

Ueberreiter's chapter reappear in other sections. However, partial overlapping is not a bad thing, and readers new to polymer science may sometimes be thankful to find some subjects treated from two or more very different points of view. On the whole, such problems have been well handled; there is enough overlapping to link up the many aspects without leading to serious waste of space.

The section on molecular structure seems to be a useful introduction to the world of macromolecules. Methods of measuring average molecular weight and molecular-weight distribution are succinctly dealt with by A. Peterlin; and there is a very large classified list of references to publications on the dependence of physical properties on these molecular characteristics, compiled by O. Fuchs. The chapter on molecular forces and molecular mobility by F. H. Muller is rather disappointing; it covers the theoretical ideas which have been developed in relation to small molecules, but their implications for macromolecules are considered only in a general qualitative way. Moreover, the chapter is marred by vague general statements about 'tendency to crystallize' in relation to chemical structure; one is left wondering whether this refers to melting point or rate of crystallization or proportion of crystalline material. These matters are much more satisfactorily dealt with in Ueberreiter's chapter on the crystalline state, which touches on crystallization kinetics, the growth of single crystals and spherulites, the detailed structure of crystalline regions, phase transitions, and melting. The feeling of over-compression is especially acute here; only a few crystal structures are mentioned (in five pages, in which over half the space is taken up by illustrations). It would have been better to leave out the few pages on basic crystallography (symmetries, systems and Bravais lattices) which serve little purpose in a book of this sort, to allow more space for polymer crystal structures. Even if this had been done, the space devoted to polymer crystal structures and to stereochemistry would still be inadequate. However, the concluding part of this chapter, dealing with melting, is less constricted; it gives a good survey of current thinking on the subject, especially on the relation of melting point to chemical constitution.

Almost every conceivable aspect of the structure and physical properties of synthetic polymers can be found in this book. Some of the more important and successful essays are those on dynamic mechanical properties by J. Heijboer, F. Schwarzl and H. Thurn, dielectric properties by M. Magat and L. Reinisch, infra-red spectroscopy by G. Schnell, and X-ray diffraction by O. Kratky. The last-named succeeds in conveying the essentials of experimental methods, the estimation of the proportions of crystalline and amorphous material, the effects of orientation in polycrystalline specimens, the interpretation of line-broadening and small-angle scattering, in 24 pages. Some branches of polymer science are developing so rapidly that the accounts here already seem out of date; H. A. Stuart's article on superstructures (spherulites and single crystals) and K. Schäfer's article on electron microscopy suffer in this way. One lively subject which has been seriously developed only within the last few years—light scattering in partly crystalline solids—is barely mentioned (in the article by W. Schultz on general optical properties).

The last two sections of the book cover some subjects

of considerable technological importance, such as polymer solutions (A. Peterlin), plasticizers (F. Würstlin), polymer blends (K. Schmieder), dispersions (J. Hengstenberg and W. Sliwka), fillers (H. Schumann), and ageing and weathering (P. Schneider). The final chapter is on the effects of high-energy radiation, by A. Charlesby and C. S. Grace; a great deal of interesting information is crammed into the limited space (28 pages).

This book will be of great value to anyone entering the polymer field, since it covers such a wide range of topics, mostly in an authoritative, if rather compressed, manner. The specialist who is already conversant with polymers will find it less useful, but even he could get a great deal out of it, not in his own special line but in other subjects with which he has perhaps only a nodding acquaintance. These remarks apply of course particularly to German-speaking readers.

The book is beautifully printed and produced, but surely even this high standard cannot justify the very high price. At this price, few individuals will buy it; they will have to rely on libraries.

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International Tables for X-ray Crystallography. Volume III. Physical and Chemical Tables. General Editor KATHLEEN LONSDALE. Volume Editors CAROLINE H. MACGILLAVRY and GERARD D. RIECK. Pp. xvi+362 and 44 figures. Birmingham: The Kynoch Press, for the International Union of Crystallography, 1962. Price £5.15.0; reduced price for individual crystallographers.

The General Editor of the International Tables has complained (*Acta Cryst.* (1962), 15, 730) of the slowness of reviews of Volume II, and in particular that no review has yet been published in *Acta Crystallographica*. There is a fairly obvious difficulty in arranging reviews of publications of this kind; the contents are so varied and so detailed that it is difficult to find a reviewer capable of undertaking the task, and secondly if one does find one he has probably written part of the book himself, and cannot be regarded as unbiased. In order to avoid a similar comment on the reviewing of Volume III. I propose to write a brief factual description, and then seek a competent reviewer, even though it should mean a delay of two or three years before a critical review appears.

Though entitled 'Tables', there is in fact much descriptive matter, always as much as is necessary to understand the uses of the tables, and sometimes considerably more. The main section headings are Examination and preparation of specimens, X-rays and their interaction with crystals, Measurement and interpretation of intensities, Interatomic and interionic distances, Texture and line-broadening analysis, Small-angle scattering, Protection against radiation injury, Dictionary of terms for Volume III, and Subject index for Volumes I, II and III. Most of these sections contain a wider selection of topics than one might imagine; for instance the first one contains not only the examination and preparation of

specimens, but methods of adjusting crystallographic directions parallel to axes of rotation or other instrumental directions. Crystallographers interested in accurate measurement of lattice parameters will be amused and possibly perturbed by the historical outline of units of wavelength given on pages 41 to 44. The measurement of X-ray intensities is discussed in great detail, including such things as the variation with wavelength of the sensitivity of detecting devices. Line broadening from small particle size, or rather the determination of particle size from line broadening and from small-angle scattering, is discussed fully, but there seems to be no discussion of line broadening from mistakes or stacking faults, and only a casual mention of line broadening from strain. The short chapter on radiation protection and the subject index to all three volumes are very welcome.

In short, Volume III of the International Tables for X-ray Crystallography, like Volumes I and II, is a necessity for all those working in the field of X-ray crystallography.

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Molecular Structure and the Properties of Liquid Crystals. By G. W. GRAY. London: Academic Press. 1962. Price 63s.

G. W. Gray a voulu, dans son livre, établir le rôle de la constitution chimique des composés organiques purs sur la nature et les propriétés des phases mésomorphes qu'ils peuvent fournir. Depuis la découverte des cristaux liquides, à la fin du siècle dernier, presque simultanément par F. Reinitzer et O. Lehmann, et l'œuvre fondamentale de Georges Friedel qui démontrait qu'il s'agissait d'états nouveaux de la matière, intermédiaires entre le solide et le liquide isotrope, de très nombreux travaux tant théoriques qu'expérimentaux, ont été publiés sur ce sujet.

Gray n'étudie ni le mésomorphisme lyotropique où la biréfringence optique est liée à la concentration de certains composés dans un solvant convenable, ni le mésomorphisme des composés biologiques. Aussi son livre s'adresse-t-il d'abord aux chimistes organiciens.

Cependant, les sept premiers chapitres qui constituent près de la moitié du volume décrivent minutieusement les différentes mésophases, smectique, nématique et cholestérique; les méthodes d'identification, les déterminations des températures de transformation; les arrangements moléculaires qui se déduisent des examens au moyen des méthodes physiques basées sur les rayons X, l'infrarouge, l'ultra-violet, la résonance magnétique protonique; les différentes théories qui tentent d'expliquer ces arrangements moléculaires et leurs propriétés.

Dans les trois derniers chapitres, plus chimiques et formant plus de la moitié du volume, l'auteur établit des relations entre le mésomorphisme et la constitution chimique pour prévoir, d'après la composition chimique d'un composé et les modifications apportées à cette constitution chimique, les mésophases qui peuvent apparaître.

Ce livre est un exposé très clair de tous les travaux, de toutes les hypothèses et théories qui se rapportent au mésomorphisme des composés organiques. Il fournit sur

le sujet une documentation aussi exhaustive qu'on puisse le souhaiter. Aussi tous ceux, chimistes, physiciens, biologistes qui s'intéressent aux cristaux liquides auront intérêt à le consulter.

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Piezoelectric Properties of Wood. By V. A. BAZHENOV [BAŽENOV]. Pp. xii+180. New York: Consultants Bureau, 1961. Price \$9.50.

Wood is undeniably an anisotropic material, and may be compared to an irregular crystal, with the remains of the plant cells corresponding to the unit cells of a crystal structure. The investigation of the piezoelectric properties of wood is therefore of interest to crystallographers, particularly since the discovery of the property is attributed to Šubnikov. Moisture would obviously be a disturbing factor, and the experiments described in this book were carried out on thin plates of wood baked to constant weight at 100 °C. and then impregnated with a mixture of beeswax and rosin. The book begins with three chapters of general theory, one on experimental methods, one on elastic anisotropy, and one on the correlation of the magnitude of the piezoelectric effect in wood with such things as the species of tree, the density, and the distance from the centre of the trunk. The three chapters at the end of the book deal with the structure of cellulose and the way in which wood is built up from cellulose and other substances. It seems established that the piezoelectric effect is due to oriented cellulose, and not to any of the other constituents.

The translator's name is not given, which is perhaps just as well for his reputation. The text abounds with such curious, though usually intelligible, terms as reflected axes (inversion axes), concomitant (compatible), and real (non-zero). Occasionally, also, there are sentences to which it is very difficult to attach a meaning: 'Wood may be regarded as a piezoelectric texture consisting of a set of cells as the elementary particles of this texture that are invested piezoelectric properties'. There is no index.

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Clays and Clay Minerals. Volume 9. Proceedings of the Ninth National Conference on Clays and Clay Minerals. Edited by A. SWINEFORD, Pp. xi+614. New York: Pergamon Press, 1962. Price £5.5.0.

This book contains papers given at the ninth annual North American National Conference on Clays and Clay Minerals held at Purdue University in October 1960. The conference featured two symposia; the first 'On the Engineering Aspects of the Physicochemical Properties of Clays' had 9 papers and occupies 198 pages; the second 'On Clay-Organic Complexes' had 13 papers and takes