scientist or administrator who fails to become aware of the new issues raised here does so at his peril.

* * *

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Theory of natural diffraction

ELEMENTS OF X-RAY CRYSTALLOGRAPHY. By Leonid V. Azároff. 610 pp. McGraw-Hill, New York, 1968. $15.75

by Richard B. Zipin

My own introduction to crystal geometry came seven years ago as a beginning graduate student in a course in which we depended on lecture notes. As the instructor was not completely satisfied with any of the textbooks available at that time, he was therefore writing his own. As far as I know, my former instructor's book has not yet been published, but here at last is a book that will fill the sorely-felt gap in my personal library. Many sections of the book were familiar to me even before I read them, as Leonid Azároff, the author of this book, and the man who taught me both got their crystallographic educations at MIT.

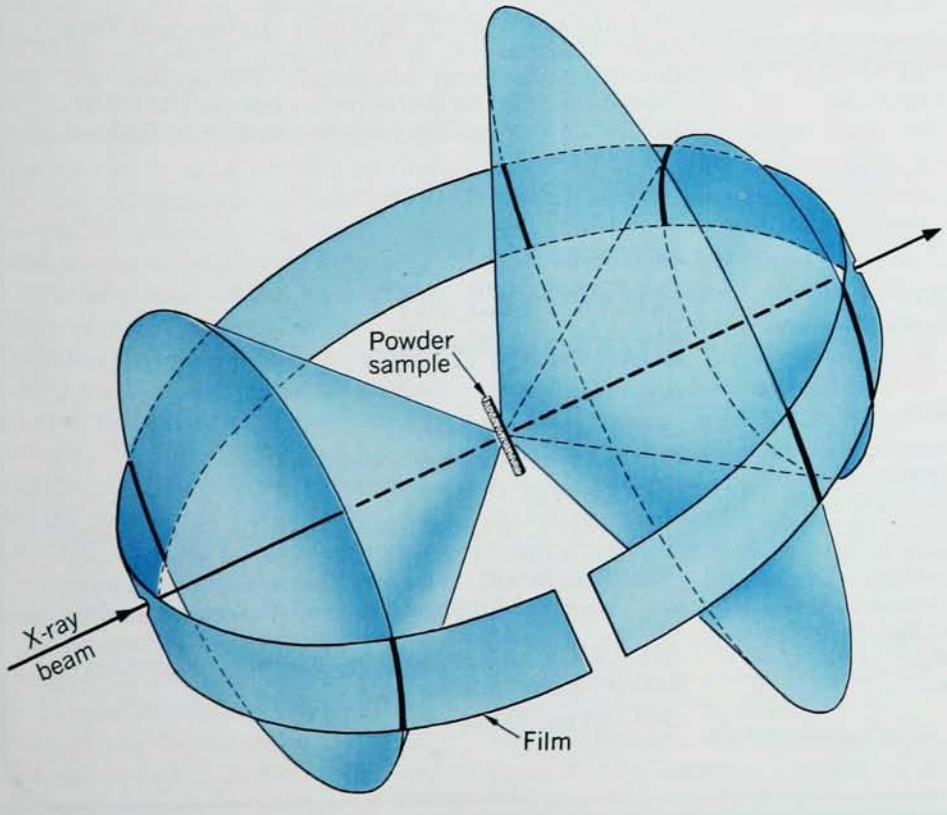
In his preface, the author warns that many readers may be reminded of lectures that they have had. He and my own professor presumably listened to the same lectures, and I have only had such lectures secondhand. Nevertheless, on opening this book I became reunited with an old friend—a clear and fairly complete introductory exposition of x-ray crystallography that should be welcomed by students and teachers alike. The author is already well-known to students of the solid state, not only for his research, but also for his previously published textbooks.

This text is based on the concept that diffraction spectra of single crystals constitute a reciprocal-lattice array. The author has separated his material into four distinct areas: crystal geometry, x-ray physics, diffraction theory and experimental methods. His personal interests are readily apparent in that the latter two subjects comprise more than two thirds of the book. The appendixes include material aimed at helping the students who will use the book as a text; there is some mathematical development, a set of tables, a short bibliography, and answers to some of the problems that appear at the end of each chapter. There is adequate material included so that instructors will find the book suitable for an introductory course at either the undergraduate or beginning graduate level.

My own preferences would have been better satisfied with a book that deals more extensively with the group-theoretic concepts in crystal geometry and the physics of x rays, rather than a book that concentrates so much on experimental techniques; but each author must write a book that satisfies himself. I can only recommend this book to those who require a good introduction to x-ray crystallography written with students in mind.

* * *

The reviewer is responsible for the application of optics to advanced dimensional measurement systems at the Automation and Measurement Division of the Bendix Corporation, Dayton, Ohio.



POWDER METHOD. The diffraction cones emanating from a cylindrical sample are shown intersecting a film strip; the strip is also placed cylindrically to intercept all the cones produced. (From *Elements of X-Ray Crystallography*).

Mossbauer spectroscopy

MOSSBAUER EFFECT METHODOLOGY, Vol. 3. Conf. proc. (New York, Jan. 1967) Irwin J. Gruverman, ed. 250 pp. Plenum Press, New York, 1967. $12.50

by H. H. Wickman

For the past four years (1965–68) the New England Nuclear Corp (a supplier of Mössbauer sources) has sponsored a Mössbauer-Effect Methodology Symposium held prior to the annual meeting of the American Physical Society. The present volume, edited by Irwin Gruverman of New England Nuclear, contains proceedings of the third symposium held in New York, in January, 1967. The volume is composed of two sections, the larger being a collection of applications of Mössbauer spectroscopy in the area of material sciences; the second section is devoted to the methodology of several relatively recently developed Mössbauer nuclides. The level of the articles is generally introductory and for the most part the discussions are accessible to nonspecialists.

Not all of the articles contained in the material sciences section could be considered to be in the mainstream of current research in which gamma-ray nuclear resonance is involved. Among the articles that should be of fairly general interest is a concise description of chemical and magnetic order in alloy phases written by Clyde W. Kimball, who considers in some detail the

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1968, 346 pp., $16.00

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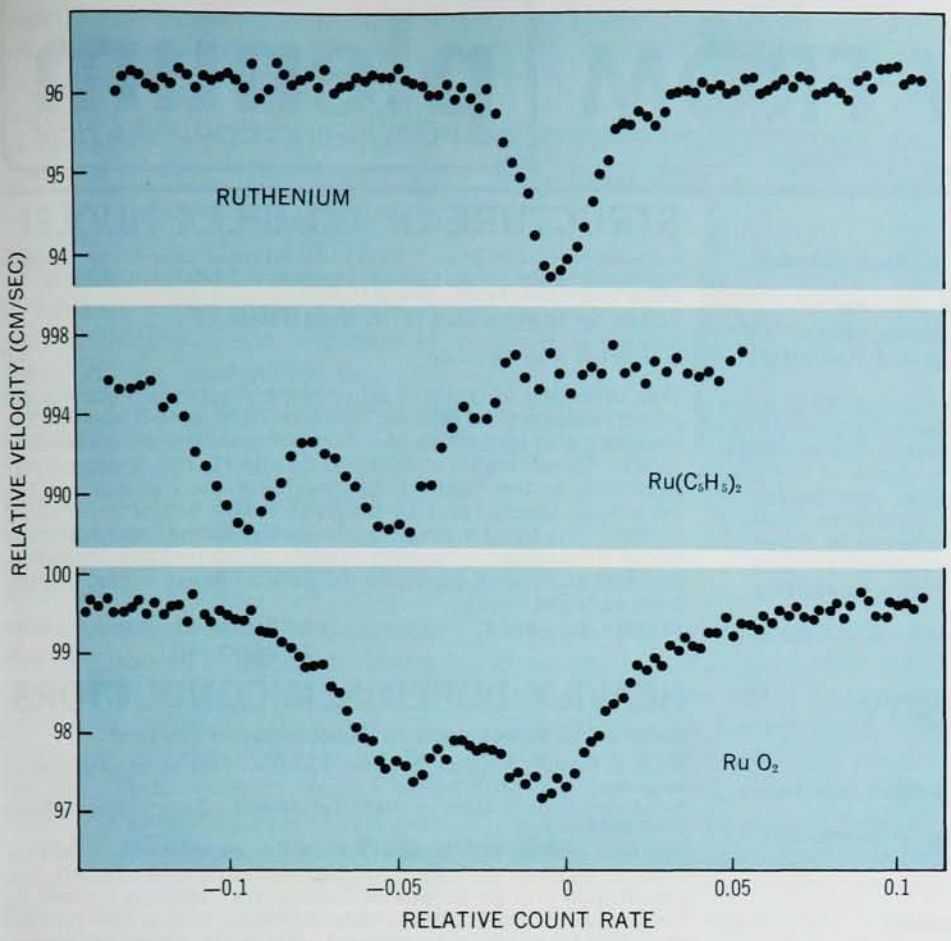

MOSSBAUER ABSORPTION SPECTRA for a source of Rh^{99} in ruthenium and absorbers of 97 mg/cm² ruthenium metal, 1800 mg/cm² $Ru(C_5H_5)_2$ and 750 mg/cm² RuO_2. (From O. C. Kistner in *Mössbauer Effect Methodology, Vol. 3.*)

line-shape problems associated with dilute metal atoms having statistically distributed near-neighbor environments. For those interested in computer applications, the article by R. H. Goodman dealing with online computer techniques in Mössbauer spectroscopy will be of use, particularly for the discussion of solutions to interfacing problems associated with small computers such as a PDP8.

The latter part of the book is devoted to recent investigations of relatively less exploited Mössbauer levels; among them are the Coulomb excited levels in the rare-earth region. In addition, Cs^{133}, Sb^{121}, Ru^{199}, and K^{40} are considered. The articles in this section are well written, authoritative, and generally offer an excellent introduction to the methodology of these isotopes. The production of K^{40} requires a source of thermal neutrons and is therefore not likely to become a commonly used Mössbauer level; the emphasis of the discussion by David W. Hafemeister and E. B. Shera is mainly on the production of this level. The gamma-ray energies of Cs^{133} (81 keV) and Ru^{199} (90 keV) necessitate low-temperature-source and absorber configurations for maximal resonance absorption; while they both have certain attractive features, the problems of small effects (Cs^{133}) or involved source preparation (Ru^{199}) make experiments with these nuclei considerably less than routine when compared with Fe57 or SN^{119m}. Surprisingly, the drawbacks just mentioned do not apply to Sb^{121}, whose evolution to a routine Mössbauer level was thwarted by an early, incorrect energy assignment for the 37-keV level. The article by Stan L. Ruby should be of considerable use to those interested in the spectroscopy of this nuclide.

With the present volume it is announced that these yearly symposia are to be self-perpetuating. Some comment should therefore be made concerning the need that may be filled by the proceedings. Rather good introductions to Mössbauer spectroscopy are available elsewhere for those interested in entering this area of research. Further, the Mössbauer technique is now commonly employed as a routine tool in part of more general studies; so there may be a tendency toward a collection of widely separated applications of a topical nature and of uneven quality. Nevertheless a yearly symposium guarantees an available forum for the inevitable break-through and if strong editorial efforts are made to achieve a successful balance between research and applications, the series has the potential of becoming something of a yearbook for the field. The present volume, however, has not yet achieved this distinction since the majority of material it contains is also available in conventional research journals.

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With a Lagrangian background

ELEMENTARY PARTICLES AND THEIR CURRENTS. By Jeremy Bernstein. 322 pp. W. H. Freeman, San Francisco, 1968. $12.00

by Ciaran Ryan

The idea of organizing a book on elementary particles around the notion of currents was indeed timely. As anyone who knows the subject even remotely will be aware, currents have come to play an increasingly dominant role in elementary-particle physics during the last ten years. It is therefore welcome news that an attempt has been made to present this aspect of elementary-particle theory in a systematic manner.

There are, of course, more things in life than currents and in particular there are particles. Hence, this book is as much concerned with particles as with currents. In fact some of the best things in the book have to do with matters of general field-theoretic character, such as the discussion of gauge invariance in the coupling between the photon and a vector meson and the drawing out of the implications of various strong-interaction Lagrangians. This is very much as it should be, for currents can only be properly understood when seen against their proper background, which is Lagrangian field theory.

The book opens with a discussion of the connection between currents and gauge transformations of field operators, which is followed by an application of these ideas to the gauge trans-