

properties, an appendix on interference figures, an ordinary index, and a gem index which also serves to give a résumé of the properties of each stone mentioned. The reviewer prefers not to specify the numerous misprints included in the book, as these are not so important to the student as are the several serious errors noted. None the less, it is hoped that these, too, can be eliminated in any future editions of what potentially is an important book.

B. W. ANDERSON

Elwell (D.). *Man-made gemstones*. Chichester (Ellis Horwood Ltd., distributed by John Wiley and Sons Ltd.), 1979. 192 pp., 46 figs., 9 colour pls. Price £15.00.

The history of the progress of mineral synthesis from its roots in the nineteenth century to its present-day state of successful activity is a fascinating subject in itself to any scientist, and since it is the gem minerals, starting with ruby, emerald, and diamond which have always been favourite targets of the crystal growers it is of vital importance to anyone connected with the jewellery trade to be well informed about the products themselves and their distinguishing characteristics.

Since 1926 when H. Michel wrote his remarkable work *Die Künstliche Edelsteine* until the present day there has been no comprehensive book dealing with the subject, and the details concerning each newly manufactured gemstone have had to be culled from articles in the gemmological journals. The appearance of Elwell's *Man-made Gemstones* is thus very welcome, the more so in that it is attractively produced and clearly written without any unnecessary padding. The fact that Dr Elwell is himself a crystal grower of repute enables him to write with authority on the complicated techniques involved and it is also a pleasant surprise to find him sympathetic to those in the jewellery trade and gem testing laboratories who have to cope with the difficulties entailed in discriminating between natural and man-made gems.

The chapters deal with the gemstones more or less in the chronological order in which their synthesis was achieved, beginning with the first partial successes by French scientists in the nineteenth century culminating in the dramatic breakthrough to commercial importance brought about by Auguste Verneuil's invention of his inverted oxy-hydrogen blowpipe (chalumeau) whereby, early in the twentieth century, factories sprang up in districts where electric power was cheap, producing gem-quality corundums and spinels in millions of carats annually. The successful preparation of ruby, emerald, and diamond each entailed a long

history of failure or partial success before reaching its present degree of efficiency, and the story of each is recorded with accuracy and just sufficient technical detail in the book, aided by plentiful diagrams and with a long list of references to the relevant literature at the end of each chapter.

The synthesis of diamond, though only in the form of tiny crystals of industrial quality, became an established fact in 1954, when a team of scientists of the General Electric Co. of America first announced their (independently authenticated) success, but the later technical triumph by the American scientists in making gem-quality diamond in a variety of colours proved too costly a process to vie with natural gem diamonds. As a result, though man-made *industrial* diamonds have long competed with fair success with natural crushed boart, the tempting commercial field for synthetic products which can simulate diamond with fair success has been assiduously explored and we have had in succession (each complete with its advertising ballyhoo and fancy names to cloud the truth) synthetic white spinel, rutile, strontium titanate, yttrium aluminate, and finally cubic zirconia produced in quantity by various methods to serve as substitutes for this most universally desired gemstone.

Quartz is another man-made mineral which has great industrial importance owing to its piezoelectric properties which enable it to control frequency in radio transmission and in electronic clocks and watches. Production grew apace in World War II and although there is no demand for colourless synthetic quartz as a gem material there has recently been significant success, particularly in Russia, in producing synthetic quartz in green, blue, and yellow colours which have now entered the market and posed for the gemmologist some difficult problems in identification.

Outside the field of crystalline gemstones, Pierre Gilson, who had already scored a notable success in the growth of fine emerald crystals (a field pioneered by Carroll Chatham) proceeded to conquer the problem of producing supremely beautiful gem opals in his laboratory, following this with more dubious versions of lapis lazuli, turquoise, and even coral which, as an organic growth, cannot be truly synthesized.

In his last chapter rather misleadingly entitled 'The Value of Gemstones' Elwell gives a brief but useful summary of the methods by which synthetic stones can be distinguished from their natural counterparts, and the book ends with an odd assortment of appendices which includes a recipe for growing your own rubies, a list of suppliers of man-made gemstones, and a bibliography, followed by an index.

The reviewer has no hesitation in recommending this book to anyone who is interested in its highly specialized subject.

B. W. ANDERSON

Atherton (M. P.) and Tarney (J.), Editors. *Origin of Granite Batholiths: Geochemical Evidence*. Orpington, Kent (Shiva Publ. Ltd., 9 Clareville Road, Orpington, Kent BR5 1RU), 1979. viii + 148 pp., 57 figs. Price £4.50 (\$9.00), + 50p (\$1.00) per copy for postage outside the UK.

This book is comprised of eleven papers which deal mainly with geochemical data pertinent to the origin of granite (s.l.) batholiths and chemically evolved volcanics erupted at destructive plate margins. The papers were originally presented at a one-day meeting of the Geochemical Group of the Mineralogical Society held at Liverpool in May 1979, and it is much to the credit of the editors and the publishers (Shiva Publishing Ltd.) that the book was published (in paperback form) before the end of 1979. This must be a record!

The eleven papers include reviews of published and unpublished data; however, much of the new data is presented in diagrammatic form only and the authors indicate that it will be published elsewhere. The references for all eleven papers are collected together at the end of the column, a feature which has presumably assisted in rapid publication.

The first paper in the book by Pitcher briefly discusses the over-all volcanic association of batholiths in different tectonic environments. Three of the subsequent papers are concerned with chemical aspects of Andean batholiths and volcanics. Atherton, Court, Sanderson, and Taylor review the trace element geochemistry of the Peruvian coastal batholith and Thorpe and Francis discuss the petrogenetic relationships of Andean intrusive and volcanic associations, and in particular address the possibility of crustal contamination during their development. Tarney and Saunders describe the trace element geochemistry of some Andean plutons in Antarctica and draw comparisons with Proterozoic and Archaean crustal rocks in E. Greenland and Scotland.

Three papers focus on the Caledonian granites of Britain and Ireland. Stephens and Halliday deal with the major element and Sr isotope variations in the Galloway pluton and consider the role of crustal contamination in its petrogenesis. Pankhurst reviews Sr and Pb isotope results and other trace element abundance data for the Foyers and Strontian intrusions and discusses possible models for their petrogenesis. The emplacement of the Caledonian Ardara pluton is dealt with by Holder.

The remaining papers include a topical and general review of Sr and Nd isotope data of volcanics formed of destructive plate margins by Hawkesworth and an account of I- and S-type granites (as defined by Chappel and White) occurring in the tin belt plate margin environment of SE Asia. Brown considers the possible changes in batholith emplacement through time in relation to proposed models of continental growth. Lastly preliminary sulphur isotope data are presented for well-defined I- and S-type granites by Coleman.

The book is by no means a complete discussion of geochemical evidence for the origin of granite batholiths, but then it was presumably never intended to be so. However, it is a timely review of some of the progress that is being made by geochemists in understanding the petrogenesis of granite batholiths. Its value is much enhanced by the speedy publication and it is likely to be a valuable reference book for undergraduates, graduates and researchers alike. At a price of £4.50, many will consider it worthwhile purchasing the book.

R. K. O'NIONS

Levinson (A. A.). *Introduction to Exploration Geochemistry*: second edition (with chapters by R. B. McCammon and B. Hitchon). Wilmette, Illinois (Appl. Publishing Ltd.), 1980. xxiv + 924 pp., 267 figs., 1 coloured pl. Price \$35.00 (Student price \$22.00).

Readership spans experienced exploration geochemists as well as the students, geologists, scientists in allied fields, and prospectors towards whose requirements the author directed his attention. The production of a second edition is fully justified by the rapid advances that have been made since the writing of the first, and the author has taken the opportunity of incorporating improvements suggested in reviews of the earlier book.

The format adopted for the new work is unorthodox; the first edition has been retained unaltered save for the insertion of a list of corrections, and the new material added in the form of an addendum of some 310 pages entitled 'The 1980 Supplement'. It is understood that this will be available separately. Chapter titles in the addendum are identical with those in the first edition while chapter numbers, figures, and tables are distinguished with an added A. Page numbers of the corresponding entry in the first edition are given alongside both second and third order headings, facilitating reference back to the earlier material. If additional discussion is unjustified, the heading is followed by 'No additional comment'; similarly,