

Mammals of Africa

Evolution of African Mammals. VINCENT J. MAGLIO and H. B. S. COOKE, Eds. Harvard University Press, Cambridge, Mass., 1978. xiv, 642 pp., illus. \$60.

Africa's Pleistocene heritage is a rich and diverse fauna. Over 700 species in 50 mammalian families now inhabit the forests, deserts, savannas, mountains, lakes, and rivers of the continent. Today this Pleistocene African ark is crashing headlong into the industrial world of the 20th century. Predicting the consequences of this collision and the future for many of Africa's mammals is impossible. Reconstructing their evolutionary past is the province of the paleontologist.

In the late Triassic small mammals shared the supercontinent Gondwanaland with dinosaurs. The succeeding 200 million years witnessed an evolution of African mammals that now range from aardwolf to zebra and from Algeria to Zululand. Documenting this evolutionary history is a colossal undertaking.

In 1972 Vincent Maglio proposed a single volume to summarize current knowledge bearing on African mammal evolution. The resulting book, to which 32 scientists contribute 27 systematic chapters encompassing 15 mammalian orders, is intended not as a definitive treatment but rather as an interim report on investigations still in progress—a sort of summary of contemporary information and ignorance. For a survey of this magnitude, the task of choosing appropriate authors has been carried out fairly successfully. Those not chosen are consoled by the dedication of the book “to the many who have contributed to the study of paleontology and prehistory in Africa.” Of the 32 contributors, not one is a citizen of an African country other than South Africa. This observation is no criticism of Maglio or his coeditor, Cooke, but it clearly signals the need for the training and encouragement of native African paleontologists.

An illuminating review of the modern African mammals is provided by Bigalke in the opening chapter. This valuable ecological and zoogeographical introduction gently reminds us of many vital common and Linnean names. Chapter 2, by Cooke, sets the geographical and chronological stage. It is accompanied by full-page maps showing continental

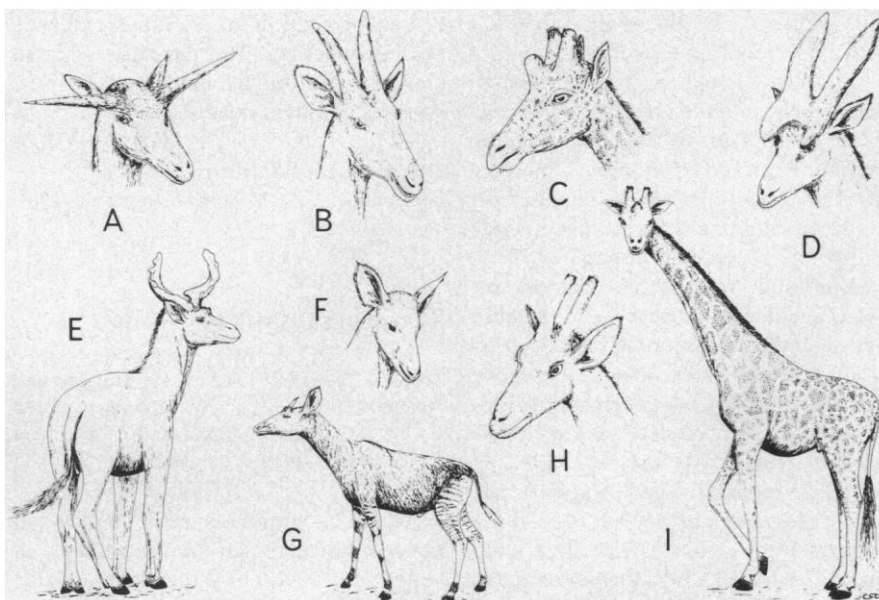
relief, vegetation, geology, and paleontological localities. We are cautioned that nearly all the relevant fossils come from the restricted localities of the northern edge, the eastern rift, and the southern tip of the continent. More detailed discussion and referencing of intercontinental relationships across geological time would have assisted the reader in assessing the Eurasian affinities of Cenozoic African mammals.

In the following 27 systematic chapters various paleontologists attempt to summarize the evolutionary biology of different mammal groups. For better-known taxa like proboscideans and suids, formal species-by-species diagnoses, discussion, and revisions are performed. Lesser-known orders such as the Tubulidentata and Embrithropoda are usually discussed in what amounts to narrative style. The nature of the coverage varies with the whim of the author and the nature of the fossil record. The stylistic variation between chapters does not detract from the book. Adequate bib-

liographies follow each chapter, and the reader can pursue any bones left unturned.

The first systematic chapter is by Crompton and Jenkins, who tackle the earliest African mammals. They give a fascinating account of the biology of these forms and sound a plea for a wide search of southern continents for more Mesozoic mammals. Lavocat's chapter on rodents and lagomorphs ends with the argument for an African origin and subsequent rafting to South America of caviomorph rodents. Simons and Delson term this mode of mammal dispersion “wholly untenable” in their concise but useful chapter on cercopithecoid and parapithecoid primates.

Primates account for six contributors and one-quarter of the book. Despite frequent anthropological laments to the contrary, the evolution of this order is relatively well documented, and much of the record is African. Walker's chapter on prosimians is succinct and authoritative, although some may regret that coverage was not extended to subfossil Madagascan forms. Simons, Andrews, and Pilbeam contribute the chapter on Cenozoic apes. It contains a formal systematic treatment of these creatures as well as excellent historical accounts of investigations in the Fayum and East Africa. The recognition of *Proconsul van-*



“Fossil and living giraffids: (A) *Zarafa zeltenei* from Gebel Zelten, Libya; early Miocene. (B) *Samotherium* sp., after *S. boissieri* from Samos, Greece; Pliocene. (C) *Giraffa camelopardalis rothschildi*, Baringo or Rothschild's giraffe, from Uasin Gishu Plateau, Kenya, showing the three-horned condition; Recent. (D) *Prolibytherium magnieri*, from Gebel Zelten, Libya; early Miocene. (E) *Sivatherium maurusium*, from North, East, and South Africa; Pleistocene. (F) *Palaeotragus primaevus*, from Fort Ternan, Kenya; middle Miocene. (G) *Okapia johnstoni*, okapi from the Semliki Forest, Congo Basin, Zaire; Recent. (H) *Giraffa jumae*, extinct giraffe, from Rawe, Kenya, and Olduvai Bed II, Tanzania; Pliocene and Pleistocene. (I) *Giraffa camelopardalis camelopardalis*, Nubian giraffe, from the Sudan; Recent. Heads not drawn to same scale; (E), (G), and (I) drawn to scale.” [From a paper by C. S. Churcher in *Evolution of African Mammals*]

couveringi and *P. gordonii* as valid species in a distinct subgenus was previously advocated by Andrews alone. The phylogenetic implications of this assessment are clear, and the chapter should promote critical testing of the hypotheses.

Chapter 9 is devoted to *Ramapithecus*. New finds in the Siwaliks and the discovery of the generalized hominid species *Australopithecus afarensis* imply that the hominid status of *Ramapithecus* may be less secure than Simons and Pilbeam suggest here. Pilbeam's newer interpretations (*Nature* 270, 684 [1977]), written later than chapter 9, are far more concordant with the evidence. They effectively make this chapter a historical curiosity.

Howell's chapter "Hominidae" is a book within a book. Its 95 pages (many in reduced print) and bibliography of 656 entries reveal an attention to detail that draws on years of personal study of the original fossils. Its systematic content will surely kindle debate.

In contrast, the chapter on Carnivora by Savage is disappointing. Its admitted shortcomings include superficial, secondhand treatment of the Plio-Pleistocene carnivores and judgments "made from intuition rather than from experience" (p. 250). The combination of Copen, Maglio, Madden, and Beden fares much better in its expert treatment of the proboscideans. The observation that isolated Plio-Pleistocene elephant molars are often insufficient for precise biostratigraphic correlation is particularly significant. Harris furnishes a fine chapter on deinotheres and barytheres. Churcher and Richardson deliver a chapter on Equidae containing a handy keyed species list and series of site maps.

Cooke and Wilkinson's chapter on Suidae and Tayassuidae uses a valuable discussion of the modern African pigs to introduce the fossils. Cooke's reconstruction of Plio-Pleistocene suid phylogeny has converged dramatically with that of White and Harris (*Science* 198, 13 [1977]). Reference to the latter work appears in Howell's chapter but is curiously absent from Cooke's. Hamilton's review of Cervidae and Palaeomerycidae is in fascinating contrast to the traditional approaches taken by many other contributors. The benefits of his Hennigian methodology are familiar, but the costs are tellingly illustrated as he is left grappling with parallelism, convergence, and fragmentary fossils. Gentry's effort on Bovidae could have been a detailed and complex account, but he donates a solid, lucid, and compact interpretation of the

evolution of this family. Maglio attempts a final synthetic chapter on patterns of African mammal evolution but faces a frustrating statistic—by his own account probably over 80 percent of Africa's former mammal taxa are undiscovered.

The book is full of fascinating and enjoyable detail ranging from Meyer's biblical citations concerning hyracoids to Patterson's description of skeletal specializations in the aardvark. Bits of humor are also found scattered among the dusty bones. Simons, Andrews, and Pilbeam describe 1907–08 Fayum fossil collector Richard Maarkgraf as being alone or with one assistant in the desert and "always traveling on camelback." In obvious reference to a modern fieldworker with considerably more *National Geographic* exposure they add parenthetically, "We have no way of knowing whether or not he smoked a pipe while riding about" (p. 123).

If a common theme characterizes this volume it is the need for much more research. Enormous gaps in our knowledge of African mammal evolution remain. Both larger and smaller gaps must be bridged before we can effectively begin to test the implications of the quotation from Charles Darwin on phyletic gradualism that prefaces the book.

Evolution of African Mammals should remain a major source of data for years to come. It will foster paleontological research because it so accurately defines our knowledge. Its ultimate success should therefore be measured by how soon its chapters need major revision.

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The Formation of Trees

Tropical Trees and Forests. An Architectural Analysis. F. HALLÉ, R. A. A. OLDEMAN, and P. B. TOMLINSON. Springer-Verlag, New York, 1978. xviii, 442 pp., illus. \$62.50.

An architectural analysis implies an understanding of the precise manner in which a structure is assembled. This book achieves just such an understanding with a far-reaching approach that is not confined to tropical trees and forests but is applicable to temperate trees, shrubs, lianes, and herbs, indeed to all types of plants and plant communities. The book represents a breakthrough in the understanding of the nebulous concept of plant "form." It brings together for the first time in English the tenets of

botanical architecture contained principally in the work of Hallé and Oldeman published in 1970 and that of Oldeman published in 1974, along with isolated ideas and specialized terminology from earlier literature.

The authors demonstrate convincingly that the trunk and branches of any tree develop according to a highly organized basic model, which represents its inherited architecture. A tree as it grows from a seed will undergo a set sequence of branching and may present at this stage a rather formal and symmetrical appearance, which some trees maintain into the adult phase (firs, "pagoda trees," and the monkey puzzle). More usually, however, the architecture of an individual tree becomes modified, and to the casual observer more confusing, by continued reduplication of the initial model. Environmental factors (damage or enhanced light conditions, for example) cause dormant buds to develop, initiating a new sequence of branching organized in exactly the same manner as that of the model developed from the seed. The authors term this process of elaboration "reiteration." The concepts of model and of reiteration, then, allow both an understanding of the apparent complexity of most mature trees as individuals and an insight into the dynamics of the growth of a forest.

The book falls into three sections, although they are not delimited as such in the table of contents: general morphology, individual tree structure, and forest structure. Many general aspects of the morphology and morphological development of trees are introduced, together with the various features of tree growth that differentiate between the models to be described in the heart of the book. In reading this first section, particularly chapter 2, the reader will have to brush up his or her vocabulary in order to follow the subsequent arguments. Contrasting pairs of characters applied to meristem, bud, and shoot development abound. Thus we find preformation and neoformation, primary and secondary orientation, continuous and diffuse growth, monopodial and sympodial growth (compare Corner, 1940), basitonic and acrotonic development (compare Champagnat, 1965), single modules and relay axes (compare Prevost, 1967), apposition and substitution growth (compare Koriba, 1958), prolepsis and syllepsis, plagiotropic and orthotropic branches, and so on. Admittedly, the use of these terms avoids a lot of tedious description, but the reader will need to keep one finger permanently in the ex-