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BOOK REVIEW

CRYSTALLOGRAPHY, second edition. By W. Borchardt-Ott Springer, Berlin, Germany, 1995. 307 pages. $29.95.

Crystallography, written by Walter Borchardt-Ott and translated from the original German by Robert O. Gould, is the second edition in English and is based on the fifth German edition. The text, a paperback, is the result of about 20 years experience teaching crystallography to chemistry students by Borchardt-Ott. The translation efforts by Gould are superb, probably because of Gould's chemistry background, and there are few colloquialisms. The book contains numerous and generally useful line drawings and tables for clarifying presented concepts. A Wulff net accompanies the book as a foldout and may be mounted on cardboard for classroom use. There are exercises at the end of each chapter along with solutions. Hermann-Mauguin (International) symbols are used throughout, although the text covers Schönflies symbols also.

A paperback book written by an authority in the field, with the stated goal to present an elementary text that is nonmathematical and easy to understand, could have considerable appeal, especially for a mineralogy course or for a chemistry course only partly devoted to crystallography. The major topics include the lattice, morphology, symmetry, the Bravais lattices, point groups, space groups, and an introduction to crystal chemistry and X-ray diffraction.

The text has a very selective choice of topics that will not appeal to everyone. Although the basics of symmetry and lattices are considered and such topics are universal, other topics that are covered will not be given much weight in some courses. For example, crystal growth, stereographic projections, and the use of the Wulff net in the chapter on morphology are not common subjects in many courses. Likewise, areas that may be of interest to chemists and spectroscopists, such as using symmetry to determine spectral properties, are omitted. In some cases, for example in the use of crystallography in crystal chemistry, X-ray diffraction, or crystal defect analysis, the topics are cursory and will require considerable expansion in many courses. Select portions of the book use organic molecules for illustrating symmetry, thereby making the text less useful for mineralogy courses, although the chapter on crystal chemistry does consider mineral structures.

There are several examples of references to concepts not covered until much later in the text, but in most cases, these flaws are only inconveniences. Examples include "point groups," which are mentioned on p. 36, but not presented formally until p. 77, "space groups" mentioned on p. 48, but not discussed until much later, and "primitive" lattices are "not chosen" in examples on p. 62–63, but the concept of a "primitive" lattice is explained on p. 72–74 (and later) where "centred lattices" are considered. Actual errors of substance are minor with perhaps the most significant one being that the text equates unit-cell axes with directions on p. 93, in direct conflict with comments made on p. 115 in which a distinction is made (correctly) between unit vectors and directions.

The text is written concisely. However, beginning students may find many explanations inadequate. For example, the definitions of "space lattice" (p. 9), "unit cell" (p. 11), "special" in the context of symmetry (p. 71), the basics of stereographic projections, and the development of crystal forms are all inadequate to allow the student to understand the concepts from the text alone. Although little is done to emphasize that point groups and space groups are derived from patterns, and motifs are generally not used to illustrate derivations, students may start to appreciate how patterns and symmetry may be related by working through some of the exercises at the ends of the chapters. Discussion of optical activity in crystals, piezoelectricity, and other physical properties is very short and lacks insight into how these properties relate to point groups and structure. Although the book is intentionally nonmathematical for the most part, there are places where some mathematics are required, for example in the use of matrix algebra for the manipulation of Miller indices. Although the text relates the mechanics of matrix manipulation, it does not give sufficient explanation of how vector algebra may be used to derive and manipulate matrices, apparently because of the effort to be concise.

The fundamental question is whether the text meets its primary goal in ease of understanding. Can it be used successfully as an introductory crystallography text? Unfortunately, the writing may be difficult to digest for many students because it is dryer than necessary, too concise, and somewhat impenetrable, and it is for these reasons that the text misses the mark for an introductory class.

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