

Campbell, J. D. *Hidden Gold: the Central Norseman Story*. Parkville, Victoria (Australasian Institute of Mining and Metallurgy: Monograph 16) 1990. 128 pp. (2 vols), 81 figures and plates. Price \$A 75.00.

The two volumes of this monograph trace the development of exploration and mining of the main gold-bearing reefs in the Norseman district at Western Australia. Campbell commences the story of systematic exploration with the 1934 structural model of H. J. C. Connolly—a moderately dipping main shear system intersected by flatter dipping shears (his 'links') that produce gently plunging tabular bodies of mineable grade mineralisation.

He demonstrates the early exploration failures and successes and development of the 'favourable horizon' hypothesis to account for regional distribution of ore shoots on the main reefs. This is a documentation of continuous development of models to predict ore occurrence and the empirical process of testing and modifying these models as underground headings and diamond drilling provided new information.

This work is almost unique in that it covers the continuous exploration and development programme of a mining camp throughout its history of systematic exploitation and demonstrates how mines require adequate reserves to be blocked out well ahead of mining. Some readers might criticise Campbell for not including modern data on petrology/mineralogy, alteration assemblages or microstructural detail. Reference is made to recent academic studies but these volumes are essentially the story of empirical models where exploration is done with a jackhammer rather than a microscope.

The superb illustrations in this monograph, with 81 figures and plates, give a clear picture of the models proposed and provide a permanent accessible record of the geometry of the ore-bodies. It is a useful text for students of mining geology and perhaps also a good lesson for older exploration geologists. Both innovative geological techniques and drilling technology were developed by the people at Norseman: how many geologists have used Connolly's contour method to aid interpretation or the Clappison wedge to control their diamond drilling?

T. LIVERTON

Jaffe, H. W. *Introduction to Crystal Chemistry* (Student Edition). Cambridge and New York (Cambridge Univ. Press), 1989. xii + 161 pp. Price £15.00.

Jaffe, H. W. *Crystal Chemistry and Refractivity*. Cambridge and New York (Cambridge Univ. Press), 1989. xii + 335 pp. Price £55.00.

The text 'Crystal Chemistry and Refractivity' is presented in two parts. The first part on the principles of crystal chemistry and refractivity has also been published as a student edition entitled 'Introduction to Crystal Chemistry'. The review of 'Crystal Chemistry and Refractivity' that follows, therefore, implicitly also applies to the shorter student edition.

These volumes are aimed at senior undergraduates, and attempt to integrate ideas on bonding, atomic packing and cation distribution. These ideas are then applied in order to explain the physical properties of minerals, with special emphasis being given to their optical characteristics.

In part I of the larger volume, the initial chapters introduce the basics of atomic structure, electron orbitals and bonding. In Chapter 3 the covalent bond is discussed in more detail, and the structures that are adopted by compounds exhibiting this bonding are reviewed. Subsequent chapters concentrate on the ionic model, and introduce and apply Pauling's Rules. The ideas of symmetry and crystal field theory are presented, and their influence on crystal structures outlined. These chapters are followed by a more general discussion of crystal chemistry, the formation of solid solutions, and their effect on density and crystal structure. All the foregoing is fairly standard stuff, and presented very well. The final chapter of part I is quite unusual, however, with a detailed discussion of refractivity and polarisability. This is a welcome contribution, since most optical mineralogy texts do not discuss the physical origins of refractive index in any detail. Jaffe also provides students with a good review of the Gladstone-Dale laws, and their various extensions and applications.

Part I stands by itself (hence the shorter volume, 'Introduction to Crystal Chemistry', is quite viable, and may appeal to some students). Part II, only found in the larger volume, consists of a series of chapters in which the structures of silicates and oxides are discussed in the context of their physical and particularly optical properties. Throughout, the structures are illustrated by some clear and well produced line drawings. They are also illustrated by some rather less clear and unattractive black and white photographs of obviously home-made packing models. These packing models may well be ideal, hands-on teaching aids, but they do not translate well onto the printed page.

In conclusion, these are interesting books, with some valuable features. They are somewhat idiosyncratic, but nevertheless should be on the shelves of all institutions involved with mineralogy. I doubt, however, if they will catch on as major teaching texts.

G. D. PRICE

Fleischer, M. and Mandarino, J. A. *Glossary of Mineral Species 1991*. Tucson, Arizona (Mineral Record Inc., PO Box 35565, AZ 85740, U.S.A.), 1991. vi + 256 pp. Price \$15.00 plus \$1.00 postage and packing (\$2.00 foreign).

This, the sixth edition of what has become a truly indispensable reference, contains some 200 new mineral names, bringing the number of valid species close to 3500. New published results since the 1987 edition have caused changes to be made in about 900 of the older entries, and six new mineral groups have been added. As before, the listing contains the formula and crystal system for each mineral, together with a reference, generally to the *American Mineralogist*, giving the first description, or to a significant recent paper.

R. A. HOWIE

Nickel, E. H. and Nichols, M. C. *Mineral Reference Manual*. London (Chapman and Hall) and New York (Van Nostrand Reinhold), 1991. vi + 250 pp. Price £9.95.

This alphabetical listing claims to provide data for more than 3700 species, the names being based on the latest recommendations of the IMA Commission on New Minerals and Mineral names, including diacritical marks. Each entry includes the name, formula, currently accepted status (A approved by CNMMN, D discredited by CNMMN, G 'Grandfather' status, i.e. minerals introduced before formation of the CNMMN but generally accepted, P polytypes not specifically given approved species status, and Q questionable status), crystal system, hardness, measured and calculated density, type locality, classification (avoiding the use of mineral group names and based on a combination of letters and numerals), and selected literature references (including for the structure determination when available). There is also an abridged synonymy, mainly for recent changes; this, for example, includes sphene = titanite, but vesuvianite is in the main list. The style and price invites comparison with *Glossary of Mineral Species* now into its sixth edition (see above), but there are clearly a number of errors which will need to be rectified before the next edition (which we are promised will include a definitive list of type locality information).

R. A. HOWIE