

but for anyone with some undergraduate physics and a fair amount of mathematical stamina. His expertise is not in doubt, nor is his scepticism. He admits: "I have been studying cosmology for thirty years now... but it was never my plan, in fact my first reaction to cosmology was one of surprise that grown people could reasonably care about such a schematic physical theory.... I think I stuck with it [because] it is too exciting to leave". By and large though, Peebles is an enthusiast for Big Bang cosmology because he feels that "the days are gone when it is easy to think of viable alternatives".

In writing this book, Peebles has set himself three guidelines: to concentrate on results that seem likely still to be of interest in a decade; to keep out of cosmo-particle physics; and to play down computer modelling. And perhaps the last two follow from the first. In my judgement he's got it about right. This is a book I shall treasure for myself, urge upon my colleagues and graduate students, and hope that my undergraduates can afford to buy. Certainly every university library should have at least one copy, because many with a taste for cosmic physics will want to dip into it, read it or use it for reference.

There are three certain truths about cosmology. The subject is fascinating, it generates almost as much nonsense as religion and it will never be far from the headlines. For all three reasons you might like to have your copy of Peebles close at hand. □

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■ Two other textbooks in the same area, both from Cambridge University Press, were unlucky to come out at the same time as Peebles's volume — they suffer badly by comparison. Roger J. Taylor's *Galaxies: Structure and Evolution* (pp 208; £30, \$49.95 (hbk); £12.95, \$22.95 (pbk)) is an updated reissue of a book aimed at keen final-year school students. It fills a neglected niche between the popular text without mathematics and full-blooded textbooks. Large public libraries and wealthy schools should think of buying a copy. T. Padmanabhan's *Structure Formation in the Universe* (pp 483; £50, \$89.95 (hbk); £19.95, \$34.95 (pbk)) is aimed at graduate students and above, and deals with the formation of clusters and galaxies. Highly theoretical. **M.D.**

■ Cambridge University Press has also just published a revised second edition of J. V. Narlikar's *Introduction to Cosmology* (£50, \$79.95 (hbk); £17.95, \$29.95 (pbk)). For a review of the first edition see *Nature* 308, 141 (1984).

The descent of *Equus*

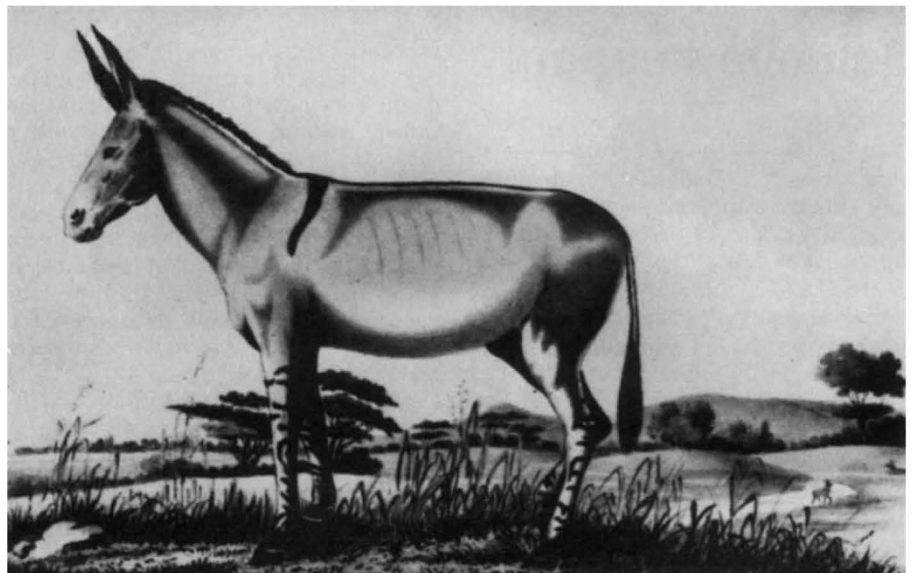
Adrian Lister

Fossil Horses: Systematics, Paleobiology and Evolution of the Family Equidae. By Bruce J. MacFadden. Cambridge University Press: 1993. Pp. 369. £45, \$74.95.

WHEN Thomas Henry Huxley, "Darwin's bulldog", visited Yale in 1876, he was enthralled by O. C. Marsh's sequence of fossil horses, from little *Eohippus* (correctly *Hyracotherium*) to modern *Equus*, forming the first clear demonstration in the fossil record of the descent of a living

occasional dwarfing, the predominant trends throughout the clade, by a combination of common descent and parallel evolution, are in the classic direction: size increase, toe reduction, elongation of tooth crowns and so on. These trends explain the success of the family as a whole, although, as MacFadden notes, they were driven by drying and the spread of grassland through the Tertiary, rather than by 'progress' through ever-better adaptation to a constant niche.

The book is arranged thematically, giving balanced coverage of taxonomy, phylogeny (a valuable summary of synapomorphies at each node of the tree), biogeography, functional morphology and palaeoecology. The history of evolutionary study receives considerable treatment; this is interesting and not



The African wild ass *Equus africanus taeniopus*, first described by Heuglin in 1861.

species. Horses have remained the most famous of fossil lineages, and, as amply demonstrated in this well-crafted book, continue to provide a testing-ground for the latest concepts in palaeontology.

As early as 1930, Matthew realized that equid evolution fitted not a single lineage but a complex branching tree, and current taxonomy recognizes about 150 fossil and living species over a 58-million-year history. Nonetheless, the portrayal of a single line leading to *Equus* persists in museum displays, textbooks and undergraduate essays. MacFadden rightly criticizes this view as misrepresenting the complexity of evolutionary history and process. On the other hand, it seems perfectly valid to ask "what is the line of direct descent leading to *Equus*?" (or any other species), provided the limitations of the question are understood. And it is interesting how often in this book, whether tracing changes in anatomy or in habitat, the discussion proceeds along the traditional line from *Hyracotherium* to *Equus*. For despite the diversification and

inappropriate given the important role of fossil horses in evolutionary and palaeontological thought. A lot of space is also taken up explaining general principles, and sometimes there is a slight imbalance; for example, 14 pages of general biogeography introduce 8 pages of horse biogeography. These passages will help students and general readers; and if specialists find that the horse meat is sometimes a little lean, there is an excellent and thorough bibliography.

Recent years have seen great advances in the study of fossil horses, particularly in phylogenetically distinguishing clades from grades, and in interpreting adaptation and ecology on the basis of analogy with feeding morphotypes among modern mammalian guilds. MacFadden has produced a timely and readable text, a good advertisement for the biological fruits that the palaeontological tree can bear. □

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