highly recommended as an undergraduate text . . . and . . . to any scientist who desires an introduction to structure determination'. Now, in producing their second edition, the authors have made the book still better by updating and judiciously enlarging it. Almost every part has been affected, with modified or expanded text, new (extra) diagrams and photographs, such as the protein-crystal synchrotron-radiation diffraction photograph shown in the section on experimental methods. Direct methods and anomalous dispersion now have a chapter each; four-circle diffractometry is explained in detail, the glossary (a most valuable feature) has been doubled in size, and the index nearly doubled too. Of course, the price has more than doubled: the factor is about seven; but it is to be hoped that at least the paper cover version will nevertheless be within the reach of the students - to whom it is addressed.

One regret - which the authors will surely share. In the year of the award of a Nobel prize in the central core of this subject area, it is sad that this book, despite its 20-page 30-section annotated bibliography, just happens not to contain any reference to the papers, or the names, of Jerry Karle and Herbert Hauptman.

J. H. ROBERTSON

School of Chemistry
University of Leeds
Leeds LS2 9JT
England

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Ferroelectrics and related materials. Edited by G. A. SMOLENSKII. (Translated from the Russian.) Pp. xix+763. New York: Gordon & Breach, 1984. Price US $280.00.

Professor Smolenskii edits a volume by seven authors eminent in this field - a field in which he has been a leader since its beginning. There are sixteen chapters by the several authors. Some of the contributions are very striking, but inevitably some are not. And in spite of the title there is not a good coverage of the whole field. It seems likely that there was a Russian-language edition before this publication, but we are not told its date. It may account for the fact that most of the bibliographic references are not more recent than 1978. The bibliographies are at the ends of the chapters, which is unavoidable. So there is a pressing need for good indexes; there are none. A quarter of the sections are concerned with a specific material, including those in chapter 2 - a brief survey of 'seven most important ferroelectrics'. But other information, even about these same materials, is scattered throughout the volume, and there is no way to find it. This is even more awkward if you seek all information on a given topic or concept (nonlinearity; tunnelling; Goldstone theorem; diagram techniques; incommensurate transitions). A good subject index should most emphatically have been provided.

The very brief introductory chapter, written by the volume editor, expands the historical classification of displacive *vs* order-disorder ferroelectrics, and goes on to include more recent topics such as incommensurate transitions. It includes material on how to search for new ferroelectrics, a search in which Professor Smolenskii has been much involved.

The very long chapter on thermodynamic theory of the ferroelectric transition gives a very careful introduction, followed by thorough exposition of many less-simple situations, including an introduction to fluctuations (treated more fully in a later chapter), and of Landau theory, improper ferroelectrics and ferroelastics. The tables are very useful. The following chapter then shows the applications to a limited number of ferroelectric materials, including the historically interesting and important material Rochelle salt. A stimulating chapter.

Another very long chapter deals with microscopic theory and its connection with the thermodynamic properties, by concentrating on some of the more important models, and keeping the discussion 'understandable to experimenters'. Thus, for example, the dipole-dipole electrostatic interaction is given great weight. There is also here discussion of dynamic susceptibility, and the chapter ends with an unduly brief treatment of central peak phenomena, in which a narrow intense light scattering occurs, for a variety of reasons, at very low frequency, and also of a scattered neutron peak. These are thorough expositions, with the limitations of the treatment chosen explicitly stated.

Classical Landau theory of phase transitions, which takes no account of interaction of fluctuations of the order parameter, is in chapter 6, as well as the 'renormalisation group' method as applied to phase transitions. The latter method calls for careful exposition to any less mathematical reader, and that is what it gets in this chapter. Very useful.

In some areas the treatment is disappointing, being no more than a recital of well-known basic descriptive algebra and a catalogue of experimental findings in a few specific materials. This is the treatment given to domain effects, to acoustic and piezoelectric effects, to electrooptic and nonlinear optical effects, to nonlinear dielectric effects, and to temperature variation of dielectric constant. Very little attempt is made here to suggest any conceptual discussion, except for a handful of references to read; losses are barely mentioned. Electroacoustic echo is dealt with separately in chapter 10.

The volume editor is a world leader in the area of diffuse phase transitions, so it is surprising that chapter 12 is so slight. The principal cause of the diffuseness is undoubtedly composition fluctuation, but it is odd that Isupov so strongly discourages the idea that any other cause exists.

Chapter 13 deals with antiferroelectricity. The concept of an antiferroelectric is ambiguous. One has to accept a 'definition' involving a free energy 'nearly equal to' that of a ferroelectric. And Kittel's original thermodynamic potential uses thermodynamic variables which 'cannot play the role of conjugate thermodynamic variables'. Both ambiguities are recognized here, but it is typical of this book that they are stated 400 pages apart. The book discusses the situation in terms of links between antiferroelectric transition and improper transitions. A nine-point definition of antiferroelectricity is adopted, and the ensuing discussion is realistic and useful.

The book concludes with an exceedingly brief account of ferroelectrics with a magnetic ordering, and a very long account of oxygen octahedral ferroelectrics (already much discussed in earlier chapters), and others, organized in 32 sections material by material. The very important hydrogen-containing ferroelectrics, with their vast quantities of

literature, are covered by one table, twice abridged from a periodical source.

The translation seems excellent, and the misprints few (gadolimium; A. M. Class; L. E. Gross; termodinamical). It is good to see that a third of the bibliographic entries are not Russian-language references, but nevertheless there are imbalances. For example, of 13 leading papers quoted for the thermodynamic theory, 12 are Russian! On topics where especially few home references are given (dielectrics; electrooptics), the text is also very brief. At US $280 for 763 pages, it is very much at the upper end of the price range.

J. C. BURFOOT

Department of Physics
Queen Mary College
Mile End Road
London E1 4NS
England

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Growth of crystals. Vol. 12. Edited by A. A. CHERNOV. Pp. x+355. New York: Consultants Bureau, 1984. Price US $65.00.

This is an English translation of the Fourth All Union Conference on Crystal Growth held in Tsakhkadzar on 17–22 September 1972, published as part of the *Growth of crystals* series. The proceedings were first published in Russian in 1977 and it has taken until 1984 (some 12 years after the conference) to produce an English translation.

The book contains 54 papers divided between *Vapour growth* (10), *Hydrothermal and solution growth* (12), *Flux growth* (7), *Melt growth* (11), *Crystal characterization* (9) together with a short section (5) on *Crystal growth in magnetic and electric fields.* Most of the papers take the form of short conference communications but longer more authoritative contributions are presented on *Chemical vapour transport* (Kaldis), *Synthetic quartz growth* (Tsinober *et al.*), *High-temperature solution growth* (Neilsen), *Melt growth of YAG* (Bagdasarov), *Oxide crystals* (Charvat), *Production of highly perfect semiconductor crystals* (Mil'vidskii *et al.*) and *X-ray topography* (Kostyukova *et al.*). Of these papers Tsinober *et al.*'s paper on quartz is particularly attractive. The authors direct themselves to some nicely detailed studies of the role dislocations play in the hydrothermal growth of quartz and in particular to the inter-relationship between growth features on the pinacoid *z* face and dislocations observed by X-ray topography. Many of the other papers, for example Charvat's paper on crystal growth of oxides, discuss state-of-the-art work and are by now extremely dated in content.

The contributed papers vary considerably, noteworthy is Chernov's paper on growth-rate dispersion in potash alum; this was certainly timely in 1972. The choice of other papers to mention can only be subjective but Anikin's paper on the problems of crystallizing large mica crystals, Kirov's discussion of diffusion cell growth and indeed the papers on growth under electric field all make interesting reading. Most readers will find something of interest in these proceedings.

The translation is effective, illustrations and general presentation good but the scope of much of the work is limited and the degree of literature searching poor. However, some 80% of the papers here detail work from eastern Europe that would otherwise not be available, this makes it a worthwhile publication. From the age of the work this book will only appeal to specialist research groups in the crystallization/materials preparation area for whom it certainly provides important data of an archival nature.

KEVIN J. ROBERTS

Department of Pure and Applied Chemistry
University of Strathclyde
Glasgow G1 1XL
Scotland

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Books Received

The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.

Electronic and atomic collisions. Edited by M. J. COGGIOLA, D. L. HUESTIS and R. P. SAXON. Pp. lv+726. Amsterdam: North-Holland, 1985. Price Dfl 375.00.

The chemical physics of solvation. Part A: Theory of solvation. Edited by R. R. DOGONADZE, E. KALMAN, A. A. KORNYSHEV and J. ULSTRUP. Pp. xxx+555. Amsterdam: Elsevier, 1985. Price US $120.50, Dfl 325.00.