theory (that is, "maximizing the amount of information in the estimate"). Decision theory ("minimizing the loss involved in making the wrong decision about [a] parameter value") is discussed in Chapter 6. The book concludes with methods for testing one's data to see whether it verifies or disproves a given hypothesis as opposed to another given hypothesis (or the ensemble of all other possible hypotheses). The authors do not include a discussion of the techniques of numerical optimization.

One of the real virtues of this book is the use of illustrative examples drawn from the field of physics rather than from games of chance. The examples are taken almost entirely from high-energy physics, which is not surprising considering the book was written by a statistician (W. T. Eadie) and four high-energy physicists.

I would rate the book excellent on the basis of content, but unfortunately the effectiveness of the book is reduced by a style of writing that lacks clarity. The book would be improved by the inclusion of more explanatory material aimed at relating the theory to the actual laboratory situation. It should be noted that even though the text was prepared by typewriter composition, it contains numerous errors and omissions, including the misspelling on the title page of the name of one of the authors. Many experimentalists (especially those in elementary-particle physics) will find this text useful as a reference.

LARRY D. KIRKPATRICK
University of Washington
Seattle

Mössbauer Spectroscopy

N. N. Greenwood and T. C. Gibb
659 pp. Harper and Row, New York, 1971. $38.50

The discovery 15 years ago by Rudolf Mössbauer of recoil-free emission and resonant absorption of nuclear gamma rays has had an impact on surprisingly diverse areas of science. Applications have spread from nuclear and solid state physics, on which the effect is based, to relativity, chemistry, biophysics and metallurgy. The reason for the enthusiastic acceptance of this technique lies in the fact that it provides new ways of observing the motion of atoms in solids, and the hyperfine coupling between the nucleus and its electrons. It also provides a new measurable parameter, the isomer shift, which has immediate relevance to questions of chemical bonding.

Starting in 1960, after a slow induction period, an ever growing volume of work has appeared in the literature devoted to what is now called "Mössbauer Spectroscopy." This, in fact, is the title of a recent 659 page volume by Norman N. Greenwood and T. C. Gibb which undertakes to review the literature of the first decade of Mössbauer-effect research.

The authors, who until recently were in the Department of Inorganic Chemistry at the University of Newcastle upon Tyne, have made many contributions to Mössbauer spectroscopy during the last decade: Greenwood is the founder and chairman of the Chemical Society's Mössbauer discussion group and organized the first Faraday Society International Symposium on Mössbauer spectroscopy.

This book is clearly the most ambitious effort in the field. No other compendium of so great a scope is available. Earlier publications include introductory monographs, conference proceedings, the widely used *Mössbauer Data Index* of Arthur Muir, Ken Ando and Helen Coogan, and a collection under the title *Chemical Applications of Mössbauer Spectroscopy* edited by Vitali Goldanskii and Rolfe Herber and published in 1968. The latter, the most recent review of the subject, does not offer the unified point of view available in the new work. None of the earlier efforts are as systematic or exhaustive as the present work, which makes a large fraction of the Mössbauer effect literature of the period through 1970 readily accessible.

It is interesting to note that this volume as well as some of its predecessors are the work of chemists. This accurately reflects the fact that a very large fraction of research utilizing the Mössbauer effect is done by chemists. In fact the dust jacket proclaims that it was "written by chemists for chemists ..." a statement that may quite unjustifiably make the nonchemist browser return it to the shelf. Actually, I think that anyone in the field would find it a valuable reference work, with the advantage of serving to underscore the close connection between solid-state physics and inorganic chemistry.

In the first 86 pages, the book provides a concise introduction to the concepts of the Mössbauer effect. The scope here is comparable to those available in other introductory monographs, but includes the more recent developments as well as more detailed tabulations. The rest of the book is devoted to an isotope by isotope discussion of the literature. In the case of Fe^{57}, which takes up about one half of the remaining pages, further subdivisions are employed to bring together related work.

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Norman F. Dessel, San Diego State University; Richard B. Nehrich, Jr., Naval Electronics Laboratory Center, San Diego; Glenn I. Voran, Naval Ordinance Test Station, China Lake, California
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A brief introduction to the physical sciences for non-majors, this text presents science as a human activity in a cultural/historical framework. The book emphasizes the wholeness of human culture and establishes the relevance of science to that culture. It discusses the potential use of science as a tool for the solution of human problems. This book may be used as a core text with supplements chosen by the instructor.

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Jerome Pine, California Institute of Technology
1972, 528 pages, (050071-1), $12.50

This text explains some of the basic discoveries of physics, emphasizing atoms, nuclei, and their constituents whenever appropriate. Both the substance of modern physics and the thought processes of the physicist are examined through quantitative discussion and problem-solving with a minimum of mathematical intricacy. Selective rather than encyclopedic, this text is more thoroughly oriented toward modern physics than most other introductory texts.

CONCEPTS OF MODERN PHYSICS, Second Edition

Arthur Beiser/*McGraw-Hill Series in Fundamentals of Physics*
1973, 480 pages (tent.), (004363-9), $10.95

Revised in light of classroom experience, the second edition of this text achieves even greater accessibility and flexibility of use than the first. More complicated (though not necessarily mathematically difficult) derivations and discussions are set apart in sections marked with asterisks; problems based on these sections are similarly marked. These sections can be omitted or passed over lightly without loss of continuity. More illustrations and exercises have also been provided.

ate, and advanced physics texts..

X-RAY DIFFRACTION

Leonid V. Azároff, University of Connecticut; Roy Kaplow, Massachusetts Institute of Technology; N. Kato, Nagoya University, Japan; Richard J. Weiss, Army Materials and Research Center; A. J. C. Wison, The University of Birmingham, Great Britain; and R. A. Young, Georgia Institute of Technology/*International Series in Pure and Applied Physics*
1973, 544 pages (tent.), (002672-6), $25.00 (tent.)

This graduate level text covers the developments in x-ray diffraction since Compton and Allison's second edition, published in 1935. Discussions are mainly theoretical, but the developments are closely linked to experimental observations wherever possible. Extensive (three chapters) treatment of the dynamical theory of x-ray diffraction is included, some of which was developed especially for this book.

X-RAY SPECTROSCOPY

Edited by Leonid V. Azároff, University of Connecticut/*International Series in Pure and Applied Physics*
1973, 480 pages (tent.), (002674-2), $20.00 (tent.)

This text represents an attempt to present the state of the science by collecting in one place tutorial discussions of most of the important areas and applications of x-ray spectroscopy. The high degree of activity in the field at present necessitates this, rather than a synthesis-type, approach. An up-to-date description is presented that should enable the reader to learn what is already known and to discover where the many interesting problems still remain.

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6.20.52-53 SOLID-STATE ELECTRONICS

* A LOW COST X-BAND IMPATT DIODE MARGINAL OSCILLATOR FOR EPR.
R. D. Hogg (Department of Physics, University of California, Santa Barbara, California 93106). (Received 12 September 1972).
A simple, inexpensive, and easy to use IMPATT marginal oscillator for microwave EPR with a sensitivity of about 2 x 10^{12} spins/gauss is presented. Construction and operating techniques are discussed, and a section on trouble-shooting is included.
(Am. J. Phys., February or March 1973)

The above abstract appeared in the November, 1972 issue of **Current Physics Advance Abstracts: Atoms and Waves.** The complete article appeared in the February, 1973 issue of **American Journal of Physics.**

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In these sections, the greater part of the discussion focuses on the two elements of the hyperfine structure that can be deduced from practically any Mössbauer spectrum: the quadrupole splitting and the isomer shift (here called chemical isomer shift, following the more cumbersome chemical usage). This emphasis accurately reflects the contents of the literature, and is an indication of the importance of these parameters to an understanding of structure and bonding. Magnetic hyperfine structure and spin relaxation are observed in a much more restricted class of materials and are not so well represented. Measurements to determine lattice or molecular vibrational modes present much greater difficulty and have been relatively rare.

Most of the discussion can be termed authoritative, but the physicist interested in magnetism or critical-point phenomena and the metallurgist interested in alloys will find the treatment of these topics less definitive. The authors do, however, deal effectively with the problems presented by conflicting publications and usually present a satisfactory resolution.

In *Mössbauer Spectroscopy* Greenwood and Gibb have been commendably successful in presenting a critical review of the first decade of Mössbauer research. Although aimed at the chemist, the volume should be of great value to anyone in any discipline that is concerned with this field.

G. K. WERTHEIM
Bell Telephone Laboratories
Murray Hill, N. J.

Chemical Analysis, Vol. 35: Laser Raman Spectroscopy

Marvin C. Tobin
171 pp. Wiley, New York, 1971. $13.50

One of the most successful applications of the laser has been as an excitation source for Raman spectroscopy. Laser light, because of its extreme monochromaticity, high intensity and ease of manipulation, is ideally suited to the reouirements of this spectroscopic method. This nearly perfect source, plus the recent availability of very low-noise multiplier phototubes and advances in the construction of double monochromators have revolutionized the field of Raman spectroscopy. Applications such as the absolute measurement of polarizability components and the polarized Raman spectra of polymers are two examples now possible with laser Raman spectroscopy.

Marvin Tobin's book clearly demonstrates the superiority of laser Raman spectroscopy over techniques using conventional sources. The book should be very useful to a wide class of research workers wanting to use laser Raman spectroscopy for a variety of applications. The book is not a tome on molecular-structure determination, nor should it be, as several excellent texts cover this area quite thoroughly. A brief introduction to the basics of polarizability theory and molecular vibrations is given in chapter 1. The (seemingly obligatory) section on group theory could have been omitted without noticeable loss.

Chapter 2, on experimental methods, is the longest and most useful one in the book. One can, given a laser light source, couple the scattered radiation into a spectrometer very efficiently, and the author gives a complete description of matching the input optics to the spectrometer optics. A worked example is included. The best way of getting the signal out of the spectrometer is then described, covering the range of very weak to very strong signals. Here the advantages and limitations of direct-current amplification, phase-sensitive detection, noise-voltage detection and pulse counting are compared. Also included in this experimental chapter is a comparison of electronic methods with photographic techniques, a summary of commercially available laser Raman spectrometers, sample handling techniques, and a very useful trouble-shooting guide.

Chapter 3 describes the use of laser Raman spectroscopy as a tool for determining molecular structure through the use of group frequencies. Both organic and inorganic substances are tabulated. Attention is given to the intensities and shapes of the Raman bands in addition to the frequencies. This information may prove very useful in pollution monitoring by Raman techniques. In addition to qualitative analysis, the author presents a good case for quantitative analysis by laser Raman spectroscopy. The final chapter briefly describes applications of Raman spectroscopy to such diverse areas as the structure of liquids, polymer configuration, and the study of molten salts.

The book is marred by a few serious typographical errors. On page 3, 10^{-5} should read 10^{+5}, and equation (2.3.2), page 42, seems to be true only for a signal-to-noise ratio of unity. As with most scientific books, the price is too high. For the price listed, more diagrams should have been included. They would have enhanced the usefulness of the book greatly.

JAMES F. VERDIECK
United Aircraft Research Laboratories
East Hartford, Conn.