The variable approach of different authors to their task—even within the standardized framework for each element—leads to some patchiness in treatment, but in general a satisfactory coverage is achieved, as in the excellent chapters dealing with the alkali metals and also in the cases of most of the less abundant elements where adequate quantitative data exist. The problem of treatment of 'major' elements is on the whole more difficult: the chapter on Mg in the present instalment happens, reasonably enough, to place greater emphasis on the occurrence of this element in waters, sediments, and low *P—T* environments in general than in igneous and metamorphic environments. A useful feature in this chapter is the recognition that for some purposes Mg^{2+} and Fe^{2+} must be considered together, but, while some phase diagrams are given for systems involving Mg sulphate, carbonate, and chloride, the reader must turn to other standard sources for oxide and silicate systems.

The chapter on oxygen (which was included in the first instalment of this volume) includes a first-class discussion of its isotope geochemistry, phase diagrams for some oxide systems, a good section on natural waters and the atmosphere, and a discussion of oxygen fugacity in natural systems, concluding with a short extra section on the experimental measurement and control of this parameter.

Treatment of the less abundant elements obviously varies greatly with the volume of available knowledge of their geochemistry; some authors compress most of their information into tables, while others are inclined to be more discursive. It is thus perhaps pointless to single out any particular chapters for comment, but that dealing with Sc is typical of the more useful ones. One matter brought home clearly by scanning through these volumes is still the relative paucity of data for many elements in metamorphic rocks and metamorphic reactions. Great efforts have clearly been made to keep the literature reference lists up-to-date at publication so far as possible. Most lists end in 1967 or 1968: a few include papers published or in press in 1969.

The work is clearly and attractively printed; there are some obvious misprints, but not enough to matter seriously. The loose-leaf format has its drawbacks, and the volumes do not easily lie flat when opened. As a work of reference the Handbook will quickly prove indispensable, and every geochemical library will need it. It is a rather expensive investment for the private subscriber. E. A. VINCENT

FAST (J. D.) *Entropy*. London (Macmillan), 1970. xii+339 pp., 77 figs., 26 tables. Price £2·00 (paper).

The appearance of this revised and enlarged second edition of Fast's well-known work on entropy brings relief to those oppressed by the growing weight of throughly unreadable books on thermodynamics. The writer has achieved extreme clarity of expression without oversimplification or loss of rigour, making this one of the very few books in the field that can be read with pleasure by the non-specialist reader. The text is also remarkably free of infelicities of translation (from the Dutch original).

The first three chapters deal with the entropy concept in classical thermodynamics, its statistical significance, and it applications (some of which have obvious minera-

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.