order of C_xH_y (other elements, alphabetically); a cross reference of the 91 classes above is given with each formula; and (3) transition-metal index (95 pp.), in which the transition metals are listed in alphabetical order, with, for each metal, their compounds listed in order by class and then by formula. Each entry in all three sections is followed by the volume and page numbers to *Strukturbericht* or *Structure Reports*. The method used for producing this volume did not allow for subscripts in the formulas nor for bold face for volume numbers, but this should cause no difficulties.

The *Sixty-Year Index* of metals and inorganic compounds, with supplement, is also well organized, but in a somewhat different way. First comes a metals classified index (48 pp.), by formula, of elements, binary alloys, ternary alloys, hydrides, borides, carbides, ..., tellurides; (2) metals structure-type index (59 pp.), with the entries listed according to the structure-type code of Pearson (this is fully explained in the introduction); (3) inorganic index (103 pp.) in which the entries, by name, are listed under the classifications: elements, hydrides, carbides, nitrides, ..., silicate minerals. Within each classification the order is that of the groups of the Periodic Table; and (4) mineral index (28 pp.), in which minerals in the metals and inorganic sections are listed together in alphabetical order.

In both of the preceding volumes, if you know the name or formula of a compound in which you are interested it is easy to find out if that particular compound has been referenced in *Strukturbericht* or *Structure Reports* in 1913–1973.

The cumulative index for *Strukturbericht*, Vols 1–7, is based on English translation from the original German indexes. It consists of a subject index (24 pp.), a formula index (36 pp. of metals and inorganic compounds, 8 pp. of organic compounds), and an author index (27 pp.). This volume will be useful for locating references to the original early literature without having to leaf through the separate *Strukturbericht* indexes.

Although the combined cost of all of these volumes is a whopping Dfl 800 ($373 or £191 at today's exchange rates) librarians and crystallographers (who may purchase them at 50% of the list prices) will have to bite the bit and add them to their collections. They are essential, the few reservations expressed above notwithstanding.

JERRY DONOHUE

Department of Chemistry
University of Pennsylvania
Philadelphia 19174
USA

Acta Cryst. (1979). A**35**, 347

Dynamical scattering of X-rays in crystals. By Z. G. PINSKER. Pp. xii + 511. Berlin: Springer, 1978. Price DM 86.00, US $39.60.

The dynamical theory of X-ray diffraction was developed by Darwin and Ewald immediately after the famous discovery by Friedrich, Knipping and von Laue, and was extended sometime later by von Laue. Very few crystals, however, were at the time perfect enough for extensive verification of the dynamical theory. New interest arose in the 1940's when Borrmann discovered the anomalous transmission effect and von Laue interpreted it using dynamical theory. But it was only in the late 1950's and early 1960's that the interest become more widespread and this coincided with the development of X-ray topographic techniques on the one hand, and crystal-growth techniques for high-perfection crystals on the other. The dynamical theory was then extended to incident spherical waves and a large number of properties of wave-field propagation were verified experimentally. Simultaneously, extensions of the dynamical theory were developed for slightly or highly deformed crystals. Professor Pinsker's important book covers all these aspects extensively, keeping close to the original papers, and the reader will find in it all the necessary theoretical developments. The book also includes a description of all the multicrystal settings which have had many applications in recent years as well as a treatment of the three- and four-beam cases. It will be very useful to all those, and they are very numerous nowadays, who perform diffraction studies with perfect or nearly perfect crystals. Useful numerical tables are given in an appendix.

A. AUTHIER

Laboratoire de Minéralogie–Cristallographie
Université Pierre et Marie Curie
75230 *Paris CEDEX* 05
France

Acta Cryst. (1979). A**35**, 347–348

Physics and chemistry of materials with layered structures. Vol. 4. Optical and electrical properties. Edited by P. A. LEE. Pp. viii + 464. Dordrecht, Holland: Reidel, 1976. Price Dfl 135.00, US $49.00.

Each chapter is reviewed separately below. Taken as a whole these chapters constitute a very well written book with a wealth of information and a pleasant mixture of experimental and theoretical sections. The latter require the reader to be familiar with quantum mechanics and solid-state theory on at least the level of introductory textbooks. Although the volume keeps to the subject of layered structures, much of the content is of a more general nature than the title suggests, and hence of value not only for the specialist. In particular, the book could probably inspire some research workers in the fields of energy-band calculations and structural analysis to turn their activity towards these interesting materials.

Common to all contributions is a clear and purposeful presentation which leaves little room for criticism. Perhaps the only justifiable critical remarks concern a few omissions of an editorial nature. Thus, for some chapters a list of explanations of the many abbreviations in the text could have been useful, as would some cross references between chapters. For instance, the reader not familiar with the notation used in the classification of polytype layer structures would be grateful for a reference to the explanation in Chapter 7. However, these omissions are only of slight inconvenience, and in general the comprehensive index (of both names and subjects) at the end of the book serves its purpose well.

The first chapter (B. L. Evans) outlines the theory of optical processes in solids and its comparison with experiment. Based on the quantum mechanics of interaction between light and matter, it is shown how the varied

behaviour of, for example, the absorption coefficient with frequency can be understood in terms of critical points as derived from the density of states in band-structure theory. It is then shown how these features are in principle modified because of the excitons and free carriers, and finally the dependence on external parameters (electric and magnetic fields, stress and temperature) is treated theoretically. The experimental part contains a very large amount of measured and calculated data referring to all types of layered compounds. The effort which must lie behind this compilation is reflected in the list of references, which comprises no less than 456, many dating from 1970 onwards.

Chapter 2 (J. Bordas) gives a detailed discussion of an important experimental technique used for extracting information from optical spectra, which for solids are as a rule rather broad and superposed on a structureless background. The method involves modulating an applied electric field (less often, the temperature is modulated) and using phase-sensitive detection in reflection or transmission measurements. The theoretical section on light absorption and its electric-field dependence supplements the treatment in Chapter 1 by instructive qualitative arguments, and is followed by a detailed description of the experimental set-up and the interpretation of its output. The remainder (56 pp.) of the chapter reviews experiments on selected substances such as PbI_2 and the series GaS, GaSe and GaTe. In the field dependence of the absorption coefficient, all these compounds show an interesting contrast to another class of materials, among which $2H$-MoS_2 is mentioned. A brief section on thermomodulation is also found.

The third chapter (R. Zallen and D. F. Blossey) is mostly concerned with the technically important substances As_2S_3 and As_2Se_3 which, in amorphous form, are widely used as photoconductors. For their single-crystalline properties, the symmetry of the individual layer is, as pointed out, often more important than the lower overall crystal symmetry, and hence the 80 space groups of two-dimensional translation symmetry (but with a three-dimensional motif) are relevant. The main point in this chapter is a fine analysis of measured photoconductivities in the crystalline state of the two compounds.

Chapter 4 is the last on optical properties (P. M. Williams) and concerns a field of study opened up less than ten years ago. In the theoretical section it is shown how the finer details in the energy distribution of photoelectrons can give information on the band structure of a material irradiated by monochromatic light. Either ultraviolet or soft X-ray radiation is used, each giving its own type of information. A brief section on the experimental equipment is followed by a very detailed discussion, where deductions from band-structure calculations are compared with results from experiments of this type; of these, many have already been performed on layered materials.

Of the remaining four chapters, three deal with transport properties. The first (R. C. Fivaz and Ph. Schmid) is a theoretical paper at a relatively advanced level. From a model band structure and a relaxation-time solution of the Boltzmann equation, the relevant mobilities are derived and compared with those from experiment. Also, a new model for charge transport across layers is given, and it is concluded that the basic problem of electron transport in layered structures is understood.

Chapter 6 (D. J. Huntley and R. F. Frindt) mainly concerns measurements of electrical resistivities and Hall coefficients for selected substances. In some of these (*e.g.* $2H$-$NbSe_2$) and at a certain temperature, the Hall coefficient reverses sign in a phase transition which is also seen in electron diffraction patterns (beautiful examples of which are reproduced). Highly interesting is a short section on intercalation, *i.e.* the interposition between layers in, say, TaS_2 of organic molecules (for instance, pyridine), a process which increased the crystal thickness by a factor of two or more.

Intercalation effects are also of special interest in Chapter 7 (also by Frindt and Huntley). The hope of finding high-temperature superconductors among layered structures has, as stated by the authors, not been fulfilled so far, but many interesting experiments have been performed, as exemplified by data on the dichalcogenides of Nb and Ta.

In the final chapter (J. M. Vandenberg-Voorhoeve), a great deal of structural and magnetic data, for both pure and intercalated compounds, are presented in tabular form and brought in perspective by the text. Some of the substances considered, *i.e.* transition-metal dichalcogenides, have magnetically ordered structures.

In conclusion, this is a book with great richness of information in each chapter. Covering a large field, it is warmly recommended to a correspondingly large group of students and research workers in solid-state physics, and especially to those concerned with energy-band calculations and structural analysis.

G. B. JENSEN

Technical University of Denmark
Department of Electrophysics
DK-2800 *Lyngby*
Denmark

Acta Cryst. (1979). A**35**, 348–349

Neutron inelastic scattering, 1977. Vols I and II. Pp: Vol. I, xii + 652; Vol. II, x + 558. Compiled and published by the International Atomic Energy Agency, Vienna, 1978. Price: Vol. I, $52.00; Vol. II, $44.00.

This paperback book contains the proceedings of a six-day conference in Vienna, October 1977. It has been produced along the lines of previous proceedings, and prospective buyers would do well to look at the volume produced in 1973 after the meeting in Grenoble to appreciate the style of the work.

The book is divided into sections according to the conference sessions I–X. Some of the articles are in Russian and some are in French but about 90% are in English; all are very much up to date. Session titles: (I/II) *Sources & instruments*; (III/IV) *Molecular spectroscopy*; (V) *Liquid crystals and polymers*; (VI) *Monatomic liquids*; (VII/VIII) *Magnetic excitations and phase transformations*; (IX) *Hydrogen in metals*; (X) *Surfaces*.

Sessions I & II. The electron LINAC and proton spallation neutron sources receive attention in the first two articles. The neutron scattering community should think hard about the experiments which can be done with these sources of hot neutrons; unfortunately there is little written