

ANCESTORS

four million years of humanity



AMERICAN MUSEUM OF NATURAL HISTORY

April 13 - September 9, 1984

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This exhibition of original fossils documenting the long course of human evolution represents an unprecedented act of international paleoanthropological cooperation among 25 institutions in 12 countries around the world. Participating institutions are listed at the end of this booklet.

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EVOLUTION

The central postulate of evolution is that all species, living and extinct, are related through descent from a single common ancestor. The story of evolution recounts the diversification of life from that common ancestor which has resulted in the extraordinary diversity of the living world. In evolutionary biology, as in all active areas of research, there is lively debate among scientists. But such argument focuses on the mechanism by which evolution has taken place, not upon the concept of evolution itself. For the idea of ramifying descent from a common ancestor predicts exactly what we find when we look at nature: that life forms fall into series of successively more inclusive groups (e.g., primates, mammals, vertebrates, chordates, animals).

In a branching pattern of descent, relationships between any pair of species may be of one of two kinds: either one species is the ancestor of the other or both are descended, at some remove, from a common ancestor. Closely related species—those with a recent common ancestry—tend to look more alike than those more remotely related since usually they will have inherited a larger proportion of the characteristics of their common ancestor.

Because of this, the distribution of characteristics within a group of related animals can be used to determine the sequence of evolutionary separations within the group, hence the degrees of relatedness among the species within it. More recently evolved characteristics will normally have a more restricted distribution, while ancient ones will be more widely spread, even if lost in some subgroups.

As a result of this process of descent, and in common with all other living species, *Homo sapiens* has a unique biological history. The archive of that history is the human fossil record.

FOSSILS

Technically, a fossil may be any evidence of past life. But where mammals are concerned such evidence almost always consists of bones and teeth, the most durable tissues of the body. These best resist post-mortem destruction by the elements and thus may survive to become incorporated into the accumulating geo-

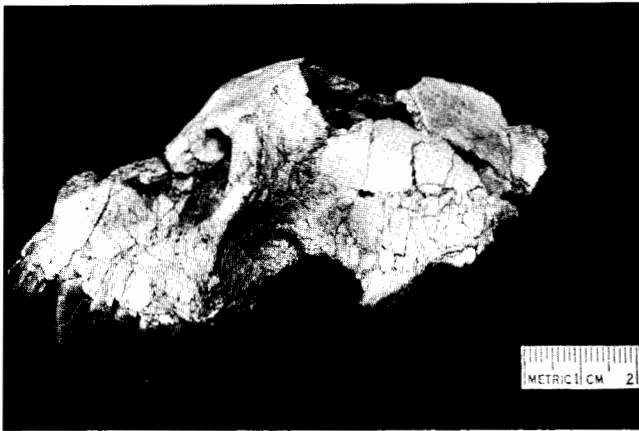
logical record. Fossils may be dated in one of two ways: they may be assigned an age in years or they may be placed relative to each other in the unfolding sequence of geological events. Year dates are generally obtained from the rocks in which the fossils are found rather than from the fossils themselves; of available methods the carbon-14 (useful only in the last 40,000 years) and potassium-argon (for rocks older than about 250,000 years) techniques are the most widely used in human paleontology. Such techniques assess the decay of naturally occurring radioactive isotopes, which takes place at very steady rates. Not all fossils can be radioactively dated, and their age must therefore be estimated by geological and paleontological comparisons with other regions.

APES AND HUMANS

It has long been recognized that the living great apes are mankind's closest surviving relatives, even though there is argument about the relative degrees of relatedness among the members of the larger group. Apes and humans (together called hominoids) share the same basic structure, but compared to apes humans are "specialized" in a number of features. The most significant of these human specializations include our large (and internally reorganized) brain; bipedal walking, which involves considerable modification of the body skeleton; our reduced face and canine teeth; and our unparalleled manual dexterity and the associated use and manufacture of sophisticated tools. It is generally agreed that the possession of any one of these features by a hominoid may be taken as a criterion of humanity, its possessors thus belonging to the human family.

EARLY PRIMATE EVOLUTION

Humans belong to the order Primates, the larger group which contains the living lemurs and their allies (the "lower primates") as well as the monkeys, apes and ourselves (the "higher primates"). The earliest known primates lived alongside the last dinosaurs, over 65 million years ago (Myr). By about 35 Myr the ancestral lower primates had been largely replaced by the early higher primates, among which we can already identify the ancestors of monkeys and apes. The closest of these more advanced forms to ape and human ancestry was



Cranium of *Aegyptopithecus zeuxis*: Egypt, ca. 33 Myr. Item 12.
Credit: E. L. Simons



Face of *Sivapithecus indicus*: Pakistan, 8 Myr. Item 11.
Credit: D. R. Pilbeam

Aegyptopithecus (item 12), known from deposits in Egypt dated to around that time. This early ape was a cat-sized, tree-living fruit eater, and unlike its successors possessed a tail.

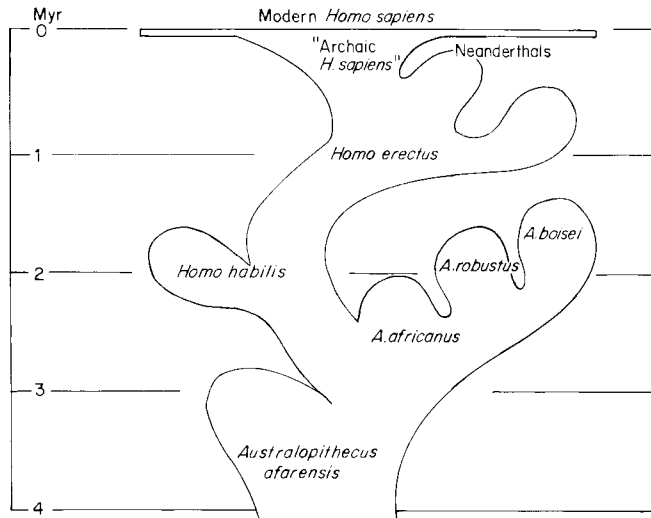
Subsequent diversification of this lineage gave rise to a variety of species known from East Africa between about 20 and 15 Myr. Descendants of this group later spread into Eurasia, where the early *Dryopithecus* (item 29) or a relative may have given rise to *Sivapithecus* (item 11) and other related forms known from Hungary to China, as well as in Africa, in the period from about 14 to 8 Myr. It is within this later group, adapted to eating tougher foods and to living in a more open environment than either their precursors or the modern apes, that the ancestry of the human family must ultimately lie. But the details of this ancestry remain obscure.

THE EARLIEST HUMAN BEINGS

The oldest forms that can clearly be admitted to the human lineage on the grounds already mentioned belong to species grouped into the genus *Australopithecus*. The first specimens of this kind were found in South Africa in the 1920s and 1930s by Raymond Dart and Robert Broom; the Leakeys began finding others at Olduvai Gorge, Tanzania, in 1959, and numerous subsequent discoveries have been made in Kenya and Ethiopia as well. Several distinct species of *Australopithecus* are known, but all share certain characteristics that both ally them with and set them off from later humans. For example, the chewing teeth are large and well developed, as is their supporting anatomy, but the canine teeth are reduced; the brain is larger compared to body size than that of any ape but not greatly so; the hip and leg are adapted to bipedal walking but show both unique and ancestral characteristics; compared to the trunk the arms are relatively long and the legs short; and in life the skull was less perfectly balanced than ours atop the spine.

VARIETIES OF AUSTRALOPITHECUS

There is some question as to exactly how many species of *Australopithecus* are known, and even whether all of these species really belong to the same genus. However, all are closely related, and only four species are generally



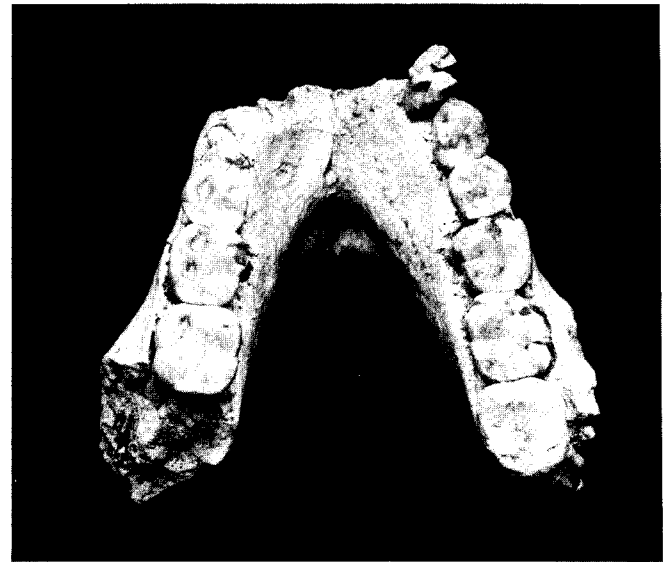
Simplified schema of the evolution of the human family.
Credit: Nicholas Amorosi

recognized. The earliest of these species, and thus the first certain hominid known, is *Australopithecus afarensis* (item 46) from eastern African deposits between about 4 and 3 Myr. The largest collection of such fossils comes from the Hadar area of Ethiopia, and includes the famous skeleton "Lucy" as well as parts of a dozen individuals believed to be from a single social group—the "first family." From "Lucy" we can tell that adult females were about 3' 6" tall, weighing perhaps 50 pounds; males were considerably larger, some estimates of weight extending upward of 100 pounds. The evidence of the skeleton tells us that these early humans must have walked bipedally, a conclusion confirmed by the remarkably well-preserved trail of striding footprints at the *afarensis* site of Laetoli, in Tanzania, dated at about 3.6 Myr. Brains were still small, though, even if somewhat bigger compared to body size than in apes, and there is no evidence of tool use at this early date.

The first species of *Australopithecus* to be recognized was *A. africanus*, named by Raymond Dart in 1925 on the basis of the "Taung child" (item 35). Best known from three southern African sites in the 3 to 2 Myr range (notably Sterkfontein: items 1-4), *africanus* is only equivocally known from eastern Africa. The distinctions between *africanus* and *afarensis* are relatively minor;

and mostly of degree: the face of *africanus*, for instance, seems to have been slightly less projecting, its incisor teeth relatively smaller, and its brain a little larger:

Both of these "gracile" (i.e., lightly built) species differ markedly from the two later "robust" species of *Australopithecus*, which share an extremely heavy build of the skull. They possess flat faces, thick jaws, and massive ridges on the braincase for the attachment of large chewing muscles; the front teeth are much reduced, while the chewing teeth are greatly expanded. The eastern African species *Australopithecus boisei* (items 43, 49) shows these features in more extreme form than the southern African species, *A. robustus* (items 5-6). Both robust species occur generally later in time (ca. 2.2-1.3 Myr) than do the gracile ones, among which their



Lower jaw of *Australopithecus afarensis*: Laetoli, Tanzania, 3.6 Myr.
Item 46.
Credit: Margo Crabtree/Science 84

ancestry presumably lay and by whose other descendants they were eventually outcompeted.

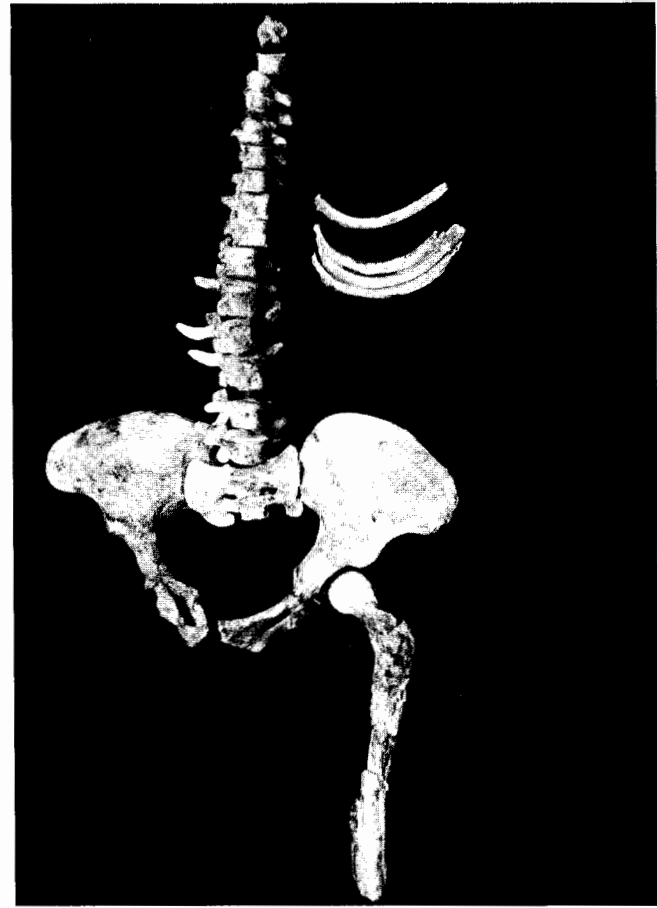
There is no clear-cut evidence that lifestyles were markedly different among the known species of *Australopithecus*. All were probably omnivores, hunting small animals and scavenging large ones they encountered



Skull of juvenile *Australopithecus africanus*: Taung, South Africa, ca. 2 Myr. Item 35.
Credit: Margo Crabtree/Science 84



Skull of adult (?female) *Australopithecus africanus*: Sterkfontein, South Africa, ca. 2.5 Myr. Item 1.
Credit: Ian Tattersall

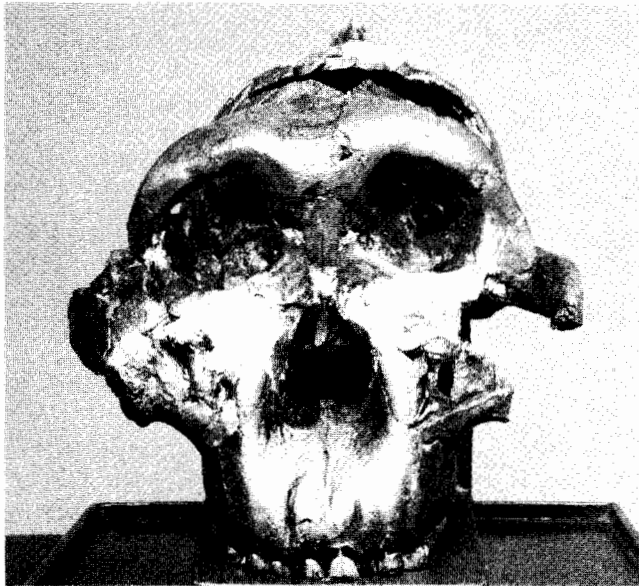


Skeleton of *Australopithecus africanus*: Sterkfontein, South Africa, ca. 2.5 Myr. Item 2.
Credit: Margo Crabtree/Science 84

dead, while depending for the bulk of their nutrition on gathering vegetable foods. The environment in which they lived was largely open savanna, through which they must have ranged widely. It has been suggested, however, that at least early *Australopithecus* may have indulged in some climbing, perhaps sleeping in trees. Despite their modest hunting activity, it seems clear that these early humans were not the savage "killer apes" sometimes depicted.



Lower jaw of *Australopithecus robustus*: Swartkrans, South Africa, ca. 1.7 Myr. Item 5.
Credit: Ian Tattersall



Cranium of *Australopithecus boisei*: Olduvai Gorge, Tanzania, 1.8 Myr. Item 43.
Credit: Margo Crabtree/Science 84

STONE TOOL-MAKING

Making and using tools is clearly one of the diagnostic features of humanity. Although other species may use—and even modify—natural objects as tools under limited circumstances, humans today not only use one tool to make another but are dependent on tools for their very survival. The archaeological record of human stone-working activities demonstrates that from the beginning a variety of stone tools was made to a regularized pattern. Earlier toolmakers may have used wood, bone, and naturally sharp stones, but evidence for such activities has not been preserved and they must in any event have been limited in effect.



Partial skull of *Homo habilis*: Sterkfontein, South Africa, ca. 1.9 Myr. Item 37.
Credit: Alun R. Hughes

EARLY ADVANCED HUMANS AND THEIR LIFEWAYS

All members of the human family subsequent to *Australopithecus* are nowadays assigned to our own genus, *Homo*. The earlier of the two extinct species of our genus normally recognized is *Homo habilis*. It first appeared in the fossil record at about 2 Myr and seems to have persisted for under half a million years. Found first at Old-

uvai Gorge (items 42, 44) and now known from South Africa (items 7, 37), Kenya, and Ethiopia as well, *habilis* differed little from gracile *Australopithecus* in the teeth but had a significantly expanded brain, a less projecting face, and a more modern body skeleton.

The oldest stone tools yet known come from East African deposits between 2.5 and 2 Myr. They include both crudely shaped “cores” and flakes struck from them using another stone. This “Oldowan” assemblage is associated with *Homo habilis* at several localities in South and East Africa. Along with other archaeological evidence, the tools suggest that *habilis* actively hunted small and medium-sized animals as well as collecting a variety of plant foods and butchering dead or disabled larger animals. There is no clear-cut evidence that these humans used fire or lived in shelters, but small groups may have ranged daily around semipermanent home bases.



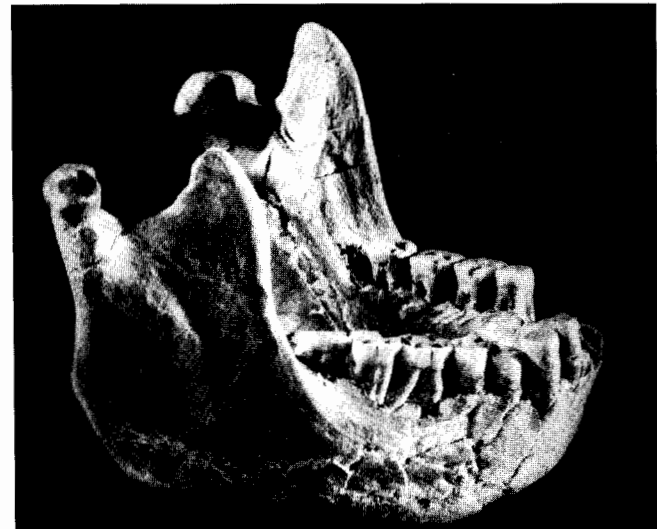
Oldowan core tools. Left, unifacial chopper; right, edge view of bifacial chopper. South Africa. Coll. SUNY, Stony Brook. Credit: Chester Tarka

The second ancient *Homo* species, the long-lasting *H. erectus*, also turns up first in East Africa (e.g. item 45), where it appears from about 1.7 Myr, and is found in sites from Algeria (item 28) to South Africa until about 0.5 Myr. Apparently widespread in the Old World (although its physical remains are known only from Africa and eastern Asia), and the first human species to penetrate the temperate climatic zone, *Homo erectus* persisted in Java (“Java Man”: items 8-9, 32-33) and China (“Peking Man”) from about 1 Myr until as late as 250,000 years ago.

Homo erectus is perhaps the most distinctive of all fossil human species. Robust but essentially modern in its body skeleton, it possessed a long, low skull, angled sharply at the back and constructed of thick bone. Its face was massive, and its forehead receded sharply



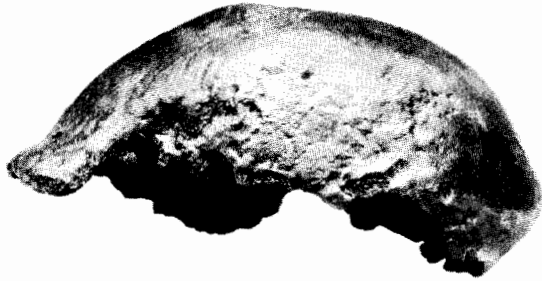
Braincase of African *Homo erectus*: Olduvai Gorge, Tanzania, ca. 1.2 Myr. Item 45. Credit: Philip Rightmire



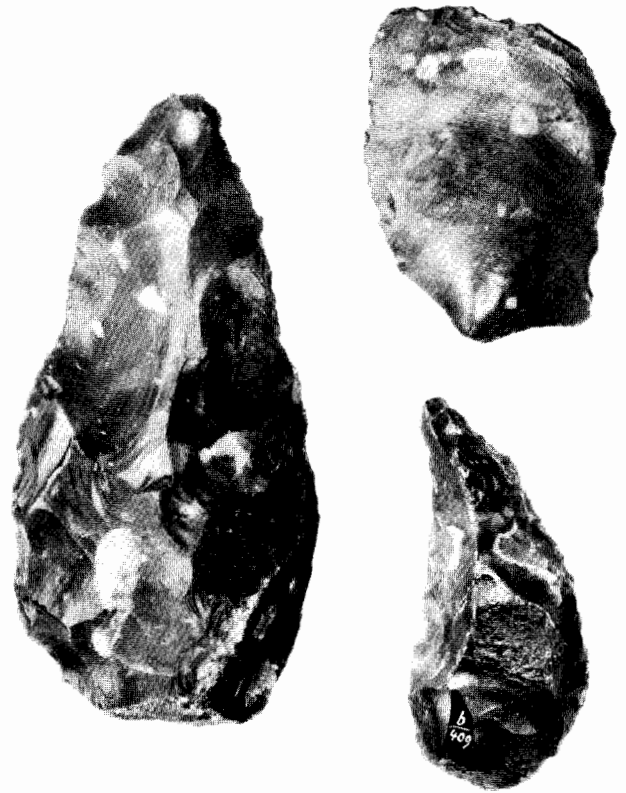
Lower jaw of African *Homo erectus*: Ternifine, Algeria, ca. 500,000 B.P. Item 28. Credit: L. Ginsburg

behind strongly developed brow ridges. The brain of *erectus* was substantially larger than that of *habilis* (although still well short of the modern average), and its teeth were much smaller than those of its predecessor.

A more complex "Acheulean" stone tool kit appears in Africa at around the same time as fossils of its probable maker, *Homo erectus*. These tools are larger than the Oldowan, more carefully shaped, and made from a greater variety of stony materials. Most typical are the bifacially flaked, pointed "handaxe" and the straight-edged "cleaver," but many tool types were made for a variety of butchering, digging and skin-cleaning tasks. Such tools have been found across Africa, in Europe, and in India; but in China and southeast Asia differences in available materials, and perhaps the use of bamboo as a substitute, led to a difference in the preserved tool kit. An accomplished hunter of large game as well as a gatherer of plant foods, *Homo erectus* was apparently the earliest form of human not only to use fire (documented as early



Skullcaps of Java *Homo erectus*: Trinil 2 (Item 8), and (below), Sangiran 2 (Item 32), both ca. 700,000 B.P.
Credit: AMNH



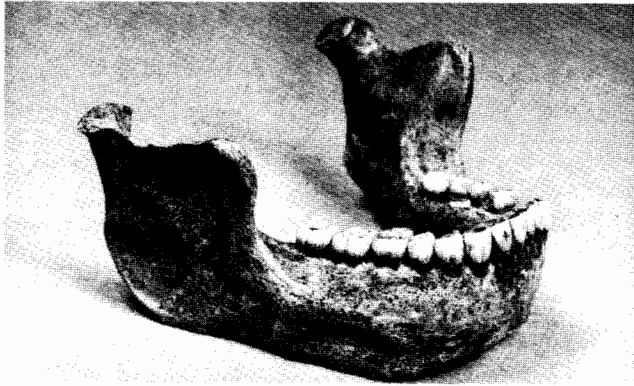
Acheulean tools. Left, handaxe; above right, Levallois flake; lower right, pointed flake scraper. St. Acheul, France. Coll. AMNH.
Credit: Chester Tarka

as 1.4 Myr in East Africa) but also to live in caves as well as in open sites.

THE ICE AGES

World climate has cooled periodically over geological time. The most recent "Ice Age," accompanied at high latitudes and elevations by the spread of ice sheets, began to affect temperate Eurasia about one million years ago, well after the beginning (at 1.6 Myr) of the geological epoch known as the Pleistocene. Since that time the climate has alternated regularly between cold phases of ice-sheet buildup and warmer periods comparable to

today. On average it has taken about 100,000 years to pass from one trough of maximum cold to the next; the last such glacial maximum occurred about 18,000 years ago. During cold phases ice sheets advanced over Eurasia as far south as central Germany and northern China, pushing the vegetation zones (e.g., tundra, heath, and temperate forests) before them. Further, worldwide sea levels dropped (often by several hundred feet) as a result of the "locking up" of precipitation in the expanding glaciers. Thus the advancing ice sheets not only fragmented human populations living in more northerly areas but also allowed humans to colonize regions such as Java, which was apparently reached at around 1



Lower jaw of European "archaic *Homo sapiens*": Mauer, West Germany, ca. 500,000 B.P. Item 26.
Credit: GPIH

Myr and had previously been isolated by shallow seas. In tropical areas the colder periods seem to have been characterized by increased rainfall.

"ARCHAIC *HOMO SAPIENS*"

By about half a million years ago, a new kind of human had appeared, perhaps first in Europe. Because these people possessed features shared with later humans belonging to our species *Homo sapiens*, many regard them as "archaic" members of that species. Some, however, classify them as an "evolved" form of *H. erectus*, while another possibility is that they represent an intermediate third species. Advanced features include expan-



Face of European "archaic *Homo sapiens*": Arago, France, ca. 400,000 B.P. Item 22.
Credit: J. Oster/MHP

sion of the facial sinuses and enlargement of the rear of the skull as well as reduction of the teeth and greater brain size relative to *H. erectus*. Humans of this type are known from Europe (e.g., items 21-26, 50) between about 500,000 and 200,000 B.P. (years before the present) and turn up a little later in northern (item 13) and in sub-Saharan (items 27, 48) Africa, where they are sometimes known as Rhodesian man. In contrast, in eastern Asia evidence from both China and Java suggests the late persistence of *H. erectus* through most of this period.

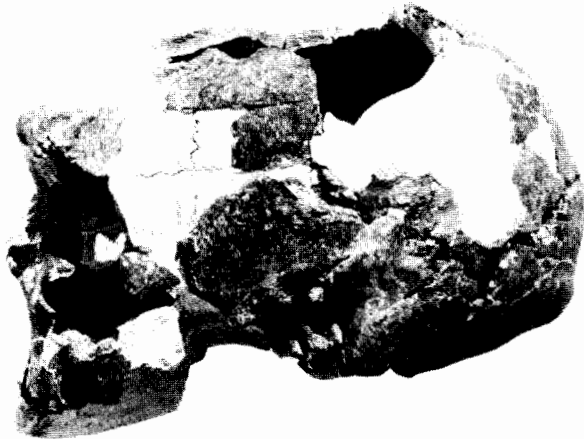
The stone tool kits of "archaic *H. sapiens*" differed little at first from those of *H. erectus*, and it was relatively late that the innovation of the "prepared-core" technique appeared, wherein a single blow of the "hammer" detached a flake of predetermined shape. However, it is with this type of human that we find the first definite evidence of the construction of shelters at open sites. These were made from branches embedded in circles in the ground, and brought together at the top.



Cranium of late European "archaic *Homo sapiens*": Steinheim, West Germany, ca. 250,000 B.P. Item 50.
Credit: Margo Crabtree/Science 84



Cranium of later African "archaic *Homo sapiens*": Ngaloba beds, Laetoli, Tanzania, ca. 120,000 BP. Item 47.
Credit: M. H. Day



Cranium of African "archaic *Homo sapiens*": Lake Ndutu, Tanzania, ca. 350,000 B.P. Item 48.
Credit: Philip Rightmire



Cranium of Neanderthal from northern Europe: La Ferrassie, France, ca. 50,000 B.P. Item 19.
Credit: Margo Crabtree/Science 84

THE NEANDERTHALS

These most famous of all fossil humans inhabited Europe and the Near East between about 150,000 (item 14) and 32,000 B.P. (item 15). The Neanderthals were the first ancient humans to become known to science (e.g., item 17), but it was not until some years after Darwin published his *Origin of Species* in 1859 that they were

recognized as a distinct type. Their body skeleton differed from ours only in minor ways, but the Neanderthal skull was very distinctive: long and low, with a protruding “bun” at the back. The face was large and projecting, and the cheekbones receded dramatically below strong brow ridges. Despite these differences the Neanderthals are generally classified as members of *Homo sapiens*, especially since their brains were as large as ours although differently shaped. The ancestry of the Neanderthals can now be identified among some of the later European “archaic *H. sapiens*” (item 50), but they appear to have died out in Europe with leaving descendants.

During the time that Neanderthals were inhabiting



Cranium of Neanderthal from the Near East: Amud, Israel, ca. 45,000 B.P. Item 39.
Credit: Tsila Sagiv/IDAM

Europe and western Asia, rather different humans are known from rare fossils in China. In Africa, this interval also saw the emergence of possible intermediates (e.g. items 16, 47) between the “Rhodesian” types and modern humans.

NEANDERTHAL SITES AND LIVING PLACES

The earliest Neanderthals (item 14) are known from France in sites dating from the end of the next to last major glacial episode, about 150,000 to 125,000 B.P. In the succeeding warmer “interglacial,” between about 125,000 and 90,000 B.P., these humans lived across Europe from France and Italy (item 34) to Yugoslavia (item 30), and possibly as far east as western Asia. Neanderthals are best known, however, from the most recent major period of glaciation (about 90,000 to 30,000 B.P.: items 19-20, 31, 39), when they ranged from the Atlantic to Afghanistan and Soviet central Asia. It is the “classic” Neanderthals of this latest period, isolated in Europe by the advance of the ice sheets, who show the distinctive features of their



Mousterian tools. Upper left, Mousterian point; lower left, side scraper; right, small handaxe. Le Moustier, France. Coll. AMNH.
Credit: Chester Tarka

kind in the most extreme form; other Neanderthals are physically more conservative.

Although the Neanderthals are often thought of as "cavemen," their remains have been found in open-air encampments as well as in caves and rock overhangs. At a number of these sites the remains of hutlike structures have been found. Neanderthal tools included a variety of flake scrapers, borers and spear-points, and sometimes handaxes. Many flake tools were made using a refinement of the prepared core technique, whereby several tools could be removed from a single core. Studies of the traces left by use on Neanderthal tools suggest that scrapers, for instance, were used in removing meat from hides, in preparing hides for clothing, and in cutting up meat for consumption. Neanderthals commonly took care of their injured and buried their dead, sometimes including grave goods such as tools, food, ochre, and perhaps even flowers. Particularly during colder periods, Neanderthals probably lived a migratory existence, following the game herds they hunted.

In sum, although it is clear that they were socially, technologically, and spiritually less sophisticated than the modern hunters who replaced them, the Neanderthals were far from the shuffling, grunting savages of the cartoons: an image foisted on them by major misinterpretations made during the first large-scale anatomical study of a complete Neanderthal skeleton (which later turned out to show the effects of advanced arthritis).

THE ORIGIN OF MODERN HUMANS

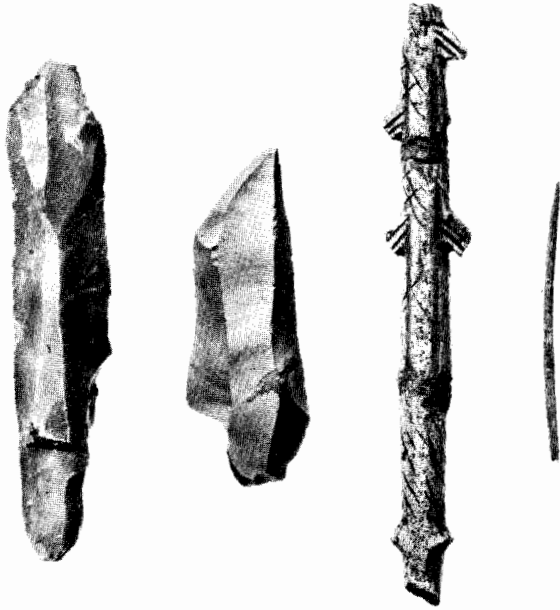
All modern humans share a distinctive skull anatomy that includes such features as a protruding chin, a vertical forehead unadorned with brow ridges, a high, rounded braincase of thin bone, and small teeth. The origin of this unique physical type is an unresolved question in paleoanthropology. The first hints of transition from earlier forms come from subsaharan Africa. Fragmentary or poorly dated remains from Ethiopia may be as old as 125,000 years; the anatomically modern Border Cave (item 36) skull from South Africa is claimed to be over 50,000 and perhaps as much as 90,000 years old. Further, some possibly "transitional" forms (e.g., items 16, 47) are known in subsaharan Africa from the same

period or a little earlier. In the Near East and northern Africa fossils from several sites document the presence between about 40-30,000 B.P. of humans (e.g. item 51) who were reasonably modern but nonetheless distinct from any surviving group; and there are earlier hints of more primitive "transitional" forms in this region too (item 38).



Cranium of early modern *Homo sapiens* from Europe: Cro-Magnon, France, ca. 25,000 B.P. Item 18.
Credit: Margo Crabtree/Science 84

By about 30,000 B.P. we find in Eurasia and Africa the remains of modern humans generally similar to the modern inhabitants of those regions. Thus the Cro-Magnons (item 18), who spread westward in Europe after about 40,000 B.P. to replace the Neanderthals by about 30,000 B.P., appear to represent the immediate progenitors of today's Europeans.



Late Paleolithic tools. Left to right: unretouched blade; burin; antler harpoon point; bone needle. France. Coll. AMNH. Credit: Chester Tarka/AMNH

TECHNOLOGY AND EARLY ART

The tool kits of the anatomically modern humans of the last glacial period almost invariably belong to the "Late Paleolithic" phase of technological development. They are characterized by elongate flakes, known as "blades," removed from semicylindrical cores which often yielded as many as 10-25 blanks. These long flakes were then worked further into any of a variety of tool types. In addition to stone scrapers, knives, engraving tools, and spear-points, Late Paleolithic people also fashioned bone implements such as needles, awls, and harpoons.

These sophisticated tool kits represented considerable improvements on earlier kits such as those of the Neanderthals, and their makers appear to have had an unprecedentedly rich cultural existence. Engraved bones, sculptures, and multicolored paintings on cave walls

have long been known at Late Paleolithic sites, and recently it has been suggested that some marked bones represent primitive calendars. The combination of technological sophistication, artistic achievement, and in some areas the apparent beginnings of trade and social stratification, clearly set off these early modern humans from any of their predecessors. These newcomers must have possessed some form of modern articulate speech; the extent to which any of their precursors may have done so remains a matter for debate.

PEOPLE SPREAD INTO NEW REGIONS

Modern humans are known in the Indonesian archipelago (e.g. item 10) as far back as 40,000 B.P., and were certainly on the mainland as well. Between about 30,000 and 20,000 B.P., and also earlier, global lowering of sea level caused by major glacial advances at high latitudes allowed humans to cross into previously isolated land masses such as Australia and North America. It is likely that most such crossings were made by Late Paleolithic hunters who were following game herds rather than purposely seeking new territories, although Australia could not have been reached from the mainland without a reduced water crossing. It may be that two distinct types of early moderns, one more robust (e.g., item 40) than the other (e.g., item 41), are represented in Australia, although differences between the two may in fact have been due to cultural practices (head binding, for example). In any event, however, all early modern human types from the Indonesian region as well as from Australia belonged to a single stock similar to living native Australians.

Archaeological evidence indicates that early peoples had crossed into North America, via the Bering land bridge, at least as long ago as 12,000 B.P. Very shortly after this they had already spread widely, for instance to southern Chile (item 52), and to California (item 53). However, the progenitors of these documented people may well have arrived in Alaska at about 20-18,000 B.P., when sea level was at its lowest, or possibly even earlier. In either case, it is certain that America was first colonized by fully modern humans, more recently than 50,000 years ago.

Ian Tattersall and Eric Delson

CONTRIBUTING INSTITUTIONS

American Museum of Natural History, New York, USA (AMNH)
 Antiquities Division of Tanzania, Dar es Salaam (ADT)
 Geological Museum, Cairo, Egypt (GMC)
 Geological Survey of Pakistan, Quetta (GSP)
 Geologisch-Paläontologisch Institut, Universität Heidelberg,
 Federal Republic of Germany (GPIH)
 Geološko-Paleontološki Muzej, Zagreb, Yugoslavia (GPMZ)
 Institut de Paléontologie Humaine, Paris, France (IPH)
 Israel Department of Antiquities and Museums, Jerusalem
 (IDAM)
 Musée de l'Homme, Paris, France (MHP)
 Muséum National d'Histoire Naturelle, Paris, France (MNHN)
 Museum of Victoria, Melbourne, Australia (MV)
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 Natural History Museum of Los Angeles County, Los Angeles,
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 Université de Bordeaux, Talence, France (UB)
 Université de Paris VI, Paris, France (UP)
 University of the Witwatersrand, Johannesburg, South Africa
 (UW)

INVENTORY OF ORIGINAL SPECIMENS

Item	Specimen	Lender	Item	Specimen	Lender
1	Sts 5 cranium	TM	28	Terrifine 3 mandible	MNHN
2	Sts 14 part skeleton	TM	29	MNHN 1857-1 mandible	MNHN
3	Sts 52a&b maxilla/mandible	TM	30	Krapina A/1 cranium	GPMZ
4	Sts 71 cranium	TM	31	Krapina C/3 cranium	GPMZ
5	SK 23 mandible	TM	32	Sangiran 2 skullcap	SM
6	SK 48 cranium	TM	33	Sangiran 4 palate	SM
7	SK 847 part cranium	TM	34	Saccopastore 1 cranium	UR
8	Trinil 2 calotte	RMNH	35	Taung 1 part skull	UW
9	Trinil 3 femur	RMNH	36	Border Cave 1 skull	UW
10	Wadjak 1 cranium	RMNH	37	Stw 53 part cranium	UW
11	GSP 15000 face	GSP	38	Zuttiyeh 1 frontal	IDAM
12	CGM 40237 cranium	GMC	39	Amud 1 skull	IDAM
13	Salé 1 cranium	UP	40	Kow Swamp 1 cranium	MV
14	Biache 1 part cranium	UB	41	Keilor 1 cranium	MV
15	St. Césaire part skull	UB	42	OH 8 foot	NMT
16	Florisbad 1 part skull	NMB	43	OH 5 cranium	NMT
17	Neanderthal cranium, femur	RLB	44	OH 7 mandible & parietals	NMT
18	Cro-Magnon 2 skull	MHP	45	OH 9 skullcap	NMT
19	La Ferrassie 1 skull	MHP	46	LH-4 mandible	NMT
20	La Quina H5 skull	MHP	47	LH-18 cranium	NMT
21	Arago 44 part pelvis	IPH	48	LDH 1 cranium	ADT
22	Arago 21 face	IPH	49	Peninj 1 mandible	NMT
23	Arago 47 parietal	IPH	50	Steinheim 1 cranium	SMNS
24	Arago 2 mandible	IPH	51	Skhul 5 cranium	PM
25	Arago B3 mandible	IPH	52	Cerro Sota 2 cranium	AMNH
26	Mauer 1 mandible	GPIH	53	La Brea 1 skull	LACM
27	Saldanha 1 skullcap	SAM			

Cover photo
Cranium of *Australopithecus robustus* from Swartkrans, South Africa,
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