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.

A. L. MACKAY

Birkbeck College Research Laboratory
(University of London)
21 *Torrington Square*
London W. C. 1, *England*

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

are analysed from a purely kinematic viewpoint and some suggestions are made concerning the possibility of improving the performance of the conventional cameras.

It is the reviewer's opinion that the originality of the present contribution can be summarized in the three following points:

First of all, the establishment and use of the formulae which provide means to determine both the rotation angle of the crystal and the direction of the diffracted beam. Actually, the unification of the methods for interpreting diagrams is one of the author's achievements. Such a standard procedure allows one not only to interpret more rationally the diagrams but also to establish the principles of functioning of cameras in course of design. The bases of such a system are called by the author 'Analytical theory of the diagrams'.

In the second place, systematic use of the kinematic analysis for the study of the cameras is made. Such study chiefly serves the purpose of investigating any possible improvements which may be accomplished for better performance. It would be interesting to check the results of some proposed changes in conventional cameras.

Finally, the establishment of the bases of the 'rotating-crystal and rotating-film method' and of the 'rotating-crystal and helicoidal-movement method'. Unfortunately, nothing can be told as yet on the practical value of these methods, because, as stated by the author himself, the appropriate cameras have never been built. Nevertheless, the full description of the principles on which they are based, together with their detailed designs, are supplied. Such preliminary studies and designs constitute a convincing proof of the theory proposed by the author concerning the interpretation of diagrams.

The criticism which can be made of the work under review covers both the subject itself and the material aspect of the typography.

Several pages are dedicated to the analysis of the Schiebold & Sauter methods which do not play any important role in crystallographic laboratories; the author himself states, in the beginning of the second part, that they 'are not very much used'.

In both the second and third parts the de Jong & Bouman method is extensively studied but, surprisingly, no reference whatsoever is made to the versatile Buerger precession method which becomes more and more popular. Apart from innumerable experimental results already available, which come in support of its practical importance, the theoretical contributions published in recent years by Barnes, Evans, Tilden, Adams, Waser, Burbank, Grenville-Wells, Abrahams, etc. opened new horizons for the generalized use of such method.

As far as the printing is concerned, some remarks must be made. First, it is a pity that a fairly good typographical composition of both the text and formulae has been printed on a paper of inferior quality, and that the binding work is not satisfactory. In the second place, the freehand captions and identification letters of all figures are regrettable, especially because they ruin drawings which are, in general, reasonably good, with the exception only of those in the third part. Such drawings, whose importance is here emphasized, are poorly made, with very thick freehand curved lines.

The quotation of some topics of the analysed work that are subject to criticism does not affect at all its essential value, which lies mainly in the originality of conception and in the generality of the proposed system of analysis. The present publication certainly must be listed among the most useful contributions ever written on the particular subject. Besides, it well reflects the importance of Spanish crystallography.

E. TAVORA*

Universidade do Brasil
Rio de Janeiro, D.F.
Brasil

The System of Mineralogy. Volume II. By the late J. W. DANA and the late E. S. DANA, entirely rewritten and greatly enlarged by C. PALACHE, the late H. BERMAN and C. FRONDEL. Pp. x+1124, with many figs. New York: Wiley; London: Chapman and Hall. 7th ed. 1952. Price $15·00; 120*s*.

Das Werk *The System of Mineralogy* von James Dwight Dana war von 1837 bis 1868 in 5 Auflagen erschienen und wurde 1892 von seinem Sohn Edward Salisbury Dana in 6. Auflage herausgegeben. Während 'Dana', Auflagen 1–6, je nur einen einzigen Band umfassen, musste die derzeit erscheinende 7. Auflage in drei Bände unterteilt werden. Das Vorwort zu Band I ist von Charles Palache, das Vorwort zu Band II von Clifford Frondel unterzeichnet; der dritte Mitarbeiter, Harry Berman, ist leider 1944 durch einen Flugzeugunfall über England ums Leben gekommen.

Band I umfasst 48 Seiten Einführung, 36 Seiten Bibliographie und als Hauptteil die spezielle Beschreibung folgender Mineralklassen: (1) Elemente, (2) Sulfide, (3) Sulfosalze, (4) Einfache Oxyde, (5) Oxyde mit Uran, Thorium und Zirkonium, (6) Hydroxyde und Oxyd-Hydroxyde, (7) Multiple Oxyde, (8) Multiple Oxyde mit Niob, Tantal und Titan. In Band II folgen alle weiteren Mineralien ohne die Silikate; letztere sind für Band III vorgesehen.

Band II ist in die Klassen 9–50 gegliedert, welche folgendermassen zusammengefasst werden: Halogenide (Klassen 9–12), Carbonate (13–17), Nitrate (18–20), Jodate (21–23), Borate (24–27), Sulfate (28–32), Selenate–Tellurate–Selenite–Tellurite (33–34), Chromate (35–36), Phosphate–Arsenate–Vanadate (37–43), Antimonate–Antimonite–Arsenite (44–46), Vanadium–Oxysalze (47), Molybdate–Wolframate (48–49) und Organische Verbindungen (Klasse 50).

Vergleicht man damit die Einteilung in 'Dana 6': (I) Native Elements, (II) Sulfides, (III) Sulfosalts, (IV) Haloids, (V) Oxides, (VI) Oxygensalts, Carbonates, Silicates etc., (VII) Salts of organic acids, (VIII) Hydrocarbon compounds, oder die Einteilung in den *Mineralogischen Tabellen* 1941/49, in welchen die Klassifizierung von Dana bzw. Groth den Fortschritten der Kristallchemie anzupassen versucht wurde: (I) Elemente, (II) Sulfide, (III) Halogenide, (IV) Oxyde und Hydroxyde, einschl. Arsenite, Selenite, Tellurite und Jodate, (V) Nitrate–Carbonate–Borate, (VI) Sulfate–Tellurate–Chromate–Molybdate–Wolframate, (VII) Phosphate–Arsenate–Vanadate, (VIII) Silikate, (IX) Organische Verbindungen, so wird man sich folgende Fragen stellen müssen:

* Present address: Department of Physics, The Pennsylvania State College, State College, Pennsylvania, U.S.A.