Notes and News

Announcements and other items of crystallographic interest will be published under this heading at the discretion of the Editorial Board. The notes (in duplicate) should be sent to the Executive Secretary of the International Union of Crystallography (J. N. King, International Union of Crystallography, 13 White Friars, Chester CH1 1NZ, England).

Index of French laboratories producing mineral crystals

The Montpellier Documentation Centre has just issued a new index of French industrial and university laboratories which produce mineral crystals. This index supersedes the index prepared in 1967.

This index may be obtained by sending the sum of three francs (postage stamps) or four international reply coupons to Professor Vergnoux, Centre de Documentation sur les Synthèses Cristallines, Université des Sciences et Techniques du Languedoc, Place Eugène Bataillon, F-34060 Montpellier Cedex, France.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (M. M. Woolfson, Physics Department, University of York, Heslington, York YO1 5DD, England). As far as practicable books will be reviewed in a country different from that of publication.

The physics of phonons. By J. A. REISSLAND. Pp.xi+319, Figs. 70, Tables 29. New York: John Wiley, 1973. Price £7·00.

The range of this book is narrower than its title suggests. The author has deliberately limited his task by examining 'the physics of phonons' only in the ideal, nonmetallic crystal in which lattice dynamics is manifested in a pure form, without the complications encountered in a real crystal by structural defects and in a metal by the electron gas. Such limitation of the range of material is quite justified and the author has fulfilled his objective with great skill and brilliance. Reissland's book is characterized by the logic of his treatment and the strict selection of his material and the reader is thus acquainted in the most efficient way with modern methods, theory and applications of lattice dynamics. The book gives clear physical interpretations of the material with which it deals even in those chapters dealing with the mathematical formalism (as, for instance, chapter 6 devoted to Green's functions). An as example of this we may note the author's attitude to the chief topic of his book – the phonon. On page 9 the author draws a distinction between the quantization of electromagnetic fields and of the fields of sound waves in solids, which are really quite different in spite of the mathematical similarity in the description of the two types of waves. The author emphasizes that the consideration of the mechanical vibrations of the lattice as a gas of Bose particles is possible only at the transition to Fourier space. Every phonon represents one of the quantized normal modes of the crystal, the totality of which is represented by the nodes of reciprocal space. The contents of the book show the usefulness of the concept 'phonon', but the author stresses once more that it is convenient (but not obligatory) to describe vibrational lattice states as particles.

The logical progression of the book is shown by the sequence of its chapters (1. Phonon. 2. Dispersion. 3. Vibrational states of a crystal. 4. Phonon statistics. 5. Phonon–phonon interactions. 6. The Green's functions formulation. 7. Lattice Dynamics as applied to ..... 8. Interaction of phonons with other 'ons'). The titles of the two last chapters need some explanation. In Chapter 7 the author examines from the viewpoint of lattice dynamics the energies and the life-times of phonons, the thermodynamics of equilibrium processes and the different physical properties of a crystal in the harmonic and anharmonic approximations – figuratively speaking about 'bare' and 'dressed' phonons. A broad range of physical properties of a solid is discussed in the same chapter: thermal expansion, elastic constants for crystals with and without a centre of symmetry, their temperature dependence, the attenuation of ultrasound, thermal conductivity, dielectric properties, piezoelectricity and ferroelectricity. In Chapter 8 there is considered the interaction of phonons with other 'ons', such as infrared phonons, photons of the three ranges of energy (optical, X- and γ-rays), neutrons, electrons, with generalized excitations (the so-called generalons), excitons, magnons and finally with the excitations caused by the imperfections of a crystal. This recapitulation of the contents of the two last chapters illustrates the range and interest of the crystal-physics topics treated by the author on the basis of lattice dynamics, the equations of which are written in the coordinate space of an object and on the base of the phonon set in the space of the impulses. The content of these chapters fully justify the title of the book. Some additional topics connected with the calculus of finite differences and with different models are given in a number of appendices. Every chapter includes a number of references – mostly papers and reviews that have appeared in the last few years. These references are the 'Ariadne threads' handed by the author to a reader in order to find his way through the voluminous labyrinth of the relevant scientific literature.

As a general observation let us look at the treatment in Section 4.8 of the thermodynamical heterogeneous process – melting – as a homogeneous process. On page 132, according to F. Lindemann, as the melting temperature is reached the amplitudes of the thermal oscillations are so large that the particles are no longer held in an equilibrium position by intermolecular forces and so the lattice is destroyed. Such a treatment may be applied to sublimation, when a sublimated particle looses its bonds with the other particles of a crystal, but it should not be applied to melting,