

HUMAN EVOLUTION

Australopithecus (Dart, 1925)

The early hominid genus, *Australopithecus*, is characterized by a mosaic of pongid-like and human-like traits. They have the brain size and brain morphology of pongids and the bipedality of humans. Teeth are characterized by thick enamel and large cusps. The cheek teeth (molars and premolars) are notably large.

Australopithecus afarensis (Johanson, White, and Coppens, 1978)

Date: 5 to 3 MYA

Distribution: Africa

Brain volume in *Australopithecus afarensis* is relatively small (380-450 cc) and body size ranges from 30 to 60 kg, comparable to pygmy chimps. Dental proportions are somewhat chimp-like with incisors and canines slightly larger than those of modern humans while premolars and molars are slightly larger than those of apes. *A. afarensis* postcranial anatomy, like the skull, is a mosaic of pongid and human traits. The pelvis and lower limbs are more human than ape, and the shoulder and upper limbs are more ape than human. The pelvis is clearly that of a biped, and the leg and foot, although not completely modern, differ from apes in the direction of bipedal adaptations.



Australopithecus africanus (Dart, 1925)

Date: 3 to 2 MYA

Distribution: Africa

Australopithecus africanus has a slightly larger brain volume (430-520 cc). Maxillary premolars are enlarged and molariform. In general the molar occlusal surface is greatly enlarged and premolars are expanded to function as additional molars. Canine and incisors are relatively small, and P3 is not sectorial. The mandible is larger and more robust than in *A. afarensis*.



Australopithecus robustus (Broom, 1938)

Date: 2 to 1.5 MYA

Distribution: Africa

Australopithecus robustus continues a specialization toward enlarging the molar surfaces by enhancing the cheek teeth. The mandible is more robust. The anterior portion of the temporal muscle is emphasized and enlarged. The face is shortened by movement of the palate and cheek teeth even farther behind the zygomatics. This produces maxillae with zygomatic processes positioned forward in a "dished" face, that is one with a concave profile. Brain size is similar to *A. africanus*.



Australopithecus boisei (L. Leakey, Tobias, and Napier, 1964)

Date: 2.8 to 1.4 MYA

Distribution: Africa

Australopithecus boisei represents the extreme of massive molarization of cheek teeth, specialized for some type of mastication that utilized large, flat, crushing surfaces. The massive mandible has even greater bone mass in the mandibular body than does that of A. robustus. Cranial volumes remain small (410 to 530 cm³).



Homo (Linnaeus, 1758)

The genus Homo, humanity, originating during this Pliocene radiation of bipedal apes, does not exhibit the expansion of cheek teeth and facial specializations for powerful mastication seen in later and more specialized Australopithecines. Instead, Homo, retaining a more primitive chimpanzee-like face and dentition, exhibits reduced projection of canine, non-sectorial P3, and expanded brain size. Changes in these two anatomical complexes, canine teeth and brain volume, transform cranial and facial anatomy from pongid to human.

Homo habilis (L. Leakey, Tobias, and Napier, 1964)

Date: 2.4 to 1.5 MYA

Distribution: Africa

Homo habilis is a small hominid characterized by comparatively small and narrow cheek teeth, a narrow mandible, a larger cranial capacity (600 to 800 cm³), and a bipedal locomotor anatomy. Hands are still robust with relatively long arms, reminiscent of their suspensory ancestry. Legs are short and feet are surprisingly modern. H. habilis overlaps in time and location with A. boisei and A. robustus.

Oldowan artifacts are associated with numerous occupation sites and a surprising number of kill/butchering sites. The largest of the butchered animals is the elephant, Deinotherium. The repeated discovery of large animals that died and were butchered under identical circumstances lends credence to the idea that Oldowan hominids may have deliberately driven large animals into the mud and killed them.



Homo erectus (Dubois, 1892)

Date: 1.8 to 0.2 MYA

Distribution: Africa, Europe, Asia

Homo erectus is somewhat larger than H. habilis. The larger bodied H. erectus has a substantially increased cranial capacity. Brain volume ranges from 800 to 1200 cc, with a mean of about 900 cc. The general features of the skull are somewhat more robust than those of H. habilis. Cheek teeth (molars are premolars) are relatively small, and the mandible has no chin. Rightmire (1986) estimates the average body weight of H. erectus to be about 48 kg. Thus, a brain to body ratio suggests a brain volume averaged about 87% of that of a modern human of comparable size (Rightmire, 1990). H. erectus is associated with the Acheulean Industrial Complex except in Asia East of India,



where the technology is more Oldowan-like. Lithic industries like the Oldowan and Acheulean, which emphasize choppers, simple flake tools, handaxes and/or cleavers, are grouped under the term Early Stone Age (ESA), or the generally equivalent term, Lower Paleolithic. Since stone tools readily survive in habitation or activity sites, there is a rich archaeological record during H. erectus time periods. The important H. erectus site at Zhoukoudian in northern China contains evidence of fires. Numerous H. erectus archaeological sites contain animal bones, suggesting habitual hunting. A common animal represented in East African H. erectus sites is an extinct relative of the gelada baboon, but H. erectus butchered game as large as hippo and elephant in numerous localities.

Homo sapiens (Linnaeus, 1758)

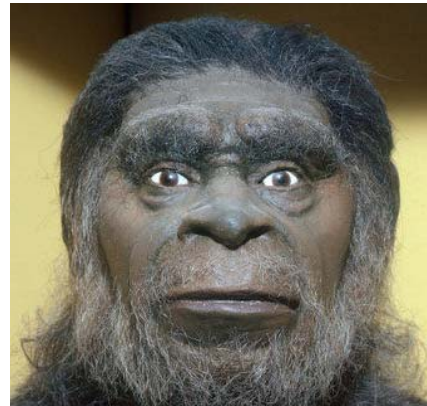
Many of the best dated archaeological sites have produced only fragmentary fossils or worse, only artifacts. The following model arbitrarily divides archaic H. sapiens into three subspecies morphotypes.

Homo sapiens soloensis (Oppenoorth, 1932)

Date: ca 400,000 to 100,000 YA

Distribution: Africa, Asia, Europe

Early or archaic Homo sapiens differs from H. erectus primarily in its larger cranial volume. Since there are geographic populations of H. erectus whose anatomy already expresses an evolutionary trend toward a large skull size, the boundary between chronospecies (H. sapiens and H. erectus) is confounded by morphological overlap in characters. Generally early H. sapiens samples have larger mean brain volumes than those of H. erectus in the same geographic region. Fossils that represent the transition from H.



erectus to H. sapiens are lumped in this discussion into a single archaic subspecies, H. sapiens soloensis. This classification is one of convenience in the absence of effective methods to reconstruct the population biology of fossil forms.

Homo sapiens rhodesiensis (also called Homo sapiens heidelbergensis) (Woodward, 1921)

Date: ca 0.4 to 0.1 MYA

Distribution: Africa, Europe

A divergent anatomy, i.e. pneumatized supraorbital torii, pneumatized mastoid processes, and massive faces, suggests a separate archaic human lineage. It is possible that this group does not represent a separate taxon from H. sapiens soloensis, but are merely its extremes of size variation or sexual dimorphism. The Bodo cranium was reconstructed from about 100 fragments found in a 25 m² area in a context that suggests Middle Pleistocene age - between 0.5 and 0.2 MYA (Conroy 1978; Kalb et al., 1980; 1984). The immediate area around the Bodo



discovery contains abundant Acheulean tools and numerous hippopotamus remains. Cut marks on the Bodo skull indicate intentional postmortem defleshing (White, 1986), a behavior associated among modern peoples with "trophy" preparation and, more commonly, funerary practices.

Homo sapiens neanderthalensis (King, 1864)

Date: 135,000 to 29,000 YA

Distribution: Circum-Mediterranean

The term Neanderthal, *H. sapiens neanderthalensis* (King, 1864), refers to a geographic population of early humans that occupied the Mediterranean area between 130,000 YA and 35,000 YA. Neanderthal cranial capacity ranges from 1,245 to 1,740 cc with an average near 1,520 cc. The skull has an unusual shape. Maximum cranial width is low on the temporal bones, producing an oval but long, low, large skull, the base of which is relatively flat. There is a profoundly robust and protruding occipital bone (a character called an occipital bun).



The postcranial skeleton indicates a powerful, barrel-chested physique with sturdy shoulders and arms. Unusually robust cervical spines and ligament attachment areas to the vertebrae, scapula, and long bones indicate exceptionally powerful shoulders and upper arms. Stout fingers terminate in more robust phalanges than modern hands. Both total thumb length and distal thumb phalanx length are longer than in our thumbs, suggesting a more powerful whole hand grip but a weaker precision grip, i.e., holding an object between thumb and fingers. Generally Neanderthal body build is comparable to that of modern humans from cold climates (Allen's Rule); powerful hands, relatively short limbs and an average male stature of about 166 cm (5' 4").

Homo sapiens sapiens (Linnaeus, 1758)

Date: ca. 0.1 MYA to Holocene

Distribution: Africa, Asia, Europe

Homo sapiens sapiens contemporary with Neanderthals are documented in Africa and across southern Asia. They coexist in some areas, especially Western Asia (Mt. Carmel, Qafzeh). The reduced bone mass of less robust *H. sapiens* mandibles is offset by external chin development that serves to reinforce and prevent dislocation of the mandibular symphysis during mastication. Cranial capacities of anatomically modern humans range from 1000 cc to 2000 cc, but generally are above 1,200 cc.



Modern humans moved into coastal Australia about 55,000 YA, and slowly penetrated into less accessible central areas. Asia, long populated by modern humans, was a source of repeated migrations across the narrow Bering Straits into the New World. During the last North American glaciation, this region would have been above sea level and accessible through an ice-free corridor about 50,000 to 40,000 YA and again between 27,000 and 8,000 YA. Early Americans spread rapidly across the continents, reaching Maine by 11,000 YA and the tip of South America by 9,500 YA. As the numbers of archaeological sites increase in the Americas, many Pleistocene animals (including giant bison, ground sloth, horse, mammoth, and mastodon) become extinct. The same drama occurred earlier in Europe as animals like the mammoth and woolly rhinoceros vanished, along with predators (other than humans) that specialized in hunting them.

Evolution of Primates.

<http://uts.cc.utexas.edu/~bramblet/ant301/thirteen.html#anchor266869>

What Does It Mean to be Human.

<http://humanorigins.si.edu/evidence/human-fossils/species/paranthropus-boisei>