of concentrated attention to the mathematical equations, and I can only state that selective checking of key tables did not reveal any important errors (Appendix 9 sphenoical).

There are many ways of skinning a crystallographic cat, and different students prefer different approaches. If you teach crystallography, consider this book in relation to the alternative texts; I think that you will find that most students will prefer an elementary text with emphasis on practical examples. A few would then profit from this book. The price is reasonable considering the typesetting of mathematical symbols.

J. V. SMITH

Hazen, R. M., and Finger, L. W. *Comparative Crystal Chemistry: Temperature, Pressure, Composition and the Variation of Crystal Structure.* Chichester and New York (John Wiley and Sons Ltd.), 1982. xv+231 pp., 87 figs. Price £19.50.

Studies of the crystalline state, mostly at room temperature and pressure, but to a lesser extent at elevated T and P, have been carried out on a variety of compounds by material scientists, solid-state physicists and chemists, as well as earth scientists. The results of such studies are, therefore, widely distributed throughout the scientific literature. The authors prepared this book 'as an attempt to consolidate the diverse literature on the acquisition and analysis of high-temperature and high-pressure crystallographic data'. It is stated on the inside of the cover that the book '. . . provides a comprehensive treatment of the collection and analysis of crystallographic data . . .'. In fact, the treatment is far from comprehensive as the experimental techniques described and the examples chosen are mainly based, sometimes unwisely, on the authors' own excellent work. However, the result is an extremely well-written summary of the authors' interests and shows the great contribution they have made to modern crystal chemical research.

Part I of the book (106 pp.) deals with 'Experimental procedures' and has Chapters 2 to 5 on 'High-temperature crystallography', 'High-pressure crystallography', 'High-temperature, high-pressure crystallography', and 'The parameters of a crystal structure'. This section was prepared as a step-by-step guide to techniques for the operation of high-T and high-P single-crystal X-ray equipment. The high-P section is restricted to the design and operation of diamond cells; this technique is described in some detail with abundant, generally clear illustrations. The T and P calibration of the equipment is discussed and a novel suggestion is made that a material with two crystallographic directions having very different ratios of thermal expansion to compressibility could be used to estimate both T and P—calcite could be used for this purpose up to $\sim$ 12 kbar and $\sim$ 1000 °C. Appendix I to Part I gives a list of addresses for equipment and specialist consumable suppliers. Appendix II gives a listing of Dr Y. Ohashi's computer program (STRAIN) for calculating the strain ellipsoid for monoclinic and triclinic materials. Appendix III lists a program for calculating polyhedral volumes and distortions. Specimen input and output data are listed for both of these programs.

Part II (102 pp.) deals with 'Structural variations with temperature, pressure and composition'. Chapter 6 covers the effects of T and includes two extensive tables with extremely useful compilations of data on bond expansion rates in simple (e.g. oxides, halides) and more complex compounds (e.g. silicates). The formulation of the mean thermal expansion rates is slightly odd in that the reference value used is that at $\sim$ 510 °C instead of the more generally used value at room-T—the bond lengths at room-T are, in fact, quoted in the tables. Chapter 7 deals with the effect of P and includes another invaluable compilation of data on polyhedral bulk moduli, bond distances, and bonding parameters for a variety of compounds. Chapter 8 covers the effect of changing composition on structural parameters.

Chapter 9 deals with the effect of T, P and composition on continuous structural variations and discusses them as analogous variables. It is stated that the 'inverse relationship' between T and P 'is *not* universal, and cannot be applied arbitrarily'. In this regard it is important to remember that thermal motion effects at elevated T can cause shortening of estimated bond lengths (as discussed in Chapter 5). However, this point is apparently glossed-over in the discussion of the effects of T and P on α-quartz. The method of Distance Least Squares (DLS) gets a brief mention at the end of this chapter. In Chapter 10 the effect of P, T and composition on discontinuous variations is considered with reference to polymorphic inversions and phase stability relations. Good examples of displacive transitions are chosen from the authors' own research but the discussion of their work on layer silicates as an example of reconstructive transitions is not appropriate as it is more applicable to the conditions of *breakdown* of the phases rather than to their *inversion* to other polymorphs. In this discussion the suggestion that serpentine could form at 800 °C and 3 kbar is clearly incorrect. At this pressure the thermally most stable serpentine (antigorite) breaks down at $\sim$ 520 °C! The use of pyroxene–pyroxenoid relations as an example of martensitic transitions may also not be valid.

The format of the book is generally attractive; it is easy to read with very few typographical errors. Line drawings are clear but some photographs are rather dark. Lists of references are given after each chapter leading to some duplication—references are up to June 1981 and the authors' ask to be notified of any omissions! Author, Subject, and Formula indices are included.

The book will be extremely useful to crystal chemists active in the earth sciences and I imagine many of them will purchase their own copies. However, the cost at little under 10 new pence per page may be prohibitive to other than the converted!

C. M. B. HENDERSON

M. O'Donoghue. *Identifying Man-Made Gems.* London (NAG Press Ltd.), 1983, 223 pp., 75 figs., 16 colour pls. Price £14.95.

This text, which aims to be a working tool for gemmologists, gem dealers, and students, uses the term 'man-made' to mean any artificial substance whether or not it has a natural counterpart, the term 'synthetic' being restricted to those gemstones which have no natural counterpart. The book is in two parts, Part I dealing with 'Methods of Growth', and also with colouration, testing, and with the problems of photographing inclusions in cut stones. Here the work benefits greatly from the reproduction of sixty-one colour photographs of gem inclusions taken by Dr E. Gübelin of Switzerland.

In Part II, 'Identification', there are chapters on individual gems: diamond, corundum, emerald, beryl, alexandrite, spinel, garnet, quartz, opal, lapis lazuli, turquoise, organic materials, and glass. The various 'simulants' (natural or man-made gemstone treated to look like other more desirable gemstones) are also described, including the composite stones better known as doublets and triplets. In a final chapter less common man-made stones are described including forsterite, greenockite, phenakite, scheelite, tourmaline, and zincite but mention is also made of several synthetic materials not in general ornamental use but which may later come into their own, such as silicon carbide (with twice the dispersion of diamond), green periclase (containing Cr and Fe), and barium sodium niobate (*n.* 2.31). There is an appendix of trade names; these are all objectionable on mineralogical grounds and their use is to be discouraged but it is nevertheless useful to have them listed here. A bibliography of relevant journals is also given, together with addresses of the publishers.

Obviously this book bears some comparision to *Man-made Gemstones* by Elwell [*MM* **43**, 1073] and Nassau's *Gems Made by Man* [MA 81-2309] but the present text is both more up to date and better oriented to the British market.

R. A. HOWIE

Craig, G. Y., ed. *Geology of Scotland* (2nd edn.). Edinburgh (Scottish Academic Press), 1983. xiv + 472 pp., 194 figs., 73 sketch-maps. Price £35 cased; £17.50 paper.

In this welcome second edition, the text of 1965 has been completely rewritten by a dozen specialists on various aspects of Scottish geology to provide in fifteen chapters an authoritative statement on present views on the geology of this geologically important and fascinating country. The plate-tectonic hypothesis, propounded since the first edition was published, has enabled Scottish rocks to be placed in a new structural and petrographical framework. The increased availability of radiometric dates, the added impetus of the discovery of oil in the North Sea, and the flow of results from widespread drilling, together with advances in igneous and metamorphic petrology have led to a rapid increase in the understanding of the geology of the area.

The growth and structure of Scotland are succinctly described by A. L. Harris, before the detailed description of the Lewisian (Janet Watson), the Torridonian, Moine, and Dalradian (M. R. W. Johnson), Lower Palaeozoic stratigraphy, structure, and palaeogeography (E. K. Walton), Caledonian and earlier magmatism (P. E. Brown), Old Red Sandstone (W. Mykura), Carboniferous and Carboniferous-Permian igneous rocks (J. P. B. Lovell), Jurassic, Cretaceous, and Tertiary sediments (A. Hallam), Tertiary igneous activity (C. H. Emeleus), Quaternary (J. B. Sissons), and finally a chapter on economic geology (P. McL. D. Duff).

The general format is the same as the previous edition; the book is clearly printed and copiously illustrated, with 84 photographs in addition to 110 diagrams and 73 mainly geological sketch-maps. This is an essential volume for all earth science libraries and the paperback edition should be cheap enough to allow all students of Scottish geology to have a copy on their own shelves.

R. A. HOWIE

Walton, E. K., Randall, B. A. O., Battey, M. H., and Tomkeieff, O., eds. *Dictionary of Petrology: S. I. Tomkeieff.* Chichester and New York (John Wiley and Sons Ltd.), 1983. xii + 680 pp. Price £49.50.

This work is a monument to the interests and the filing system of petrological terms started by the