author is well qualified for the task; he has made significant contributions to X-ray crystallography; he is a professor of theoretical physics and hence well able to cope with some of the complexities that are glossed over in other books; and he is a good experimentalist who knows the difficulties with which the embryo research student is faced.

The book contains nine chapters—on the geometry of crystals, the scattering of X-rays, crystal diffraction, Fourier-transform theory, experimental methods, intensities of X-ray reflexions, space-group theory, determination of crystal structures and refinement. There are forty-four problems at the ends of the various chapters, carefully chosen and nicely graduated in complexity; solutions are given at the end of the book.

Of course, no author will ever accept that another's book is ideally organized, and, true to this tradition, I shall give my views on what I think are some of the deficiencies of the book and how they could be corrected in future editions.

First, the treatment of symmetry is too brief. The subject seems easy to experienced workers, but new students do find difficulties with its principles and conventions and they need a gradual introduction. A particular defect in the book is the absence of a treatment of two-dimensional space groups; symbols such as pgg are introduced later in the book without any explanation. No attempt, also, is made to show the derivation of three-dimensional space groups; they are dealt with purely descriptively. Translation itself is regarded as a symmetry element, centred lattices resulting from this operation rather than from the combination of parallel symmetry elements such as mirror and glide planes.

The section on diffraction starts off oddly, with a rather schoolboyish derivation of the diffraction pattern of a grating; the complex-exponential method would have fitted in better with the succeeding work. Also, the relation between the Fourier transform and diffraction theory is too brief; experience has shown that it needs careful exposition if it is to be properly appreciated. The same criticism applies to the introduction of the reciprocal lattice; it is treated purely as a mathematical contrivance and its basic physical meaning is not mentioned.

On the other hand, the chapters on the scattering of X-rays by atoms and the intensities of X-ray reflexions are excellent. The author shows considerable physical feeling for these subjects, and any reader who properly digests these chapters will have a better appreciation of the basic principles of the subject than many experienced crystallographers have. The theories of absorption, extinction, temperature effects and anomalous scattering are treated much more effectively than in most introductory textbooks.

The book is well produced, and the diagrams especially are beautifully conceived and drawn; the author has clearly spared no pains in expressing his ideas through them. The writing also, apart from a few grammatical infelicities, is very good and clear. The book can be recommended unreservedly to those contemplating entry into this still fascinating field of the study of crystalline matter through its diffraction of X-rays. H. Lipson

LIQUID CRYSTALS

Liquid Crystals and their Applications

By Thomas Kallard. Pp. vi+219. (Optosonic Press: New York, 1970.) $12.

During the past ten years, the subject of liquid crystals has changed from one of almost purely academic interest to one of considerable technological importance. This book now provides a source of valuable information on many of the technological applications of nematic and cholesteric liquid crystals. This is achieved by presenting detailed accounts of twenty-five patents relating to liquid crystals and their uses. These include the use of nematic liquid crystals in electro-optical devices such as valves, shutters, visual display systems, phase-matching devices for light beams, multi-frequency light deflectors, memory systems, and the like, and also of nematic liquid crystals containing dichroic dyes for colour display systems. Other patents describe the uses of cholesteric liquid crystals in devices for thermal imaging, in detecting electric fields, in detecting low concentrations of vapours, in surface thermography, for example, of skin, and in non-destructive testing of electronic circuits, laminates and so forth. Patents relating to the preparation of polarizing films and sheets, encapsulated cholesteric liquid crystals and dried emulsion coatings of cholesteric liquid crystals are also given. The contents therefore give a broad impression of the implications of liquid crystals in spheres such as medicine, television, electronics and engineering. A brief list of areas of possible future applications is also interesting.

The book does not provide basic background information on liquid crystals, but for the reader who requires this, there is presented an extensive bibliography of texts, review articles and publications relating to liquid crystals. This adds value to the text by drawing together many widely disseminated sources of information.

The reader should realize that the bibliography, while extensive, is not exhaustive, particularly with regard to literature before about 1960. The text is pleasing in presentation, but a little marred by typographical errors.

Readership should extend to chemists, physicists, medical technologists, engineers and electronic engineers. By appealing to such a broad group, the text should stimulate yet more interest in liquid crystals, and if this in turn leads to further beneficial applications, publication of the book will have been amply justified.

G. W. Gray

HIGH ENERGY PHYSICS

Proceedings of the Fourth International Symposium on Electron and Photon Interactions at High Energies

Edited by D. W. Braben. Pp. ix+328. (Daresbury Nuclear Physics Laboratory: Daresbury, nr Warrington, 1969.) 120*s*.

Science becomes ever more specialized. The first International High Energy Physics Conference (Rochester Conference) was held in 1955. At the 1960 conference a small subgroup of physicists working—or hoping to work—with electron accelerators met for one day at Cornell University to discuss their specialized topics. This became a habit; a separate symposium on electron and photon interactions was held in Cambridge, Mass., in January 1963; others at DESY, in Germany, in June 1965, at SLAC, in California, in September 1967 and now another at Daresbury, in England, in September 1969. Each occasion accelerated the coming into operation of a new electron accelerator. Many more physicists now work in this specialized field and produce exciting work. The conference was unusual in that individual papers were not read at all, but summary talks were presented, summarizing the recent work in the field including the submitted abstracts. This makes the conference proceedings easier reading for the inexpert.

A vast quantity of new information was presented on various photoproduction processes. But the exciting new information lies in three fields: inelastic electron scattering, the study of vector mesons (ω, ρ and φ) particularly in their production by electron–positron storage rings, and in quantum electrodynamics.

Inelastic electron proton scattering has been studied for some time, but Dr R. E. Taylor, of SLAC, presented