distances and occasionally other details. A collection of over 1000 literature references completes this part.

This section of the book, which aims at bringing together and summarizing the results of all significant crystal-structure determinations, is clearly a work of major importance to crystallographers. It has, of course, been done before, in the pages of *Strukturbericht* and *Structure Reports*, and most notably in Wyckoff's *Crystal Structures*. But the present volume is unique in that all this, and much more besides, is brought together within the covers of a single volume. The aim of the work is excellent. How far this aim has been achieved, and the importance of the result will depend chiefly on two factors, accuracy and completeness. These are necessarily rather difficult to estimate except after prolonged use and detailed study. Some misprints are of course inevitable in a work of this size. Most of those noticed here by my colleagues and myself have been fairly trivial, e.g. on p. 249 *d*-Dulcit should be *i*-Dulcit or better simply Dulcit (but this is taken from an error in *Strukturbericht*). The reference given (464) is, however, wrong. On p. 261 a space-group symbol and the reference for Dibenzoylperoxyd are wrong. On p. 280, the alternative space group for Thiophen (C_{2v}^{17}–*B*2*ab*) is omitted, and reference 167 does not apply. On the same page reference 212*a* should be 212*a**. On p. 286 the formula $C_{22}H_{28}O_2S$ is missing in the first column. On p. 309 the β angle of 91° 40′ is missing for the alternative description of *p*-Nitranilin. On p. 310, for *p*-Dinitrobenzol, *a* should be 11·05 instead of 11·5, and here and on p. 391 reference 1*a* does not apply. On p. 413, seventh line from foot, *C*2/*a* should be *C*2/*c*. On p. 506 Donohue is misprinted three times as Donohne. On p. 512 the second part of reference 517 is wrong. On p. 869 two wrong references occur in the same line. With regard to completeness, the coverage seems to be good. Only the unimportant omission of 4-aminosalicylic acid (*Structure Reports*, 1950, p. 534) has been noted.

The part of this volume which deals with crystal-structure data is completed by two further relatively small sections covering ionic and atomic radii (§ 1503, 15 pp.) and lattice energies of crystals (§ 1504, 12 pp.). The ionic radii include data from Goldschmidt, Ahrens, Stockar, Zachariasen and Pauling, and appear to be very complete, while the covalent radii include various organic links with effective radii for van der Waals contacts and examples from organic crystals. Lattice energies of crystals are dealt with compactly with an adequate collection of formulae.

The second part of this volume deals, almost exhaustively, with the absorption (and re-emission) of electromagnetic radiation by crystalline solids. In assessing this section of the work I have been helped by my colleague Dr J. C. D. Brand, who has made continuous use of the book over a period of several mouths. Subdivided according to the frequency of the radiation, commencing with the highest frequencies, the sections can be enumerated as follows: (1) X-ray spectra of the sub-valence shells of elements and small molecules (§ 1508, 99 pp.), and the formations of electronic energy bands in metals (§ 1507, 5 pp.). (2) Photo-emission of electrons from metals and metalloids (§ 1506, 4 pp.). (3) Crystal spectra in the visible and near ultra-violet region (§ 1509, 72 pp.): included here are the electron-transfer spectra of ionic crystals; the sub-valence shell transitions of ions of the transition elements, rare earths, and trans-uranic elements; and the spectra of molecular (mainly organic) crystals. Phosphors and semiconductors, however, are not treated. (4) Absorption spectra of alkali halide crystals with deliberately-induced lattice defects (§ 1511, 36 pp.). (5) Vibration spectra of crystals (§ 1505, 212 pp.). This section includes a very large amount of experimental material of which the theoretical interpretation is still incomplete. Most of the data are for polycrystalline mulls, but measurements of the infra-red dichroisms of single crystals are also indexed. (6) Radio-frequency and microwave absorption by crystals (§ 1510, 39 pp.), including nuclear resonance frequencies of diamagnetic crystals and paramagnetic ions in crystals, and nuclear quadrupole spectra. Nuclear magnetic resonance spectra, however, are excluded. The general plan is that in each section and sub-section the tabular material is prefaced by an outline of the theory and, sometimes, of the experimental method; symbols and conventions are also carefully listed. The closure of the literature survey in the various sections is not quite uniform, but, in general, coverage is complete to the end of 1952.

The theory of the absorption of electromagnetic radiation by crystals is still in an early stage of development, and the emphasis in the tables is therefore on an adequate presentation of the experimental material. To physical chemists interested in this field, the value of a work of reference having twenty years' accumulated data within a single bound volume cannot be overemphasized. The compilers are to be congratulated on the care and labour with which several hundred assorted diagrams from the literature have been redrawn systematically on a common scale. The overall picture is of a book written and produced in the best tradition of German scholarship.

The cost of the book is very high, but it is nevertheless good value. Most crystallographers will be immediately concerned only with the first part of the volume, consisting of § 1501–§ 1504, while the second part (§ 1505–§ 1511) is of more interest to spectroscopists and physical chemists. As these two parts are of nearly equal bulk, it seems a pity that they could not be published as separate volumes. A split of this kind would greatly increase the popularity of the work for all those concerned with structure analysis, and the smaller volumes would certainly be far more convenient for everyday use.

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Petrographic Mineralogy. By ERNEST E. WAHLSTROM. Pp. vii+408 with 173 figs., 1 plate and 30 tables. New York: Wiley; London: Chapman and Hall. 1955. Price $7·75; 62*s*.

In the latest of his textbooks Prof. Wahlstrom has attempted to bridge the gap between existing texts on the principles of crystal optics on one hand and those which deal with systematic petrography on the other. The purpose of the book is to show the methods by which an elementary student, with some knowledge of crystal optics, on examining a rock slice with a petrographic microscope may first recognize the mineral constituents

correctly and then identify and classify the rock. The book may be divided into three parts.

The two short introductory chapters describe very briefly the collection and preparation of samples, the principles of mineral separation and the most important methods for further examination of the sample. Then follows a good chapter dealing with the microscopic examination of minerals and aggregates, with special emphasis on the determination of optical orientations. Next come an elementary account of the basic procedures for using the universal stage, and a little chapter on the graphical presentation of chemical data for rocks, which includes the procedure and tables for the calculation of the C.–I.–P.–W. norm.

The second part (pp. 91–283) deals systematically with the optical properties of the rock-forming silicate and non-silicate minerals. The treatment here is excellent and again emphasizes the use of accurately determined optical properties for mineral recognition and, where possible, estimation of the chemical composition. The text is supported by numerous microphotographs of somewhat variable quality, easily read optics–composition diagrams and good line drawings of important habits of many of the minerals, showing the orientation of the indicatrix. A very useful set of determinative tables concludes this section.

The final part of the book is devoted to the recognition, description and classification of igneous, sedimentary and metamorphic rocks. The igneous and sedimentary chapters are clearly written and enable the rock to be classified by combining optical mineral determinations with structural and textural features. The final chapter, devoted to the classification of metamorphic rocks, is very disappointing and is by far the least satisfactory section of the whole book. In adopting a structural approach, which of itself is quite useful, the author has failed to make any adequate reference to the chemical or mineralogical nature of the original rocks or to the conception of grade in metamorphism.

For its treatment of optic orientation, its presentation of the optical properties of minerals and its determinative tables the work can be highly recommended, but the early chapters, while providing adequate references, are too brief to be really useful and the later chapters are no real substitute for an adequate petrography. The book attempts to cover too wide a field and at 62*s.* can hardly be recommended to students for its optical mineralogy alone.

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Propagation des Ondes dans les Milieux Périodiques.

By Léon Brillouin and Maurice Parodi. Pp. 348 with 185 figs. Paris: Masson. 1956. Price 4,000 fr., bound 4,600 fr.

Strictly speaking, this should be described as a new edition, much enlarged, of Prof. Brillouin's book *Wave Propagation in Periodic Structures*, first published about ten years ago in English. In that time it has become something of a classic. The main thesis, which it admirably presents, is that there is an underlying unity in a great variety of physical problems, ranging in scale from the dynamics of crystal lattices to the engineering design of linear accelerators. This unity arises from the presence, in each case, of identical systems coupled in succession, and shows itself mathematically in the necessity for using the same methods in solving the equations. Of course there are special problems relevant to each case, but there must always be this basic isomorphism in the mathematics to match the basic similarity in the physical structures.

It is natural that, when a student is introduced to the theory of each particular problem, he should be taught by specialists who only see their own aspect of it. It is essential, before he plunges too deeply into the advanced theory, that he should read a book such as this to link all these specialized accounts together. The peculiar beauty of the present matter is its great simplicity. There is no need of high-brow mathematics. The emphasis is on the physical ideas, which are usually the simple mathematical invariants of the equations. Pass bands and stop bands, impedance, group velocity, reciprocal space, zones, transformation matrices, four-terminal networks, etc., are the concepts whose properties and uses are explained and developed. These are the abstractions in terms of which an engineer or physicist must learn to think. There is an enormous gain in seeing them in their most general context, not merely as special devices in a restricted field of application.

About two-thirds of the text reads as a direct translation of the original work, with a few minor additions, such as the rigorous proof that the separate pieces of a single zone may be translated to exactly cover the first zone. The new material has been concentrated mainly into four new chapters. Chapters 6 and 12 deal with the work of M. Parodi in systematizing the solution of problems involving propagation in finite arrays. An elegant formalism, using the Gegenbauer polynomials, is introduced, and provides the standard solutions rapidly and neatly. This looks useful, and should be better known. The two final chapters introduce essentially new topics —propagation in slotted wave guides and the interaction of electrons with moving periodic fields. The mathematical problems here are more complex, and only approximate solutions are offered. One has the feeling that the mathematical and physical analogies with the earlier, simpler cases might have been further exploited to make the argument clearer.

In the hope that a new English edition may soon appear, I offer the following criticisms in detail. The argument of § 47 is still as obscure in French as it was in English, and seems merely to be an attempt to fight again an old battle about the self-consistency of the Debye theory of specific heats. The treatment of Bloch's theorem in two or three dimensions is superficial. No mention or use is made of the group-theoretical methods which are fashionable nowadays in studies of crystal structure. Something more might be said about systems with cyclic boundary conditions, both as a device to avoid surface effects in crystals, and in models of cyclic molecules (or, perhaps, of cyclotrons).

But these are niggling points in an admirably lucid account which could and should be read by every physicist or engineer before he burrows into his professional speciality.

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