

BOOK REVIEW

Environmental Mineralogy: Microbial Interactions, Anthropogenic Influences, Contaminated Land and Waste Management, edited by J.D. Cotter-Howells, L.S. Campbell, E. Valsami-Jones and M. Batchelder. Mineralogical Society of Great Britain & Ireland, London, 2000, xii + 414 pages, hardback. [ISBN 0 903056 20 8, Price £50 (US \$70); £32 (US \$45) for members of the Mineralogical Society; £39 (US \$55) for members of associated Learned Societies.]

This is the latest addition to the Mineralogical Society of Great Britain & Ireland's series of thematic volumes, and follows the Society's Winter Meeting 'Environmental Mineralogy' held at Aberdeen in January 1999. It is the first of this series to be published by the Mineralogical Society itself, and achieves a high standard of presentation and content, at a reasonable price.

The book presents us with a set of fifteen papers arranged into four sets, each accompanied by a concise and informative introduction provided by the editors. These concentrate on 'Mineral-microbe interactions', 'Anthropogenic influences on mineral interactions', 'Minerals in contaminated environments' and 'Minerals and waste management', respectively. The format invites comparison with the EMU Short Course volume 'Environmental Mineralogy' edited by D.J. Vaughan and R.A. Wogelius, also published recently. However, these books should be seen as complementing each other rather than duplicating.

The four sets of papers in the Mineralogical Society's volume give a structured examination of key aspects of mineralogy in the environment. The first deals with the micro-organisms that interact with rocks, soils and sediments. To me, these papers seemed particularly valuable in dealing with processes at the boundary between inorganic minerals and the biosphere, and could well be expanded as a book in their own right. After the introduction by J.D. Cotter-Howells, there follows a review of mineral-microbe interactions by J. Berthelin, C. Leyval and C. Mustin, illustrated by discussions of 'real-life' examples that have been investigated. Then come three review papers dealing with mineral dissolution by bacteria (E. Valsami-Jones and S. McEldowney), solubilization of minerals by fungi (G.M. Gadd) and weathering of rocks by lichens (M.R. Lee). These concentrate on the micro-organisms and how they function within the geosphere, and in doing so provide a platform to understand the inter-dependence between the biosphere, soil and weathering.

The next set, following its introduction by L.S. Campbell, comprises three papers dealing with acid rock drainage and a single paper devoted to deterioration of building stone. C.N. Keith and D.J. Vaughan discuss sulfide oxidation and contemporary investigations of surface reactions affecting common sulfide minerals in acid rock drainage. D.A. Jenkins, D.B. Johnson and C. Freeman provide a vivid description of mineral reactions, hydrochemistry and microbiology in acid mine drainage arising from the legacy of copper mining at Mynydd

Parys, Anglesey, Wales. Between these, is a discussion by J.L. Jambor of sulfide weathering, acidification and neutralization potential in relation to acid drainage of sulfidic mine tailings. The fourth paper, by C.A.S. Alves and M.A. Sequeira Braga, departs from the main theme in describing the role of soluble salts in the decay of granite masonry in the city of Braga, Portugal.

The third set, introduced by E. Valsami-Jones, looks in a more generic fashion at specific groups of minerals in relation to contaminant (mostly heavy metal) behavior in soils, sediments and the remediation of contaminated land. K.A. Hudson-Edwards describes metal retention by manganese oxide minerals in river channel and floodplain sediments, using examples from rivers draining the orefields of the North Pennines in England. W.E. Dubbin reviews the intercalation of contaminants into layer silicates by examining surface reactions and complexation processes. This is one of the few papers here that deals with clay minerals in their own right. K.V. Ragnarsdottir and L. Charlet give a detailed examination of uranium minerals, solubility and transport, that also touches on toxicity, ore formation, mining and tailings degradation. Finally, M.E. Hodson, E. Valsami-Jones and J.D. Cotter-Howells examine the occurrence and stabilization of metals and, briefly, organic pollutants by phosphate minerals, emphasizing evidence from experimental research in relation to the potential of these minerals in controlling pollution.

The final set looks at three aspects of waste containment. A. Dyer describes at length evidence going back to the 1960s for the capability of zeolites to scavenge low concentrations of radioisotopes from effluents and their uses in treating radioactive wastes, soils, animals and man as well as in waste repositories. A.T. Donohew, S.T. Horseman and J.F. Harrington describe experiments into gas transfer through clay pastes between the liquid and plastic limits, by bubble migration and rapid fracture propagation but not by intragranular flow within the paste matrix. In the relatively brief final paper, R.K. Rowe and C.B. Lake discuss use of modified bentonite clays in geosynthetic clay liners for municipal landfill, emphasizing hydraulic conductivity and differences in design and construction, in relation to the performance of composite liners for waste effluent containment.

These are authoritative, contemporary reviews that cover a wide range of subjects. Despite some eclecticism with regard to style and topic, the editors have succeeded in drawing together a structured mineralogical approach to key environmental processes. The papers are densely written, with extensive lists of references, but could perhaps have included more illustrations. The book is recommended to students and researchers in the relatively new field of environmental mineralogy, as a benchmark source book for some of its more important topics. Moreover, it has much to offer to the wider community of environmental geochemists and microbiologists.

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