

ORIGIN AND EVOLUTION OF MAN

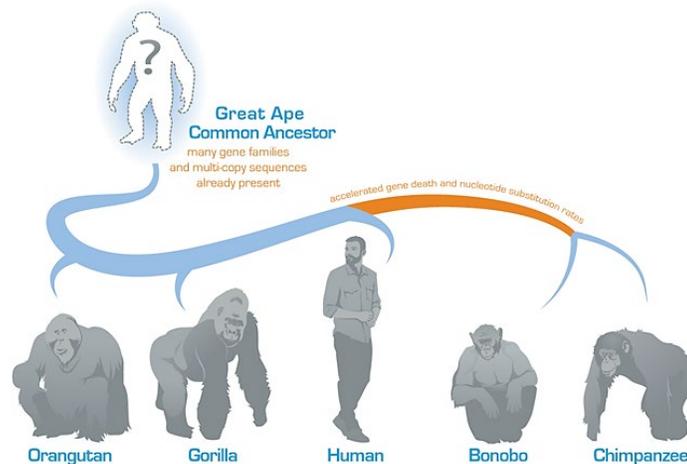


Fig: The hominoids are descendants of a common ancestor.

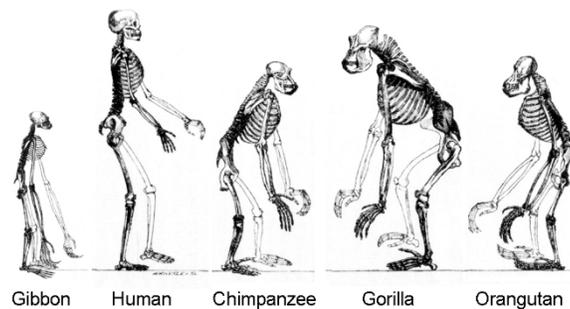


Fig: Skeletons of members of the ape superfamily, Hominoidea.

✦ INTRODUCTION:

Human evolution is the evolutionary process within the history of primates that led to the emergence of *Homo sapiens* as a distinct species of the hominid family, which includes all the great apes. This process involved the gradual development of traits such as human bipedalism, dexterity and complex language, as well as interbreeding with other hominins.

Primates diverged from other mammals about 85 million years ago (mya), in the Late Cretaceous period, with their earliest fossils appearing over 55 mya, during the Paleocene. Primates produced successive clades leading to the ape superfamily, which gave rise to the hominid and the gibbon families; these diverged some 15-20 million year ago (mya).

The *Homo* genus is evidenced by the appearance of *H. habilis* over 2 mya, while anatomically modern humans emerged in Africa approximately 300,000 years ago.

❖ STAGES IN HUMAN EVOLUTION:

The following are the stages of human evolution:

(1) Dryopithecus:

These are deemed to be the ancestors of both man and apes. They lived in China, Africa, Europe and India, where it lived from 13 to possibly 8 mya. The genus Dryopithecus refers to the oak wood apes. When Dryopithecus was alive, the tropical lowlands which it inhabited were densely forested, so the members could have predominantly been herbivores.

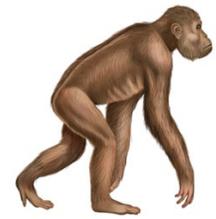


Fig: Dryopithecus

(2) Ramapithecus:

Their first remains were discovered from the Shivalik range in Punjab and later in Africa and Saudi Arabia. They lived in open grasslands. Two pieces of evidence confirm their Hominid status:

- Thickened tooth enamel, robust jaws and shorter canines.
- Usage of hands for food and defence and extrapolations of upright posture.

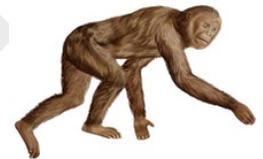


Fig: Ramapithecus

(3) Australopithecus:

The fossil of this genus was first discovered in 1924 in South Africa. The genus Australopithecus evolved in eastern Africa around 4mya. During this time period various forms of Australopiths existed, including Australopithecus anamensis, A. afarensis, A. sediba, and A. africanus.

They lived on the ground, used stones as weapons and walked erect. They were 4 feet tall and weighed 60-80 pounds.



Fig: Australopithecus

(4) Homo habilis:

They were the first hominid (human-like). They showed bipedal locomotion. Their cranial capacity was ~ 650-800 cc.

The first tool manufacturers were Homo habilis. Chipped stones were used to make tools. As a result, they are also known as able, skillful man, toolmaker or handyman. For various activities, several shaped tools were employed.

They lived in Africa about 2 mya. They were 1.2 to 1.5 metres tall. They didn't eat meat. They led a community life in caves. They took care of their young ones.



Fig: Homo habilis

(4) Homo erectus:

The first fossil of Homo erectus was found in Java in 1891. These were named as Pithecanthropus Erectus. These were considered as the missing link between the man and apes. Another discovery made in China was the Peking man.

This specimen had large cranial capacities and is believed to have lived in communities.

Homo erectus used tools comprising quartz. Tools made of bones and wood were also discovered. There is evidence of collective huntings. There is also evidence of the use of fire. The Homo erectus is believed to dwell in caves.



Fig: Homo erectus

(5) Homo sapiens neanderthalensis:

The Homo erectus evolved into Homo sapiens. During evolution, two sub-species of Homo sapiens were identified, namely Homo sapien neanderthal and Homo sapiens sapiens. The cranial capacity of Neanderthal grew from 1200 to 1600 cc. Some small hand axes had also been discovered. This species of hominids could hunt big names such as mammoths.



Fig: Homo neanderthalensis

(6) Homo sapiens sapiens:

The remains of Homo sapiens were first discovered in Europe and were named as Cro-Magnon. In these, the jaws are quite reduced, the modern man's chin appeared, and the skull was rounded. Their cranial capacity was about 1350 cc. They gathered food through hunting. Art first appeared during this time.



Fig: Homo sapiens

✱ **TRENDS IN HUMAN EVOLUTION:**

There are a number of trends in the evolution of the proto-hominins to modern Homo sapiens. These traits do not occur all at once, but over millions of years. In general, the trends include:

- the forward movement of the foramen magnum
- a reduction in the size of the canines
- an increase in the size of the molars
- disappearance of the diastema (gap between the incisors and canines)
- an increase in cranial capacity
- a decrease in prognathism (jutting forward of the bottom part of the face)
- thinning of the bone
- rounding of the skull.

It is to be noted that not all of these traits occur at the same time and there is variation among the various hominin species, but all of these morphological characteristics occur in the evolutionary line of Homo sapiens.

Three other trends are important in the evolution of hominins: bipedalism, non-honing chewing complex, and encephalization of the brain. These are discussed in more details as below:

(1) Bipedalism:

Research in the 20th century showed that bipedalism, or upright walking, was the first morphological trait on the road to humanity. It is the primary form of moving around, & it is habitual.

There are numerous anatomical changes that evolved to make hominins efficient bipedal locomotors. Here are some of the major changes that occurred (eLucy 2007):

- **foramen magnum:** the foramen magnum is the hole at the bottom of the skull, allowing for the spinal cord to pass through perpendicular to the ground
- **spinal cord:** the s-shape of the spine lowers the center of gravity needed for efficient bipedal walking
- **pelvis:** the pelvis became bowl-shaped to help support the upper body while walking, aid in balance, and provide for the necessary muscle attachment that allows for the forward swing of leg
- **femur:** the larger femoral head along with the hip joint absorbs more stress while walking
- **feet:** big toe, or hallux, is in line with other toes, which allows for more force when pushing off while walking.

(2) Non-honing chewing complex:

Apes have a honing chewing complex, which is good for cutting and shredding food. Their upper canines are large, pointed (triangular shape), and projecting. These two teeth also have a sharp edge on the back. This edge is kept sharp because each time the jaws close, the upper canine rubs against, or hones, the sharp edge of the lower third premolar. This can happen because of the diastema present on the jaws that allows for the jaws to close completely. Without the honing action, the canines and premolars would not be able to efficiently shred leaves and fruit.

Over time, hominins lose this honing complex. The diastema disappears, the canine reduces in size, and the molars increase in size (Larsen 2014).

(3) Encephalization of the Brain:

Encephalization of the brain refers to a couple of things: 1) the increase in brain size over time (about 20% increase over australopithecines) and 2) the size of the brain in relation to total body mass. The brain-size to body mass ratio does not change that much in the hominins.

During this process of encephalization, there is also a rewiring of the brain that coincides with the emergence of material culture such as stone tools. Also, that with the emergence of *Homo*, we see the lateralization of the brain, where it becomes asymmetrical (right brain, left brain).

* MAJOR HOMINID SPECIES:

The original meaning of "hominid" referred only to humans (*Homo*) and their closest extinct relatives. However, by the 1990s humans, apes, and their ancestors were considered to be "hominids".

The Hominidae (whose members are known as the **great apes** or **hominids**) are a taxonomic family of primates that includes eight extant species in four genera:

(1) *Pongo* (the Bornean, Sumatran and Tapanuli orangutan):

- Orangutans are great apes native to the rainforests of Indonesia and Malaysia. They are now found only in parts of Borneo and Sumatra, but during the Pleistocene they ranged throughout Southeast Asia and South China.
- From 1996, they were divided into two species: the Bornean orangutan (*P. pygmaeus*, with three subspecies) and the Sumatran orangutan (*P. abelii*). A third species, the Tapanuli orangutan (*P. tapanuliensis*), was identified definitively in 2017. All three orangutan species are considered critically endangered.
- Orangutans are among the most intelligent primates. They use a variety of sophisticated tools and construct elaborate sleeping nests each night from branches and foliage.
- The social structure of the orangutan can be best described as solitary but social; they live a more solitary lifestyle than the other great apes.



(2) *Gorilla* (the eastern and western gorilla):

- Gorillas are herbivorous, predominantly ground-dwelling great apes (largest living primates) that inhabit the tropical forests of equatorial Africa. The genus *Gorilla* is divided into two species: the **Eastern gorilla** and the **Western gorilla**. Both species are classified as Critically Endangered by the IUCN.
- The DNA of gorillas is highly similar to that of humans, from 95 to 99% and they are the next closest living relatives to humans (after chimpanzees and bonobos).
- Gorillas' natural habitats cover tropical or subtropical forest in Sub-Saharan Africa. The mountain gorilla inhabits the Albertine Rift montane cloud forests of the Virunga Volcanoes. Lowland gorillas live in dense forests and lowland swamps and marshes as low as sea level, with western lowland gorillas living in Central West African countries and eastern lowland gorillas living in the Democratic Republic of the Congo near its border with Rwanda.
- Gorillas live in groups called troops. Troops tend to be made of one adult male or silverback, with a harem of multiple adult females and their offspring. Gorilla infants are vulnerable and dependent, thus mothers, their primary caregivers, are important to their survival. Male gorillas are not active in caring for the young, but they do play a role in socializing them to other youngsters.



(3) *Pan* (the chimpanzee and the bonobo):

- The genus name *Pan* was first introduced by Lorenz Oken in 1816. This genus consists of two extant species: the chimpanzee and the bonobo (since 1928). Taxonomically, these two ape species are collectively termed panins. Both species are listed as endangered on the IUCN Red List.
- The most obvious differences are that chimpanzees are somewhat larger, more aggressive and male-dominated, while the bonobos are more gracile, peaceful, and female-dominated.
- Native to sub-Saharan Africa, chimpanzees and bonobos are currently both found in the Congo jungle, while only the chimpanzee is also found further north in West Africa.
- Pans' are among the most intelligent primates. They use a variety of sophisticated tools and construct elaborate sleeping nests each night from branches and foliage. Their learning abilities have been extensively studied.



Fig: Bonobo (left side), Chimpanzee (right side)

(4) *Homo*:

- *Homo* is the genus that emerged in the genus *Australopithecus* that encompasses the extant species *Homo sapiens* (modern humans), plus several extinct species classified as either ancestral to or closely related to modern humans (most notably *Homo erectus* and *Homo neanderthalensis*).
- Anatomically modern humans (*Homo sapiens*) emerged close to 300,000 to 200,000 years ago, in Africa. *H. sapiens* soon after its first emergence spread throughout Africa, and to Western Asia in several waves, possibly as early as 250,000 years ago.

Fig: *Homo sapiens*
