

Interior décor

Gregory Houseman

Mantle Convection: Plate Tectonics and Global Dynamics. Edited by W. R. Peltier. *Gordon and Breach: 1989. Pp.881. \$198, £116.47.*

MANTLE convection has become one of the most exciting fields in the Earth sciences because it is at the heart of the basic physical and chemical configuration of our planet. It is a field that has seen great progress and intense disagreement in the past 20 years. An enormous volume of literature has been produced — pity help the newcomer who alone tries to find a way through the maze of papers expressing conflicting, and indeed contradictory, views. This volume makes a valuable contribution to the task of clearing a way through the minefield.

The editor has assembled substantial review papers by specialists in each of the fields of convection theory, seismic imaging, high-pressure physics, global geochemistry, mantle viscosity, numerical models of convection, geoid analysis and planetary accretion. The result is not necessarily a balanced overview of mantle convection, but it is relatively complete in that most of the lines of evidence that have been brought to bear on the question of mantle convection are covered. Some interpretations are more controversial than others; the obvious disadvantage of each topic being reported by only one or two groups of authors is that the interpretations presented don't necessarily reflect consensus with other groups working in that field. Although parts of the volume can be criticized on these grounds, I think that the net result is very successful. This volume could well be used as the starting point for a stimulating series of seminars on the subject of mantle convection and Earth structure.

An outsider might expect that, in 881 pages of well-documented scholarly review papers contributed by leading figures, there would at least be some consensus on the basic geometrical configuration of the convecting layer. Does the mantle consist essentially of a single-convecting layer, or of two layers separated by a density difference with a (probably leaky) interface about 700 kilometres deep? Paradoxically, one of the most basic parameters of the subject is one of the most difficult to determine. This question runs as a theme through most of the book, and although the balance of opinion seems to come down in favour of whole-mantle convection, some of the authors seem to find, as I do, that the evidence may have more than one interpretation. My guess is that the best prospect of an unambiguous resolution to this question lies with direct measurement

of the physical properties of silicates at the high pressures representative of lower mantle conditions.

One could turn to many of the problems discussed in this volume to illustrate the difficulties involved in applying an imperfect dataset to obtain perhaps poorly resolved parameters. The measurement of mantle viscosity is one of the most basic measurements relevant to mantle convection. Since Haskell's original observations in 1935, there have been numerous analyses as the database has grown. Lambeck, in his book *Geophysical Geodesy* (Oxford University Press, 1988), describes a vertical viscosity stratification significantly different to that summarized

here by Peltier. Is this difference perhaps a measurement of lateral viscosity variation in the mantle? The vertical viscosity structure inferred from analysis of the long-wavelength geoid is different again, requiring a very large increase in viscosity from the upper mantle to the lower.

I highly recommend this book as a survey of the present state of play in mantle convection, although the field has some way to go before an unequivocal description of the Earth's interior can be presented. □

Gregory Houseman is in the Department of Earth Sciences, Monash University, Clayton, Victoria 3168, Australia.

Detecting decay

C.K. Brain

Recent Vertebrate Carcasses and their Paleobiological Implications. By Johannes Weigelt. Translated by Judith Schaefer. *University of Chicago Press: 1989. Pp. 188. Hbk \$68.95, £47.95; pbk \$22.95, £15.95.*

THE justification for an English translation of a book that was published in German more than 60 years ago is the recent upsurge of interest in the discipline that has become known as taphonomy. Taphonomy deals with the rather macabre topics of death, decay, burial and fossilization, and its adherents are the palaeo-detectives of science who interpret the most meagre of clues in their reconstruction of disastrous events in the lives of long-dead organisms. One of the first and most distinguished of these palaeo-detectives was Johannes Weigelt (1890–1948), professor of geology and palaeontology at Martin Luther University, Halle-Wittenberg and founder of the Museum for Earth Science of Central Germany at Halle. His liberally illustrated book, written in the rambling style of a European naturalist, is widely respected as a seminal work in taphonomy but, until now, has not been available in English. Judith Schaefer's translation does full justice to the original text.

Taphonomy, coined by the Russian palaeontologist I. A. Efremov in 1940, is somewhat more inclusive than "biostratigraphy", the term Weigelt proposes in his book. The discipline, which has been remarkably successful in allowing the reconstruction of circumstances of life and death of early hominids and other populations, was formally constituted at a symposium held in 1976 at Burg Wartenstein, Austria, under the auspices of the Wenner-Gren Foundation for Anthropological Research. The resulting volume from that meeting, *Fossils in the Making*

(University of Chicago Press, 1980), was co-edited by Anna K. Behrensmeyer, the mother of taphonomy, who also contributes the foreword to the present volume, together with Catherine Badgley.

Weigelt's book is essentially a report written on his return to Germany after 16 months of intensive fieldwork on the Gulf Coast of the United States, where his mission had been to document processes of vertebrate death and burial to determine their relevance to fossil preservation. In Texas, Weigelt focused his attention on Smithers Lake, a body of water in Fort Bend County, whose level was prone to fluctuate a good deal, intermittently covering and exposing a vast assemblage of carcasses along its southern shore. The year, 1924, was appropriate for Weigelt's purposes: severe drought and icy winds killed more than a million head of cattle near Smithers Lake, together with fish, turtles and alligators. Weigelt scrutinized these disintegrating carcasses and found features already familiar to him among fossils in European museums. He concluded that many spectacular "death assemblages" from the remote past had resulted from analogous catastrophic events.

In his conclusion, Weigelt wrote that his aim had been to "stimulate interest in a method . . . that our sciences of geology and paleontology can continue to use to great advantage, and in so doing, win new friends". He would surely be gratified to find how many new friends he now has. □

C.K. Brain is honorary Professor of Zoology at the University of the Witwatersrand, and is Director of the Transvaal Museum, PO Box 413, Pretoria 0001, South Africa.

New in paperback

- *Understanding Human Evolution* 2nd edn by F. E. Poirier. Published by Prentice Hall, price £27.60, \$35.60.
- *Western Civilization in Biological Perspective* by S. Boyden. Published by Oxford University Press, price £15, to be published in the United States January 1990. See review in *Nature* 331, 670 (1988).