methods (contrary to direct methods until recently), combined with data from isomorphous replacement, seem to be very effective in phase refinement and extension at lower resolution, especially in direct-space procedures.

Papers on coordinate refinement, with constraints, by least-squares or Fourier methods (Diamond, Steigemann *et al.*; Jensen, Freer *et al.*), on phase refinement at higher resolution by direct methods (mentioned above) and on model building (Diamond, Nagano) show the immense computational problems inherent in these methods, which have become highly important since more high-resolution data have become available.

Four major subjects can be distinguished in section *C*. The first is a study on electron diffraction of polycrystalline material by Imanov. Five papers give good insight into the problems and developments in the field of small-angle scattering. Special attention is given to collimation corrections (Schmidt, Walter), evaluation of scattered intensities from models of macromolecules (Šoler), and acquisition of neutron data (Klesse). Fedorov introduces large-angle scattering.

Studies on Fourier syntheses and least-squares refinements permanently hold the attention of the crystallographer. The papers on symmetry considerations (Larson), anomalous dispersion (Larson) and fast Fourier transforms will assist every programmer in getting optimum efficiency in his programs. Rollett gives remarkable conclusions on convergence in least-squares techniques.

In the last part of this chapter, developments in program design and data-handling techniques have been gathered. Owing to the rapid developments in computer design during the last decade large program systems and data systems have been set up, and are at the disposal of the modern crystallographer. A great variety of information on program design for large computers is given by Sakurai, Hall, Stewart, Sasvári, Ahmed and Morimoto. Trends in minicomputer techniques are discussed by Sparks and Gabe, and the Cambridge data base by Motherwell.

The reviewer is pleased to recommend this book to crystallographers with interest in direct methods and protein crystallography. The subjects contained in the third part are of general interest to most crystallographers. As a continuation of the proceedings of foregoing Summer Schools it is a valuable book; it provides very useful information on principles and developments in crystallographic computing.

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Liquid crystals. By S. CHANDRASEKHAR. Pp. x + 342, Figs. 158, Plates 16. Cambridge Univ. Press, 1977. Price £18.00.

This book is concerned with liquid crystals, the strongly anisotropic, but fluid, states which a large number of organic materials are now known to form and which possess degrees of order intermediate between those of the crystalline solid and the amorphous liquid. Although the title is a general one, the work refers only briefly to lyotropic liquid crystals and concentrates strongly on liquid crystals formed by thermal effects on pure materials or their mixtures – the so-called thermotropic systems. Even here there is a bias, for smectic liquid crystals feature in only one of the four main chapters (additional to the brief introduction), whereas 258 pages are devoted to nematic and the related cholesteric liquid crystals.

Statistical theories of nematic order and continuum theory of the nematic state are dealt with fully in Chapters 2 and 3, respectively. These fairly complex matters are covered lucidly, and it is valuable to have these theories and their implications, on which the published work is scattered rather widely throughout the scientific literature, discussed concisely and logically between two covers. The latter part of Chapter 3 on the relationships between theory and the physical behaviour of nematics is very useful, particularly as it considers, in detail, disclinations and matters such as the twisted nematic cell, the Fréedericksz effect and electrohydrodynamics, all of which are of importance in relation to the application of nematics in electro-optical display devices.

Chapter 4 on cholesteric liquid crystals gives an account, which is again very clear, of the quite difficult optical properties of this type of mesophase. It then covers disclinations, flow properties, effects of external fields, and factors influencing the helical pitch and the relevance of these matters to the applications of cholesterics in displays and thermography.

Chapter 5 deals rather briefly with just two of the eight smectic polymorphic types (smectics *A* and *C*), and with transitions involving these phases. The account is most valuable however, expounding as it does various theories of the lamellar order of these phases and their interrelationships with the properties of these smectic states.

The book is attractively presented, and the literary style is pleasing and very readable. Diagrams are numerous and clear, and the index seems adequate. Despite the publication date of 1977 the author's preface is dated August, 1975, and it is not therefore surprising that of over 400 reference citations, the numbers decline from around 80 dated 1973, to less than 50 dated 1974 or 1975, to a handful dated 1976.

The text is surely a valuable addition to the current literature on liquid crystals and should be appreciated by anyone of graduate level and above doing research in the field of liquid crystals or concerned with their technological applications.

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The plastic deformation of simple ionic crystals. By M. T. SPRACKLING. Pp. ix + 242. London: Academic Press, 1976. Price £9.20.

For the majority of those who study crystals, dislocations and other imperfections are unwelcome phenomena. Nevertheless, for metals, the importance of dislocations and other structural imperfections for ductility, work-hardening