addition is an early chapter on simple crystal chemistry and some scattered atomistic rationalizations. The core of the book consists of Chapters 5–10 (150 pp.) in which all thirty-two symmetry classes are described in some detail. Each of these chapters is devoted to a crystal system: first each class is described, then the stereographic projection, indexing, and calculation and graphical determination of the axial constants of crystals in the system are treated. The verbal descriptions are more extensive than in Phillips. The figures are abundant, clear, and helpful.

One's estimation of the value and place of *An Outline of Crystal Morphology* will depend on one's views on education in general and on the function of crystallographic study in geological education. Although the author has, by and large, attained his stated goals I, for one, am not satisfied with such limited goals. In my opinion the book does not provide a satisfactory approach to the introductory study of crystallography for present-day university students for at least two important reasons. First of all, the approach is too old-fashioned and limited to provide the sort of understanding and appreciation of the crystalline state that students need today. Like the author, I think the study of morphological crystallography has a place early in courses (British sense) in geology but a much smaller place. Morphological crystallography should be used mainly as a natural point of departure for a more general study of the nature and behaviour of the solid phases with which geologists deal. Early overemphasis on crystal faces alone leads almost inevitably to a certain amount of distortion of the way one thinks about crystals. Equally important, the type of treatment is too dogmatic and cookbook-like. One is mostly told that such and so is the case without enough development and explanation of how we know or why we should know. Crystallography is a marvellous subject in which to display the development and application of mental strategy and tactics, but little of this comes through.

On a more detailed level, there are numerous undesirable and some wrong statements and usages. Of these, two types of statements which recur throughout the book should be mentioned. One involves confusion of the concepts of *pattern* (scheme of arrangement) and *structure* (the arrangement itself). Thus, the word lattice commonly is used when structure is meant. The second type involves emphasis almost wholly on the metrical (size and shape relationships) rather than the symmetrical features of lattices, cells, and crystallographic axes.

For those who are interested in a large dose of morphological crystallography at the beginning level, this book offers an excellent simple coverage of all thirty-two classes. The diagrams and stereograms at the end of each chapter on a system should be especially helpful for beginners. D. M. HENDERSON

LIPSON (H.) and COCHRAN (W.). *The Determination of Crystal Structures*, 3rd edn. Vol. 3, *The Crystalline State*. London (Bell), 1966. viii+414 pp., 393 figs., 13 plates. Price 90*s*.

This third edition is the first revision of the popular and durable *Determination of Crystal Structures*. When first published in 1953 [M.A. **12**–295], it presented an essentially complete coverage of the state of the art of crystal structure determination

as it was then practised. The new edition, as mentioned by the authors, now represents an introductory account of the subject. Even so, the size has increased; the book is now sixty-nine pages longer, and another eighteen pages previously devoted to appendix material (covered more fully in *International Tables for X-Ray Crystallography*) are now devoted to regular text matter.

The essential character and content have been retained even though the original nine chapters have grown into fourteen. A new chapter (3), 'Intensity Statistics Applied to Space-Group Determination', has been expanded by A. Hargreaves from Section 4.5 of old Chapter 2. The remaining chapters of 1–9 retain their original titles. The earlier ones are substantially the same as before. The later ones are more extensively revised. Chapter 9 (old 8), 'Direct Methods', has been rewritten and expanded by M. M. Woolfson. Chapter 12, 'Accuracy and Refinement', has been revised from old Chapter 8.

The new material is well described by the new chapter titles: 10, 'Fourier Transforms and Optical Methods'; 11, 'Effects of Thermal Vibration'; 13, 'Neutron Diffraction and Electron Diffraction'; and 14, 'Anomalous Scattering and Structure Determination'. The authors state that, after careful consideration, they decided against including any treatment of (electronic) computing. They feel that this aspect cannot be treated adequately in a book of this size and type.

As before, the book presumes a knowledge of structural crystallography, X-ray optics, simple vector algebra, and some higher algebra. Without a doubt, this clear and concise presentation will continue to be popular among those with sufficient preparation. Among mineralogists, the book is most likely to be used by those who have a somewhat stronger physical and mathematical background than what is typically obtained by the end of undergraduate work in geology.

D. M. HENDERSON

AMOROS (J. L.) and AMOROS (M.). *Molecular Crystals: Their Transforms and Diffuse Scattering*. New York and London (John Wiley & Sons), 1968. xxi+479 pp., 42 figs. Price 210*s*.

This book is the second to be published in a series of monographs in crystallography under the editorship of M. J. Buerger. Although the title itself indicates that the book has its greatest relevance to the study of organic compounds, nevertheless it contains much of interest to others concerned with crystal structure determination, whatever the realm in which they practise.

The most commonly performed crystal structure determination assumes that the crystal has an ideally periodic distribution of atoms, giving a regular array of X-ray diffraction maxima in Bragg reflection positions. Although for many substances this is a very close approximation to reality, for many others it is not, since crystals are often to some degree and in some manner disordered. This disorder can lead to measurable X-ray intensity scattering in non-Bragg directions. The present work discusses mainly the effects on diffraction of disorder of a particular kind, that produced by thermal vibration.