

the chapter in which they show how comparisons of these ratios can be used to identify the environment from which the lead was derived. Sulphur isotopes, here discussed with carbon isotopes by H. Omoto and R. O. Rye, offer a means of distinguishing between magmatically derived sulphur and sulphur formed by the reduction of sulphate in sea water. Nevertheless, the applications of these stable isotope data appear less straightforward than they did a decade ago.

Finally, E. Roedder considers the case for regarding fluid inclusions as true samples of the ore fluids, and A. J. Ellis, B. G. Weissberg, P. R. L. Browne, and T. M. Seward discuss the actualistic evidence from explored and active geothermal systems.

For anyone working in the field of ore genesis this book is an essential reference, bringing the American literature up to date to 1975 and contributing many ideas, some of which require more rigorous investigation. The authors would not, I am sure, wish it to be regarded as the last word on the subject; the disagreements between themselves is a sufficient indication of that. But it does show an important branch of geochemistry in a healthy, developing condition. For the thermodynamic and other data, a standard notation has been introduced in this edition, which is a compromise between that used by some geochemists and that recommended by IUPAC.

KINGSLEY DUNHAM

Mitchell (R. S.). *Mineral Names: What Do They Mean?* New York (Van Nostrand Reinhold Co. Ltd.), 1979. xviii + 229 pp. £10.45.

Etymology is rather a minority taste, and even the great J. D. Dana gave it short shrift: 'As a name is a name after it is once adopted, the origin of the word is not of much importance' (*Syst. Min.*, 3rd edn., 1850, p. 171). Professor Mitchell must have set himself the task of fleshing out the dry bones, and has succeeded admirably; I can strongly recommend this book to all who prefer their learning to be pleasurable, and as a companion to the standard texts on descriptive mineralogy.

The early part of the book gives it its characteristic flavour, and twelve, too-short chapters (pp. 3–80) deal with names derived from persons, places, impersonal names (botanical terms, institutions, companies, tribes, mythological characters), chemical composition, Greek and Latin terms, terms from other languages, and with prefixes, suffixes, symbols, and rules for the formation of names. These sections could be fascinating if extended, but unfortunately they are confined to a few examples in each category. The main part of the work is

devoted to an alphabetical listing of names and their derivations (pp. 83–205), and closes with three short appendices, a general bibliography, and an index.

Writing a review tends to bring out the pedant lurking within, even though Ruskin is said to have described it as 'mere upholsterers' work', and to produce a hankering for the book that the author might have written—but didn't. I am thus led to regret the fact that the present author, unlike his predecessor A. H. Chester (*A Dictionary of the Names of Minerals including their History and Etymology*, 1896), chose to reject completeness in favour of a somewhat arbitrary selection based on M. Fleischer's *Glossary of Mineral Species* (1975), and to omit all but general references. The latter is not a serious fault, since most of the original references can be found elsewhere; but where biographical information is included that results from the author's researches, it ought to have been properly documented.

Personal names constitute by far the largest single class of roots of the mineral names listed, accounting for some 45% of the 2665 or so in the book, and of these nearly a quarter (about 300) need more information. Professor Mitchell has found much that is new to me, but if he had consulted the *World Directory of Mineralogists* by Font-Altaba and Hooker (IMA, 1970) he could have added another forty-five dates of birth; and L. J. Spencer's *Biographical Notices of Mineralogists Recently Deceased* (*Mineral. Mag.* vols. 19–25 and 28) add a few more, including E. Bertrand (1844–1909), J. B. de A. Ferraz (1883–1926), R. von Görgey (d. 1915), F. Grünling (1857–1919), T. Hohmann (1843–97), K. Jimbo (1867–1924), and V. Billiet (d. 1945, not 1944). Dates for J. Imhof (1902–69), H. (not J.) Jordan (1808–87), and R. Sinner (1890–1960) are in *Die Mineralien des Binn-tales* (H. A. Stalder *et al.*, Bern, 1978). No mineral reference work seems to have identified the correct Robert Ferguson (1767–1840), a landowner, politician, and collector, of Raith, near Kirkaldy, Scotland. Eötvös Lorand (1848–1919), the Hungarian physicist, is to be found in many reference and biographical works under his family name, Eötvös.

There remains a considerable number of eponymous persons for whom no dates nor other personal data appear to be on readily accessible record, and it is fortunate that many are still alive and able—if reminded—to supply the missing details. Collectors, dealers, mine managers, and others, unless they have published or achieved fame (or notoriety) in some other manner, usually escape notice in reference works; and the task of pursuing them in newspaper files or public records can be

endless. I would appeal to all readers of this review to write to Professor Mitchell (or to myself) with any additional biographical information that they discover.

It has been a stimulating experience reading the book, which must be regarded as but an introduction to the subject. I very much hope that there will be a second, revised and expanded edition, that will include more data, more references, and many of the names omitted from this one; for by such is the history of our science enriched.

P. G. EMBREY

Cox (K. G.), Bell (J. D.), and Pankhurst (R. J.). *The Interpretation of Igneous Rocks*. London (George Allen & Unwin), 1979. xiv + 450 pp., 197 figs., 35 tables. Price £8.95.

In some branches of geology, new textbooks appear rather frequently but this is not true of igneous petrology when the publication of a new book is something of an occasion. This book represents a welcome addition to the literature on igneous petrology because it has a quite new and interesting approach to the subject.

To the reviewer's knowledge none of the authors has had first-hand experience of experimental petrology but they have nevertheless made the application of experimental studies a major part of the book, the treatment of this topic, amounting to 174 pages. In the introduction to the phase equilibria section it is clearly stated that the approach is chiefly empirical and is not based on thermodynamics. There is a modern tendency to belittle this empirical approach and to consider it to be out of date. When the Geophysical Laboratory was founded in 1907 the 'wise men' at that time had suggested that the new science of thermodynamics would permit the calculation of phase relation in all the silicate systems from thermodynamic data. When Dr. N. L. Bowen retired in 1952, he told this reviewer that, although forty-five years had elapsed since the founding of the laboratory, not one chemical system had been calculated or modelled with the precision which could be attained by experiment. The same observation is still true after seventy-three years. The two approaches are complementary as Cox, Bell, and Pankhurst make abundantly clear. On a similar theme there have always been critics of the experimental approach to petrology who have felt it their mission in life to point to the simplifying assumptions that the experimentalist or theoretician must make, and the most persistent of these criticisms is that few natural rocks represent equilibrium assemblages. However true this is, the assumption

that equilibrium is attainable must be the starting-point of all studies of the failure to attain equilibrium.

The book begins with fractionation and goes on to discuss variations in the composition of magmas. An alkali-silica plot is used to show the range of variation of these oxides for different rock types and the nomenclature, of the more common volcanic rocks, is illustrated in this diagram. Although the authors state that their diagram is not intended to form a system of classification, it seems likely that others will use it for this purpose.

The phase equilibrium section is divided into two parts, the first is contained in three chapters which take the reader as far as ternary systems with ternary solid solution. The discussion of partial melting is particularly useful because, as the authors point out, the natural case will never be represented by perfect fractional melting or perfect equilibrium melting and so they discuss 'incremental batch melting'. The description of ternary equilibria in systems in which solid solutions are present considers both equilibrium crystallization and perfect fractional crystallization. This section has in the reviewer's opinion one slight failing — it does not stress that the tangent rule cannot be applied to a liquidus field boundary in the same way as it is applied in systems without solid solution. In short, it is not possible to specify under equilibrium crystallization conditions when a field boundary changes from co-precipitation of both solid phases to resorption of one phase and precipitation of the other, unless the bulk composition has been specified. The second part is concerned with quaternary systems and experimental work on natural rock systems, with and without the addition of water. Between these two sections there are chapters on the interpretation of variation diagrams and on petrography of volcanic rocks. The authors have divided the purely experimental part into two sections, presumably because they have found from their own teaching experience that a course in undiluted experimental petrology may be like drinking even the best of malt whiskeys, it should not be taken in excess in one sitting, but is best tasted over a period of time and may even be diluted with water, despite the popular notion that this is a heresy.

The next section of the book deals with the petrography of the plutonic rocks and the interpretation of evidence for their mode of intrusion and cooling. The final two chapters are on trace elements and the use of isotopes in the study of igneous processes. Even igneous petrologists are divided into two classes: those who are interested in the distribution of minor or trace elements and those who are not. This part of the book should