graphic fraternity who already have some familiarity with Fourier series and Fourier transforms but would like to broaden their knowledge and understanding.

Chapter four, a short one, illustrates a point which, while familiar to most crystallographers, is not often so clearly demonstrated and that is the dominance of phases over intensities in determining crystal structures. Fourier syntheses are illustrated with correct phases and random structure amplitudes (or even structure amplitudes belonging to another crystal structure) and these show correct structures quite well. The reviewer is reminded of a remark made (in jest) at an international conference concerning this point – that it seems to offer the possibility of solving crystal structures without data!

The following four chapters (about 25 per cent of the book) deal with the solution of crystal structures of which some part is already known and here the three basic types of synthesis (α, β and γ) with some variants are described, analysed and compared. Of particular value is the way in which the authors relate their own work to that of others. There are numerous illustrations of the applications of the syntheses and a nice balance is preserved between the theoretical and practical aspects of these methods.

Two chapters deal with the isomorphous replacement method, the first, a short one, describing the basic principles of the method and the second a comprehensive account of Fourier methods of dealing with data from isomorphous crystals. The final two chapters deal similarly with Fourier methods applied to anomalous dispersion.

The book is well illustrated and very readable. Few errors were detected by the reviewer and even those were fairly minor ones relating to the index. Large numbers of references are given and these are assembled at the end of each chapter. This work can be recommended without reservation to all crystallographers who can afford the rather high price.

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Elementary science of metals. Wykeham Science Series No. 1. By J. W. MARTIN. Pp. 135. London: Wykeham Publications, 1969. Price £1.

The aim of the Wykeham Science Series is 'to broaden the outlook of the senior grammar school pupil and to introduce the undergraduate to the present state of science as a university study'. The subject of this volume is the structural and mechanical aspects of physical metallurgy; this is an appropriate topic for treatment at this level, and a good choice as number one of the series. Sixth formers and undergraduates studying physics or chemistry will find that the book opens their minds to a whole area of science of great practical importance, but which is often barely touched on by such students. The book is most welcome, and one hopes that it will be widely read by the audience for whom it is written.

The first half of the book deals with bonding, crystal structure, polycrystalline structures, alloys and phase diagrams. An indication of the level is that Bragg's law is derived and the Laue, rotation and powder techniques of X-ray diffraction are outlined, but the book does not actually show how such techniques can distinguish between, for example, a body-centred cubic and a face-centred cubic metal.

The second half of the book surveys a wide range of elastic, plastic and fracture phenomena in metals, and gives simple and readable explanations of how they occur. The treatment of the geometrical features of dislocations is exceedingly brief and only edge dislocations are described. Although dislocations are said to form loops, the screw character of portions of these loops is ignored. The subsequent treatment of plastic deformation therefore rests on shaky foundations, but this treatment may well be appropriate in a book of this kind; it shows the enormous importance of dislocations and may encourage readers to find out more about them later.

An attractive feature of the book is the series of simple 'do-it-yourself' experiments given at the end of each chapter. Yet in some ways my main disappointment was that the experimental angle had not been stressed further by indicating more explicitly in the later parts of the book how the techniques introduced earlier have been used to establish the processes described. There is for example no explicit reference to any technique for revealing dislocations experimentally until an electron micrograph of a dislocation tangle is almost casually introduced into a section on work hardening.

Only experience of students reading the book will show whether it has succeeded in its aims; it deserves to do so and I hope it will.

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Crystals and X-rays. By H. S. LIPSON. Pp.xiv+198. London: Wykeham Publications (Science Series), 1970. Price £1·75.

This little volume should appeal to the general reader interested in science and, in particular, in the origins and methods of X-ray crystal structure analysis. The writing is bright and lively. The reader is presented, quickly and painlessly, with brief and informative descriptions of the beginnings of X-ray crystallography, its experimental methods, its early successes in solving simple crystal structures, and the application of Fourier and related methods to more complex structure problems. Professor Lipson's use of the analogies between the optics of visible light and X-rays enables him to present many aspects of crystal structure from relatively novel and stimulating points of view.

This reviewer cannot resist the temptation to draw attention to one of Professor Lipson's rare crystallographic lapses: on p. 68 he notes that lines of reciprocal-lattice points are arranged along curves in Weissenberg photographs and that 'certain lines are straight; these represent ... the axes of the reciprocal lattice'. A glance at the photograph on the same page reveals, of course, that all central lines of reciprocal lattice points lie along straight

lines clearly delineated by continuous radiation streaks. In this respect the 'axes' do not differ from other central lines of reciprocal-lattice points. In general, however, the text is remarkably free from slips of this sort.

In spite of its many good features, this reader found the book disappointing. It offers virtually nothing new to the professional crystallographer or diffractionist. Nor does it, despite the author's prefatory remarks, present '... an explanation of X-ray diffraction in elementary physical terms', unless one is willing, as Professor Lipson apparently is, to equate X-ray diffraction with X-ray crystallography or, more specifically, with X-ray crystal structure analysis.

This is a book which, except for a few paragraphs, could have been written thirty years ago. There is little in it to indicate that any real progress has occurred in the theory and techniques of X-ray diffraction in the intervening years. No serious mention is made of the large and rapidly growing fields of X-ray topography, of dynamical interactions in perfect and nearly perfect crystals, or exciting developments like the Bonse–Hart X-ray interferometer. The fundamental work of Warren, Guinier and of many others in diffraction physics is ignored.

This book, as noted above, will probably appeal to some general readers. It cannot be recommended to X-ray diffractionists (or crystallographers).

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Crystal geometry. A set of transparencies for an overhead projector with notes for lecturers. London: ITL. Vufoils Ltd., 1970. Price Unit H1: 5 foils £2·75; Unit C1: 9 foils £3·90; Unit 2: 3 foils £1·65; Unit 3: 3 foils £1·60; Unit 4: 5 foils £2·25; Units 5: 9 foils £3·63.

ITL Vufoils are diagrams related to a variety of topics, produced on transparent plastic, which can be used with an overhead projector. Several complete sets are available from the manufacturers or individual frame units may be purchased if so desired. Only the set of diagrams on crystal geometry will be reviewed here.

The diagrams are well produced on flexible, transparent plastic sheets, set in a more rigid frame for easy handling. There are several diagrams in each frame, arranged in such a way that only one may be viewed or any combination of them used as overlays and projected simultaneously as a composite diagram. The location of each overlay is quite positive and the plastic sheets are sufficiently robust to stand up to rather more than normal usage. Very brief though useful lecture notes are supplied with the Vufoils.

There are two frame units illustrating close-packed structures – one each for hexagonal and cubic, consisting of five and nine overlays respectively. The diagrams relating to cubic close packing are particularly good. They clearly illustrate the form of packing by using different colours for the atoms of different layers and quite convincingly show that the cubic close-packed structure is identical with the face-centred cubic structure. This is where the Vufoils will be found to be most useful as such diagrams never quite 'come off' when drawn hastily on a blackboard and ping-pong ball models are much too small to show to a large audience.

Three frame units cover the topic of unit cells in which the features of the fourteen Bravais lattices are illustrated and the unit-cell parameters defined. Primitive lattices are converted into centred lattices by the use of overlays, though the positioning of the lettering on the overlays is not always accurate. However, this is a minor blemish easily allowed for. The lecture notes define a lattice point as '··· a point within a group of atoms such as the centre of symmetry or centre of gravity ···'. So long as this information is not passed on to the students it does not matter, but if the notes are to be useful they should be accurate. To be fair, they give a more correct definition in the next paragraph. The reviewer would have liked to have seen diagrams illustrating the reasons why there are only 14 Bravais lattices, for example why we don't have a body-centred monoclinic lattice and why the face-centred and body-centred tetragonal cells are equivalent. This is only a personal preference, however, and their absence does not detract from the usefulness of the set of diagrams.

To complete the set on crystal geometry, there is one frame unit on Miller indices consisting of nine overlays. These diagrams are always difficult to draw so that their meaning is obvious and the Vufoils are quite successful in this respect. However, the diagrams are oriented solely towards the use of Miller indices for the description of crystal morphology and may have had a wider appeal if they also illustrated the diffraction planes which give rise to Bragg reflexions.

For lecturers whose artistic talents do not quite match their scientific abilities, these Vufoils should prove to be a valuable teaching aid.

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