BOOK REVIEWS

Bowie (S. H. U.), Kvalheim (A.), and Haslam (H. W.), editors. *Mineral Deposits of Europe. Volume 1: Northwest Europe.* London (Inst. Mining and Metallurgy and Mineralogical Society), 1978 (publ. 1979), xii + 362 pp., 106 figs., 1 coloured geol. map. Price £30 (£25 to members of either Society).

This is the first of five volumes on the geology of European ore deposits. There is an introductory chapter on the main geotectonic and metallogenic features of the region and each of the six national chapters incorporates a short introduction to the geological framework of the territories described.

The present volume is concerned with the mineral deposits of Finland, Sweden, Norway, Denmark and Greenland, the United Kingdom, and Eire. The introductory chapter by F. M. Vokes gives a very clear summary of the metallogeny of north-west Europe and also provides useful tables of the production of various ores and concentrates in 1974.

Anyone who has tried to gather information on the geology of European ore deposits has come to realize that no concise description of the ferrous, non-ferrous, and non-metallic mineral deposits of Europe is available in English or, indeed, at all. The chapters on the Scandinavian countries are particularly useful in this respect. The Finnish deposits are described in detail by the late P. Isokangas, who includes much data supplied by mining companies. The Precambrian bedrock geology of Finland has long been familiar due to the pioneering work of Sederholm and Eskola but the Finnish ore deposits have been less well known. The Swedish mineral deposits include the iron, manganese, and sulphides of Bergslagen (central Sweden) separated to the north by granites and gneisses from the Skellefte district, the main producer of complex sulphide ores, and the iron and copper deposits of Norrbotten. These and many other orebodies are described in detail by E. Grip, including the apatite-bearing iron ore deposits of Kiruna type and their production figures as well as the complex sulphides and stratabound Pb–Zn ores of the Swedish Caledonides.

The major Norwegian tectonic and metallogenic provinces involve Precambrian rocks and the Caledonides. The ore deposits are described in detail by J. A. W. Bugge, ranging from the quartz-banded iron ores of Finnmark, through the ilmenite deposits of Egersund anorthosite province, Ni–Cu deposits in norites and peridotites, the niobium and rare earths of the Fen carbonatite complex to the stratabound Pb–Zn–Cu–Fe sulphide deposits of the Caledonides. H. Sørensen, B. L. Nielsen, and F. L. Jacobsen describe briefly the clay, evaporite, and diatomaceous earth deposits of Denmark but a greater part of this chapter is devoted to the metalliferous deposits of Greenland, including the banded iron ores at Isua, chromite in the Fiskenæsset anorthosite, the Ivigtut cryolite body (now entirely mined out), and the storehouse represented by the agpaitic nepheline syenites and associated rocks of Ilímaussaq (uranium, thorium, rare earths, zirconium, niobium, and beryllium).

The United Kingdom contribution by Sir Kingsley Dunham, K. E. Beer, R. A. Ellis, M. J. Gallagher, M. J. C. Nutt, and B. C. Webb considers British deposits in terms of the Caledonian Foreland, the Caledonides, the post-Caledonian pre-Variscan cover, the Variscides, the post-Variscan cover (Permian and Trias), and the later Mesozoic and Tertiary. The epigenetic deposits in the Carboniferous and the mineral zoning in the Pennines are described as are the deposits in Devon and Cornwall linked with Armorican magmatism. Mineral deposits in the post-Variscan cover are dominated by the commercially important evaporite deposits, including rock-salt, dolomite, gypsum, anhydrite, celestine, and potash. The final chapter on the Republic of Ireland by C. E. Williams and P. McArdle, stresses the substantial base-metal deposits in the Lower Carboniferous limestones; these include the Navan lead–zinc orebody, the Tynagh base-metal deposit containing lead, zinc, copper, silver, and baryte, the Silvermines deposit with lead, zinc, and baryte, and the Gortdrum copper mine.

The approach in this important series is for the chapters to be written on a national basis, which is clearly sensible from the point of view of available expertise and on the basis of the eventual readership. The arrangement of descriptions of ore deposits is within a metallogenic framework of epochs and provinces or districts rather than on a commodity basis. This approach is not helped by the arrangement of the index: thus the seeker after information on Cornish cassiterite, for example, finds no entry under cassiterite; if one turns to tin there is indeed an entry 'Cornwall, U.K.' but no page number, and only when one looks up 'Cornwall, U.K.' itself is one given a string of ten page references enabling one to extract the desired information somewhat hidden in paragraphs about Variscides, stockworks, greisen-bordered vein

swarms, etc. It could be argued no doubt that the reader might not know that the main tin mineral is cassiterite, but what would be made of the description of the ore from the Benallt mine in North Wales as containing alleghanyite, banalsite, and granophyllite (the latter presumably a misprint for ganophyllite)? Elsewhere from the index it is apparent that wolfram occurs only in Sweden whereas tungsten occurs in Norway, Finland, and the UK as well as in Sweden.

In other respects the volume is well produced and very free from printing errors. The numerous geological sketch-maps and sections, the tables of production statistics, and the selected references combine with the text to make this an essential series for all mining companies, universities and colleges, government planners, and all organizations requiring mining and mineral statistics, as well as for private and public libraries.

R. A. HOWIE

Applied Geochemistry Research Group, Imperial College of Science and Technology. *The Wolfson Geochemical Atlas of England and Wales.* Oxford (Clarendon Press: Oxford University Press), 1978. 14 pp., 48 maps (44 in colour), 1 coloured map, and 2 overlays in back pocket. Price £35·00.

The Wolfson atlas is the product of research that had four major aims: first to investigate 'the potential of widely spaced stream-sediment sampling coupled with multi-element analysis as a rapid means of detecting broad-scale regional patterns' in element distribution; secondly the 'development of methods for the automated mapping of such data by computer'; thirdly 'the explanation of the role' of this type of reconnaissance geochemical mapping in 'mineral exploration', 'agriculture, pollution, and public health'; and fourthly the establishment of 'criteria for the interpretation of the data in terms of the different user interests'.

The compilation of the Atlas involved the collection and analysis of some 50 000 samples and the data processing and mapping of over 1 million analytical results. The sampling was completed in ten weeks by sixty students at a cost of £22 000. The analytical and data processing cost are not detailed.

The first two aims of the research appear to have been largely achieved. The Atlas comprises a series of attractive colour maps, which clearly depict the regional distribution patterns of a number of elements. These maps can be overlaid by transparent maps of the solid and superficial geology when comparison shows that the geochemical patterns closely reflect the geology. The value of the maps is constrained by the small scale of 1:2 million and by the fact that the data was 'smoothed' in order to reduce sampling and analytical noise. At this scale the question is posed as to whether the maps provide much information not already available from a knowledge of the geology of the country. In particular can the map of calcium distribution be justified? Larger-scale maps providing more detailed information remain on open file at Imperial College.

The fourteen-page text that accompanies the fifty-one maps details the procedures used for sampling, analysis, data processing, and map compilation but provides only a brief outline on interpretation and on the geological significance of the results for different user interests. Hence the third objective receives brief attention and the fourth is barely touched.

The Atlas provides broad scale information that may assist user interests concerned with planning at national level. For regional considerations more detailed information is essential. The Atlas has successfully demonstrated the application of the techniques used. Whether these techniques would be relevant in other countries where distances are greater, roads fewer or non-existent, the geology of a differing order of complexity, and the user interests of a differing degree of sophistication must be assessed in relation to input needs and costs. The production of the Wolfson Geochemical Atlas of England and Wales required a considerable input, the full costs of which are not known. Its market is likely to be limited by its price of £35.

M. M. COLE

Verwoerd (W. J.), editor. *Mineralization in Metamorphic Terranes.* Geol. Soc. South Africa, Spec. Publ. 4, Pretoria (J. L. van Schaik Ltd.), 1978. xvi+552 pp., 272 figs., 11 geol. maps, 1 coloured plate, 56 tables. Price R15.00 ($18.00).

This beautifully produced volume contains thirty-two papers, and three extended abstracts, presented at 'Geokongres 75', the Sixteenth Congress of the Geological Society of South Africa, held at the University of Stellenbosch, 30 June–4 July 1975. It includes much important geochemical, mineralogical, and petrological material (for full list of authors and titles see MA79-2158), as well as being of direct interest to economic geologists. Meteoriticists will be intrigued with the suggestion that the Bon Accord nickel deposit, Barberton, long famous for a range of unique Ni-bearing minerals, is of meteoritic origin. All Earth Science libraries should have this volume.

R. A. HOWIE