years of work there. It would be by a compelling positive demonstration that he would contribute to our understanding. He has only served to cloud it in this volume.

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Five Decades of Physical Anthropology

A History of American Physical Anthropology, 1930–1980. Papers from a symposium, Detroit, April 1981. FRANK SPENCER, Ed. Academic Press, New York, 1982. xvi, 496 pp., illus. $44.50.

In 1930, the American Association of Physical Anthropologists (AAPA) was founded by Aleš Hrdlička and 83 other scientists, most of whom were anatomists. They adopted the *American Journal of Physical Anthropology* (*AJPA*), which Hrdlička had started in 1918, as the official publication of the new society. Fifty years later these events were celebrated in Charlottesville, Virginia. And a major portion of the 1981 meeting of the AAPA in Detroit, Michigan, was devoted to reminiscences, ruminations, records, and revisionist historical sketches on a wide array of subfields in physical anthropology.

Twenty-four of the shorter papers were published as a jubilee issue of the *AJPA* (**56**, 327–557 [1981]). Most of them, including ten that focus on dead (but by no means extinguished) stars, were written and delightfully read by senior members of the profession.

A History of American Physical Anthropology, 1930–1980 consists of the generally longer, less personal accounts, mostly by younger scientists. Few of them are able historians. However, chapter 1, "The roots of the race concept in American physical anthropology" by Brace, merits a wide readership and high marks for erudition. Brace squarely confronts racist influences on the two chief founders of institutional physical anthropology in the United States—Hrdlička, based at the American Museum of Natural History, and E. A. Hooton, with whom most of the second generation of physical anthropologists studied at Harvard.

Brace argues that Hrdlička was indirectly influenced by the American craniologist Samuel George Morton via his mentor and idol in Paris, the brainy Paul Broca. Hooton admired Sir Arthur Keith, who was tainted by Haeckelian racism. Fortunately, some of Hooton's intellectual progeny left the white sheets on the bed. Sherwood L. Washburn, a Hooton student who in his turn trained many anthropologists of my generation, brainishly resisted the quantitative racism and elitist eugenics of his teacher and stays ever ready to battle others of that ilk.

Brace's closing comments are upbeat. He reiterates the modern view that we should abandon the concept of race altogether and instead record the gene frequencies and traits of populations that are identified simply by their geographic localities. This genotypic and phenotypic information is to be interpreted in terms of historical and proximate selective forces.

If we classify the chapters according to the triune model of physical anthropology, half (11 through 20) are on aspects of human variation; a fourth (3 through 7) are on primatological subfields; and three (8 through 10) cover paleoanthropology.

Human variation is the least newsworthy realm of physical anthropology. Yet, unlike that in paleoanthropology and, to a lesser extent, primatology, basic research in human variation has many applications for human health and forensic sciences. Its practitioners have ruled the AAPA benignly and served as editors of the *AJPA* for many years, during which time membership has grown to include more than 1100 persons, including numerous students and foreign scientists.

The chapter by Weiss and Chakraborty on genes, population, and disease is one of the best in the volume. It contains a balanced historical review of changing ideas on the relative importance of selection and drift, adaptive and nonadaptive traits, classical and balance theories of genetic polymorphism, the genetic effects of radiation, and other long-standing controversial issues of population genetics. The authors justly praise Frank Livingstone's landmark hypothesis linking subsistence practices in Africa with the maintenance of the malaria-based human genetic polymorphism, sickle-cell trait. This work paved the way for other studies on cultural factors in the ecological genetics of certain human diseases. But despite a "*wealth* of progress" (p. 394) definitive solutions have not been forthcoming because of the complexity of most diseases and the cultural and genetic processes that govern their expression.

Physical anthropologists have contributed notably to studies on human ecology (reviewed by Little), growth and development, physiology, and adaptability (reviewed by Beall and by Little), paleopathology (reviewed by Ubelaker), and forensics (reviewed by Thompson). These subfields appear to have healthy futures. Additional promising subjects for study by physical anthropologists are nutrition (including paleonutrition), biological aging (Beall, p. 456), and historical demography (Harrison, p. 469). All of these areas would benefit from greater *inter*disciplinary emphases instead of the more common multidisciplinary approaches. This means that students will have to declare their research topics early and include a variety of archeological, cultural anthropological, basic natural scientific, and medical subjects in their programs. Postdoctoral studies and joint M.D.-Ph.D. degrees probably will become increasingly common among human variationists.

Human skeletal biology is moribund because of its long history of abuse by racial typologists and its largely descriptive nature (Armelagos *et al.*; Lovejoy *et al.*). Armelagos *et al.* argue that functional approaches and perspectives,

which have benefited paleoanthropology and paleoprimatology, should be employed in studies of human skeletons from post-Pleistocene archeological sites. It should not be forgotten that osteology is a fundamental subject for researchers in many of the flourishing subfields of archeology and physical anthropology.

Only 50 pages of the volume (chapters by Mayr, Boaz, and Trinkaus) are devoted to paleoanthropology. However, until recently Americans have not contributed much through fieldwork, tending instead to interpret the fossils found by colleagues from the Old World. The premature death in Peking of Davidson Black, a Canadian, stifled our chance for a larger part in the early history of paleoanthropology.

Paleoanthropology is booming largely because of remarkable discoveries by Mary, Richard, and Louis Leakey in eastern Africa and F. Clark Howell and Donald C. Johanson, both of whom trained at the University of Chicago and directed projects in Ethiopia. Aside from the overwhelming quantity of fossil hominids that have been produced by their efforts, it was high-budget multidisciplinary approaches to the fossil-bearing formations that advanced the science so far. Thanks to geochemists, stratigraphers, palynologists, paleontologists, and other specialists, we are gaining a good sense of the time frame for hominid evolution in the Pliocene and Early to Middle Pleistocene of eastern Africa and the habitats in which the creatures lived. Johanson and his colleagues are to be commended for monographing the Hadar specimens promptly, in an award-winning issue of the *AJPA* (**57**, 373–791 [1982]). The long-awaited interpretative volumes on the Olduvai and Koobi Fora hominids are still in preparation.

Although Mayr (pp. 234–235) accepts *Australopithecus afarensis* Johanson, White, and Coppens, 1978, as a valid species, he argues that the temporal and spatial distances between the specimens from Laetoli, Tanzania, and Hadar, Ethiopia, make it likely that they were genetically different populations and may not represent a single taxon. My studies on the Hadar foot bones and Laetoli hominid footprints also suggest that there were two species of Pliocene Hominidae. Like Tobias, Boaz (p. 252) would sink *A. afarensis* into *Australopithecus africanus*.

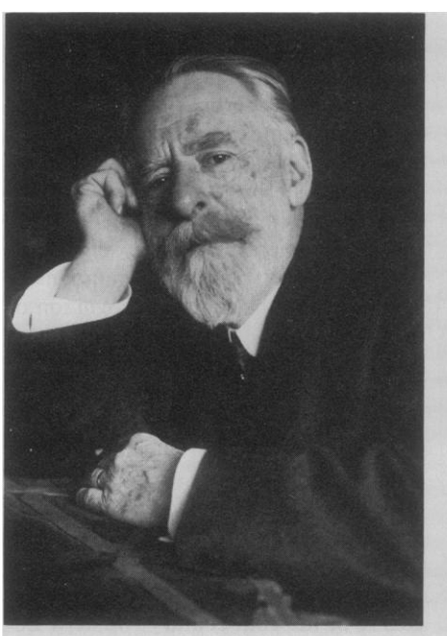
The five major subareas of anthropological primatology (behavior; neuroanatomy; molecules; prosimians; and anthropoids) are reviewed informatively (by Ribnick, Falk, Goodman and Cronin, Cartmill, and Fleagle and Jungers, respectively). Americans are prominent in all of them.

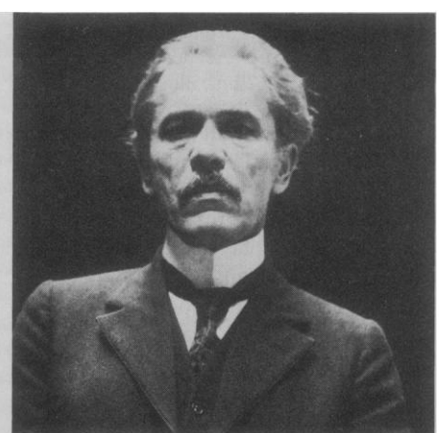
Behavioral primatology received major early impetus from two American psychologists—C. R. Carpenter, who conducted superb short field studies, and R. M. Yerkes, who established laboratories for psychobiological research on great apes. Although Hooton's primary research was focused on "race," he had a passion for primatology and wrote a number of pop anthropological books and textbooks in which primates were featured. Beginning in 1959, Washburn led a renaissance of field studies on nonhuman primates. He organized conferences on primate behavior and human evolution and inspired many students to watch monkeys in Africa, Asia, and South America. However, none of them established long-term research programs and field stations, as Louis Leakey's students of apes (D. Fossey, B. Galdikas, J. Goodall) and Stuart Altmann did.

Molecular anthropologists have contributed to hominoid phylogenetics by discrediting the very early divergence models for the Hominidae. However, there is still room for skepticism about claims that *Homo*, *Pan*, and *Gorilla* separated from one another only 5 million years ago (p. 117). Goodman and Cronin (pp. 119–136) openly disagree between themselves about the validity of molecular clocks and other fundamental theoretic issues.

Cartmill can claim a kiss from Clio for his chapter on the prosimian periphery of anthropology. He neatly demonstrates the difference between intellectual history and the mere setting down of names and events.

Fleagle and Jungers focus chiefly and selectively on problems of hominoid evolution in a chapter entitled "Fifty years of higher primate phylogeny." At the outset they state that the history is bound to be biased by their training and interests (pp. 187–188). Like Cartmill, they dwell on the role of parallelism in primate evolution and Sir W. E. Le Gros Clark's invocation of it to explain the postcranial morphological similarities between apes and humans (p. 196). In fact, what Le Gros Clark, W. L. Straus, Jr., and other primatologists had ascribed to parallelism should have been designated chance similarity. Fleagle and Jungers (p. 206) get parallelism straight but seem to have confused con-





Three figures in American physical anthropology. *Clockwise, from left*: Frederick Ward Putnam, who founded at Harvard what is "the oldest (continuously operating) department in the country, [which produced] in 1898 the first Ph.D. in physical anthropology in America"; Aleš Hrdlička; and Earnest Albert Hooton. [From *A History of American Physical Anthropology, 1930–1980*, courtesy (respectively) of Peabody Museum, Harvard University; National Anthropological Archives, Smithsonian Institution; and Peabody Museum, Harvard University]

vergence with chance similarity. I submit that if human similarities to apes were the result of different selective pressures, they would exemplify chance similarity.

Fleagle and Jungers pass over the role that my work on knuckle-walking (*Science* **166**, 953 [1969]) played in stimulating models of hominoid evolution and novel studies on the forelimb remains of Miocene and later fossils. Whereas S. L. Washburn, D. R. Pilbeam, E. L. Simons, J. T. Robinson, R. E. F. Leakey, V. Sarich, and, in his first paper, J. G. Fleagle variously incorporated early knuckle-walkers in their models, I maintained that available fossils of *Proconsul, Australopithecus*, and *Homo* did not allow us to determine whether they were knuckle-walkers. Further, the comparative anatomical evidence argues against knuckle-walkers in the hominid lineage. Recent discoveries of metacarpal bones at Hadar evince that Pliocene Hominidae lacked the diagnostic features of knuckle-walkers. Instead the Hadar hominids were probably terrestrial bipeds that still climbed up trees for night lodging, escape from predators, and some foraging (Tuttle, *Philos. Trans. R. Soc. London Ser. B* **292**, 89 [1981]).

Like many other sciences, physical anthropology has accumulated an "ethical load" that might be more menacing than the elusive "genetic load" that impressed past makers of public policy. Anthropologists must be sensitive to the concerns of persons who do not want graves disturbed and primates trashed in trivial experiments and who are offended by racist museum exhibits here and abroad. Then their newsworthy and practically applicable research will amuse and benefit all of humankind.

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Human Prehistory Legitimated

The Establishment of Human Antiquity. DONALD K. GRAYSON. Academic Press, New York, 1983. xii, 262 pp., illus. $27.50.

Historians of 19th-century geology, paleontology, and archeology agree that establishing that human beings had inhabited the earth for longer than six thousand years played a significant role in the development of each of these disciplines. Yet Grayson's book is the first comprehensive analysis of the controversies that led to the recognition of this antiquity. Apart from a concise review of the intellectual background of this controversy and of closely related 19th-century debates about the historical significance of the morphological diversity of humanity, Grayson focuses upon a small group of investigators who, between 1810 and 1860, sought evidence to determine when human beings first appeared in the geological record. By carefully examining the work of each of these men in the context of the time when it was done, he sheds new light on a fascinating intellectual enterprise that turns out to be poorly understood by modern archeologists. He makes an especially important contribution to understanding the career of Jacques Boucher de Perthes, the first scholar who studied this problem from a combined archeological, geological, and paleontological point of view. He points out the limitations of Boucher de Perthes's sometimes fanciful interpretations and his occasionally dishonest reportings of his finds, but he also delineates his striking evolution from being an isolated amateur championing preposterous theories in 1846 into being a well-informed researcher in 1857. On a more general level, Grayson demolishes the stereotype of uniformitarians as necessarily furthering the recognition of the true antiquity of humanity and catastrophists as impeding it.

Grayson also demonstrates that during the first half of the 19th century most paleontologists did not attribute Pleistocene glacial deposits to Noah's flood while at the same time claiming (in an incomprehensible contradiction of Scripture) that these deposits must antedate evidence of human activity. In the course of the 18th century, western European paleontologists had come to view the earth as having been shaped over many millennia by a beneficent God as a habitat for mankind. For humanity to appear before this process was complete was widely interpreted as casting doubt on God's role in it. It was this belief that led most paleontologists to reject the possibility that mankind had appeared prior to the extinction of the megafauna associated with Pleistocene gravels.

Although traces of human presence were repeatedly found associated with the bones of extinct mammals in caves in England and western Europe beginning as early as 1774, the majority of eminent geologists and paleontologists dismissed these associations as natural mixtures of material from different ages or as the results of poorly controlled excavations; however, it appears that they often did this without adequately examining the evidence, which sometimes included indications that humans had worked the bones of prehistoric animals. The situation was further confused because cave deposits were notoriously difficult to date geologically. The antiquity of humanity was not established until Boucher de Perthes and M.-J. Rigollot demonstrated beyond doubt that in the Somme Valley there was an intimate association between stone tools and Pleistocene fauna in a stratigraphic context that a uniformitarian geology required to be many thousands of years old. (For this reason the importance of the work of Charles Lyell should not be discounted as much as it is by Grayson.) Between 1857 and 1859, these finds led most British scholars to accept the great antiquity of humanity as an established fact.

Like J. W. Gruber, Grayson points out that the recognition of the antiquity of humanity preceded the publication of *On the Origin of Species* and that this issue was not necessarily linked to an evolutionary view of human origins either before or after 1859. He suggests that, if Darwin had published earlier, the backlash probably would have made it more difficult for scientists to accept the evidence for a great human antiquity. He therefore treats the debate about human antiquity as one that centered on the available evidence. He agrees with the majority opinion of the time that, prior to the work of Boucher de Perthes, this evidence remained inconclusive. Yet he also observes that in some instances rejection of the evidence for the great antiquity of humanity stemmed from the "sheer belief that such things could not be." He notes as well that prior to the late 1850's support for early human origins did not come from leading scientists, who generally opposed such claims or dismissed them as premature. Hence "the right persons" were not making the necessary discoveries. These observations suggest that, important as factual evidence may have been for resolving this issue, an internal explanation cannot account for the sudden reversal of opinion within the scientific establishment in the late 1850's, or for the widespread public interest in this reversal. Nor can it