In conclusion, a useful volume that appeared too late.

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Anomalous scattering. Edited by S. RAMASESHAN and S. C. ABRAHAMS. Copenhagen: Munksgaard, 1975. Pp. xi + 539. Price D. Kr. 200.00.

In April 1974 an Inter-Congress Conference was held in Madrid on the subject of anomalous scattering. The results of this meeting have been assembled into a welcome and valuable book dealing with every conceivable aspect of anomalous scattering.

The book is organised into eight chapters each dealing with a different general theme and within each chapter individual papers are presented by their authors. An indication of the coverage of the whole work will be given under the chapter headings.

I. *Historical Survey*

This begins with a well-written narrative-style account by A. F. Peerdeman of the discovery of the anomalous scattering of X-rays by Bijvoet and his coworkers. Peerdeman makes an interesting remark 'It was about that time after the first elation over the success of our anomalous child that I had a feeling of slight disappointment because this child appeared to be anomalous in another respect. It seemed to be fully grown at its birth'. This remark seems justified by what follows in the book; the theory and the implications of anomalous scattering were known almost immediately the effect was conceived and all subsequent work has been the refinement of theory, the improvement of measurement techniques and the discovery of new applications.

II. *Experimental Determination of f′ and f″*

This chapter includes a number of papers describing the experimental measurements of the real and imaginary components of anomalous scattering for various elements (Cu, Co *etc.*) and also measurements on simple binary compounds. The agreement between measurement and theory is, in general, very satisfactory.

III. *Novel Applications of Anomalous Scattering*

A great deal of what is contained in this chapter would not normally be associated with anomalous scattering by a conventionally trained X-ray crystallographer – for example, non-kinematic and inelastic scattering of electrons, the identification of atomic environment and excess diffuse X-ray scattering. The structural crystallographer will find interesting the paper by S. Ramaseshan, T. G. Ramesh and G. S. Ranganath on the application of anomalous scattering to centrosymmetric structures where scattering at two different wavelengths gives information similar to that obtained from isomorphous replacement.

IV. *Absolute Configuration and Tensorial Properties*

Four of the papers in this chapter are concerned with various aspects of determining absolute configuration including the sign of tensorial properties. The fifth and final paper in this section, concerned with the experimental determination of f''_{Ga} for Mo $K\alpha$, seems more properly to belong to Chapter II.

V. *Accurate Intensity Measurement, Including Anomalous Scattering*

When the idea of looking for Bijvoet differences was first mooted, many researchers believed that the differences of intensity of Friedel pairs of reflexions would be too small to observe. Indeed, in the foreword, Professor Dorothy Hodgkin freely admits that she was among their number. While this conclusion was incorrect what is true is that the information to be gained from anomalous scattering can depend critically on the precision of intensity measurements. The four papers contained in this chapter are full of interest to the structural crystallographer with theory, experiment and the analysis of results all being included.

VI. *Effects of Dispersion on Refined Atomic Parameters*

The chapter begins with two papers on errors in atomic positions due to neglect of the anomalous component of scattering. Once again the third and final paper seems out of place. This paper is by P. J. Black and R. N. Corby on the application of anomalous scattering to the solution of crystal structures and includes ideas on linking anomalous scattering to direct methods of solving structures.

VII. *Anomalous Scattering and Structure Analysis of Macromolecules*

Over 160 pages are devoted to this most important topic. The two initial papers, which deal with the general techniques of applying anomalous scattering to macromolecules, have a heavy overlap in content. Other papers deal with specific applications. The final paper of this chapter is by Mössbauer on the application of anomalous dispersion of γ radiation.

VIII. *Structure Determination Using Neutron Anomalous Scattering*

Some atomic nuclei give anomalous scattering of thermal neutrons and this has been exploited over the past few years. There are only two papers in this section but they are important ones and may point the way to a powerful method of solving the phase problem when suitable nuclei are present in the structure.

There is a brief *Discussion* section associated with the material of each chapter and some of the points raised therein add greatly to the usefulness of the book.

With so many authors one cannot usefully comment on the quality of writing and presentation. However the editors have done their work well and the whole work hangs together as an entity.

The book is marred by a number of errors, some fairly significant, but current sales of the book are accompanied by an errata sheet which undoes most of the damage.

This is a valuable contribution to crystallographic literature and all working crystallographers should have access to a copy.

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Lectures on crystal morphology. 2nd ed. By I. I. SHAFRANOVSKII (translated from the Russian, 1968). Pp. 159. New Delhi and Rotterdam: Amerind, 1973. Dfl 23·50, DM 23·50, £ 4·50.

This book is based on a course of lectures delivered in 1959 at the L'vov State Ivan Franco University. The first edition was mainly concerned with minerals, but the second edition draws its examples from a wider field, though minerals still figure largely in the subject matter. It presents an extensive, though somewhat compressed, treatment of the forms of crystals (this term being used in a general sense). The treatment covers not only the well-developed polyhedra with plane faces, on the study of which traditional morphological crystallography is based, but also the products of abnormal conditions of growth, such as dendrites, skeletal forms, crystals with curved faces, 'hopper' crystals, and those with heavily striated faces. Formerly, exact mathematical descriptions of the morphology of crystals were confined to those in the former category, and were in terms of their interfacial angles. Such descriptions underlay certain schemes for identifying substances by their external crystallographic properties, such as those of E. S. v. Fedorov, A. K. Boldyrev, and T. V. Barker. Abnormal growth forms were described in purely qualitative terms, but the book shows that such pictures can now be supplemented by more exact ones in which the abnormalities are identified with special developments of the shape of the crystal body at named vertices, edges, and faces, the symmetry of the ('ideal') crystal at these sites being taken into account. The author makes a strong plea for the wider adoption of these more exact descriptions, in view of the information which abnormalities can give about the conditions attending the growth of a crystal, in particular the 'symmetry' of the environment, as determined for example by the directions of flow of the crystal-feeding medium. Examples in the field of mineral genetics are given.

As mentioned above, the treatment is rather compressed, and this makes for difficult reading in some parts. There are copious references (mainly Russian), but no index or detailed list of contents, so that it usually takes some time to run to earth any particular item of the subject. For a book of medium price it is well produced, except for the few halftones among the illustrations that are so bad that they fail completely in their purpose. On the whole, however, the book is a very useful account of the subject, and is notable for the detailed coverage given to the many non-ideal forms in which crystalline bodies commonly appear, particularly in Nature.

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Phase relations and structures of solids at high pressures. Progress in solid state chemistry. Vol. 11, Part 1. By C. W. F. T. PISTORIUS. Pp. 151. Oxford: Pergamon Press, 1976. Price £ 5·75.

Since Bridgman's pioneering studies it has been realised that it is possible to transcend the accidental bounds of laboratory conditions and investigate the wealth of polymorphic forms assumed by solids at very high pressures. It is to be hoped that this will provide a fertile ground for theoretical work and that useful materials may be formed at high pressures, *e.g.* superconductors and metals.

This excellent review covers the decade before 1974 and has been built on previous reviews, with a very thorough coverage of the literature for the coexistence of solid–solid and solid–liquid phases, including 1116 references. Unfortunately the nomenclature in the literature is confusing, Greek letters, Roman numerals and other symbols abounding, and the author makes a plea for a much needed authoritative convention for the naming of polymorphs.

There have been few major changes in experimental technique during the decade, and references to this topic are brief. Inevitably the review is largely a catalogue, covering the elements and binary compounds, with shorter sections on more complex compounds of the type XY_2, XYZ_2, XYZ_4, X_2Y_3, X_2YZ_4, and some binary systems, but a useful semitheoretical discussion is also included in the sections. The lattice energies of two polymorphs differ by a small amount compared with their mean value and the calculation of transformation temperatures and pressures is not yet entirely satisfactory, even for the alkali metal halides. Nevertheless there are interesting empirical relations (subject to exceptions) pointed out by the author, *e.g.* within a group of the periodic table, the heavier elements model the high-pressure behaviour of the lighter elements. Within a group of related compounds, such as the alkali metal halides, an increase in the cation radius simulates the effect of increase in pressure (a rubidium salt will have the same structure as a potassium salt under high pressure), the effect of changes in the anion being very much less. This cation rule holds even for crystals with more complex anions, such as the alkali metal nitrites, and has not been explained.

It is impossible in this review to do justice to the wealth of material presented, but attention may be drawn to the interesting work on the effect of pressure on electronic, superconducting and magnetic transitions, and to chain formation in the liquid. The author has examined the data critically and points out instances where further experimental work is called for; he also draws attention to the many problems requiring theoretical solution. The review is warmly recommended.

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