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

Borrowdaile, 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

individual contributions and the way they were organized. For example, why is there no list of the titles of photographs? Why is there no list of localities? Why have individual contributions been allowed to vary so much in the information they provide on context and location? Was it never considered that readers might wish to collect samples of their own of figured material? The so-called subject index (it also contains the names of contributors) is inadequate. Almost all the items listed under USA, for example, are repeated without cross reference under Appalachian.

The Atlas is without doubt a very useful addition to the literature on cleavage. It probably is too expensive for individual purchase, but ought to be in libraries used by structural and metamorphic geologists. It must be much regretted, however, that it is not better designed to aid systematic use. All I can suggest to the new reader is that he gets to know the photographs well enough to be able to impose his own system on them.

R. NICHOLSON

Sunagawa, I., ed. *Materials Science of the Earth's Interior.* Tokyo (Terra Scientific Publishing Company) and Dordrecht, Holland (D. Reidel Publishing Company), 1984. 653 pp. with figs. and plates.

Although data on growth, morphology, and properties of natural and artificially obtained crystals are amply presented in the available scientific journals and in special monographs, geoscientists have always looked for a condensed, comprehensive treatment of such topics, specifically applied to problems arising from studies of processes operative in the Earth's crust and interior. The book edited by and with the participation of the well-known specialist Professor Sunagawa fills such a gap. The book comprises articles by leading scientists in Japan from nine research groups, along three principal lines: experimental studies of the material of the Earth's interior, characterization of materials derived from the Earth's interior; and a theoretical group. The topics of the book are dealt with in seven chapters: silicate melts; crystal growth and synthesis of large single crystals; electron and crystal structures; analysis of thermal and stress histories; solid materials in the Earth's interior; interaction between solid and fluid components; and technical developments. All articles within each chapter are of particular interest, each one backed by numerous references and original contributions. Titles like Structures and some physical properties of silicate melts of geological interest (I. Kushiro), Growth of crystals in nature (I. Sunagawa), High-temperature crystallography of olivines and spinels (Y. Takeuchi *et al.*), Application of transmission electron microscopy to the studies of decomposition and exsolution of minerals (N. Morimoto and M. Kitamura), Ultra-high pressure phase relations of the system MgO–FeO–SiO_2 and their geophysical implications (E. Ito), Petrology of materials derived from the Upper Mantle (K. Aoki), Hydrothermal synthesis and phase relations of the polymetallic sulphide system (A. Sugaki *et al.*), and many others give a cross-section of the content of the book. It would be no exaggeration to say that the latter provides an excellent overview of present-day scientific thought in Japan in this field.

The book is suitably illustrated and much credit is due to the publishers for their fine printing and layout. The book is primarily intended for geoscientists, but it could definitely benefit scientists in fields, such as chemists, physicists, geophysicists, crystallographers, etc. who would like to have an up-to-date idea of the problems tackled for elucidation of the state and the dynamics of materials making up the Earth's crust and interior. As it is said in the preface, it 'will form a good starting point of future development of the science'.

I. KOSTOV

Donnay, G., and Donnay, J. D. H. *The M. A. C. Crystallographic Laboratory Manual.* Montreal (Mineralogical Association of Canada), 1984. 84 pp., 15 figs., 8 photos, 4 charts. Price $15.00 (Canadian).

This is a handbook of practical assignments designed to form part of a course in crystallography for students of mineralogy. It was originally prepared for students of McGill University, and has now been reprinted by the Mineralogical Association of Canada for wider use. The manual contains eleven exercises, covering morphological, structural and X-ray crystallography. The morphogical exercises include the identification of crystal forms from wooden models, the derivation of crystal forms by drawing stereograms, and the use of the Wulff net to study a triclinic crystal. X-ray exercises include the measurement and interpretation of precession, rotation, Weissenberg, and powder photographs.

Each assignment is a substantial exercise which on completion would give the student a good understanding of the topic studied. For example, in the first assignment the student is asked to learn to identify and name all forty-seven crystal forms. Background information and guidance are given with each exercise, including many practical hints