In Part 1 Fink examines silicic lava flow emplacement and associated hazards; two particularly well-illustrated chapters describe observations of emplacement of blocky flows on Arenal (Linneman and Borgia) and Etna (Kilburn and Guest); and Lopes-Gautier summarizes current knowledge of flows on the Moon (? active lavas), Mars, Venus, and Io.

Part II includes accounts by Tilling and Peterson and by Pinkerton of the practicalities of making field observations; of active flows, by Hardee of the measurement and significance of convection heat transfer rates in molten lava; and by Rothery and Pieri of the 'black art' of thermal remote sensing of active volcanoes.

Part III begins with accounts of simple lava flow models by Dragoni and by Kilburn. Hardee then shows that heating by viscous dissipation during flow can maintain the temperature of a lava flow along its length, or even result in slight superheating downstream (komatite petrologists should note). A novel modelling procedure (the cellular automata method) is outlined by Barca *et al.* in which a flow is treated as numerous cells of discrete volume at various times and positions, rather than continuously in time and position. Sørenson's chapter 'A short introduction to continuum mechanics' aims to review the concept of treating collections of particles as continuous media. It is ill-judged; few readers will attempt to penetrate the 20 pages of maths when the author has made literally no attempt to apply the concept to lava flows.

Part IV is a single chapter by Peterson and Tilling on 'Interactions between scientist, civil authorities and the public at hazardous volcanoes'. Emphasis is on how and why the volcanologist must keep people informed during a crisis, and the need to develop effective communication skills, including, 'specificity, consistency, accuracy, certainty and clarity'. Can a volcanologist ever be certain about the risk of an eruption?

Unfortunately, the book lacks coherence because connections and continuity between chapters are not evident. I wonder what direction authors received from the editors.

The book is proposed as 'essential reading for not only researchers and field scientists involved in volcanology but also for mineralogists and petrologists'. I doubt it is essential, but most of the articles are very informative. The excitement of working on active volcanoes comes through strongly in several chapters, a quality that should rub off on the undergraduates and postgraduates who will use this book as a source of information for term papers and seminars on volcanology. Although expensive, the book should be on library shelves. C. H. DONALDSON

Ashwal, L. D. *Anorthosites*. Berlin, Heidelberg and New York (Springer Verlag), 1993. xix + 422 pp. Price DM168.00.

Being almost monomineralic, anorthosites are unusual rocks, which require special petrogenetic processes. They range in age from Archaean to Tertiary, and are especially important in the Precambrian. Because so many anorthosites make up the bulk of large intrusions and layered complexes, these rocks present important tectonic problems. And anorthosite is the major crust-building component of the moon and possibly Mercury. Because of its wide mode of occurrence, the origin of anorthosites and their associated minor rocks such as gabbros, norites and diorites has long constituted a special and distinct subject. Thus Lewis Ashwal's volume follows a distinguished line of publications devoted to the 'anorthosite problem'.

Anorthosites are divided into six basic types, that form the basis of the main chapters. Archaean calcic megacrystic anorthosites, mid-Proterozoic massif-type anorthosites, anorthosites in layered mafic intrusions, anorthosites in oceanic settings, anorthosite inclusions in other igneous rocks, and extraterrestrial anorthosites. Each chapter, and in particular the first three, includes, where appropriate, a summary of the field relations, form, structure, textures, mineralogy, major and trace element geochemistry, ore deposits, age and isotopic compositions, more detailed descriptions of principal occurrences, petrogenesis, and tectonic setting. Finally, there is a summary–synthesis chapter that includes petrogenesis and timing of anorthosite formation. The reference list is very extensive, including, for example, Russian and Mongolian literature; I estimatte about 1230 references.

I find this book extremely useful, because it is a very comprehensive review and thus provides an invalubable up-to-date data-bank of facts and ideas about all aspects of anorthosites. Frankly I have learnt a lot about these interesting rocks from this book. Ashwal writes with an enthusiastic style which is encouraging to the reader. The book is far from a dry compilation of data, because he has infused it with a good dose of ideas and concepts, often arguing the case for and against controversial opinions, and he is not afraid to contribute his own opinions. There is no doubt this is an esential companion for all anorthositologists. Because anorthosites are such important components of many Precambrian terranes, of layered intrusions, and extraterrestrial bodies, this book will be useful to a wide range of earth scientists, who will be encouraged by the modest price. Libraries should

certainly stock a copy. I congratulate Lewis Ashwal on such a fine volume — it is not surpisisng it took six years to write.

B. F. WINDLEY