Book Reviews

Works intended for notice in this column should be sent direct to the Editor (P. P. Ewald, Polytechnic Institute of Brooklyn, 99 Livingston Street, Brooklyn 2, N.Y., U.S.A.). As far as practicable books will be reviewed in a country different from that of publication.

Tabellen zur optischen Bestimmung der gesteinsbildenden Minerale. By W. E. Tröger. Pp. xi+147, with 256 figs. and 17 tables. Stuttgart: Schweizerbart'sche Verlagsbuchhandlung. 1952. Price DM. 27·80.

The optical and chemical data published in the last twenty-five years have been correlated in the hope of presenting them in an up-to-date text-book, but conditions in post-war Germany have necessitated a restriction of this plan to publication in tabular form without critical text and with key references only. The resulting volume is to be considered as a new form of Mügge's *Hilfstabellen zur mikroskopischen Mineralbestimmung* in *Die Physiographie der petrographisch-wichtigen Mineralien* of Rosenbusch.

The 234 minerals thus tabulated are numbered for cross reference and divided, first, into the water-soluble minerals, then into the four main optical groups: opaque, isotropic, uniaxial and biaxial. These, in their turn, are arranged on the chemical and structural basis of the classification of Strunz (*Mineralogische Tabellen*, Leipzig, 1949). If dealing with a completely unknown mineral, reference is made to the initial key diagram in which the mean index of refraction is plotted against the double refraction. This gives sufficient indication as to which tables to consult. Useful data on the paragenesis of individual minerals are given in the tables, and it is suggested that the information in this column might have been adapted to make the basis of a second key table. Such a paragenetic key table would be particularly useful to students and might even be of service to the compiler, for rare accessories in igneous rocks are amply listed, but there are notable omissions of some mineral phases of primary significance in the study of metamorphic rocks: spurrite, for example, is included, but not tilleyite, rankinite or larnite.

Each mineral is, in general, featured in three ways: in a table, as a drawing and, when subject to chemical variation, in graphical plots. Once the abbreviations have been mastered, and the eye adjusted to the neat and space-saving hand italics, the tables are seen to contain a wealth of information compressed into their ten columns. While recognizing that this is primarily a work on the optics of minerals, the insertion of the usual non-optical properties prompts the question why X-ray data should be ignored, for, in such cases as the cell sizes of garnets and spinels, and the $\bar{2}01$ spacings of the soda–potash feldspars, X-rays analysis is at least as important as the determination of the density. The chemical staining tests for nepheline and orthoclase are also omitted.

The convenient arrangement of the illustrations is the main feature of the book. 'Nothing' says the author 'is so conducive to a rapid understanding of a mineral species as a good crystal drawing in parallel perspective ...', and here are hundreds of them, the materialization of all the doodles a petrographer ever pencilled beside his microscope, but, we are assured, carefully based on those in Goldschmidt's *Atlas* and with the necessary optics added. (These visual aids extend even to the determinative lists where the columns are headed by the appropriate arrangement of isogyres and vibration directions.) Most of the drawings for the uniaxial minerals are so simple as not to warrant inclusion and their space might more usefully have been given to the biaxial water-soluble minerals, none of which is illustrated. The care is, perhaps a little overdone, for in such diagrams the presence of any but the simplest crystallographic forms is irrelevant to the petrographer's purpose, and their inclusion often hinders the attainment of the perception intended. When necessary, diagrams of oriented sections and stereograms are also supplied, and here it is felt that an opportunity has been missed by not emphasizing in the drawing of dolomite the relation between the twin lamellae and the cleavage, and its difference from that in calcite.

For minerals of variable composition, 96 easily read graphs are presented. Those for the plagioclase feldspars incorporate the results of Kohler and of van der Kaaden and show the data for the low- and high-temperature forms. It should, however, be borne in mind that these graphs vary in accuracy, and it would have been helpful if the plotted points on which the curves were constructed had been inserted, particularly as the 36 compiled by the author are published here for the first time.

The book is completed with monograms for the evaluation of optical measurements, and with lists of minerals arranged according to such further properties as dispersion, the optics of cleavage flakes, colour, magnetism and anomalous double refraction. Bearing in mind the range of minerals it covers, it must be regarded as one of the best collections of tabulated data available.

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X-ray Structure Analysis. By A. I. Kitaigorodskii. Pp. 650, with 325 figs. Moscow; Leningrad: State Publishing House for Technical-Theoretical Literature. 1950. Price 18 roubles, 40 kopeks.

A Practical Course in X-ray Structure Analysis, Vol. 1. By G. B. Bokii and M. A. Porai-Koshits. Pp. 430 with 312 figs. Moscow: University Publishing House. 1951. Price 8 roubles, 10 kopeks.

Outside the Soviet Union there is little demand for textbooks in Russian, and, apart from the possibility of re-publication in translation, the main interest is in the indications they can give of the level of crystallography in that country. Papers in Russian on various branches of crystallography and the structure of matter now amount to about 200 per annum, and more than 20% of the papers under the heading of Structure of Matter (*A*6)

abstracted by *Chemisches Zentralblatt* are in Russian. Besides the Institute of Crystallography in Moscow and the Fedorov Institute in Leningrad, there are chairs of crystallography in Moscow, Leningrad, Gorki and Lvov Universities, and such institutions as the Kurnakov Institute for General and Inorganic Chemistry make considerable use of X-ray structure-analysis methods.

The expansion of activity in the subject has been accompanied by the production of a surprisingly large number of textbooks—since 1948 something like ten books have been written on various aspects of crystallography and about the same number of standard textbooks have been translated from English into Russian.

Professor Kitaigorodskii's work is a remarkably complete textbook and if a single volume had to be chosen to cover the London University M.Sc. degree in crystallography, this book, except in crystal chemistry and physics, comes closest to fulfilling the requirements of the course. It begins with classical crystallography, covering optical goniometry and stressing the work of Fedorov and Vulf in this branch and in the theory of symmetry; it deals with X-rays, all types of cameras, and techniques of structure analysis both with and without measuring the intensities of reflexions. It ends with examples of the determination of structures, taking $Zn(CN)_2$, CH_3HgCl, SiC(V), B_4C, diphenylnaphthalene and $C_2H_2HgClBr$ from recent Soviet papers and examples of partial determinations of globular proteins by the Cambridge school. Although published in 1950, inequalities and other recent developments are dealt with. The treatment of many topics is new and is the result of the author's own work, particularly on such questions as the errors in Fourier summations and the packing of organic molecules. There is considerable mathematical theory in all sections. Deloné's unit-cell transformation theory, recently re-presented for the *International Tables* by Ito, is included.

A defect in the book is its lack of references. Only a dozen or so are given and they are all to Soviet journals. There is an index, which is an asset by no means universal in Russian textbooks, but the only references in it to non-Russian workers are 'Laue method', 'Fok–Hartree atomic scattering factor' and 'Vulf–Bragg equation'. Readers of Buerger's *X-ray Crystallography* and Booth's *Fourier Techniques* will recognize many of the photographs and diagrams. The pretence that non-Russian work does not exist is probably like the Victorian attitude to the facts of life: everybody finds out sooner or later, but the details are not mentioned in public. The author shows a wide familiarity with the literature although he does not mention it explicitly. The international space-group symbols and Ångström units are used.

A small point which might prove salutary if adopted elsewhere is that the printed errata sheet has a column assigning the responsibility for each mistake. The score is five mistakes by the editor to two by the author.

In short, this is a most interesting book which might be well worth having in many laboratories.

The second book is based on lectures and seminars given in the Geological and Chemical Faculties of Moscow University. It is much simpler and less mathematical than Professor Kitaigorodskii's, though covering part of the same field, and is very thorough. The Ministry of Higher Education approve it as a textbook.

The contents of Vol. 1 are: Part I, 'Fedorov's theory of the structure of crystals', including a section (66 pp.) of the *International Tables* for 30 important space groups, being an explanation of space-group theory; Part II, 'X-rays and crystals' is an account of the physical principles of X-ray diffraction and the geometry of various methods; Part III, 'The first stage of a structure analysis (investigation of symmetry and lattice type)', describes various cameras and what can be done with them.

To those who are not students perhaps the most interesting section is the description of the range of X-ray cameras made by the Physics Scientific Research Institute (NII) of Moscow University under the direction of Docent M. M. Umanskii. Pictures of the cameras and their work are given. In Russian papers these cameras are often referred to by rather cryptic initials and a list is therefore included at the end of the review. Some interesting methods of presentation are used, and particularly neat is the device of a Chinese fan which can be distorted to show how the reciprocal lattice is reproduced on a Weissenberg film.

If such a detailed book, presumably covering the first-year course in X-ray crystallography, is given to students one may wonder whether they have to attend lectures as well.

Vol. 2 is promised as covering harmonic methods in X-ray structure analysis.

Abbreviations used for instruments in Russian crystallographic literature:

RKD: Debye–Scherrer camera; RKV: single-crystal oscillation–rotation camera; RKSO: flat-plate camera for Laue photographs; RKOP: single-crystal oscillation camera for measuring unit-cell repeat distances; RGNS: Weissenberg camera; KFOR: de Jong and Bouman camera.

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Los Métodos del Cristal Giratorio. By F. HUERTA. Pp. 108, with 38 figs. Madrid: Consejo Superior de Investigaciones Científicas. 1952. Price 20 ptas.

This publication is divided into three parts, which are preceded by a general introduction.

In the first part, aside from a short theoretical account covering subjects like the reciprocal lattice and X-ray diffraction, fundamental formulae are derived for the determination of both the rotation angle of the crystal and the direction of the diffracted beam. According to the author, these formulae have a general character and can be applied to the normal-beam, equi-inclination, anti-equi-inclination and equi-cone variants of all methods.

In the second part the formulae are systematically applied to the interpretation of Weissenberg, de Jong & Bouman, and Schiebold & Sauter diagrams, and also to the study of the diagrams obtained by using two new methods proposed by the author.

In the third part the functioning of the cameras relative to the methods quoted in the previous paragraph