operator 'and' redundant. If one seeks to restrict the search and find references that contain only 'alkali feldspar' as two adjacent words then it is necessary to enter "alkali feldspar" using double quotes (single quotes are ignored). This use is explained in the manual but it is hidden away on page 25 and should have been given more prominence. The operator *near* can also be helpful in delimiting searches and the software provides the option to chose how far apart are the searched words. Searching for alkali *near* feldspar with *near* set to 4 words would find not only any reference to alkali feldspar but also 'alkali and plagioclase feldspar'.

The software has considerable flexibility, it supports the use of wild cards and parentheses can be used to generate combination phrases. Nevertheless, some care must be taken in the search routines to allow for the limitation of the software. Searching for selenium references and entering the symbol Se, for example, will generate 1948 'hits'. The software is not case-specific and here it finds any reference to Se, se or SE! Searching for 'basalt' gives 2503 hits, but searching for 'basalts' gives 3183 different hits. These are limitations that are common to other database search protocols and should not be seen as a criticism of *MinSource specifically.*

The most productive approach to database search is to start with a broad topic and then 'refine' the search to focus on the area of interest. *MinSource* has good facilities for refining searches and with some experience (and persistence) the software works well and is rapid. However, all this, may be of little avail to users because of the wholly inadequate printing facilities. Having found and limited your references to some dozen or more relevant abstracts the user is only allowed to print abstracts one at a time. This is not only very inconvenient, it leaves the user with the impression that they are not allowed hard copy of more than a small number of abstracts. The user will normally have already paid for a hardcopy of *Mineralogical Abstracts* and there is no valid reason to limit access to further copies. These printing facilities within the software must be changed if the publishers intend this to be a serious user-friendly database.

Overall *MinSource* is a major step forward offering individual users affordable access to a major geochemical and mineralogical database. Given improvements to the printing options and some refinement of the documentation it should be well received by the mineralogical and geochemical community. The uses of the system are considerable and all researchers in the field should be encouraged to take up the 30 day free demonstration offer to see for themselves the usefulness and overall time savings that can be achieved. J. N. WALSH

Potts, P.J., Bowles, J.F.W., Reed, S.J.B. and Cave, M.R., Eds. *Microprobe Techniques in the Earth Sciences*. London (Chapman & Hall), 1995. xi + 419 pp. Price £29.95 ISBN 0-412-55100-4.

This book is the sixth offering in the *Mineralogical Society Series* (Great Britain & Ireland), and continues the high standard that we have come to expect of this series. In October 1992, The Mineralogical Society and the Royal Society of Chemistry convened a two-day meeting on 'Microanalysis Techniques in the Earth Sciences' with the intention of reviewing the current state of the field and predicting future directions of development; the book reviewed here is an outgrowth of that meeting.

The general principles of microbeam analysis and the array of microbeam techniques currently available are reviewed by J.V.P. Long in Chapter One. It is good to see an overview of this type as the introduction to such a volume, and this chapter should be required reading for all graduate and advanced undergraduate students in the Earth Sciences; the message that "...a *combination* of these procedures will be appropriate...during the course of an investigation" cannot be repeated too often.

The following nine chapters deal in detail with specific techniques or groups of techniques, and it must be noted that the authors have all been involved in the development of these techniques since their inception. S.J.B. Reed reviews electron-microprobe analysis (EMPA) in Chapter 2, from principles of the method to instrumentation to data-reduction procedures. P.E. Champness covers analytical electron microscopy (AEM), focusing particularly on quantitative aspects of X-ray analysis and electron energy-loss spectroscopy (EELS). D.G. Fraser covers the range of techniques associated with nuclear microprobe analysis: proton-induced X-ray emission (PIXE), proton-induced gamma-ray emission (PIGE), Rutherford backscattering spectroscopy (RBS), nuclear-reaction analysis (NRA) and elastic-recoil-detection analysis (ERDA). In view of the growing importance and potential of these techniques for the Earth Sciences, I found this chapter far too short, essentially giving only cursory mention to PIGE, NRA, RBS and ERDA. In order to catch the interest of graduate students sufficiently to encourage them to use these techniques in their work, it is usually important to give several examples of the effective use of new techniques; in this regard, this particular chapter could have been three times its current length. J.V. Smith and M.L. Rivers do an excellent job in describing the theory, instrumentation and application of synchrotron-based X-ray techniques,

particularly the synchrotron X-ray fluorescence (SXRF) microprobe, together with brief discussions of X-ray absorption spectroscopy (XAS) and X-ray diffraction (XRD). A wide variety of examples of work in Earth and Planetary Sciences is discussed and in a final section (page 222), an invitation is issued to the interested reader to contact one of the authors (JVS). Ion-microprobe analysis is extremely well-summarized by R.W. Hinton. I found this a very instructive chapter with a lot of detail on how to cope with many of the practical problems encountered in ion-microprobe analysis and a comprehensive coverage of the literature. W.T. Perkins and N.J.G. Pearce summarize microanalysis by laser-ablation inductively-coupled plasma mass spectrometry (LA-ICP-MS). In the last ten years, this technique has developed into a powerful millibeam to near-microbeam ($\sim$20 μm) analytical method for trace elements and potentially for isotopes. The equipment is relatively inexpensive, and as emphasized by Perkins and Pearce, promises to be an analytical 'workhorse' in the years ahead. S. Kelley covers Ar-Ar dating by laser (microprobe) extraction techniques, focusing in particular on the advantages and disadvantages of the different types of lasers currently in use. Some applications are discussed, but this is a fairly mature technique and a broader section of applications would have been instructive. I have the same criticism of Chapter Nine, by I.P. Wright, on laser-microprobe analysis of stable-isotope ratios: the principles and instrumental aspects of the method are very well-covered, but a more extensive survey of the utility of the method is desirable. S. Roberts and I. Beattie describe micro-Raman spectroscopy, which must be unique among analytical methods in that it does not (generally) have an acronym attached to it. Theory and instrumentation are briefly discussed, together with some applications, particularly the rather important uses in fluid-inclusion studies of minerals.

The title of this book, "Microprobe Techniques in the Earth Sciences", can be divided into two parts. The "Microprobe Techniques..." are very well-treated in these chapters, demonstrating the acknowledged expertise of all of the authors. The "...in the Earth Sciences" is somewhat uneven from chapter to chapter; some authors do a comprehensive job of summarizing the broad impact of the technique in the Earth Sciences while others treat this part as a minor appendage to the more important experimental method. However, despite this criticism, *Microprobe Techniques in the Earth Sciences* is a very instructive book that fills a niche in the literature. I learned a lot from the book and so will my students.

FRANK C. HAWTHORNE

McGuire, W.J., Kilburn, C. and Murray, J. *Monitoring Active Volcanoes*. London (UCL Press), 1995, 432 pp. Price £65.00 ISBN 1.85728.0369.

This book covers "all of the techniques currently in use in volcano monitoring". Using mostly a case study approach after the introductory chapter, each chapter generally provides an intelligent mix of historical development, basic theory and practical application for each technique. The average chapter length is 30 pages, including ample references. Chapter 2 includes an attractively simple treatment of the theory behind analogue and digital data acquisition, conversion and telemetry. This signals the growing use of remote and electronic sensing methods in volcano observation. Chapter 3 on seismic monitoring moves comprehensively from historical development to practical network deployment criteria then explains simple source mechanisms and shows typical seismogram traces.

Chapter 4 shows how real-time ground deformation has been used to monitor vertical and lateral emplacement of dykes in Reunion island. Chapter 5 explains the principles of long term ground deformation techniques, including tilt, introduces a "Mogi" model and provides contrasting field examples in Italy, Japan, Iceland and Mexico. Chapter 6 provides a valuable explanation of new GPS techniques and survey design, with application specifically to Mount Etna. Chapter 7, on infrared thermal monitoring, provides the background physics and demonstrates a few selected responses to thermal anomalies from lava flows, lakes and domes.

Microgravity in chapter 8 is treated from scratch, with a comprehensive listing of over 20 basaltic, andesitic and rhyolitic volcanoes including source models and detailed application to the magmatic intrusive system at Poas volcano in Costa Rica. The next two chapters each cover relatively new geoelectrical (resistivity) and geomagnetic methods, both with good theory but overall with perhaps more tentative results for selected volcanic systems. Chapter 11 on remote sensing of volcanic plumes stands out in being disappointingly short (only 10 pages); it does introduce COSPEC and in particular SO_2 estimates, as well as providing many references, but it omits for example, any results from Pinatubo, precisely where these methods were so successful. Luckily, Pinatubo and Unzen are both covered in chapter 14 on forecasting. Chapter 12 on fluids and gases describes sampling methods and uses the Bay of Naples and the Aeolian islands as detailed examples. Chapter 13 provides a broad basis for forecasting the behaviour of lava flows in general, from both theoretical and observational methods. Chapter 14 gives an excellent overview of volcano