

methods are original and, the translators note, could be used profitably by modern workers and teachers. Published in 1971 as ACA Monograph 7, the 325 page hard

cover book is available at \$25 from the ACA, c/o Polycrystal Book Service, P.O. Box 11567, Pittsburgh, Pennsylvania 15238, U.S.A. Additional information

may be obtained from the ACA secretary, Dr Walter Roth, General Electric Research and Development Center, P.O. Box 8, Schenectady, New York 12301.

## Crystallographers

We regret to have to record the death on 9 October 1970 of Dr **Helmuth J. Goldschmidt**. Author of a large number of scientific papers, he earned a high and world-wide reputation as a result of his contributions to knowledge about the structures of alloys and intermetallic com-

pounds. These achievements culminated in the publication recently of his book *Interstitial Alloys*, which has become a standard work of reference. He pioneered some of the early developments on high-temperature powder cameras in Britain, and was the author of the I.U.Cr.

Bibliography on *High-Temperature X-ray Diffraction Techniques* issued in 1964. For the last twenty-five years he led the X-ray Crystallography team at the B.S.A. Group Research Centre, first in Sheffield, later in Birmingham.

## Book Reviews

*Works intended for notice in this column should be sent direct to the Book-Review Editor (M. M. Woolfson, Physics Department, University of York, Heslington, York YO1 5DD, England). As far as practicable books will be reviewed in a country different from that of publication.*

**Theoretische Grundlagen der allgemeinen Kristalldiagnose im durchfallenden Licht.** VON ROBERT RATH. S. viii+133 mit 109 Abb. Berlin: Springer-Verlag, 1969. Preis, gebunden DM 48, U.S. \$13.20.

Es gibt heute mehrere gute, auf die Praxis der Kristalldiagnose mit dem Polarisationsmikroskop ausgerichtete Bücher. Was jedoch schon lange fehlte, ist eine ergänzende Darstellung der theoretischen Grundlagen; das umfassende Standardwerk von Pockels ist seit Jahrzehnten vergriffen und heute teilweise veraltet. Das vorliegende Buch von R. Rath soll diese Lücke schliessen.

Wegen der Beschränkung der Stoffauswahl im wesentlichen auf die Grundlagen der Kristalldiagnose im durchfallenden Licht für Dünnschliffdicke, ersetzt es jedoch nur Teile des (2½ mal umfangreicheren) Pockels. Der Inhalt beschränkt sich im wesentlichen auf folgende Abschnitte: 1.-2. Ein- und dreidimensionale Lichtausbreitung, mit der Behandlung von optischen Bezugsflächen. 3. Mikroskopische Messung der Lichtbrechung, mit einer ausführlichen theoretischen Behandlung der Becke-Linie. 4.-5. Zusammensetzung von Planwellen bei der Interferenz, mit Intensitätsbetrachtungen. 6. Mikroskopische Messung der Doppelbrechung, mit der Behandlung von Kompensatoren. 7. Formdoppelbrechung. 8. Intensität im konvergenten Licht (Achsenbilder), im wesentlichen in der neuen, eigenen Darstellung des Autors. 9. Mikroskopische Bestimmung des Charakters der Doppelbrechung. 10. Einfluss der Absorption auf die Form der optischen Bezugsflächen.

In der Darstellung ist das Buch knapp gehalten und auf das wesentliche reduziert, klar geschrieben und mit sehr anschaulichen Abbildungen versehen. Das Literaturverzeichnis enthält 51 Zitate. Der mathematische Aufwand ist begrenzt, doch ist es sicher etwas untertrieben, wenn der Autor dazu lediglich Schulkenntnisse voraussetzt.

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**Métallurgie générale.** By J. BÉNARD, A. MICHEL, J. PHILIBERT and J. TALBOT. Pp. x+607. Paris: Masson & Cie, 1969. Price f. 98.

In this age of specialization, when metallurgy has come to mean only 'physical metallurgy' for so many, it is refreshing to see a book like Bénard's and his colleagues' *Métallurgie Générale*. Physical Metallurgy owes its exalted position to the discovery of the many ways in which basic science can be brought to bear on metallurgical phenomena in the field of structure, and to the glamour of the resulting 'scientification' of the subject. What tends to be overlooked is that other branches of metallurgy have derived similar intellectual stimulus from their related sciences.

The present volume provides a logical and fairly rigorous treatment of the physical, mechanical, thermodynamic and chemical aspects of metallurgy, going back in each instance to the basic principles with which a second year science student will be familiar. Though much of metallurgy is still empirical, enough stepping stones can be laid down by modern theory to form a path for rational and deductive thought linking the phenomena together. The authors have succeeded brilliantly in outlining this path.

The book starts with the dependence of physical and mechanical properties on structure on the atomic, crystallographic and microscopic level. It goes on to treat the mechanism of phase transformations and their utilization in the technical manipulation of structures and properties. A third division is devoted to corrosion and its electrochemical and structural aspects. The fourth division illustrates the chemical and engineering principles of the main methods of metal extraction and refining. A final short division reviews the experimental methods used for the study of the metallic state.

Throughout, in concepts and examples, the treatment makes use of the most modern work; this is what differentiates it from the classical General Treatise. Yet it has the stringency and elegance of classical French textbook writing; without this, the subject could never have been covered in 580 text pages.

It seems futile to discuss in a review the preferences that have led the authors to include certain subjects, and omit others, in a work of this scope. A highly competent bibliography enables the student to supplement this reading.

The present work calls to mind Cottrell's equally excellent comprehensive treatise (*An Introduction to Metallurgy*), the only one in the English literature of comparable scope and intent. The reader will find more meat in the present work than in Cottrell's intentionally easy and panoramic presentation. The two works are sufficiently different in approach, outlook and choice of subject matter to make a translation of *Métallurgie Générale* into English desirable.

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**An introduction to metallurgy.** By A. H. COTTRELL. Pp. x + 548. London: Arnold, 1968. Price £3.25.

About twenty years ago a book entitled *Theoretical Structural Metallurgy* by the above author appeared. The selection of topics in this excellent volume was centred around the electron theory of metals and the statistical thermodynamics of metals and alloys, presented at an elementary level. At that time the theory of metals was rather new and a book of this type was needed. During the last two decades, however, the science of metals has developed rapidly and has now acquired a recognized and well established position. Instead of preparing a revised edition of his book the author has therefore found it appropriate to write a completely new volume in which he reasserts the unity of metallurgy in the light of the recent developments in the science of metals.

This new book is more or less a survey of the whole field of metallurgy and, as such, difficult to present in a few words. In short the material can, from a physical point of view, be divided into five sections: atomic theory including chemical bonding; thermodynamics, reaction kinetics and phase equilibria; crystal physics; elastic and plastic properties; electronic structure and properties. These sections, which together represent more than half of the book, are linked up using chapters and illustrative examples in which the author wishes to demonstrate how the characteristic features of metals and alloys and processes of practical metallurgy such as extraction, refining, casting, heat-treatment and plastic working are connected with the science of metals. The treatment of the various topics is rather traditional and kept at an elementary level.

In many of his earlier books the author has manifested an exceedingly clear presentation of subjects within the field of physical metallurgy. This new book is no exception in this respect. Most of it exemplifies a brilliant pedagogic power, especially in the more theoretical parts. By choosing to present such a wide field in one book, it is not possible, although the book contains many pages, to give more than a rather superficial treatment of the various topics. What, however, impresses is the way in which the author builds

up the mosaic pattern which symbolizes the field of metallurgy. In order to give a complete general impression, the various pieces of the mosaic must however be rather small and limited in scope and different pieces from the same topic will appear in many places in the pattern. This makes the reading of the book a stimulating and refreshing business which now and again reveals links between the various parts of the field which one does not generally think of. This kaleidoscopic presentation of the material is however a weakness if one wishes to use the book as a textbook for an introductory course in metallurgy. It must be difficult for a beginner to get a real grasp of, for example, lattice defects when the material is split into small pieces presented in 4 or 5 different places in the book. In order to appreciate fully the merits of the book one must have a certain background knowledge of the field but, if this is so, one is then guaranteed easy and pleasant reading.

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**Practical X-ray spectrometry.** By R. JENKINS & J. L. DEVRIES. Pp. x + 189. London: Macmillan, 1970. Price £3.00.

The appearance of a second edition of a technical book two years after its original publication relieves the reviewer of the job of assessing the need the book is supposed to fill. This vote of confidence is confirmed by careful chapter-by-chapter reading. In this day and age, X-ray spectrometry enjoys increasing application by many who had no intensive training in the field. It appears that the authors have managed to compromise well between background information and straightforward practical instruction. The authors' intent to let the newcomer to the field share in their rich experience is apparent throughout the book.

If a third edition follows after as short an interval as the second (which the reviewer hopes), the value of the book could be considerably enhanced by more extensive discussion of 'energy dispersive' methods by solid-state detectors without the use of dispersing crystals. The X-ray microprobe also deserves some mention. A third edition would also provide an opportunity to eliminate some obvious errors found without even looking for them (*e.g.* misspelled names in the references).

None of these shortcomings nor some disagreements between the views of authors and reviewer can detract from the value of the book to all those who are engaged in practical X-ray spectroscopy. That the reviewer had suggested use of the book even before being asked to review it is proof of the sincerity of his recommendation in this review.

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