



Down in the mouth — a 'Goldschmidt' toad which, despite its remarkable development alteration, was found doing well in a garden in Hamilton, Canada. From the cover of *Phenotypes* by C. David Rollo. This academic tome "stresses the importance of genomic integration as a selectable feature in the evolution of multicellular phenotypes". Chapman and Hall, £45, \$85.

Remains of the day

Peter Andrews

Vertebrate Taphonomy. By R. Lee Lyman. Cambridge University Press: 1994. Pp. 524. £50, \$79.95 (hbk); £24.95, \$34.95 (pbk).

THE way in which animal bones become preserved and fossilized is a matter of increasing interest, not just for archaeologists and palaeontologists but also for those interested in the biochemistry and mineralogy of animal and plant remains. The study of fossilized remains, or 'taphonomy', covers all aspects of preservation from the time the remains were parts of living organisms to their incorporation in geological strata and removal for study in the laboratory. Taphonomy tells us about conditions of survival of the remains and is fundamental to biological and ecological interpretations of the fossil record (and therefore important to those who attempt to extract DNA from old bones or who study diagenetic processes). But the field has suffered from the lack of a comprehensive and authoritative treatment; Lyman has now provided this in *Vertebrate Taphonomy*.

The first three chapters provide a short history, with examples, of the study of taphonomy. The author takes pains to formalize the subject in terms of the scientific method and its implicit assumptions. He sees the principles of uniformitarianism and actualism as being fundamental to taphonomy and recognizes the progressive nature of taphonomic evidence. Implicit in his argu-

ment is the question of what information is provided by the study of taphonomy. On the one hand, taphonomy may be seen as a necessary precursor to reconstructions of past environments by first reconstructing past faunas; on the other, it may itself be viewed as an extra source of information about the environment, revealing aspects of environmental processes that might not be apparent from more traditional approaches.

The main part of the book contains detailed accounts of taphonomic processes. Chapters 4 to 7 deal with dispersal and accumulation of vertebrate remains, whereas chapters 8 to 11 consider surface and subsurface modifications. Chapter 4 combines an excellent summary of the vertebrate skeleton, including basic background on bone histology, with a useful account of some of the ways of counting vertebrate remains according, for example, to numbers of elements, animal units or individuals. This methodology is an obvious strength of the author's own work. There then follows a chapter on population parameters and disarticulation patterns of skeletons. This is an odd mixture: the latter topic flows on naturally from the previous chapter to the next two chapters on the processes of accumulation and dispersal and the frequencies of vertebrate remains; but the subject of population parameters is misplaced here — indeed, it could be argued that it has no place at all in this book, as the topic is more a matter of palaeoecological interpretation than taphonomic reconstruction.

The comprehensive treatment of surface modifications provides a valuable resource for future research. The effects

of all sorts of natural processes are documented in detail and there is an informative section on human modifications. The descriptions of changes to bones after burial are less authoritative, mainly because such modifications have been less well studied by vertebrate taphonomists. More disappointing is the chapter on diagenesis: much of the work by mineralogists is neither included nor referenced.

Vertebrate taphonomy has tended to focus on mammal remains, partly because many palaeontologists who study birds, fish, amphibians and reptiles have still to recognize the need to consider taphonomic processes. There is nevertheless a useful chapter that summarizes taphonomic research on these four groups of lower vertebrates. The methods have evidently been based on those devised for mammals, although it is questionable whether either the taphonomic processes themselves or their effects on bone histologies are the same.

Vertebrate Taphonomy concludes with an excellent discussion chapter, a marvellous bibliography running to 35 pages and a good glossary and index. They round off a comprehensive, detailed and accurate book that will make taphonomy accessible to specialists and nonspecialists alike. It is essential reading for all vertebrate palaeontologists, archaeologists and palaeoecologists and provides crucial background information for workers in other disciplines who use fossil material, especially molecular biologists attempting to extract DNA from fossil bone. □

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