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 ($\varepsilon$ 1.760, $\omega$ 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

afterwards; he is quoted to have said later that "No Asscher would faint over an operation on a diamond. He's much more likely to open a bottle of champagne". The faceting and polishing of the gems cut from the rough Cullinan took three polishers, working 14 hours a day, eight months to complete. There are many other gems in the Sceptre (332 diamonds, 31 rubies, 15 emeralds, 7 sapphires, 6 spinels and an amethyst); the positions of all of these are indicated and it is remarked that although most of the rubies are of a fine purplish-red colour they are accompanied by two spinels in positions where rubies might be expected, and that some or all of the spinels may have been used in the belief that they were rubies. The amethyst 'sphere' (~32.8 mm diameter) is composed of two joined hemispheres to form part of the 'monde' at the head of the sceptre; pleochroism is noticeable.

The Crown of Queen Elizabeth the Queen Mother contains some 2800, mainly cushion-shaped, diamonds, but the main feature is the Koh-i-nûr (Mountain of Light) cushion-shaped brilliant. When this stone (186 ct) was ceded to Queen Victoria following the annexation of the Punjab in 1849, its Indian cut was considered to be poor, and it was recut in 1852 to 105.6 ct. It is classified as a type II diamond, and though by modern standards the cut is far from perfect in that the large culet is parallel with the table facet giving the impression of a black hole in the centre of the stone, it is nevertheless described as still being full of 'life'.

There are many other crowns and parts of the regalia described in detail in this outstanding work. Mention must be made of the Sovereign's orb, for example, which is in gold, set with jewels in enamel settings. In the meticulous detail recorded in the Gemmological Commentary we learn that the jewels comprise 365 diamonds, 9 emeralds, 9 sapphires, 13 rubies, one amethyst and one glass! Two or three centuries ago, it was common to hire diamonds and other jewels for use in Coronation ceremonies. Thus at the Coronation of George II in 1727, diamonds valued at £12,000 were hired for £480 and set in St Edward's Crown and three sceptres. Nowadays the opposite situation applies: the Stuart sapphire originally on the front band of the Imperial State Crown was moved to the back in 1909 to accommodate the Cullinan II diamond in its place, and the 'spare' sapphire previously at the back is now free from the regalia and is displayed in the Martin Tower, Tower of London.

One of the many delights of this work lies in the numerous colour photographs of the regalia, many of the close-up views of the individual stones having been produced by the team of gemmologists, including Alan Jobbins, Ken Scarratt and Roger Harding, and also Frank Greenaway, the photographer from the Natural History Museum. The price of these two magnificent volumes may prevent one from dashing out to buy a set, but this work records for posterity far more details of the gemstones in the regalia than have hitherto been available. We should each try to ensure that it is available for consultation in a nearby university or regional library.

R. A. HOWIE

Vertéz, A., Nagy, S. and Süvegh, K. (Eds.). *Nuclear Methods in Mineralogy and Geology: Techniques and Applications*. New York and London (Plenum Press), 1998, xiv + 555 pp. Price $ 135.00. ISBN 0-306-458322.

Many geoscientific problems can be tackled by using one or more methods based upon nuclear processes. Some methods, such as XRF, have been used widely and routinely for some time. Others, such as accelerator mass spectrometry (AMS), have been applied in the earth sciences fairly recently and/or require equipment that is relatively inaccessible to most researchers. This diversity and rapid development make it time-consuming for a researcher to acquire an up-to-date overview of all available methods. This volume goes some way towards providing such an overview and is very welcome.

This hard-bound volume has 555 pages of closely-spaced text (page size of 16 cm × 24.9 cm; up to 57 lines of text per page). The work contains 10 chapters, an appendix, a subject index and a mineralogical index.

The first chapter covers many basic principles of nuclear physics. Subsequent chapters deal with major methods: neutron activation analysis; nuclear reaction prompt gamma-ray analysis; energy of geological materials using ion and photon; radioactive dating methods. The final two chapters concern various nuclear methods for 'dating' groundwater and for 'isotopic palaeoclimatology'. Each chapter includes a bibliography that contains references up to the mid-1990s.

The appendix is a valuable data compilation, comprising 4 tables, occupying 36 pages. These tables give fundamental physical constants,