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,

relative natural abundances of stable isotopes, and details of radioactive isotopes, including half-lives, modes of decay (alpha, beta, etc.) and gamma energies. The final table lists the binding energies of orbital electrons.

Generally, the work is well-presented. However, many, usually minor, lapses in clarity occur. It is apparent that most of the authors are not native English speakers; terms like 'experimentist' are common. Additionally, certain terminology used in this volume, such as 'magmatectonical setting', is not used universally. Typographical errors are also common, some chapters averaging perhaps one error per page. More seriously, terminology is occasionally explained poorly. Many diagrams are also reproduced poorly, although essential information is usually presented adequately. However, some exceptions occur, including figures that omit important details, such as axis labels.

Unfortunately, the format of the bibliographies will limit their usefulness. Each one lists entries in the order that they are first referenced within the text. Numbers, rather than authors' names, provide the means of cross-referencing. Furthermore, each entry omits a title and includes only the authorship, bibliographical source and date of the reference.

The first chapter, entitled 'Basics of nuclear science' is a major strength. This chapter occupies about 20% of the volume and provides fundamental information concerning nuclear processes. A further positive feature of the book is the detailed description of the theory underpinning each method appearing in chapters 2 to 9. However, some significant omissions and imbalances occur. Equally important analytical techniques may receive dramatically different levels of coverage. For instance, the book describes AMS in only 6.5 pages, but devotes 91 pages to Mössbauer spectroscopy. More serious are some notable omissions in the consideration of applications. The chapter entitled 'Radiometric methods for dating groundwater' is particularly restricted in scope. It is really only applicable to 'groundwater dating' in a very restricted sense, namely placing constraints on recharge times. Only ^{14}C, tritium and ^{85}Kr data are considered. In fact, 'groundwater dating' can also involve determinations of solute or water residence times within particular rock formations or structures, or solute residence times within the water. Such 'dating' can employ other radiometric methods for obtaining temporal information (e.g. methods based on ^{36}Cl, ^{129}I, U-series isotopes and ^{4}He). However, these methods are not considered in this chapter.

Many applications of the analytical methods are described. However, the volume as a whole is biased towards the theory behind these methods. It is also a pity that no chapter summarises the relative advantages and limtations of different analytical methods, or considers how different methods might complement one another. Similarly, within each chapter there could have been a more integrated treatment of each analytical method's advantages, limitations and applications. For example, the chapter on neutron activation analysis describes the ways in which some petrogenetic problems were addressed using trace element data. An appraisal of the unique advantages and drawbacks of NAA for acquiring such data to solve these particular problems would have been helpful. The most poorly integrated chapter is the one on 'isotopic palaeoclimatology'. Unlike others, this chapter considers no analytical methods, but describes how isotopic data constrain past climates within the time interval between the Quaternary and the Proterozoic. This overview is informative, but without being related specifically to the analytical methods considered elsewhere in the volume, the chapter is misplaced in this work.

Nevertheless, the editors and authors must be congratulated for producing a volume that covers many varied methods in considerable depth. The work should appeal primarily to mineralogists, petrologists and geochemists who already have a basic knowledge about the various 'nuclear methods' that are available, but who wish to acquire more in-depth information about these methods. This volume is probably too expensive to warrant purchasing by most individuals. However, the book should appear on the shelves of any serious earth science library.

R. METCALFE

Charlet, J.-M. (Ed.). *Centenary of the First Studies of the Shaba Geology (Zaïre) Stratabound Cu Deposits and Associated Mineralizations.* Brussels (Academie Royale des Science d'Outre-Mer), 1997, 482 pp. Price 900 BEF.

The volume contains 22 papers, of which 18 are in French and four in English, presented at the International Cornet Symposium in September 1994 at Mons in Belgium. This symposium