to be purchased by libraries than to find its way to the bookshelves of the individual, particularly at the price of $31.50.

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Applications of liquid crystals. By G. MEIER, E. SACMANN and J. G. GRABMEIER. Pp. iii + 164. Springer-Verlag, 1975. Price $23.00.

A review of this book by J. E. Lydon has been published in the October issue of *Journal of Applied Crystallography*, page 418.

Количественный рентгенографический фазовый анализ. By *Л. С. Зевин* and *Л. Л. Завьялова* **(Quantitative X-ray phase analysis.** By *L. S. Zevin* and *L. L. Zavyalova*). Pp. 184, Figs. 53, Tables 26+7 (in appendices). Moscow: Nedra, 1974. Price Rb 0·62.

A review of this book by K. Łukaszewicz has been published in the December issue of *Journal of Applied Crystallography*, page 513.

Technische Mineralogie. Bd. 8. Auflösung von Kristallen. By R. B. HEIMANN. Pp. viii+270. Springer-Verlag, 1975. Price DM 115.00.

The subjects of crystal habit, solution and etching with which this text deals have a history from the early days of crystallography (one reference is to 1820) up to the present-day development and application of dislocation theory and chemical kinetics.

The first and longest section of this book is devoted to 'micromorphology', *i.e.* the systematic study of the form, stability and kinematics of surface etching. It begins with a survey of theoretical approaches to these topics, leading on to illustrative examples in which the structural and chemical aspects play their role in detail. Due weight is given to the symmetry of etch pits and their relation to crystal symmetry groups. In Chap. 6 there is a brief account of techniques of etching and chemical polishing and of various procedures for observing and recording the results. There is also reference to 'hypomorphy' and other steric effects. The second section, on 'macromorphology', deals principally with the kinematics of solution of spheres and hemispherical holes, with appropriate examples.

From the wide literature available it can be claimed that this text is a selection well chosen to illuminate the whole field in a reasonable compass without neglecting the 'applied' aspect. The introductions to various theoretical facets are, by reason of brevity, somewhat demanding and presuppose in particular a good knowledge of classical crystallography – a demand somewhat lightened by adequate literature references. This would apply to such topics as the Gross kinematic theory, the Gibbs–Wulff and Herring theories and the Frank topographic theory. The standards of presentation and printing, apart from a few misprints, mostly of minor importance, are generally high. The generous provision of diagrams and plates is a most acceptable feature. It is a book to arouse as well as satisfy the reader's interest.

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Electronic structure of polymers and molecular crystals. Edited by JEAN-MARIE ANDRE and JANOS LADIK. Pp. 704. New York and London: Plenum. Price $67.20.

This rather formidable work is an edited volume in the NATO Advanced Study Institute Series, and contains the main lectures read at a course held in the University of Namur from September 1st to 14th 1974. At the present time there is a great experimental effort in progress in the optical and conductivity properties of molecular crystals, and future practical applications, if they are to come, will eventually involve polymers, if only to secure adequate mechanical properties for material to be used in electronic devices. So there is a great need to develop the theory of electronic behaviour of π-electron molecular crystals at the present time. The same may be said for polymers, although the efforts here may still be a little premature.

The first three lectures, by J.-M. Andre, J. Ladik and J. Delhalle (of Namur) outline successively *ab initio* and semi-empirical band structure calculations in polymers, LCAO band structure calculations, and some numerical applications of the foregoing to one-dimensional chains. In the fourth lecture G. D. Mahan (Indiana) discusses methods of interpreting, and theoretically calculating, the optical properties of molecular crystals. This author concludes that a high-density, close packing of polarizable substitutents is absolutely essential to attain high-temperature superconductivity [since these lectures were given the first polymeric superconductor $(SN)_x$ has been discovered, with a critical temperature of 0·26 K]. W. L. McCubbin (E. Anglia) deals with the symmetry properties of polymers and their influence on calculated band structure, E. Atkins (Bristol) discusses the X-ray structure determination of polymers, and Ph. Coppens (Buffalo) deals with experimental charge densities (from X-ray crystallography) and their use in testing theoretical band structure calculations. D. T. Clark (Durham) in 130 pages gives an exhaustive account of ESCA as applied to polymers. J.-L. Calais (Uppsala) surveys the various efforts to deal with electron correlation in polymers and molecular crystals, F. C. Collins (Ohio) deals with *ab initio* SCF–LCAO Hartree–Fock calculations, and F. E. Harris (Utah) and D. P. Santry (Hamilton, Ontario) continue with reviews of their own contributions. R. Rein (Buffalo) discusses methods for calculating intermolecular interactions between biopolymer units leading on to M. Simonetta's (Milan) discussion of the conformation of constituents in molecular crystals. F. Herman (IBM San Jose) with K. H. Johnson and R. Kjellander outline applications

of the self-consistent-field X scattering-wave method for molecular crystals and polymers, including TTF–TCNQ. In his second contribution W. L. McCubbin writes about electron states of disordered chains and J. Ladik reviews his band structure calculations on periodic DNA and protein models. The very last chapter, by K. Laki and J. Ladik, a joint effort by a biochemist and a mathematician, discusses protein energy converters. There are really two sections to this article which are not very closely related, but the general idea (of collaboration between theoretical physicists and biologists) is certainly worthy of support.

This book does give a clear outline of the quantum chemical approach to polymers. However, it is still not too clear of the exact validity of the various approximations, or the weight one can put on their predictions. As an experimental tool to probe polymer energy levels clearly ESCA has arrived as a 'god-send'. Of the future importance of collective electron behaviour in biomacromolecules there can be no doubt. This has been clear for many years now, from the first LCAO–MO calculations of M. G. Evans and J. Gergely, in fact. But we are still in the region of speculation, trying to relate theory to experiment, trying to find the bases of the subject. To those scientists wishing to take part in the struggle, this volume is to be commended. We may confidently expect polymers to be increasingly employed in the electronics industry, and solid-state physics to be developed as a precise tool in the investigation of biological membrane and organelles. This book will be a help to those engaged in the theoretical aspects of this endavour.

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Crystal growth and characterization. (Proceedings of the Second International Spring School on Crystal Growth, Japan, 1974.) Edited by R. UEDA and J. B. MULLIN. Pp. vii+419. North-Holland/American Elsevier, 1975. Price $33.95.

The Second International Spring School on Crystal Growth was held in full view of Japan's sacred mountain at the Fuji View Hotel on Lake Kawaguchi in 1974. The organizers under Professor R. Ueda had no difficulty in attracting some of the world's leading crystal growth and assessment experts to this superb setting. The twenty seven chapters are opened by Professor F. C. Frank, who has just retired from Bristol University.

A. Ookawa, K. Jackson, A. A. Chernov and F. C. Frank deal with theoretical aspects of nucleation and growth. Brian Mullin, Brian Cockayne, J. R. Carruthers and A. F. Witt cover practical aspects of melt growth. Denis Elwell gave two lectures on flux growth. Professor Ueda and D. W. Shaw considered thin-film and epitaxic growth. Professor E. Kaldis and Stan Austerman conclude the first half of the book with a discussion of vapour growth.

The theme of crystal characterization is opened, with an all-embracing review, by Bob Laudise. N. Kato ably demonstrates the power of X-ray techniques and others discuss etching, field-emission microscopy, field-ion microscopy, and electron microscopy. However, a feature of the school was the emphasis by Professor I. Sunagawa of Tohoku University and others on the power of optical techniques for assessing crystal perfection. These older methods are much less costly and sometimes more effective than the more fashionable powerful tools. Professor Harry Gatos of MIT concludes the volume with a review of thirty years of surface science.

This handy volume, well produced from typed camera-ready copy, is particularly useful to those interested in assessing crystal perfection and characterizing crystal defects. It is a useful addition to the rapidly growing literature on all aspects of crystal growth. To those of us who were there, it acts as a pleasant reminder of the sun, snow and discussion of a very happy week.

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Advances in structure research by diffraction methods. Vol. 6. Edited by W. HOPPE & R. MASON. Pp. 250. Oxford: Pergamon, 1975. Price DM 76.00.

This volume contains a single article written by Barrie Dawson and entitled *Studies of Atomic Charge Density by X-ray and Neutron Diffraction. A Perspective.* It is divided in three parts, the first of which deals with diffraction physics such as the Zachariasen treatment of extinction and experimental studies of extinction by Cooper, Rouse, Prager, Barnea and others. The second part describes structure factor theory and contains much of Dawson's pioneering contributions, including an as yet unpublished study on the electron density in the H_2 molecule. The third part gives a detailed description of charge density and thermal motion studies in a number of relatively simple solids such as diamond, silicon, fluorite, alkali halides, aluminum and magnesium oxide. Different data sets are listed and many alternative treatments discussed. This section is especially instructive in illustrating Dawson's meticulous approach to science. Due to Barrie's untimely death the section on organic structures is based on draft notes and references and covers only about five pages of text. The most recent references in the book are to articles published in 1973.

As correctly described by its title, the volume is a perspective of the field as seen by one of its major architects and a worthy commemoration to Barrie's scientific achievement. We are indeed fortunate that he did succeed in documenting his views so others may share the benefits of his insight. The book is too detailed to serve as an introduction to charge density studies but it is highly recommended for advanced study.

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