open question. The important case of tourmaline is also an interesting one, in light of more recently published papers on the structure by Donnay & Buerger (1950), and Ito (1951). Both workers have used the classic method of refinement, by reading atomic coordinates from a Fourier map. Each has arrived independently at what is undoubtedly the correct structure, but refinement cannot proceed beyond $\pm 0{\cdot}05$ Å by such a method based on a projection 7·2 Å deep. Recourse should be made to three-dimensional methods (with appropriate series-termination corrections) or differential methods; perhaps a least-squares analysis would be the most direct method.

Finally, at the end of the book is a detailed discussion of a procedure for indexing a triclinic powder pattern. The procedure consists of indexing the pattern on an arbitrary unit cell, based on three lines of low angle (representing three non-coplanar reciprocal lattice vectors), followed by a series of ingeniously symbolized systematic transformations after Delaunay, to find the proper unit cell for a triclinic, monoclinic or orthorhombic (or higher symmetry) lattice. The method is illustrated by application to two known crystals, and appears to be complete and straightforward, though its success admittedly requires very accurately determined spacings. The practicability of such techniques as this can only be proved, however, by its successful application to several unknown examples.

### References

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## Geometrische Kristallographie und Kristalloptik. By F. Raaz and H. Tertsch. Pp. x + 215, with 260 figs. Vienna: Springer. 2nd ed. 1951. Price 32*s.* 6*d.*

The science of crystallography has nowadays so many diverse applications that a sound knowledge of the subject is rapidly becoming indispensable to an ever increasing number of scientific workers both academic and industrial. Although the emphasis has passed from the purely morphological to the structural aspect, it is unsatisfactory for the student to go straight into the study of the principles of structure analysis without the initial discipline of a course in morphological and optical crystallography. For this purpose an introductory textbook, such as this, provides an admirable approach.

The second edition is practically a reprint of the first, which appeared in 1939. It is divided into two parts: the first, by Prof. Raaz, deals mainly with morphological crystallography, and occupies 123 pages; the second, by Prof. Tertsch, consists of only 85 pages, and deals with the optical properties of crystals. The general arrangement of each part follows orthodox lines. After the discussion of axes, indices, zones, stereographic and gnomonic projections, crystal symmetry and the systems with their classes, the first part ends with a short description of twinning and a very concise historical summary of ideas on crystal structure. In the descriptive section of the crystal classes, iodosuccinimide (p. 68) is used to illustrate class $C_s^v$–*4mm*. This is correct according to the outward symmetry shown in Fig. 74, but the substance has now been placed in class $C_4$–4 on structural grounds.

The second part of the book is exceedingly concise, most aspects of theoretical crystal optics being dealt with, together with outlines of the optical methods; these including not only microscopical ones, but those also in which polished plates and prisms are used. Brief sections are devoted to the effects of temperature and pressure on optical properties.

It is a pity that in this edition the optical part could not have been expanded somewhat to give more practical guidance in the technique of determining optical properties. A little over one page is all that is devoted to immersion methods; about two pages are given to a description of the polarizing microscope; and—not so serious in an introductory text—two and a half pages to a description of the construction and use of the 4-axis Federov Universal Stage. These are minor points however. The book is otherwise excellent; it is clear, concise, has a good range, is very legibly printed and (although some of the diagrams are rather small) is well illustrated, especially in the morphological section.

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## Der Ultraschall und seine Anwendung in Wissenschaft und Technik. By L. Bergmann. Pp. xi+748, with 460 figs. and 83 tables. Zürich: S. Hirzel Verlag. 5th ed. 1949. Price 50 Swiss francs.

This well known book, now in its fifth edition, stands completely apart in its field; it is so much better and so much more complete than other books on the same subject that one is tempted to call it *the* book of ultrasonics.

As in the preceding edition, the book is divided into two parts: the first deals with the production and the measurement of ultrasonics; the second is devoted to applications. It is impossible, in this short review, to give an idea of the wealth of material, scientific or bibliographic, contained in these 750 pages. Let us simply list a few of the applications covered thoroughly: velocity and absorption of ultrasonics in liquids, gases and solids; ultrasonic stroboscopy; material testing; application to communications techniques; coagulation and dispersion produced by ultrasonics; cavitation; chemical, thermal, biological and medical action of ultrasonics.

This new edition has been brought fairly up to date; for instance, its description of the use of the pulse method is adequate. It contains a very remarkable series of photographs (between crossed nicols) of vibrating glass rods. The reviewer found it worth while to devote some time to the contemplation of their beauty, their symmetries and the elaborate nature of their patterns. The sort of delight one gets thus is too rare in modern physics to pass unnoted.

One sometimes may wish that Bergmann had been more critical instead of retaining an aloof and purely de-