*, volume 42 of the Advances in Chemistry Series. Kurt Niedenzu, a well-known contributor to boron-nitrogen chemistry, edited the volume. Each paper is written by the original contributor and is presented in the format of a journal publication.

There can be little question that the contributors to this volume represent most of the world's leading contributors to the area of boron-nitrogen chemistry. Contributors from Germany are Goubeau and Becher, the distinguished senior members of the Technische Hochschule at Stuttgart. Goubeau reports on the determination of boron-nitrogen force constants of amine-boranes, aminoboranes, and borazines from vibrational spectra. Becher discusses the elucidation of some structural problems in aminoboranes by means of vibrational spectra. Other contributors from Germany are Roland Köster (Max-Planck Institute, Mülheim) and Heinrich Nöth (Inorganic Institute, Munich). Köster and Nöth, who represent the strength of the younger generation in boron chemistry in Germany, are considered two of the most prolific contributors in the world; Köster works more in the general area of boron chemistry and Nöth more specifically in boron nitrogen chemistry. Köster presents here an extension of work in the bisborolanes system which he discovered earlier. Nöth reports on preparations and reactions of the relatively new hydrazinoboranes. From England, Lappert (University of Manchester) reports on the first example of a cyclic 3-coordinate boron-nitrogen ring compound isoelectronic with cyclobutadiene.

Distinguished academic contributors from the United States are Parry (University of Michigan) who reports on amine addition compounds of borane- and tetraborane carbonyl, Lipscomb (Harvard University) who discusses the relation of the structure of $EtNH_2$-$B_8H_{11}NHEt$ to the problem concerning the "covalent radius" of boron, and Dewar (University of Chicago) who presents a review of the chemistry of a new class of heteroaromatic compounds containing boron atoms as components of six-membered aromatic rings. There are many other fine articles by such well-known contributors as Letsinger (Northwestern University), Zimmer (University of Cincinnati), Seyferth (Massachusetts Institute of Technology), and Laubengayer (Cornell University). Rounding out the contributions of organic, inorganic, and physical-organic chemists are the presentations by Kaufman (Research Institute of Advanced Studies, Baltimore), who once again lends the theoretical support of a quantum mechanician in the areas of interest to organoboron chemists.

Except for a few minor typographical errors (for example, Seyferth's name is misspelled in the headings on pages 261, 263, and 265), the material is presented and reads just like typical journal articles. As for the technical evaluation, who can disagree with such a select group on such specific subjects in their area of specialization?

I have one reservation in recommending a book of this type and that reservation involves the question of whether such papers should be published as a book in the first place. Would not all of these fine articles appear just as promptly, perhaps more promptly, if they were published in the appropriate journal or journals? If one is willing to pay $7.50 for 32 bound papers by well-known authors on boron-nitrogen chemistry, then I

recommend this book to them. But I think most researchers would prefer to read these articles in the journals and then to reproduce those of special interest. In later years, would it not be easier to find these papers in the journals rather than in this volume? A much more valuable volume would be one that contained the 32 most informative contributions made to boron-nitrogen chemistry during the last 5 years, or a review and evaluation of boron-nitrogen chemistry. Some of the most informative contributions in boron-nitrogen chemistry were made by those who contributed to this volume, but these more valuable works were published in the journals, not in books.

In 1959, volume 23 of the Advances in Chemistry Series, *Metal-Organic Compounds*, was published. Volume 23, like volume 42, was the result of a symposium. The big difference in the two volumes lies in the fact that many of the papers in volume 23 are very broad review articles (for example, metal alkoxides by D. C. Bradley, organolithium compounds by Don Esmay, Grignard reagents by T. D. Waugh and R. C. Waugh, organoboron compounds by R. M. Adams, and organoaluminum compounds by R. F. Schultz) and therefore very desirable in a bound volume. The contributions in *Boron-Nitrogen Chemistry* are much more concerned with discussions of very specific problems, and their logical place is in the journals.

I feel that, although this volume will be of some value to those actively working in the area of boron-nitrogen chemistry, books of this type are not necessary and that the publication of such papers in this form should be discouraged.

E. C. Ashby
Department of Chemistry,
Georgia Institute of Technology

Botany

The Structure and Life of Bryophytes. E. V. Watson. Hillary House, New York, 1964. 192 pp. Illus. $3.

This small book is one of a series in biology issued by the Hutchinson University Library, London. Approximately three-fourths of the contents present a highly readable and more or less straightforward account of the morphology of mosses and liverworts. The remainder recounts very sketchily and not always representatively some of the results of recent and contemporary research on bryophytes in such areas as physiology, ecology, cytology, genetics, geographical distribution, and speciation. The author does not pretend that his coverage has the depth and detail found in such standard texts as those of Parihar and of Smith. It is Watson's hope, rather, that ". . . it will enable the university student to see morphological facts from a new angle and at the same time have his interest directed to other branches of bryophyte study."

The first chapter contains an introduction that provides sufficient background information, including the basic terminology, to allow even the rank novice to read the book with understanding. After a short and perhaps too condensed discussion of classification, the next seven chapters (119 of the 170 pages of text) are devoted to morphology; this includes discussion of the gametophytes and sporophytes of both mosses and liverworts, as well as separate chapters on asexual and sexual reproduction. The remaining one-fourth of the book is devoted to morphogenesis, anatomy, and physiology (one chapter), ecology (one chapter), and geographical distribution, geological history, cytogenetics, and speciation (one chapter). The final chapter contains some concluding remarks which attempt to evaluate the present directions of bryological research. The book contains a selected bibliography of 267 entries, none of which is more recent than 1961.

Geographical distribution is probably the least adequately handled of all the subjects treated. The scant six pages devoted to it are drawn almost entirely from Herzog's classical *Geographie der Moose*, and the discussion is limited essentially to distributional patterns of Europe and South America. Cytogenetics is treated much too briefly, although the reader is referred to the excellent review by Lewis. Systematics and biosystematics are scarcely mentioned, and the recent studies of mosses, in which chromatographic techniques were utilized, are ignored. The fine structure studies of the chloroplasts of both mosses and hepatics might have been discussed.

Despite these shortcomings, which I am sure were imposed by considerations of length, this is an important book. It is competently assembled and very well written. The style is informal, and the writing is unlabored. It is a stimulating book that can be recommended to all botanists, but especially to students who wish to gain more than an elementary knowledge of this unique group of plants. In my opinion, Watson has achieved his aim in writing the book.

Lewis E. Anderson
Department of Botany,
Duke University

Nuclear Engineering

Effects of Radiation on Material and Components. John F. Kircher and Richard E. Bowman, Eds. Reinhold, New York; Chapman and Hall, London, 1964. xii + 690 pp. Illus. $22.50.

The title of this book is somewhat imprecise, because the book's scope is limited to the changes produced in the physical properties of matter by high energy and ionizing radiation commonly produced by nuclear reactors. The objective that the authors set out to accomplish—namely, to condense the accumulated data available in the information system of the Radiation Effects Information Center at the Batelle Memorial Institute into a book for the convenience of engineers involved in the design of equipment or structures for use in high energy radiation fields —has been admirably achieved. The book is well written and is perhaps as readable as such a condensation of data can be. Among the subjects covered with good perspicuity are polymers, fuels, lubricants, organic compounds, ceramics, metals, alloys, semiconductor devices, and electronic components.

The majority of the references are to reports based on work carried out on government-sponsored programs. These documents presumably have not been subjected to the screening and review given to articles that are published in the formal literature. Thus, with all due respect to the perspicacity of the authors, one is inclined to have some reservations about the value of the data. Perhaps, the thing made most abundantly clear by this compendium is that a wide gulf exists in this field between science, or what is normally called science, and engineering. The fault lies with neither the scientist nor the engineer but rather with those who force applied developments without