Elements of X-ray Diffraction.

By B. D. CULLITY. Pp. xiv + 514 with many figs. and tables. Reading, Massachusetts: Addison-Wesley. 1956. Price $10·00.

The book is addressed to a reader with no previous knowledge of the theory of X-ray diffraction, the experimental methods used and their applications. The treatment is based on the Bragg's law and no knowledge of the reciprocal lattice is required, that subject being referred to only in an appendix of some 15 pp. Within these self-imposed limitations the author has given a very good introductory account of the subject which should be of interest to students of metallurgy, chemistry and mineralogy requiring a simple description of the methods of X-ray analysis.

The subject matter falls into three sections: Fundamentals, Experimental Methods, and Applications. The first of these (136 pp.) consists of four chapters dealing with the properties of X-rays, the geometry of crystals, and the direction and intensity of the diffracted X-ray beams. The rotating-crystal method is mentioned only briefly on the grounds that 'the complete determination of complex crystal structures is a subject beyond the scope of this book and outside the province of the average metallurgist who uses X-ray diffraction as a laboratory tool'.

The section on experimental methods (76 pp.) has three chapters devoted to the Laue method, the powder method and diffractometer measurements, the last including a readable account of the use of proportional, Geiger and scintillation counters.

The remainder of the text contains an account of some applications of X-ray analysis and amounts to rather more than half the book (238 pp.). The applications referred to are nearly all of metallurgical interest, such as the determination of simple structures, precise parameter measurements and their application to phase-diagram work. Chemical analysis, quantitative and qualitative, is covered in three chapters, in which the use of diffraction methods, fluorescent radiation and absorption measurements are described.

The book concludes with a chapter giving a list of text books, reference books and periodicals recommended for further study of the subject, and fifteen appendices. Each chapter concludes with a number of problems, the answers to some of which are given.

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Modern Instruments in Chemical Analysis.

By FRANK M. BIFFEN and WILLIAM SEAMAN. Pp. ix+333 with many figs. New York, Toronto, London: McGraw Hill. 1956. Price $7·50; 56*s*.6*d*.

This is a book which describes a number of physical methods used for, or applied to, chemical analysis. Examples of the subjects covered are emission spectroscopy, flame photometry, mass spectrometry, polarography, potentiometric analysis, and radioactivity. Only one of the fourteen chapters deals with X-ray diffraction and this review is confined to a discussion of that chapter (pp. 31 with 18 figs.). The authors stress that their accounts are not designed for the expert, but for the general practitioner who might wish to learn what kind of help a particular instrument could afford him; so it would hardly be fair to expect the chapter on X-ray diffraction to contain much to intrigue the skilled crystallographer.

As the title of the book implies, there is special emphasis on the tools of the trade. The properties of X-rays, the crystalline state, and the basic methods of recording diffraction patterns are dealt with in a matter of some eight pages. There follows a short description, with illustrations, of examples of commercial diffraction apparatus, including the diffractometer (which is referred to as a Geiger-counter spectrometer). A quite noteworthy amount of experimental detail about powder methods is packed into the space of a few pages, and the chapter finishes with a very brief pointer to the scope of X-ray fluorescence spectroscopy.

It is a little unfortunate that the table of wavelengths on p. 126 was taken without correction from the 1933 edition of *The Crystalline State*. The values are thus in kX. units, and not in Å units as stated, and this leads to a discrepancy between the Cu $K\alpha$ radiation figures given in the text on p. 146 and in the corresponding table. It may perhaps be considered another error of judgment that in giving advice about sources of crystallographic information there is mention of *Strukturbericht* but not of *Structure Reports*, and of Wyckoff's *Structure of Crystals* but not of his more recent *Crystal Structures*.

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Order–Disorder Phenomena.

By E. W. ELCOCK. Pp. ix + 166 with many figs. London: Methuen; New York: Wiley. 1956. Price 11*s*.

This book, one of Methuen's *Monographs on Physical Subjects*, gives an excellent introduction to the difficult topic of order–disorder problems. It consists of five chapters. The first gives a general introduction and the second deals with the several kinds of order parameters and their experimental determinations. The principal subject of this volume, however, is to be found in the next two chapters, which treat the statistical theory of ordering of binary alloys. The third chapter follows closely the presentation, given in Fowler & Guggenheim's, *Statistical Thermodynamics*, of two interpenetrating lattices, each of them being entirely or partially occupied by one of the constituents. In the fourth chapter alloys, described by four interpenetrating lattices, are discussed. The title of this chapter is somewhat misleading, as it suggests that Chapter 3 is concerned only with stoichiometric alloys. The last chapter gives a clear exposition of the problems of ferromagnetism, antiferromagnetism and ferrimagnetism. Most chapters conclude with a summary.

The theoretical investigations in each chapter are followed by the experimental evidence, and the discrepancies between these two are discussed, and, as far as possible, explained.

The booklet is also intended for the reader with less specialized interests, and it may stimulate him to make

a deeper study of the subject. It is, however, a disadvantage that too few references are given in the text. Some textbooks and general articles are listed at the end. As these references often treat a multitude of topics (e.g. Bozorth's *Ferromagnetism*), it will not be very easy to find the special subjects mentioned in the text.

Though the X-ray crystallographer will find here the necessary concepts for his investigations on alloys, X-ray diffraction itself is rather scantily represented. In my opinion only X-ray crystallographers will understand the theoretical part (Chapter 2), and the experimental results are given without much explanation of the methods used.

As, however, X-ray diffraction is only one of the tools for investigating alloys, this omission may perhaps be excused.

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Although the basic concepts of many parts of the subject are essentially wave mechanical, the book does not call for a detailed knowledge of the formalism of modern quantum theory, and consequently most of it may readily be understood by any well taught university student of the physical sciences. Several topics have been omitted: perhaps the most surprising is the omission of any mention of thermoelectric effects. Other topics such as low-temperature conductivity are only touched upon.

The book is beautifully produced with clear diagrams on almost every page and several photographic reproductions of especially interesting phenomena. Sets of problems are to be found at the end of each chapter along with a useful list of general references.

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Introduction to Solid State Physics. By C. KITTEL. Pp. vii+617 with many figs. New York: Wiley; London: Chapman and Hall. 2nd. ed. 1956. Price $12·00; 96*s*.

The second edition of this well known book on solid-state physics by Prof. Kittel will be welcomed by all interested in this subject. The length of the book has been increased from approximately 400 to 600 pages. The new material consists of sections on alloys, semiconductors (including a clear account of transistor action), photoconductivity, luminescence and imperfections in solids. The object of the book remains the same: to provide an introductory textbook on solid-state physics for students of physics, chemistry and engineering. It achieves this object perfectly. As in the first edition, the exposition of each topic is reduced to its simplest terms, the essence of the phenomenon being made clear with a minimum of formal mathematics.

Les Dislocations dans les Cristaux. By W. T. READ. Translated from the English by P. COULOMB. Pp. xv+237 with 76 figs. Paris: Dunod. 1957. Price f. 2650.

This is a translation of *Dislocations in Crystals*, already reviewed at length in these columns (*Acta Cryst.* (1954), **7**, 522), which follows the original very closely in both matter and format. In a preface by P. Lacombe it is stated that the translation was written by M. Coulamb 'during an untimely recall to the colours'.

The price is considerably higher than that ($ 5·00) of the original American edition although the quality of printing, paper and binding are somewhat inferior.

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Books Received

The undermentioned works have been received by the Editors. Mention here does not preclude review at a later date.

Anorganische Pigmente und Röntgenstrahlen. By R. KÖNIG. Pp. xi+132 with 174 figs. and 28 tables. Stuttgart: Enke. 1956. Price DM. 24·00.

Principles of Engineering Geology and Geotechnics. By D. P. KRYNINE and W. R. JUDD. Pp. xiii+730 with many figs. and photographs. New York; Toronto; London: McGraw-Hill. 1957. Price $10·00; £3.15*s*. 0*d*.

Elements of Pure and Applied Mathematics. By H. LASS. Pp. xi+491. New York; Toronto; London: McGraw-Hill. 1957. Price $7·50.

Rheology: Theory and Applications. Volume 1. Edited by F. R. EIRICH. Pp. xiii+761 with many figs. and tables. New York: Academic Press; London: Academic Books. 1956. Price $20·00; £7.3*s*.0*d*.

Phase Diagrams in Metallurgy. By F. N. RHINES. Pp. ix+340 with many figs. New York; Toronto; London: McGraw-Hill. 1956. Price $12·00; 90*s*.

The Barker Index of Crystals. By M.W. PORTER and R. C. SPILLER. (Published for the Barker Index Committee.) Vol. 2. Crystals of the Monoclinic System. Part 1: Introduction and Tables. Parts 2 and 3: