

Friend discusses the link between charnockite formation and granite production in southern India, where both these rock types may be attributable to the dilution of a CO₂-rich volatile phase by H₂O (released during hydration), which initiated partial melting. Weaver and Tarney argue that although the Lewisian granulites of NW Scotland are strongly depleted in heat-producing elements (K, Rb, Th, U), the Indian charnockites are enriched in these elements, which removal of a partial melt cannot explain, though the concept of a chemically evolving fluid flux in the deep crust is consistent with available chemical data.

Partial melting is favoured by Olsen to explain the Front Range migmatites of Colorado, a process also invoked by Johannes for Scandinavian migmatites. For the migmatites of southern Brittany, Brown emphasizes the importance of isothermal melting at 700–800°C while the pressure diminished from 10 to 5 kbar.

The papers are each commendably brief and with the references collated at the end of the volume. Most of the contributions offer reviews of published work and give an up-to-date summary of research on migmatites and the genesis of granites and granulites. This book will provide a useful source of reference for both teachers and students.

R. A. HOWIE

Mangone, G. J., ed. *American Strategic Minerals*. New York (Crane Russak Inc.), 1984. xvi + 153 pp., 15 figs. Price \$19.50.

This latest addition to the growing literature of Western strategic minerals* may interest the mineralogist concerned about future supplies of minerals, but it is primarily intended for the United States citizen who needs to appreciate more fully the essential role of mineral supplies from abroad in maintaining at once the most advanced consumer economy and one of the two largest arsenals in the world. The volume contains the texts of six papers presented at a national conference held at the University of Delaware, Wilmington, in December 1982, organized by Professor Mangone who, besides occupying the Chair of International Law and Organization and directing the Center for the Study of Marine Policy, is also a Fellow of the Geological Society of America. In his brief foreword he claims that 'without access to minerals under secure conditions and at reasonable prices, the strength of the United States could be quickly dissipated' and he adds the view that the two world wars of the present century were started, by Germany and Japan, to gain access to minerals. No

doubt many will regard this last view as an oversimplification, but no one should doubt that access could have serious implications for future international relations.

Professor J. C. Kraft of the University of Delaware ('Strategic Minerals and World Stability') illustrates the world distribution of major deposits of the ores of Fe, Cr, Ni, Mn, Au, Ag, Pt, Pb, Zn, Cu, Al, Ti, Li, and Be by means of maps that bring out its marked non-uniformity. He shows very frankly why it is desirable for the USA to maintain good relations with South Africa as its major supplier of chromite, diamonds, platinum group metals and gold; and he makes the new suggestion that gold may, after all, prove to be the most significant strategic mineral. He stresses the gravity of the coming resource crisis and wishes to communicate the realities of a finite world to the lay public.

V. A. Cammarota ('American Dependence on Strategic Minerals') and J. D. Morgan ('Future Demands of the United States for Strategic Minerals'), both of the US Bureau of Mines, contribute authoritative data which show that although the United States is, and will remain for another century, a major producer of many minerals required by its industry and commerce, it is becoming increasingly dependent on imports of about twenty minerals, some of which are not found in quantity with its borders. There is little likelihood of a reversal of this trend. A tabular comparison covering 36 mineral commodities shows that the position of the European Community and of Japan is markedly worse as regards import dependence than that of the USA, while the USSR is very nearly self-sufficient.

Professor J. R. Moore of the University of Texas ('Alternative Sources of Strategic Minerals from the Seabed') is not content merely to discuss the potential for Ni, Co, and Zn in deep-sea ferromanganese nodules, the recovery of which remains hamstrung by international discord, but proceeds to advocate the continental shelf and coastal placers within the United States' territorial limits as an alternative source of strategic minerals including those of Cr, Pt, Au, Ti, Zr, P, and even of Pb, Zn, and Cu. The restriction of this zone to 32 km wide means that the total area is small compared with the American landmass, and it is difficult to envisage substantial contributions even if the expensive work of prospecting can be undertaken.

A. L. Mendelowitz and J. E. Watson, both of the International Division of the US Accounting Office contribute a concise account of United States overseas mining investment between 1966 and 1979, showing that investment in Developing Countries ranged from 17 to 36% of the total. Finally, J. W. Curlin, editor of the journal *Strategic Materials*

* See also *Mineral. Mag.* (1984), 48, 305.

Management discusses the political dimensions of the problem and here, on internal United States policy matters, we pass beyond the scope of the *Mineralogical Magazine*.

KINGSLEY DUNHAM

Nassau, K. *Gemstone Enhancement*. London and Boston (Butterworths), 1984. xiv + 221 pp., 42 figs., 69 photos (28 in colour). Price £20.00.

This is a work designed primarily for the gemmologist and jeweller, but earth scientists and a wider public will find it fascinating reading. The book is comprehensive over the whole 'gemstone enhancement' field and should quickly become a standard reference work—up-dated editions will, no doubt, follow as new techniques develop.

The author deals first with the history of gemstone treatments and (unlike many other writers) has consulted the original works of C. Plinius Secundus (AD 23–79), translations of the Stockholm Papyrus, P. Holm (c. AD 400) and many other original works. This 20-page chapter is provided with an excellent bibliography. In the chapter devoted to heat treatment, the approach is also historical. The important factors in specifying the conditions of the heat treatment are clearly set out in tabular form, as are the effects of heat upon gemstones. Other topics of current interest include oxidation–reduction in blue sapphire, silk and asterism in blue sapphire, impurity diffusion, heat-induced cracking, and the reconstruction and clarification of amber.

The section on irradiation treatment commences by listing the rays and particles used. The apparatus and methods used for the production of the various irradiating emanations are described in some detail, as are the various changes which are induced. Precautions to be observed in dealing with radioactive gemstones are explained. Enhancement procedures described in Chapter 5 include impregnation by bleaching, by coloured and colourless oils, waxes and plastics; surface modifications including surface colour coating, foil back, mirror back, and star-back; lasering and glossing; composite gemstones produced by overgrowth, surface different colour, or asterism. Doublets, triplets, artefact-included, and gel-filled composites are also explained. The short chapter on gemstone identification is concluded by a discussion on the question of the disclosure of enhancement processes.

The main part of the book is a most informative alphabetical listing of the gem species known to be treated. The historical development of the treatment method is described as are the methods used and the theory behind them. Bibliographies are provided for most species.

There are excellent appendices (A) on heating,

including descriptions of furnaces used, (B) on irradiation, (C) on the fifteen causes of colour, and (D) a list of purveyors of suppliers and services—mostly from the USA.

There is an important source-book, clearly written and arranged for ready reference. Fortunately for European readers the price is related to British production costing; it is very reasonable for this comprehensive work.

E. A. JOBBINS

Borrowdale, G. J., Bayly, M. B., and Powell, C. McA., *Atlas of Deformational and Metamorphic Rock Fabrics*. Berlin, Heidelberg, and New York (Springer-Verlag), 1982. xiv + 551 pp., 27 figs., 622 photos. Price DM 138.00 (£35.00).

This volume consists primarily of 234 pages of black and white photographs. Most of them are of naturally deformed rock, in outcrop or thin section. A small minority are of experimentally deformed rock or rock analogues. Two plates illustrate meteoritic material. Each page of photographs is accompanied by a descriptive text, allotted the full facing page, but rarely occupying more than half of it. Photographs are grouped under eighteen heads: almost all are good prints. Many of them are both beautiful and full of interest.

The emphasis of the Atlas is on the appearance of cleaved rock in cross-section. Only in relatively few cases is there any expressed interest in the third dimension. No attempt is made to provide a view of the history of investigations into cleavage, nor to provide reference material in its absence. No attempt seems to have been made to encourage the inclusion of material from classic sites. I was glad to see a photograph from Anglesey. The spotted Cambrian slates of North Wales, however, are referred to only with respect to what is called here a disaggregation structure.

Three preliminary chapters offer an analysis of the difficulties of making significant observations on cleavage and useful inferences from them. The distinction of close-set jointing from cleavage is mentioned and an empirical test rejected (p. 2). No reference is made to any genetic grounds for distinction. Varieties of cleavage are distinguished, but cleavage itself is not defined. In contrast, the text accompanying Plate 74 (J. G. Dennis), makes clear its author's view that for fractures to constitute a cleavage, a grain fabric is required, and the rock must have been strained so that the principal axis of shortening is at an obtuse angle to the fractures.

I respect the purpose of the preliminary chapters but wonder at their effectiveness. In my view they represent misplaced effort. The concerns they express should have been made evident through