Earth models, seismological, compositional and thermal, are elegantly explained and brought right up to date with an authoritative summary of the literature. The book (264 pages) includes approximately 470 references and an appendix for the PREM (seismic) model for the mantle and core. It is well illustrated, and indexed with some 250 items. The book is well produced, and the text virtually error-free, through one important boob on page 97 has inverted the important concept of liquidus and solidus. The book provides an extremely useful introduction and handy references to researchers working in the earth sciences, physics and materials science. It will provide an almost essential upgrade to a number of undergraduate courses, including the more traditional geology and geophysics. It is very highly recommended.

A. P. JONES

Ganguly, J. (Ed.) *Difffusion, Atomic Ordering and Mass Transport* (Advances in Physical Geochemistry, Volume 8). Berlin, Heidelberg and New York (Springer-Verlag), 1990. xiii + 567 pp. Price DM 290.00.

The latest volume in this well-established series brings together thirteen review-style articles which are connected by the general theme of atomic migration and diffusion. This is a very broad field and is tackled here on a variety of scales from the atomic to the geological outcrop, using both theoretical and experimental methods. The relationship between the chapters may therefore seem somewhat tenuous, and it is unlikely that many readers will be familiar with more than a few of the topics presented here. However, each chapter is representative of a particular approach to some diffusion-related problem, and the list of the 22 contributors confirms that the leading practitioners in the field are displaying their wares (see M.A. 91M/4233-4245).

The book is loosely grouped into themes which reflect the scale of the process discussed. The first three chapters deal with mainly theoretical approaches to the microscopic interactions which control atomic transport and ordering. Kubicki and Lasaga outline the role of molecular dynamics computer simulations in determining diffusion in silicate melts; Ross presents a summary of Ising models and their application to cation ordering in a number of mineral systems, and Downs discusses how electron density is determined from X-ray diffraction data and then applied to computer models of crystal structures.

Chapters 4–10 deal with volume diffusion in various mineral systems, principally from an experimental point of view. Chakraborty and Ganguly review compositional zoning and cation diffusion in garnets, and the implications to geothermo-barometry and geochronology; Morioka and Nagasawa summarize ionic diffusion experiments in olivine; Jaoul, Sautter and Abel describe the nuclear microanalysis techniques for measuring diffusion profiles. Volume diffusion is known to be affected by various factors: Goldsmith emphasises the effect of pressure on Al, Si diffusion and oxygen isotope exchange, Graham and Elphick describe the role of hydrogen in enhancing oxygen diffusion, while Kramer and Seifert discuss experiments designed to measure the effect of strain. In Chapter 10 Parsons and Brown summarise and add to their body of work describing the mechanisms and kinetics of exsolution in alkali feldspars.

Moving to grain boundaries introduces larger scale problems with more immediate applications to petrological processes, Joesten presents a very useful summary of grain-boundary diffusion with a discussion of how the available data can be applied to mass transport in metamorphic rocks. In Chapter 12 Lesher and Walker discuss the role of thermal gradients in diffusional mass transport in magmas (the Soret effect), and in the final chapter Lichtner presents in 100 pages, a detailed account of quasi-stationary state approximations to fluid/rock interactions and their application to a number of geological processes.

There is much of interest in this volume and the themes discussed are central to our understanding of geological processes. The chapters are all written to a high standard and the editor has done a good job in ensuring a uniformity of presentation and style. Bringing together these chapters provides a good impression of the range of activities at the frontiers of the subject, and practising research workers will find the book a useful source of information as well as providing a fairly high-level introduction to fields beyond their specific expertise. The book should certainly by available in institutional libraries wherever serious research and teaching are carried out.

A. PUTNIS

Mazor, E. *Applied Chemical and Isotopic Groundwater Hydrology*. Milton Keynes (Open University Press), 1990. x + 274 pp. Price £37.50.

This book emphasises the physical and chemical properties of water and their variations with time. Its strength lies in its use of numerous examples and case histories to show how the chemical information coded into water during its passage