BOOK REVIEWS

Parker, A. and Rae, J. E. (Eds.). *Environmental Interactions of Clays*. Berlin, Heidelberg and New York (Springer-Verlag), 1998, xiv + 271 pp. Price £49.00. ISBN 3-540-58738-1.

It is difficult to think of any environment at the Earth's surface where clays are not present. Often major components of soils, rocks and sediments, they are also ubiquitously dispersed throughout the world's rivers, lakes and oceans, as well as through the very air we breathe. Given the extraordinary properties of clays, it is not surprising then that their interactions with all manner of substances are central to many diverse environmental processes, issues and concerns. The variety of chapters in *Environmental Interactions of Clays* reflects this diversity and the editors have done an admirable job in bringing together the collection of subjects and disciplines represented in this book, which stems from a conference of the same name held at the University of Reading in 1996. Together the individual contributions cover four main themes concerning the interactions of clays in relation to: the containment of wastes; the properties of soils; the behaviour of toxic elements and compounds; and effects on human health.

A brief introductory chapter by Rae and Parker outlines terminology, the environmentally significant properties of clays, and the scope of environmental studies involving them. It is usefully pitched at a level undoubtedly aimed at students and those unfamiliar with clays. However, in parts, such as the classification of clay minerals, it is possibly oversimplified and may confuse rather than elucidate the subject for this audience. Reference to the following chapters is also limited and a criticism that might be levelled at the book as a whole is the lack of more general cross-referencing both between chapters and to the companion volume in the series. Although in a book of this nature this is obviously a high ideal. The second chapter by Putsch considers the transport of radionuclides in smectite clay. The chapter is written very much from the Swedish perspective, but nonetheless illustrates the wide range of issues that need to be addressed to determine the likely performance of bentonites as sealing materials in high-level radioactive waste repositories. The following chapter by Dickson provides a concise account of the very many roles and functions of clays and oxide minerals in soils. Teachers looking for material on which to base courses will probably find this chapter one of the most useful in the book, largely due to the clear style in which it is written. The interactions of non-volatile micro-organic pollutants and clay minerals is the subject of the chapter by House. The relevant properties of both clays and organic pollutants are discussed along with the use of various isotherms to describe sorption processes and the mechanisms of sorption. The chapter concludes with a case study of the sorption of pesticides by sediment in the R. Windrush, which demonstrates the importance of attempting to understand the functional behaviour of sediment in terms of its mineralogical composition. By far the largest contribution to the book is that of Jackson on the biogeochemical and ecological significance of interactions between colloidal minerals and trace elements. It represents a detailed and extensively referenced review of the subject with useful emphasis on the role of biological processes in many interactions and concludes with a useful summary of suggestions for future work. From this and the preceding chapter it is clear that detailed characterization of both natural and experimental clay materials and close collaboration between mineralogists, biologists and chemists are essential to make progress in these areas. The following chapter on the use of clay barriers in landfills by Arch is written very much from the practical point of view in terms of the geotechnical considerations and material properties required of clay liners for landfill sites. A large part of this contribution uses a case study to illustrate the detailed quality control and assurance procedures that are often now required by local authorities to ensure that that clay liners are effective. The final contribution by Wagner, McConnochie, Gibbs and Pooley details the range of approaches applied to assess the biological effects of exposure to clay mineral dusts. They point out that clay minerals are the most common dust particles found in the lungs of the general population. Data are presented from investigations on kaolinites, palygorskites, vermi-

culites, micas and montmorillonites with emphasis on the multidisciplinary approach necessary to determine the potential health risks of exposure to clay mineral dusts. A useful glossary of medical terms is also given.

As a whole, both the contents and style of the various contributions have created a diverse and valuable source of information that will hopefully serve to stimulate the cross-disciplinary research and exchange of knowledge necessary to more fully understand the 'Environmental interactions of clays'. S. HILLIER

Blair, C., Bury, S., Grimwade, A., Harding, R. R., Jobbins, E. A., King, D., Lightbown, R. W. and Scarratt, K. *The Crown Jewels: the History of the Coronation Regalia in the Jewel House of the Tower of London*. London (Stationery Office), 1998. Volume I: *The History* (xxiv + 812 pp) and Volume II: *The Catalogue* (xxiv + 630 pp). Price (Royal Quarto: quarter bound in leather; edition limited to 650 copies) £1000.00. ISBN 0-11-701359-5.

These two sumptuously produced volumes, with text and photographs printed on substantial, silk-surfaced paper, record the results of research into the history of the English Coronation and the associated regalia in greater detail than has ever before been possible. Volume I is concerned entirely with the origins and history of the Coronation ceremony, but it is in Volume II that detailed examination of the Crown Jewels is documented, revealing many discoveries and new insights about the history of the gemstones. Each item has been newly photographed and the team of three gemmologists have taken the opportunity to examine the jewels with sophisticated gemmological techniques. This review will be concerned therefore only with Volume II (although the complete set was loaned for the purpose of review).

The catalogue illustrates and describes the regalia, including not only the numerous crowns, orbs and sceptres, but also the various swords, plate and textiles. Each chapter begins with a brief 'abstract' giving the size and general appearance of the item, before a general description of the history of the various formats and vicissitudes (as when the plan by the adventurer Thomas Blood in 1671 to steal the Crown Jewels was frustrated, but not before he had battered the arches of the Crown with a mallet the better to conceal it beneath his cloak: repair to Crown and Orb, £145). The description of each major item is concluded with a 'Gemmological commentary', and it is here that we get a listing of the size and weight of all the major gemstones, including details of their surface imperfections, chips, minor scratches and any visible inclusions.

The Imperial State Crown in brief has 2868 diamonds, 17 sapphires, 11 emeralds and 269 pearls, but interest lies mainly in its larger individual gemstones. The so-called Black Prince's Ruby has been in the Crown Jewels since around 1367 and for many centuries was described more correctly as a balas ruby. It is actually a large polished crystal (~170 ct) of red spinel with three vestigial octahedral faces and was pierced for use as a pendant in the Middle Ages; at the top it supports a small ruby, and on the back of its mounting is a small plaque recording the recent history of the crown. The Stuart sapphire (~104 ct) at the rear of the crown (replaced at the front by the Cullinan II diamond) is a fine blue, cut with an oval brilliant crown and step-cut pavilion; at least one of the seven visible crystal inclusions appears to be a zircon. The octagonal rose-cut St Edward's sapphire set in the cross is a fine velvety blue (ε 1.760, ω 1.768); scratches on the crown facets appear to be the result of testing the hardness of the stone, a rather basic form of gem testing, now generally avoided. The large cushion-shaped brilliant on the front of the Crown is the second largest stone (317.40 ct) cut from the Cullinan diamond; it has a maximum diameter of 45.4 mm, is free of internal reflections and its colour-grade in the basket setting compares with a D masterstone.

The Cullinan I diamond, formerly known as the Star of Africa I, is a pear-shaped brilliant mounted in the head of the Sceptre with Cross, and is the largest cut colourless diamond in the world; it weighs 530.20 ct when free of its setting. The rough Cullinan diamond (3025 ct) discovered in the Premier mine, South Africa, was purchased by the Transvaal Government and presented to the reigning monarch, King Edward VII (the package was escorted on board ship to England by armed guards; this, however, was a dummy operation, the diamond being sent by ordinary mail. Bath packages arrived safely). The Cullinan was handed over to the firm of Asscher in Amsterdam for cutting and was successfully cleaved into two main pieces weighing 2029.9 and 1068.1 ct. We learn that, contrary to popular legend, the cleaver Joseph Asscher did not faint