of pictures which, when viewed in a stereoscope, gives a great deal of three-dimensional information.

It is quite obvious that reconstruction from serial sections is a very active field of endeavor. Had Gaunt not died before his manuscript was completed he would probably have included all the new methods and fields of application that have been mentioned in this review. In spite of its omissions, the book is of great value for scientists in various disciplines. In my opinion, it should be on every morphologist's bookshelf. And by "morphologist" I mean anyone concerned with the three-dimensional structure of sectionable objects.

HANS ELIAS

Department of Anatomy, Chicago Medical School, Chicago, Illinois

Mammals Presumed Most Useful

The Origin of the Domestic Animals of Africa. H. EPSTEIN. Revised in collaboration with I. L. Mason. Africana, New York, 1972. Vol. 1, xii, 574 pp., illus. Vol. 2, xii, 720 pp., illus. $85.

This work is a curiously old-fashioned one to be published in the latter third of the 20th century; it is old-fashioned in language ("wither," "brisket," "gaskin," "hock," "thurl," "hook-bone," "pin-bone," and "stop" for anatomical terms), old-fashioned in its discursiveness (1158 pages of text and figures unmarred by graphs or statistics), welcomely old-fashioned in its wealth of illustrations (1297 figures), old-fashioned in its thoroughness (44 pages of bibliography and 85 pages of indexes), old-fashioned in the assumption that the reader is educated and thus will be thoroughly familiar with multiple names of places, tribes, archeologic sites, and historical personages, and old-fashioned in a reliance on flowing anatomical description to a degree of detail that most readers will find skippable. The very title is old-fashioned; "animals" here means mammals, and then only those presumed to be most useful to man. The dog is included, but cats are mentioned only in passing and do not receive the discussion which they deserve as one of the two native domestic mammals of Africa.

Is there merit in such a compendium? Indeed there is, because for each of the domestic mammals included (dog, cattle, water buffalo, sheep, goat, pig, ass, horse, and camel) Epstein reviews the Quaternary history of the wild ancestors and the early history of domestication. For all the species except the Nubian ass, the wild ancestors were Eurasiatic, not African, so that, as a necessary part of the discussion of their origins, a full history emerges of early domestication in the Old World. This side of the treatment is much more complete than that of Zeuner (*A History of Domesticated Animals*, 1963), so complete in fact that in Epstein's present volumes we have for the first time in English a source to which a student can be sent to acquire the historical background for his studies in mammalian domestication. To have immediately available, for instance, an outline of Studer's classification of breeds of prehistoric dogs is a great help, for European writers use this terminology consistently, without sufficient explanation of its meaning. Whereas many Europeans have regarded Studer's breeds as subspecies, complete with trinomial names, Epstein realizes that these are but types, and not breeds or subspecies, but he keeps the names for their descriptive and historical usefulness. Indeed, with regard to sheep and pig, he believes that the well-known turbary type, first described from Swiss "lake-dwellings," is a natural product of malnutrition and poor care and so may appear in any human culture, thus negating former ideas of movements of domestic animals over long distances to appear subsequently in the archeologic record.

Cattle, as befits their importance in African economy and culture, receive the greatest attention, two-thirds of volume 1. Since this one section is as long as many books, and illustrates well Epstein's treatment of each of the species, I will let the cattle serve as an example for the other sections, all shorter. The chapter begins with basic taxonomy, and then Epstein outlines the history of a series of subspecific names, as based on morphology of the skulls, offered by several authors in the 19th century. All these names are shown to represent morphological types, not subspecies, since the skull grows to conform to the stresses put upon it by the increasing size and weight of the growing horns. Size of horns depends in turn upon sex, genotype, and availability of food.

Genetic change, by artificial selection for short-horned cattle, seemingly began before 3000 B.C. No mention is made of any genetic studies on shapes of horns in cattle; a knowledge of such genetics would seem important for further understanding of the early history of cattle.

The zebu is then discussed historically and morphologically; considering the great success of the descendants of zebus in Africa, one would expect some introductory discussion of physiological adaptations to heat, but we find a short summary on this topic toward the end of the section on cattle. (In most sections, physiology receives little or no attention.) The anatomy of the humps of zebus and part-zebu cattle is described and figured in considerable detail; mixed cattle have the hump placed more anteriorly and it tends also to be fattier and less muscular than in pure-bred zebus. Epstein considers the hump of a zebu to be as much a result of artificial selection as is the fat of a fat-tailed sheep.

Epstein then treats in detail all of the known African breeds of cattle, present and past (the past being mostly Egyptian, as recorded pictorially), under four phenotypes: humpless longhorns, humpless shorthorns, zebu, and sanga; these last are crosses between zebus and non-humped cattle. The situation is complicated by the fact that two major introductions of zebu stock have occurred in the history of Africa, once by or before 2000 B.C., and again after A.D. 670, following the invasion of Africa by Arabs. Possibly in both instances, but certainly in the later one, the cattle were introduced via southern Arabia into East Africa; these later immigrants, marked when relatively pure-bred zebu by the thoracic position of the hump (as contrasted with a cervicothoracic position on sanga), have spread widely across the central part of Africa south of the Sahara. Humpless cattle are now mostly limited to West Africa, Egypt, and the areas north of the Sahara. Most of Africa's famous large-horned cattle are of sanga stock.

In places in the section on cattle, as

sometimes elsewhere, Epstein takes long detours into obscure human history; for instance, his discussion of the Afrikander breed of cattle covers 27 pages, but much of this is concerned with historical problems concerning Bushmen, Hottentots, Bantu, Dutch, and Portuguese, all of whose movements, and their moving of cattle, had or could have had an influence upon the ancestry of Afrikander cattle. On such topics Epstein is often both thorough and erudite, although he cannot always give a final answer to a specific problem amid the conflicting assumptions of the past.

Epstein treats characters of skulls, horns, humps, and color patterns with loving care. Indeed, the number of pages dedicated to such descriptions, combined with a diffuse (that is, old-fashioned) organization (plus the horrendous price), will decrease the popular sale of these useful and often interesting volumes. Yet the set, in its way, is a tremendously useful one, saving untold hours of library research for anyone entering into the bibliographic maze on the origins and history of the major domestic mammals of the Old World. At the same time, Epstein largely ignores the rich patterns of the economic and other values to man of the animals discussed and pictured here with such care; there is material on this subject for another two volumes, which it is to be hoped someone will write soon.

CHARLES A. REED
Department of Anthropology, University of Illinois, Chicago

Animal Resources

Conservation of Nonhuman Primates in 1970. BARBARA HARRISSON. Karger, Basel, 1971 (U.S. distributor, Phiebig, White Plains, N.Y.). vi, 100 pp. $6.70. Primates in Medicine, vol. 5.

This important book provides a broad view of current problems in primate conservation. It is divided into two major sections, one entitled The Exporting Countries, which considers primate population trends and supply problems in Latin America, Africa, Madagascar, and Asia, and one entitled The Importing Countries, which focuses on the volume of trade and the use of primates in Europe and the United States. The book is well balanced, considering the interests of both the naturalist, who views nonhuman primates as important faunal components of their native habitats, and the biomedical researcher, interested in primates as laboratory subjects. It discusses the species of greatest prominence in research and pharmaceutical production, such as the rhesus macaque, the squirrel monkey, the vervet, and the chimpanzee, as well as those not used in laboratory research but currently endangered because of ecological problems, such as the lion-tailed macaque, the douc langur, and the red colobus monkey.

Many species of nonhuman primates are in need of concerted conservation attention because of pressures from human populations. One of the most serious threats, according to Harrisson, is the loss of habitat due to the destruction of tropical forests. Increased logging and deforestation are a major trend throughout the tropics. Nonhuman primates are also sought in many areas for food, and in others they are exterminated as agricultural pests. Finally, primates are caught in large numbers for use in scientific research, pharmaceutical production, zoos, or the pet business. In 1968, approximately 200,000 live nonhuman primates were transported worldwide. In many cases, this trade represents a wasteful and inefficient utilization of valuable animal resources. For example, in 1968 the United States imported 75,000 primates from Latin America, of which 29,000 were destined for the pet trade. Animals shipped for this purpose often experience high mortality and present a public health hazard of infectious disease.

The author gives particular attention to chimpanzee populations and utilization. Although total African population figures are not available, it is apparent from many field studies that chimpanzee populations are declining seriously, as are those of all the great apes. The process of capture and collection is so wasteful that Harrisson estimates an annual drain on wild populations of 4500 to 6000 individuals to meet the current demand of 750 chimps a year.

Harrisson concludes with a number of recommendations to alleviate losses of nonhuman primates. These include: (i) increased emphasis on the significance and value of nonhuman primates as scientific resources of international importance, (ii) greater development of natural reserves and refuges, (iii) more intensive research programs on primate population ecology in natural habitats and in areas where conflicts exist between human and nonhuman primates, (iv) improved methods of trapping, holding, conditioning, and transportation, (v) development of breeding colonies for biomedical research, (vi) greater care in selecting species as research subjects, and the substitution of nonprimates whenever possible, and (vii) more careful regulation and licensing of the simian pet trade by public health authorities.

Certain details and charges in the books are controversial—for example, contrary to the opinions quoted, I think the Indian government and exporting firms have made very substantial improvements in the export of rhesus monkeys, and I would not characterize present conditions as "highly unhygienic." Also the book lacks numerical population data on most species, but this accurately reflects the state of the field.

In general, Harrisson has provided a vital service in this small book. She writes with clear authority and detailed knowledge from the field, and she also expresses considerable understanding and sympathy toward the valid use of primates in biomedical research. Her book deserves to be read and discussed by a wide audience of ecologists and conservationists as well as biomedical and behavioral researchers interested in the welfare of their subjects.

CHARLES H. SOUTHWICK
School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland

Man's Morphological History

The Ascent of Man. An Introduction to Human Evolution. DAVID PILBEAM. Macmillan, New York, 1972. x, 208 pp., illus. Paper, $3.25. Macmillan Series in Physical Anthropology.

As little as two years ago David Pilbeam produced for the World of Science Library an introduction to the evolution of man. That volume, although containing a personal interpretation, was aimed primarily at the layman, the student reading outside his major field, and possibly the beginning student of human evolution. This new book is subtitled "an introduction to human evolution," and Pilbeam does attempt to make the language and con-