Work hardening in an aluminum alloy. Dislocations are shown piled up against barriers in the crystal. Such pile-ups exert back stress on the dislocation source; so that an increasing amount of shearing stress must be applied to the crystal for the source to operate, resulting in work hardening. Photo provided by Neville Carter of Earth and Space Sciences Dept. of SUNY (Stony Brook) was taken by K. C. Jain, Dept. of Engineering SUNY (Stony Brook).

Many of these were taken from the research literature and should help to give the student a feeling of a direct relation to experimental results.

The student, particularly, will find the organization of each chapter very appealing. Major concepts are identified in bold numbered sections, with questions examining conceptual understanding at the end of most sections and a summary section at the end of each chapter. Extensive problems at the end of each chapter apply ideas as well as occasionally extending them. Answers to the questions are also given as an additional learning aid.

Inasmuch as the book is introductory and descriptive, it would be helpful to find references to more detailed, advanced treatments displayed more prominently. Unfortunately, those that are given are somewhat hidden, and some effort is required to seek them out. Figure captions in small print overlap into the otherwise wide margin on the left side of the page. This physical format appears to be a distinct asset for the student.

All in all, the book is rather impressive and should find good use in the classroom.

UWE J. HANSEN
Indiana State University

Far-Infrared Spectroscopy

By K. D. Möller, W. G. Rothschild
797 pp. Wiley, New York, 1971. $29.95

The volume under review is a well produced, 800-page compendium of information about far-infrared spectroscopy—defined by the authors as covering the wavelength range from fifty microns to 1000 microns. The use of these wavelengths for research purposes has increased so much in the last decade that a volume with the title *Far Infrared Spectroscopy* was certain to appear sooner or later, but it is difficult to see to whom this particular book is addressed. It is not sufficiently systematic to be suitable for student use, nor does it have enough original matter or critical content to make it appealing to specialists. The latter will find that they are continually meeting material familiar to them and which has simply been lifted out of published sources.

The authors, K. D. Möller and W. G. Rothschild, are themselves practitioners in experimental far-infrared spectroscopy; but they do not seem to have had a clear vision of what their book should contain, so they have had about one-third of the book written by other authors in the form of appendices. I deplore the practice of having hidden authors and believe that much of the material that these contributors have written is not suitable for sale in book form but should properly have been given as review articles in journals. There, not only would there be better assurance of enthusiastic scholarship on the part of the individual authors, but they would have had the benefit of critical refereeing before their work was printed. The last appendix is a "far-infrared bibliography" by E. D. Palik, whose work over the years has been much appreciated by workers in the far infrared field; but Palik's contribution would have been more appropriately presented in an inexpensive government publication, which then,

10. ATOMIC AND MOLECULAR RADIATION PHYSICS

By **L. G. Christophorou,** *Oak Ridge National Laboratory and the University of Tennessee*

Aimed at the researcher, the book deals primarily with the interaction of radiation with single atoms and molecules, as well as multiple collision conditions in gases. It further provides a coherent picture of different areas of research in atomic and molecular photophysics, and atomic and molecular collision processes.

1971 672 pages $29.00

11. COLOR AND SYMMETRY

By **Arthur L. Loeb,** *Kennecott Copper Corp. and Harvard University*

A volume in the Wiley Monographs in Crystallography, edited by M. J. Buerger

The investigation and findings reported in this volume grew out of a re-examination of the seventeen plane symmetry groups. The author confines his discussion to the euclidean plane, treating three dimensions: two geometrical coordinates and color. He uses an "algorismic" approach to enumerate all planar colored configurations. Sixteen pages of colored illustrations tabulate these configurations.

1971 179 pages 103 illus. 97 color plates $14.95

12. DIRECT NUCLEAR REACTION THEORIES

By **Norman Austern,** *University of Pittsburgh*

Volume 25 in the series, Monographs and Texts in Physics and Astronomy, edited by R. E. Marshak

The author has provided a survey of the background and practical development of theories of direct nuclear reactions, furnishing a guide to modern research in this field. Here, for the first time, is an evaluation and classification of the literature in one of the most prolific areas in nuclear physics.

1970 390 pages $19.95

13. STATISTICAL MECHANICS OF CHAIN MOLECULES

By **Paul J. Flory,** *Stanford University*

"This volume should be on the bookshelf of anyone who needs to understand the properties of chain molecules, since it is an excellent exposition of the applications of configurational statistics which govern the facility with which cyclic structures are formed, as well as the properties such as mean-square dipole moment, optical anisotropy, spectral dichroism, and mechanical characteristics."

—Laboratory Equipment Digest

1969 432 pages $18.50

14. DISSOCIATION IN HEAVY PARTICLE COLLISION

By **G. W. McClure** and **J. M. Peek,** *both of Sandia Laboratories*

A volume in the Wiley-Interscience Series in Atomic and Molecular Collisional Processes, edited by C. F. Barnett

This book is a comprehensive index to the published information on dissociative collisions. It classifies the work according to the colliding particles investigated and the properties of the dissociation fragments, describes the experimental and theoretical methods, presents criteria for a well-defined measurement, and summarizes the most significant conclusions from the work accomplished to date.

1972 224 pages $13.95

15. FAR-INFRARED SPECTROSCOPY

By **K. D. Möller,** *Fairleigh Dickinson University,* and **W. G. Rothschild,** *Department of Chemistry, Ford Motor Co. Research Center*

A volume in the Wiley Series in Pure and Applied Optics, edited by Stanley S. Ballard

Here is a comprehensive volume to help researchers in any aspect of far-infrared spectroscopy to survey the entire field, and to show workers in other fields the kinds of problems that can be studied with far-infrared methods. Among the subjects discussed are the application of far-infrared spectroscopic techniques to a wide variety of phenomena in physical chemistry, solid state physics, and certain areas of molecular biology.

1970 800 pages $29.95

16. LASERS

Second Edition

By **Bela A. Lengyel,** *San Fernando Valley State College*

The second edition of *Lasers* is the author's attempt to bring to the reader the vastly expanded field of lasers as they existed at the end of the 1960s. *Lasers* focuses on the scientific and engineering problems involved in the design and construction of lasers.

". . . a well-conceived, well-executed, well-referenced, and well-recommended concise reference on lasers."*—IEEE Spectrum*

1971 388 pages $14.95

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hopefully, could be kept up to date.

Turning now to the remaining two-thirds of the book. The 160-odd pages on techniques are, for the most part, a rather uncritical regurgitation of published work, some of which has been imperfectly understood by the authors. For example, on page 144, where the question of comparing the resolution of a Fourier transform spectrometer with a grating instrument arises, the authors say:

> "It is simpler to improve the resolution of a Fourier transform spectrometer since we only have to double the length L of the displacement of the movable mirror in order to double the resolution. The measuring time is then also doubled."

This is not true. If a given spectral interval is to be recorded at twice the resolution and the same signal-to-noise ratio maintained, the recording time will be quadrupled in the detector-noise-limited case. Earlier, on page 50, they say that nitrogen dioxide may be used for wavelength calibration of a far-infrared spectrometer. This would be a very bad choice. Nitrogen dioxide is an asymmetric rotor with an already complicated spectrum made more so by magnetic splittings from the molecular paramagnetism. Identification of particular features in this spectrum would be difficult if the pressure, path length or resolution were slightly different from what had been published. So nitrogen dioxide is not well suited for use in wavelength calibration. These lapses undermine confidence in the authoritativeness of the work in some of the things the authors have chosen to write about.

About half of the book is given over to nine chapters, each of which is devoted to a specific topic where far-infrared spectroscopy has found effective application. Interesting topics have been chosen, but the choice is somewhat arbitrary and the level of treatment is not uniform. Much of the material consists of simply presenting results as given by original authors, and little is given in the way of critical comment, conclusions or systematic theoretical treatment. In fairness to the authors, however, it should be said that for some topics, such as the discussion of condensed phases, there is still so much to be found out that in attempting presentation at the text-book level they have courageously taken on a nearly impossible task. As was said about the material in the appendices, some of the subject matter treated in chapters 5 through 13 would have been better expanded into review articles and published appropriately.

There are some regrettable omissions. No mention is made of the use of far-infrared molecular maser sources.

These have found application in magnetic resonance experiments, in liquid-state studies, and will undoubtedly play a part in other fields. Though the dust jacket speaks of the application of far-infrared spectroscopy to "certain areas of molecular biology," this enticing topic does not appear to be given much space in the volume.

From what has been said, it is evident that I do not recommend this volume. My view is that matter in a text-book form should either have careful systematic presentation if it is directed at students, or critical scholarship if it is directed at experts. For both classes, the addition of matter giving a physical and historical perspective would be valuable, but the book does little to set the scene for this branch of physics in showing where its unique contributions have already been made, or are likely to be made in the future.

H. A. GEBBIE
University of Colorado
Boulder

Rydberg Series in Atoms and Molecules

By A. B. F. Duncan
119 pp. Academic, New York, 1971. $7.50

This monograph appears at a time when the subject of Rydberg series, especially in molecules, is in the midst of a new period of activity. The author's experience and contributions to the field extend from the 1930's to the present, and include both theoretical and experimental work, largely dealing with the spectroscopic aspects of the topic.

In essence, the book deals with the energy levels of Rydberg series: how they are calculated; the relation of the constants of the generalized Rydberg formula

$$E = A - R/(n - \delta)^2$$

to the electronic structure of the ion core to which the electron is bound; what series are known experimentally and how they are identified. The text puts one into contact with the literature, particularly the spectroscopic literature, in a fairly thorough and effective way. It is a terse and extensive summary of what has been observed.

As a reflection of the difference between the orientations of the author (or the constraints placed by the publisher) and this reviewer, I should point out what appears to be a major shortcoming of the book. This is a shortcoming that could easily be remedied when a second edition is being prepared. The book is simply too narrow. What it does, it does well. However, it omits several of the more timely and