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Notes and News

Announcements and other items of crystallographic interest will be published under this heading at the discretion of the Editorial Board. The notes (in duplicate) should be sent to the Executive Secretary of the International Union of Crystallography (J. N. King, International Union of Crystallography, 13 White Friars, Chester CH1 1NZ, England).

ACA Special Interest Group on Small-Angle Scattering

This Special Interest Group of the American Crystallographic Association has been established with the following Board of Directors: H. Brumberger (Chairman), P. Geil, R. W. Hendricks, P. W. Schmidt, B. P. Schoenborn, L. B. Shaffer. Enquiries about the Group should be directed to Dr H. Brumberger, Department of Chemistry, Syracuse University, Syracuse, New York 13210, U.S.A.

A two-session symposium on small-angle scattering will be held at the next meeting of the ACA to be held at Evanston 8–13 August 1976 (for details see the *Calendar of Events* section). The invited papers being presented will be on neutron diffraction analysis of oriented lipid bilayers (B. P. Schoenborn) and small-angle diffraction at the Stanford Synchrotron Radiation Project (R. M. Stroud).

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

Topics in applied physics, Vol. 5. Mössbauer spectroscopy. Edited by U. Gonser. Pp. xviii + 241. Figs. 96. Berlin, Heidelberg, New York: Springer-Verlag, 1975. Price DM70, US \$28.70.

This volume contains six essays on different aspects of Mössbauer spectroscopy, each written by a well known scientist actively working in the field, and compiled under the editorship of Professor Uli Gonser. As each contribution is essentially an independent entity, it is convenient

in the first instance to discuss them individually.

The first chapter by U. Gonser presents the historical background to Mössbauer spectroscopy. The physical principles are introduced simply, with the minimum of mathematics but with a thorough explanation of the concepts. Similarly the principal hyperfine interactions are described using the simplest forms of the equations. Unfortunately the brief foray into combined effects is more difficult to follow, largely because of the lack of illustrated examples. The treatment of experimental techniques is straightforward, apart from the last section on polarization effects which, although interesting, seems to have been included at the expense of more widely used experimental techniques such as the application of an external magnetic field.

The second chapter by P. Güttlich attempts to survey the applications of Mössbauer spectroscopy to chemistry. It commences by reintroducing the principal hyperfine interactions in greater mathematical detail (in some 14 pages), although one feels that this should have been covered once and for all in the first chapter to avoid duplication. The remainder of the chapter is divided equally between a detailed discussion of isomer shift data and of the quadrupole splitting. The emphasis is placed upon iron compounds, but some reference is made to other elements. The chapter as a whole does not contain a single pictorial example of a Mössbauer spectrum, and this contributes to a feeling of frustration when, having seemingly digested the basic ideas, one is confronted with a long concluding list of tantalizing applications (including for example the study of surface reactions, frozen solutions, phase transitions, dynamic processes, etc.) without a single example. One might consider many of these topics to be highly relevant to any text on applied physics.

The third chapter by R. W. Grant gives an excellent account of the determination of magnetic structure from the combined magnetic–quadrupole interactions, and includes several examples where polarized radiation has been used. Although some of the equations are very complicated, they can be skipped over at first reading. It is a pity that no examples have been given for isotopes other than ^{57}Fe , and more reference to magnetic exchange interactions in non-stoichiometric materials and solid solutions would have enhanced the chapter considerably.

The fourth chapter by C. E. Johnson is probably the best, and is concerned with applications in biophysics. The account

centres on the haeme and iron–sulphur proteins, and conveys the essential details in an interesting and lucid style without being sidetracked by the theoretical complexities involved in the analysis of the data.

The fifth chapter by S. S. Hafner discusses the Mössbauer spectra of soils and rocks obtained from the lunar surface by the Apollo and Luna missions. Much of the information has been hitherto buried in weighty conference reports and the geological literature, and this critical evaluation will be much appreciated by those who are not active in the field of lunar science.

The final chapter by F. E. Fujita describes applications to physical metallurgy. Many examples are given, and it is pleasing to find these discussed in terms of their relevance from the point of view of a metallurgist. The adoption of this approach makes the chapter well worth reading.

The overall standard of the book is high. Inevitably there are the usual problems arising from a multi-author publication such as duplication of essential introductory material, but in general the editorial supervision appears to have been good. Extensive references to the original literature are given in all chapters; there is an index, and a master reference list of symbols is provided. The selection of topics gives a fairly wide coverage of Mössbauer spectroscopy, but it is to be regretted that discussion has been restricted almost entirely to the ^{57}Fe resonance. While this was inevitable in chapters four and five, it creates an artificial bias in the other chapters. Nevertheless, this book is an essential acquisition for the library, and hopefully the price is low enough to tempt the individual buyer.

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X-ray spectroscopy. Par L. V. Azaroff. Pp. xii + 560, Figs. 154, Tableaux 8. New York: McGraw-Hill, 1974. Prix £11.00.

L'objectif du livre d'après l'éditeur, est de présenter non une synthèse mais 'an up to date description that should enable the reader to learn what is already known and to discover where many interesting problems still remain'. Ce double but fait que l'on ne doit pas chercher dans ce volume une oeuvre susceptible de rem-

placer un classique de la spectroscopie X comme celui de Manne Siegbahn. Cependant le livre figurera dans la bibliothèque des laboratoires spécialisés ou en voie de le devenir. Il réunit une dizaine d'exposés par douze auteurs qualifiés dont l'éditeur lui-même.

Il est toujours difficile que ce type d'ouvrage assure à chaque lecteur le choix des thèmes et la présentation homogène, sans lacunes importantes ni redites inutiles, qu'il aurait souhaité y trouver.

Ici, après un premier chapitre à caractère introductif sur les spectres X par P. E. Best, les méthodes expérimentales sont exposées dans les chapitres 2 et 3: J. S. Thomsen traite de la spectroscopie X essentiellement par un et deux cristaux plans 'with particular emphasis on corrections and sources of errors which must be considered in obtaining highest accuracy'; J. R. Cuthill traite des spectromètres à réseau et de leur application en spectroscopie d'émission. Les éléments de la théorie des spectres sont donnés dans le chapitre 4: spectres d'émission, par G. A. Rooke et le chapitre 5, *Many-Body Effects*, par L. Hedin. Dans les chapitres suivants sont exposés les spectres d'absorption: chapitre 6, par L. V. Azaroff et D. M. Pease; puis le rayonnement synchrotron et applications: chapitre 7, par R. P. Madden; la spectroscopie des photo-électrons X: chapitre 8, par B. M. Hagström et Ch. S. Fadley; enfin dans le chapitre 9, D. J. Nagel et W. L. Baun exposent les effets de liaison sur les spectres X, en général. Deux appendices donnent quelques valeurs numériques de longueurs d'onde (d'après J. A. Bearden, dans son échelle A^*) et de niveaux d'énergie (K , L_1 et M_1).

Chaque chapitre a son autonomie et s'adresse, semble-t-il, à des lecteurs de formation différente. Certains exposés seront utiles aux débutants convenablement éclairés; d'autres, comme le chapitre 5, seront lus avec intérêt par des spectroscopistes qualifiés. Alors que, par ailleurs, le livre gagnerait à des coupures, on peut regretter que le traitement des spectres des ions multiples chargés dus, entre autres, au bombardement par particules positives ou à l'excitation par traversée de feuilles (beam-foil spectroscopy) n'ait pas fait l'objet d'un chapitre et soit à peine pris en considération, malgré son importance actuelle.

On ne saurait critiquer la bibliographie dont il nous est dit qu'elle n'est pas exhaustive. Des lacunes peuvent cependant être déplorées.

La présentation typographique du volume est très bonne. Il n'en est pas de

même de sa présentation analytique: on peut s'étonner que la table des matières soit réduite à une liste des différentes parties (sans noms d'auteurs), sans aucun appel de leurs subdivisions et paragraphes; il est malaisé de se référer rapidement aux sujets traités et l'index lui-même ne facilite pas la tâche.

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The development of X-ray analysis. By Sir Lawrence Bragg. Pp. viii + 270, Figs. 151. London: Bell, 1975. Price £6.50.

The scope and aim of this beautiful book is best expressed by quoting the first paragraph of the Introduction which W. L. Bragg wrote shortly before his death on July 1st, 1971:

'This book does not claim to be a complete and up-to-date account of all the progress now being made in X-ray analysis in laboratories over the world. It is of a more historical and reminiscent nature. In describing each new advance I have chosen my examples and illustrations from the first work which broke new ground, rather than from the latest achievements. I have tried to see these advances in perspective, and recall the excitement and enthusiasm at the time as each new insight into the structure of matter was achieved, over the sixty years since X-ray analysis started.'

It is sad to think that W.L.B. did not live to enjoy the acclaim that this work of love and pride will undoubtedly receive by those familiar with the subject as well as by students who approach it for the first time.

Like his father W. H. Bragg (Sir William), W.L.B. is a master of simplified presentation of subjects which could easily be blurred by a mass of scientific detail or an attempt at being encyclopedic. His style is concise, yet clear. He stresses the essential steps in the development of crystal structure analysis from the first deciphering of the ZnS and NaCl structures, via the silicates and metals to the full analysis of protein structures like hemoglobin. In each of these steps W.L.B. has been a tenacious pioneer against great odds, clearing the way for a host of workers following in his path. The various chapters show up the principal

ideas that brought about the sudden advances in the decoding of the information hidden in the X-ray diagrams. All the freshness of discovery is recalled in the examples of actual structure determinations which the author uses in his discussion. Introductory chapters on X-rays, on the principles of optical interference, and on symmetry prepare the reader for a course covering all the standard (non-algebraic) methods of crystal structure analysis. Mathematical derivations and formulae are replaced by a qualitative inspection into the physical causes leading up to the results. Any teacher offering a course on X-ray diffraction would do well to read this book carefully and to extract its physical argumentation. This is all the more advisable at a time when so often thinking is prone to be dominated by the computer.

The manuscript was practically finished only two weeks before Bragg's death, according to the foreword by his son. W.L.B.'s co-workers and friends, Henry Lipson and David Phillips, carried out the final editing. The book is a worthy legacy from a great scientist whose life's work opened up new continents.

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Semi-conducting ore minerals (Developments in economic geology 4). By R. T. Shuey. Pp. 415, Figs. 57, Tables 31. Amsterdam: Elsevier, 1975. Price Dfl. 55.00.

This book has succeeded in its declared purpose of providing a comprehensive monograph on the semiconductor physics of ore minerals for geophysicists, geochemists and extractive metallurgists. It is, however, unlikely to prove as satisfactory for specialists in the solid state. The level of mathematics, especially the chapter on electronic structure, is pitched too low for the theoretical chemist or physicist, but may in other places be somewhat high for the average applied scientists at whom the book is aimed. Certainly the employment of the principles of chemical equilibrium as a basis for semiconductor theory rather than Fermi-Dirac statistics (for which this reviewer is thankful) would not please every theoretician.

The book is divided into several parts dealing with principles and the properties