to use a restrained-least-squares refinement program. Restrained least-squares refinement for proteins is discussed by Wayne Hendrickson. As proteins are so large some way of reducing the number of entries in the normal matrix is needed.

This book is highly recommended for every laboratory (and computer room) bookshelf. It contains the old and the new, the practical and the thoughtful, and covers a wide range of topics with many good references. I raise one adverse criticism on the production of this photo-offset book; namely, the quality of printing of some of the articles. Certain chapters, produced faintly by a dot-matrix printer, are very difficult to read. They would have been better if they had been retyped or type-set. Apart from this the editors have done a first-class job of producing an up-to-date volume covering advances in computing in crystallography.

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Structural chemistry of silicates: structure, bonding, and classification. By F. LIEBAU. Pp. xiii+347, 136 figures. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1985. Price DM 163.00.

'The hardness of men's hearts makes an idol of classification, *but a knowing heart will use it as an aid*'. Thus ends this remarkable book with an optimistic twist by the author (in italics) of a statement by Samuel Butler. Silicates are perhaps among the least lauded of substances in human societies. Yet, six silicate species comprise about 95 volume % of the Earth's crust. They play an essential economic role from stained-glass windows and wine goblets to building stone, from computer chips to bricks and concrete. Without silicates and their products, civilization as we know it would not exist.

A very readable and highly informative book, it can be easily incorporated into a graduate level course sequence, particularly in ceramics, structural inorganic chemistry and the earth sciences. A bibliography with over 650 references to nearly every significant publication on silicate crystal chemistry is a valuable aid for literature search. The figures – most of them displaying scaled crystal structures – are elegantly crafted. A most important feature, rarely noted in such treatises, is the complementary and uniform quality of these drawings.

Ten major chapters comprise the book. Aspects of chemical crystallography make up six (Chapters 4, 5, 6, 7, 9 and 10). Chapter 4 is of key importance, for it reveals the symbols and principles behind silicate anion nomenclature. Because $[^{[4]}Si^{4+}O_4]^{4-}$ has mesodesmic properties, silicates polymerize in bewildering variety and to this day, a rationalization of rules for predicted silicate polymerization does not exist. Important classificatory principles involve the connections of the silicate polyhedra, usually tetrahedra. Linkedness (L) involves topologic fusions of the polyhedra (corners, edges, faces), connectedness (S) refers to the available corner-sharing elements, and branchedness (B) refers to the secondary dendrites which attach to the central spine and five types are discerned. The dimensionality (D) refers to the space in which the Si_xO_y cluster is described and multiplicity (M) to further polymerizations of similar units within the same space to form a larger aggregate in that space. Finally, a diversity of chain lengths in SiO_4 units can exist, the periodicity (P). The German word for the number of polyhedra before a chain segment translationally repeats followed by -er, specifies the periodicity. Alamosite, $Pb_{12}[Si_{12}O_{36}]$, is one of the largest, a *zwölfer* chain.

The remarkable feature of this book is its thoroughness. The description and portrayal of crystal structures is wonderfully reviewed in Chapter 2. Very few textbooks on mineral structure (and there are many!) do justice to this problem. Chemical bonding theory in all its ramifications appears in Chapter 3. Chapter 8 reviews the other classifications of silicates. This is another rich lode. Yet it is clear no classification is absolute. A classification must always serve some purpose (an added bonus would be built-in predictability of general properties, but this is rare!). This one, I believe, is an efficient working classification, a means toward sensible taxonomy and information retrieval. It is a language of crystal structure. Unfortunately, not all bases can possibly be covered. For example, I would create a new radical class for all $2r[Si_{2p}O_{5p}]$ (r = ring, p = number of tetrahedra in a ring), the so-called double rings. All these map with their connectivities conserved on a sphere. Recently, I was involved with the giant $[Si_{48}O_{120}]$ core in ashcroftine, but $p \neq 24$! It defines the truncated cuboctahedron, an Archimedean semiregular solid. All of these silicates whose connectivities define maps on a sphere, define polyhedra.

A magnificent book! At least ten years of effort went into it. The uniformity of figures, the sensibility of the tables, the beautiful layout, the thorough coverage and above all a book which befriends the reader (freely translating a remarkable late Bach cantata '... And take me by your hand/and gently lead me on.'). I doff my hat to author and publisher.

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Diamond. By G. DAVIES. Pp. x+255. Bristol: Adam Hilger, 1984. Price £17.50, US $28.00.

This is a delightful book, written not for the diamond specialist, but for the intelligent layman. Focusing on a single topic such as diamond might seem to be very narrow, even if glamorous, but the author leads the reader through wide-ranging tracts of solid state physics, surface physics, spectroscopy, chemistry and geology, not to mention history, politics, economics and gemology, whose variety and interest are an intellectual feast, educative and entertaining in the best sense.

The book begins with the ancient history, where one learns that the value we nowadays associate with diamond is of fairly recent vintage, dating approximately from Roman times only. Then we have the epic story of the nineteenth-century struggles to synthesize diamond, culminating with the first genuine success when the General Electric team in Schenectady announced, in 1955, their development of a reliable, repeatable process, and when, in 1957, commercial sales of synthetic grits began. This story is buttressed by a clear, methodical exposition of the underlying thermodynamic principles and the phase diagram for carbon. The modern scene (*i.e.*, as of 1983) is then surveyed: one learns with some astonishment that a substantially greater amount of diamond is today made artificially [80 million carats (16 tonnes)] than is obtained by mining (50 million carats), although the production of gems, the principal money-earners, still rests solidly on mining. This leads to the central portion of the book, which is devoted to the uses of diamond.

The fact that some 25 tonnes of diamond are produced and used annually today (compared with, say, 1920, when less than one hundredth of that amount was available *per annum*, or even with the mid 1950's, when about 4 tonnes *per annum* were produced) testifies to the fundamental importance of diamond to modern industry in the developed world. In mass terms, engineering applications easily dominate. This means cutting, grinding and polishing; but there is nothing crude about these processes, considering that, for different materials and different sorts of cutting, the synthetic techniques employ distinctly different conditions, creating diamond particles of quite different characteristics, each optimized for a particular requirement. Beside engineering uses, however, there are a host of other contrasting and remarkable applications, often highly specialized, each exploiting some combination of the unique properties that diamond has. Most of us know that diamond anvils are invaluable for the achievement of very high pressures in research, and, in daily life, all of us know about the diamond stylus for record players (having a lifetime 20 times that of its closest rival), but I will mention just three other examples. First, since diamond is so hard it can be ground to an exceedingly sharp edge, and since its surface is strongly water-repellant ('oily') too, it makes a superb surgical knife; this can have a radius of curvature of only a few tens of atoms at its cutting edge and, as tissue falls away from it directly, the cut is clean and strain-free. Second, since diamond has so low a specific heat at low temperatures, it allows the construction of a heat sensor for the measurement of radiation (as from a star), capable of detecting rates of energy as minute as 10^{-15} W. Third, since diamond is so transparent to light, especially infrared, and so inert to chemical attack, and also so strong, it was used (as a disc of 18 mm diameter, 2·8 mm thick) for the spectrometer window of the Pioneer space probe, monitoring the acid atmosphere and red-hot surface of Venus, in 1978. This is all scientifically fascinating. Following the description of these and other specialized applications there is a section on the impurities and atom replacements that occur in diamond, where even more up-to-date physics is effortlessly brought in. It is interesting, and as yet unexplained, that fractional replacement of carbon by nitrogen, to the extent of 10^{-4}–10^{-3}, significantly improves crystal growth and strength.

Each of these extraordinarily different uses and features of diamond is explained by Dr Davies in terms of the structural, chemical and physical principles of matter, so that each becomes an illumination of these principles of physical science. Thus, the bolometric application above is tied in with the physics of atomic vibrations, with quantum theory, and with Einstein's paper of 1907. All this is done so intelligently and so readably, neither blinding the reader with jargon, nor patronizing, that there is educative value in the book far beyond what the title would lead one to expect. The quantity of information is considerable, enhanced by numerous footnotes and many references for further reading; yet the digestibility of all this is ensured by the style adopted, including, for instance, the use of distinct subsections within the chapter, and the unobtrusive summaries that crop up every now and then in the text, especially at the ends of chapters.

For the old-fashioned crystallographer in each of us, there is a special message. Yes, gem-quality diamonds *can* now be grown synthetically: to the size of a pea, crystal clear, tinted as desired, almost flawless, and with the most beautiful display of complex, symmetrical faces. But the conditions for this are fearsome: five days' continuous maintenance of the mass of nickel metal solvent-catalyst at 55 000 atmospheres pressure, at a temperature of 1400 °C, and with a 50 °C gradient between the raw-diamond feedstock and the growing implanted seed. This is simply too expensive to compete with what nature has provided, already manufactured in the depths of the earth's crust.

The final chapter on gemstones, including diamond fakes and simulants, is exciting in its own right but only one small part of a fascinating book.

This book can be recommended as an excellent gift for any reasonably intelligent lay person, sufficiently interested in physical science. It is good quality armchair reading for anyone, including even the ordinary crystallographer. It is not unduly expensive, by present-day standards.

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International tables for crystallography. Vol. A. Edited by Th. Hahn. Pp. xvi+854. Dordrecht: Reidel, 1983. Price Dfl 385.00, US $165.00, £80.00; or, for individual crystallographers, Dfl 215.00, US $90.00, £45.00.

This book is a new version of the well known *International Tables for X-ray Crystallography*, Vol. I, *Symmetry Groups* (first edition 1952), familiar to every crystallographer. The difference in the titles of these two versions reflects the main aim of this new book – *IT*, Vol. A (1983), as we shall now refer to it – which, according to the editor's intention,