# BOOK REVIEWS

TABELLEN ZUR OPTISCHEN BESTIMMUNG DER GESTEINSBILDENDEN MINERALE, BY W. E. TRÖGER. xi+147 pp., 17 tables, 376 figures, 2 plates in rear pocket. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany. DM. 27.80. ($6.67) 1952.

Professor Tröger, of the Mineralogical Institute of the Technical University of Darmstadt, has succeeded in providing workers in optical mineralogy and microscopic petrography with a highly useful and effective tool in his compilation, Tables for the optical determination of the rock forming minerals. The work is essentially without formal text, except for the introduction and an explanation of abbreviations. Most of its data are summarized in 6 tables:

1. Water soluble minerals.
2. Opaque or nearly opaque minerals.
3. Uniaxial or pseudocubic minerals.
4. Uniaxial tetragonal minerals.
5. Uniaxial hexagonal minerals.
6. Biaxial minerals.

The last are arranged chemically under oxides, hydroxides, carbonates, sulfates, phosphates, nesosilicates, sorosilicates, inosilicates, phyllosilicates and tectosilicates. Each table gives information under the headings: (1) Name, system, chemical composition; (2) Common forms, twinning, habit, aggregate structure; (3) Cleavage, gliding, hardness, density; (4) Optical orientation; (5) Refringence and birefringence; (6) Angle and dispersion of the optic axes; (7) Color in thin section, pleochroism, absorption; (8) Special diagnostic chemical characteristics; (9) Diagnostic characteristics of similar minerals; and (10) Parageneses. An amazing amount of information has been packed into the tables, although the descriptions of the parageneses are necessarily curtailed and thus somewhat oversimplified.

With each of the tables are numerous figures of two types: (1) Three dimensional and sectional crystal drawings showing the optic orientation and (2) Curves relating compositional variation to variations in optical properties and density. The orientation diagrams are unusually good and are alone worth the price of the book. Variation diagrams are given for garnets, spinels, opal, melilite, vesuvianite, scapolite, rhombohedral carbonates, tourmalines, beryl, cancrinite, davyn, columbite-tantalite, amblygonite-montebrasite, topaz, andalusite, staurolite, epidote, piedmontite, allanite, axinite, cordierite, prehnite, rhodonite-wollastonite, orthopyroxenes, augitic pyroxenes, aegirine, jadeite, anthophyllite, cummingtonite, actinolite, glaucophane, arfvedsonite, hastingsite, hornblende, muscovite, biotite, lepidolites, margarite, chlorites, stilpnomelane, montmorillonite, orthoclase, plagioclase (19 curves) and thomsonite. Unfortunately most of the curves are expressed in molecular percentage of end-member molecules, even for systems of great complexity. The majority of the curves are either new ones constructed by Tröger or are taken from Winchell's fourth edition of Elements of Optical Mineralogy. The pyroxene diagrams are mainly those of Hess and the plagioclase ones those of Köhler and Nieuwenkamp. In many cases, e.g. the epidote group, cordierite, sodic amphiboles, biotite, lithium micas, margarite, and chlorites, the diagrams are sharply oversimplified or are constructed from optical-chemical information now known to be archaic. Must we force extreme extrapolations for minerals for which our data are admittedly insecure? Were it not better to admit gaps in our knowledge than to perpetuate misconceptions? Compilations are valuable to the extent that they are critical.

Also in the work are a number of diagrams relating to the determination and interrelation of optical constants, and finally, "finding" tables based on density, dispersion, optic figures on cleavage pieces, color and pleochroism and miscellaneous observations.

No advanced mineralogist will wish to be without this book, which will undoubtedly have widespread application and repeated use. The reviewer would even have been forced to purchase a copy. Its positive values outweigh considerably those inclusions of dubious merit. Even the latter are of value, since they emphasize the need for more information on many common mineral species.

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FORTUNES IN MINERALS INCLUDING URANIUM. Simple Tests and How to Make Them by Ion L. Idriess. 310 pp., 3 figures, 2 plates, several tables. Anglobooks, 475 Fifth Avenue, New York 17, N. Y. $5.50, new ed., 1951.

If you like your mineralogy cookbook style, this is your dish; if you like your geology homespun, then this book is woven after your woof and warp. Mr. Idriess writes for the non-technical prospector and amateur mineralogist in a loose conversational style, seemingly intended to assure the layman that, after all, the earth sciences are simple, mundane subjects, whose principles can be learned by rote. Several introductory chapters, containing such exhortations as, Get the idea! and Use your head! are followed by general discussions of rocks and mineral deposits ("To learn the different kinds of rocks is simple—merely the memorizing of a score or so of the main rocks."). Next appear descriptions of various chemical tests—flame tests, glass tube tests, bead tests and wet tests. Two chapters are devoted to detailing the tests for detecting 25 metallic elements. Eleven of the remaining chapters of Part I describe the ores of various metals and substances including such odd bedfellows as those of Chapter XXII, The ores of mercury, antimony and mica, and of Chapter XXIII, Ores of asbestos, tantalum and niobium, manganese, zinc, chromium, iron. These descriptions are interrupted by a three-chapter interlude on how rocks and minerals were formed ("The granite will always be a granite, the diamond a diamond, etc. Although a pegmatite is a granite it will always form into a pegmatite."). The descriptive section concludes with "A summary of minerals and their families" and an afterthought chapter on the diamond. Part II deals with uranium, its ores—primary and secondary and how and where to hunt for it.

The book is full of errors of fact, of implication, of omission and of typography, as well as being garrulous, verbose and circumloquacious. It would substitute simpleness for simplicity and table d'hôte methodology for the application of scientific principles.

The last chapter, a one-page statement of the "mineral wealth" of the sea, winds up with, "And so ends this book on minerals. Read it carefully, then read it again, and the information in it will become much plainer." I doubt it.

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SIR DOUGLAS MAWSON ANNIVERSARY VOLUME, The University of Adelaide, Adelaide, Australia; 224 pp. 1952.

The Sir Douglas Mawson Anniversary Volume is a collection of 16 contributions to geology in honor of Professor Mawson's 70th birthday anniversary, presented by colleagues, friends and pupils and edited by M. F. Glaessner and E. A. Rudd. A fitting laudatory preface, provided by Emeritus Professor Sir William Mitchell, Chancellor of the University of Adelaide from 1942 to 1948, characterizes the world renowned geologist and Antarctic explorer as a resolute man and an inspiring leader.

Contributors to the volume include A. R. Alderman, D. R. Bowes, W. R. Browne, W. H. Bryan, W. B. Dallwitz, M. F. Glaessner, E. S. Hills, A. W. Kleeman, C. E. Marshall, R. T. Prider, R. C. Sprigg, F. L. Stillwell, C. E. Tilley, L. K. Ward, A. W. G. Whittle and A. F. Wilson. The following papers will be of particular interest to mineralogists and petrologists: The transformation of quartzite by migmatization at Mount Fitton, South Australia by Bowes; A note on glauconitic minerals of low refractive index from Lower Tertiary beds in South Australia and Victoria by Dallwitz; The determination of the extinction angle in monoclinic pyroxenes and amphiboles by Kleeman; Uraninite from Rum Jungle and Ferguson River, Northern Territory by Stillwell; Nepheline parageneses by Tilley; and The charnockite problem in Australia by Wilson. Other papers embrace topics in the fields of areal and economic geology, glaciation, metamorphism of coal, sedimentation, stratigraphy and tectonics. The general high quality of the collected works can be regarded as a measure of the esteem in which their inspirer is held.

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THE THIN-SECTION MINERALOGY OF CERAMIC MATERIALS, by G. R. Rigby. 179 pp., 11 figures, 20 tables, 3 indexes. Published by The British Refractories Research Association, Beechfield, Queens Road, Tenkhull, Stoke-on-Trent, Staffordshire, England. 1948, 21 s. ($2.95).

This is in several ways a most useful volume, summarizing as it does widely scattered data on crystalline compounds ("artificial minerals") and minerals encountered in the microscopic examination of ceramic raw materials, products and wastes. Although the book is designed primarily to introduce microscopic mineralogical techniques to the technical personnel of the ceramic industry, it contains much information of value to workers in mineralogy, too. The book is divided into five parts: I. The preparation of thin sections; II. The identification of mineral phases; III. Optical properties of minerals found in ceramic materials, slags, glasses and sinters; IV. Determinative tables; and V. Appendices. Part I, on thin-section preparation, touches on impregnation, cutting, grinding, mounting and covering. Ignored are some of the recent advances in thin-section technology, such as the use of methyl metacrylate (Bell, *Econ. Geol.*, **34,** 804–811, 1939) and new improved cutting methods (Meyer, *Econ. Geol.*, **41,** 166–172, 1946).

Part II is a condensed, simplified treatment of methods in crystal optics which omits the usual background in the physics of light for vectorial crystalline materials. Dr. Rigby describes the microscope and its adjustment, determination of crystal (optical) group, refractive indices and birefringence, crystal systems and habit, and optical orientation. Under refractive index determination, the immersion method of mineral study is described briefly, despite the restriction of the title of the book to "thin-section mineralogy."

Mineralogists probably will find most valuable Part III, which describes the minerals and "artificial minerals" of ceramic raw materials, slags, glasses and sinters. There are approximately 140 entries, not all of equal status, for whereas most are species, some entries are for series and a few even represent groups. The most complete descriptions include: composition, specific gravity, crystal system, optical groups and sign, melting point, refractive indices, interference figure, relief, birefringence, form, cleavage, color, distinguishing features and occurrence. The determinative tables of Part IV are separated first for the optical groups and then constructed on the basis of increasing average index of refraction. However, it is not made clear what this index value represents, whether it is a mean index for biaxial minerals or an average mean index for those minerals with considerable optical variation. Thus the tables are useful only in a very general way. Appendix

I is White's test for uncombined lime; II is the bibliography; and III is a list of references to photographs that illustrate many of the described substances.

The book has two successes: It is a praiseworthy attempt to acquaint workers in ceramic materials with a highly useful technique developed in a neighboring, but to them, often largely alien science; and also, it makes available to mineralogists information in collected form on artificial substances that supplements data on their natural counterparts.

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INTERNATIONAL TABLES FOR X-RAY CRYSTALLOGRAPHY. Vol. I. Symmetry Groups. Editors: N. F. M. Henry and K. Lonsdale. xii+558 pages, 237 figures. Published for the International Union of Crystallography. The Kynoch Press, Birmingham, England. 1952. Price £5 5s, postpaid.

The first volume of what was originally planned as a revised edition of the *International Tables for the Determination of Crystal Structures* has now appeared. Because of the many changes which have been made, it is considered to be an entirely new publication, and has a new title. The most obvious change is that the entire text is in English. However, in examining the new volume, many other significant changes are to be found.

The volume opens with a Historical Introduction by M. von Laue, which includes an account by Sir Lawrence Bragg of the early work done by himself and his father. Some of the new features which follow the introduction are as follows; sections on two-dimensional lattices, point groups and space groups, which should be of value from the pedagogical standpoint; an enlarged treatment of unit cell transformations and transformation matrices; symmetry diagrams for the 32 point groups; a sub- and super-group tabulation, the former replacing the old "Untergruppen" in each space group description; etch-figure symmetry and Laue-projection symmetry, described by the appropriate two-dimensional point group symbol, for various crystal planes in each of the 32 point groups; point group symmetry and the physical properties of crystals, including optics, optical activity, pyroelectricity and piezoelectricity.

The major new feature (158 pages) consists of the general geometrical structure factors, which in the previous edition were included in the individual space group descriptions. Also given are simplified structure factors for certain special positions of the space groups, and the electron density formulae. This section is essentially in the form previously published by Dr. Lonsdale in her *Structure Factor Tables*. In that publication, all space groups having a center of symmetry, but with the origin elsewhere, had alternative descriptions with the origin moved to the center of symmetry. Not only has this been done in this new section, but likewise has been done in the main section, where dual descriptions are given for such space groups.

In the descriptions of the 230 space groups, several changes are evident. Two descriptions are given for each monoclinic group. One (1st setting) has the unique axis in the *z* position, and one (2nd setting) has the unique axis in the conventional crystallographic *y* position. In the tetragonal system the alternative *C* and *F* descriptions are omitted, and all drawings are in the normal position; likewise with the *H* descriptions in the hexagonal system. Also, the hexagonal primitive lattice is very properly designated as *P* rather than *C*. In the cubic system the diagrams intended to show the general positions and the distribution of symmetry elements have been entirely eliminated.

Minor changes include a new order for some of the 32 point groups. For example; monoclinic- 2, *m*, 2/*m;* orthorhombic- 222, *mm*2, *mmm;* tetragonal- 4, $\bar{4}$, 4/*m*, 422, 4*mm*, $\bar{4}2m$, 4/*mmm*. Some of the abbreviated space group symbols have been dropped, and more complete symbols used instead, such as *mm*2, 422, $\bar{4}_2cm$, $4_2/m\ cm$, 622, $6_3cm$ and 432.

A tabulation of the diffraction symbols for the 230 space groups, following that of Buerger (*X-Ray Crystallography*), is included. The order of listing differs from that of Schoenflies, and somewhat from that of Buerger. Following the space group descriptions, the structure factor tables and electron density formulae, are several short sections, including Patterson and Patterson-Harker Functions; Transformation of Coordinates; and Notes on Special Topics. These topics are: Reduction of General Primitive Lattice Triplet to the Corresponding Conventional Bravais-lattice Triplet; Sub- and Super-groups of the Space Groups; Space Group Determinations by Methods Outside the Friedel Law; and Inequalities Arising from Symmetry Elements. The volume concludes with an Index of Three-Dimensional Space-group Symbols for Various Settings, and a Dictionary of Crystallographic Terms in English, French, German, Russian and Spanish.

This new volume in no way impairs the continued usefulness of the first edition. However, this improved and enlarged volume is a real contribution to this important field of science, and the editors are to be congratulated for the splendid work they and their coworkers have done. Incidentally, the quality of the printing is excellent.

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STRUCTURE REPORTS FOR 1949. Vol. 12. General Editor, A. J. C. Wilson; Section Editors: C. S. Barrett (Metals), J. M. Bijvoet (Inorganic compounds), J. M. Robertson (Organic). Published for the International Union of Crystallography. N. V. A. Oosthoek's Uitgevers Mij, Utrecht. viii+478 pp. (1952). Price 45.-Dutch florins, postpaid.

This is a companion to volume 11 (for 1947–8). Volumes 8, 9 and 10, which will fill the gap since the last *Strukturbericht* (vol. 7, 1939), are yet to appear. The editors have continued the policy of giving such a complete summary of the structure data that in most cases reference to the original article will not be necessary. On the other hand, non-structural data in the original paper, no matter how important, are not abstracted. In some cases the editors have added information, such as interatomic distances, when not given in the original. They may make critical comments concerning the data presented. Both of these features are very desirable.

The section on metals is arranged alphabetically. In the other two sections it is necessary to use either the formula or the subject index to locate a given substance. An author index is also included. The many workers who have occasion to use these reports will be grateful for the efforts of the editors and the abstractors who have made this volume possible.

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SULPHUR. A Study by the Secretariat of the Chemical Products Committee. Published by the Organisation for European Economic Cooperation. Paris. 1952. Columbia University Press, New York. 62 pp. Price $1.00.

A study of potential sulfur supplies from among the members of the O.E.E.C., including native sulfur, pyrite, oil refining, shale-oil, and coal. In spite of possible increased production, improved methods of recovery and economies in the use of $H_2SO_4$, there is a serious deficit in prospect. However, in terms of the U. S. production this deficit is very small. It could easily be met by an increased quota from the U. S., which in turn could easily be accomplished by employing even on a small scale certain economies—especially in the production of fertilizers which require little or no $H_2SO_4$.

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