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.

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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

here on the instruments which might be used on such facilities. Ultracold and very cold neutrons (UCN ~ 500 Å; VCN ~ 80 Å) may be more available in the future, even as polarized beams, extending the neutron wavelength range beyond anything available in the past; more food for thought.

The spin-echo technique is highly regarded for futuristic instrumentation, and this is given a brief review. The developments of film methods of recording neutron scattering are most exciting and should stimulate new science.

The IAEA meetings constitute the best forum for the discussion and dissemination of new techniques in neutron scattering, and this section is no exception; indeed it is probably true to say that this work is more healthy now than ever before.

Sessions III & IV. This extensive section contains many papers concerned with rotation or hindered rotation of groups such as methyl and ammonium groups, though there are a few papers rather out of place. As this is a discipline for which there is no obvious single international journal for such papers, this collection will be found most useful to those studying this field which ranges over plastic crystals in the main. At the previous IAEA meeting this field was open and clear; we are now getting to grips with the new problems raised and the near future will certainly see considerable developments. Unfortunately there is no article which gazes into the crystal ball!

Session V. The novel experiments on liquid crystals here reported have a close affinity with those on plastic crystals, and it is good editorial management to get this session in the same volume as the previous two. The coverage of polymer work is probably not so complete as that for liquid and plastic crystals but is nevertheless valuable.

Session VI. Further progress on non-superfluid and superfluid ^{4}He is reported, and the review touches also on ^{3}He, though detailed experimental results on this system are not reported. Other liquids studied are argon and lead, but there must be much other work not covered in these volumes.

Sessions VII & VIII. These sessions begin with a review of incommensurate structural phase transitions, phenomena which should be noted by all crystallographers. These may be much more common than previously expected, and the crystallographer would do well to call on all his experience of the many structural studies and remember those cases where the Bragg peaks showed the modulation characteristic of the incommensurate phase.

Most of the contributed papers are concerned with spin waves, though there is the occasional phonon paper. As phonons were the subject of a conference in Paris in September 1977, such papers in this volume are inconvenient. For full coverage the *Proceedings of the International Conference in Lattice Dynamics*, Paris, 5–9 September 1979 [(1978), edited by M. Balkanski. Paris: Flammarion] should be consulted.

Session IX. Hydrogen in metals: diffusion, dispersion curves and structure all need the neutron scattering technique, and the current work in the field is well covered in this volume.

Session X. Structure plays a more dominant role in this final session than elsewhere in these volumes, but efforts are now being extended to study the dynamics of these systems, typified by nitrogen or methane on exfoliated graphite. This work seems to be in need of the crystallographer's skill in understanding structure; such an understanding is essential for the interpretation of the inelastic scattering. This section is as complete a coverage as one could hope for in one place, though it may soon be out of date.

These volumes will become just as important as the previous volume from the Grenoble meeting in 1972. No group which aspires to neutron scattering should be without their copy, and the price should be compared with that of any specialized journal. There is an advantage over a journal as each paper is followed by a record of the discussion which was generated at the time of presentation.

Our poor knowledge of the structure of plastic and liquid crystals and of surfaces may prompt crystallographers to deviate from their present course of research, maybe even applying X-ray scattering to these self-same systems. Of course no comparison of the value of neutron scattering with X-ray scattering could be expected in these volumes, but the clear progress in the former activity should stimulate advances in the latter.

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Electron diffraction 1927–1977 (Conference Series No. 41). Edited by P. J. DOBSON, J. B. PENDRY and C. J. HUMPHREYS. Pp. xi + 442. The Institute of Physics, Bristol and London, 1978. Price £25·00, US $49.00.

This volume, with 67 papers in total, consists of invited and contributed papers which were presented at the International Conference on Electron Diffraction held at Imperial College, London University, from 19 to 21 September 1977. As this conference was planned in celebration of the 50th Anniversary of the discovery of electron diffraction in 1927, it is natural that the book is entitled 'Electron Diffraction 1927–1977', although it contains little historical material. In the half-century since its discovery, electron diffraction has played an important and unique role in the study of the structure of matter, but it is also true that it has been accompanied by inherent theoretical difficulties due to the complexity of the process of electron scattering by matter. However, this complexity may be more informative eventually, and may continue to be an inexhaustible source of attractive research problems worth pursuing further. In the last decade too, stimulating discoveries of diffraction effects, such as the critical-voltage effect and electron channelling, have been made, and advances in the theory of LEED as well as in the theory and application of electron-microscopic lattice images have been considerable. And, relating to all of these topics, the dynamical theory of electron diffraction has been explored very extensively from various approaches. In these respects, the publication of this book is quite timely.

The text consists of seven chapters: 1. *Dynamical theory*; 2. *Diffuse scattering*; 3. *Structure factor and symmetry determination*; 4. *Low energy electron diffraction*; 5. *Instrumentation*; 6. *Defect structure*; 7. *Miscellaneous*. Each chapter, except Chapter 7, contains one or more invited