logical implications). The fourth chapter introduces quantum-mechanical considerations, notably the methods used to enumerate the micro-states of the system, and thus to distinguish between Bose–Einstein, Fermi–Dirac, and Maxwell–Boltzmann statistics. The last two chapters will be of less direct concern to mineralogists, covering the calculation of the entropy of monatomic and diatomic gases respectively. Among the appendices is an overdue critique of the misuse of the entropy concept in information theory, which could usefully have been extended to deal with some of the nonsense that has been written about the entropy of living organisms and biological macromolecules.

The book is well printed and generally free of errors, but for the price the reader is entitled to expect a binding strong enough to withstand the continuous use which this book deserves, rather than the flimsy paper covers provided.

R. G. J. STRENS

WOOSTER (W. A.) and BRETON (A.). *Experimental crystal physics.* 2nd edn., Oxford (Clarendon Press), 1970. ix+150 pp. 71 figs (incl. 12 plates). Price (in U.K. only) £3.

This edition contains 50 % more material than the 1st edition (M.A. **13**–685), and must be regarded as a development from it rather than a re-issue. There are additional chapters on dielectric properties, the Hall effect, crystal growing, ferroelectrics, semiconductors, and ferrimagnetics, and a substantial amount of re-writing of the earlier material, with omission of some of the more elementary optics. The plan of the work is the same, most chapters consisting of a succinct account of the theoretical principles, followed by a description of an appropriate apparatus and one or more worked examples incorporating actual experimental results. For a number of the experiments the apparatus described has been changed from 'do it yourself' equipment to instruments produced for the purpose by Crystal Structures Ltd. In general the c.g.s units used in the 1st edition are retained, though two of the new chapters use M.K.S. units. The only obvious error relates to the structure of barium titanate for which the diagrams are incorrect and the description misleading.

E. J. W. WHITTAKER

RATH (R.). *Theoretische Grundlagen der allgemeinen Kristalldiagnose im durchfallenden Licht.* Berlin, Heidelberg, and New York (Springer-Verlag), 1969. viii+133 pp., 109 figs. Price DM 48; $13.20.

This clearly arranged and superbly illustrated book presents a concise up-to-date survey of theoretical crystal optics. It thus fills a gap frequently noticed by mineralogists and material scientists alike; it also indicates the significance of modern computer techniques for processing complex optical calculations. The author's claim, that no mathematics beyond A-level standards is being used, appears, however, to be an understatement. A year or two of university mathematics would certainly help the reader to deal with Maxwell's equations and vector analysis.

The first two chapters give a mathematical treatment (based on Maxwell's equations) of anisotropy and isotropy, birefringence, and refractive indices, finally arriving at the indicatrix equation. There is an excellent tabulation of index planes and indicatrices of orthorhombic and monoclinic crystals, illustrating conditions for crossed, horizontal, and inclined dispersion.

Chapter 3 is of particular interest for any scientist employing transmitted light technique. It presents a critical survey of theories regarding the origin of the Becke Line and gives the author's mathematical derivation of this phenomenon—and of its occasional 'shortcomings'.

Interference of two waves with the same direction of vibration, and of two waves the directions of vibration of which are normal to each other, is considered in chapter 4: 36 diagrams summarize a variety of possible interference conditions at phase differences varying, in 30° steps, from 0° to 330°.

Chapter 5 discusses quantitatively the relations of light intensity and phase difference (with crossed polars only, and with test instruments or compensators). Of special interest are graphs for $I = f(\lambda)$, $\Delta = 0{\cdot}001 - 0{\cdot}022$. The logical continuation of these considerations is the practical and mathematical aspects of the use of test instruments, to which chapter 6 is devoted. Separate sections deal with 'Berek', 'Ehringhaus', and 'elliptical' compensators. The optical activity of quartz (as an important raw material for the optical industry) receives special attention.

Birefringence caused by homogeneous distribution of isotropic or anisotropic particles in an isotropic medium is surveyed in chapter 7. This reviews the classical calculations of Wiener and proposes a simplified model.

The theory of optical effects in convergent light (chapter 8) includes a mathematical deduction of isochromatic lines and isogyres, and quantitative parameters of the distribution of light intensity within the field of view. The author also suggests an improved method for the calculation of interference figures.

An excellent and exhaustive survey of the determination of the optical character is given in chapter 9. Computer-plotted diagrams illustrate the quantitative distribution of light intensity in uniaxial and biaxial, optically positive and negative crystals cut normal to the optical axis (or the acute bisectrix, respectively).

Finally, the effects of absorption are given brief consideration.

This book is a most welcome addition to the library of anyone interested in transmitted light microscopy of crystalline substances. Let us hope there will soon be an English edition!

E. F. STUMPFL

ADAMS (J. A. S.) and GASPARINI (P.). *Gamma-ray Spectrometry of Rocks.* (Methods in Geochemistry and Geophysics no. 10.) Amsterdam, London, and New York (Elsevier), 1970. xi+295 pp., 108 figs. Price £7·75.

The title of this book is misleading as only two out of the seven chapters have much bearing on the gamma spectrometry of rocks. The impression gained is that the text material was gathered with little regard to a pre-defined title. This is not to say that the book is badly written, but that it presents physical theory not related to gamma