

Human Evolution

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- Human evolution states that humans developed from primates or ape like ancestors.
 - Charles Darwin published his idea about man's ancestry in the book '**Descent of man and selection in Relation to sex**'. He suggested that man, apes and monkeys have a common ancestor.
 - **Anthropology** is the study of human evolution and culture. It deals with fossils of prehistoric and living man.
 - **Genology** is the sequential arrangement of stages in evolution.
 - The field of science which studies the human fossil record is known as **palaeoanthropology**.
 - It is the intersection of the disciplines of **palaeontology** (the study of ancient life forms) and **anthropology** (the study of humans).
 - All human beings are classified as *Homo sapiens* (*Homo* is the genus name meaning man, *sapiens* is the species name meaning wise).
 - The **fossils of prehuman and ancestral human forms** are **obtained from** widely diverse regions of **Africa, Asia and Europe** which indicate that man's centre of origin was probably in Asia and Africa.
 - More precisely man has originated in central Asia, because –
 - The oldest known fossils have been obtained from Asia, China, Java and India (Shivalik hills).
 - The number of domesticated animals and plants is maximum in Asia.
 - Climatic conditions in Asia and nearby places were most conducive for human evolution.
 - **Prehuman evolution** includes origin of mammals and origin of primates.
 - **Mammals evolved in the jurassic period**, about 195 million years ago **from the cynodont reptiles** which branched off from the stem reptiles called cotylosaurs.

Cotylosaurs are the earliest and most primitive of reptiles. They evolved from the amphibians during the early carboniferous period some 340 million years ago, but were all extinct by the end of the Triassic, about 90 million years later. From among their members came 2 major evolutionary lines – one led to the mammals & the other to the archosaurs, ruling reptiles.
 - The **first mammals** were **shrew like terrestrial insectivores** or **rat like creatures**.
 - The **primates originated in the beginning of the tertiary period** (palaeocene epoch) about 65 million years ago from the small, terrestrial shrew like insectivores, a stock from which other types of existing mammals also arose.
 - The **primate** (order of placental mammals) **contains two suborders : prosimians and anthropoids**.
 - The insectivore mammals namely, tree shrews, gave rise to the primitive primates called **prosimians in the beginning of the tertiary period**.
 - Among living primates, the prosimians (suborder Prosimii) (*Gr.pro*, before and *simos*, monkey, ape) include **tarsiers, lemurs and lorises**.
 - **Tarsiers** are **found in forests of Philippines and East Indies**. They are **insectivorous mouse-sized animals** with enormous eyes suitable for nocturnal life.
 - **Lemurs**, squirrel-like animals, are confined largely to the island of **Madagascar**. They feed on plant material, including fruits.
 - **Lorises** occur in **Africa and Asia** including **South India**.

evolved **210 - 240 million** years back from **cynodont/ synapsid reptiles**.

- The term **anthropoid apes** is used for ancestral anthropoids from which monkeys → apes → human evolved.
- **Apes** are characterised by **absence of tail**.
- Human are placed in the family **hominidae**.
- The evolutionary line of old world monkeys diverged from *parapithecus* in the oligocene.
- **Evolution of man from ape like ancestors is supported by molecular and anatomical evidences** besides the fossil evidence.
- In modern classification, **humans have been placed in class mammalia and order primates**.
- Some anthropologists divide human beings into six races, viz. **caucasoids, negroids, mongoloids, Australian natives, American Indians, and Polynesians**.
- All human races **have the same chromosome number and gross morphology**.
- The diploid number of chromosomes in gorilla, chimpanzee and orangutan is 48.
- *Homo* is the genus which is divided into the following species : *habilis*, and *sapiens*. It is the genus to which humans belong.
- **Common origin of man and chimpanzee** is best shown by **chromosome number and banding pattern**. Chimpanzees are the most human like of the apes and frequently used in psychological experiments.
- Evidences for common ancestry of great apes & man are :-
 - **Chromosomal evidence** – Somatic cells of man have 46 (23 pairs) chromosomes. In apes their number is 48. Man has evolved from an ancestor having 48 chromosomes by the centromeric fusion of two chromosomes. Chromosomes of man and apes have been studied with special staining techniques and it has been established that –
 - (a) chromosomes of man and apes have similar banding pattern.
 - (b) some chromosome of man and apes have identical bands.
 - (c) the banding pattern of human chromosome number 3 and 6 are compared with those of particular autosomes in the chimpanzee. It shows a common origin for man and chimpanzee.

- **Evidence from blood proteins** – It has been proved by the blood protein tests that man is most closely related to great apes (Chimpanzee and Gorilla) and next closest, in order, are the old world monkeys, the new world monkeys and tarsiers.
- **Evidence from blood groups** – In humans four blood groups A, B, AB and O occur. The blood groups A and B are found in apes but not in monkeys. This indicates that **human beings are more closely related to apes than to monkeys**.
- **Evidence from haemoglobin** – There is 99% homology in haemoglobin of man and gorilla. This suggests that the two are closely related.
- **Characteristics of primates** are –
 - Arboreal (tree dwelling) habit.
 - Opposable great toe and thumb for grasping.
 - Eyes in front of head for stereoscopic vision (depth perception)
 - Expanded forebrain.
 - Lengthy gestation, one birth at a time.

EVOLUTION OF MAN

- **Evolution of man probably took place in central Africa.**
- **Carolus linnaeus** gave the scientific name *Homo sapiens* to man.
- **Erect posture, perfect bipedal locomotion, orthognathus (flat) face, grasping hands, upright neck** are the **characteristic of modern man**.
- **In modern man, cranial capacity is high, 1300 - 1600 cc** with brain to body weight ratio being highest 1:46.
- *Dryopithecus* is **common ancestor of human and apes** that lived in arboreal life in Asia as well as Africa.
- Origin and evolution of man were explained under the following headings – **prior to ape man; ape man including prehistoric man; and true man including the living modern man.**

Prior to Ape men

- *Parapithecus* – It was **discovered from the oligocene epoch in Egypt**. This fossil is believed to represent the ancestors of today's old world monkeys, apes and humans.
- *Propliopithecus* – This fossil was **discovered from miocene strata of Faiyum depression**.

- *Limnopithecus* and *Pliopithecus* – These fossil apes represent altogether a different line of evolution which diverged from the hominid line quite early and become extinct during pliocene.
- *Dryopithecus* – Fossil of *Dryopithecus africanus* was **discovered from miocene rocks of Africa and Europe**. It lived about 20 - 25 million years ago. *Dryopithecus africanus* is **regarded as common ancestor of man and apes**.
- *Proconsul* – *Proconsul africanus* was **discovered by S.B. Leaky (1948) from the rocks around lake Victoria of Kenya, Africa**. It lived in early miocene epoch.
- *Shivapithecus* – This fossil was **discovered from middle and late pliocene rocks of Shivalik hills of India**, hence it is named *Shivapithecus*.
- *Ramapithecus* – It has been established that in late miocene epoch *Dryopithecus* gave rise to *Ramapithecus* which was on the direct line of human evolution. *Ramapithecus* survived from late miocene to pliocene. Thus he appeared about 14 - 15 million year ago.
- Fossil of *Ramapithecus* was discovered by **Edward Lewis** from pliocene rocks of **Shivalik hills of India**.
- Similar to *Ramapithecus*, *Kenyapithecus wickeri* was discovered from pliocene rocks of **Kenya (Africa)**.
- There is a gap of about 9 - 10 million years in *Ramapithecus* and *Australopithecus*.

Ape man including prehistoric men

- *Australopithecus* (**first ape man**) – The early human stock gave rise to *Australopithecus*.
 - Commonly called southern ape, *Australopithecus* appeared about 4 to 1.5 million years ago (**early pleistocene**).
 - **Tuang baby** (*A. africanus*) was **discovered by Raymond Dart from Africa**.
 - **Lucy** (*A. afarensis*) excavated by **Donald Johanson**.
 - He had both human and ape characters with **bipedal locomotion, omnivorous diet and erect posture** (ancestor of man who first stood erect).
 - His **cranial capacity was 350 - 480 c.c.**
 - Six species of *Australopithecus* known as *A. ramidus*, *A. afarensis* (Lucy), *A. africanus* (Tuang baby), *A. aethiopicus*, *A. robustus* and *A. boisei*.

• *Homo habilis* (**first homonid tool maker or Handy man**).

- *Homo habilis* [*Homo* (man) *habilis* (skillful or mentally able)] **lived in early pleistocene** about 2 - 1.75 million years ago.
- Nut cracker fossil man, discovered by **Leakey**.
- His **cranial capacity** was about **735 c.c.**
- He was the **first fossil man who used tools** of chipped stones extensively.

• *Homo erectus* (**erect man**)

- *H. erectus* is **considered a direct ancestor of modern man**.
- *Homo erectus* evolved from *Homo habilis* about 1.7 million years ago in the **pleistocene**.
- *Homo erectus* includes **three fossils** – java ape man, peking man, and heidelberg man.
- **Java Ape man's** (*Homo erectus* = *Pithecanthropus erectus*) fossils (discovered by **E. Dubois from Java**) occurred in the pleistocene deposits some 1.5 million to 5,00,000 years ago (middle pleistocene).
- He had **cranial capacity** about **940 c.c.**
- He was **omnivorous, cannibal** and **had large protruding jaws**.
- He was the **first prehistoric man to make use of fire for hunting, defence and cooking**.
- **Peking man** (*Homo erectus pekinensis*) = *Pithecanthropus pekinensis* *sinanthropus pekinensis*) lived most probably about 1.5 to 5,00,000 years ago (**middle pleistocene**).
- He had a **cranial capacity** about **850 - 1200 c.c.**
- Peking man was **slightly shorter, lighter and weaker than Java man**.
- **Heidelberg man** (*Homo erectus heidelbergensis*) had **cranial capacity** about **1300 c.c.** [(intermediate between those of erect man (*H. erectus*) and neanderthal man (*H. sapiens neanderthalensis*)).

True man including the living modern man

- **Neanderthal man** (*Homo sapiens neanderthalensis*)
 - Neanderthal man **existed in the late pleistocene period** and its fossils were found **in the neanderthal valley in Germany**.
 - The **cranial capacity** was about **1450 c.c.** roughly equal to that of modern man.
 - He had slightly **prognathous face** and were the **legendary cave dwellers**.

- Neanderthals were **adapted** to a **cold environment** and were predatory and hunters.
- They **used clothings, utensils and fine tools**.
- In neanderthal society injured and dead were cared for, they even performed **elaborate burial rituals**. Neanderthals may had a religion.
- **Became extinct** 35, 000 years ago.
- **Cromagnon man** (*Homo sapiens fossil*)
 - Cromagnon man **emerged about 34000 years ago in holocene epoch**. Thus it is **regarded as most recent ancestor of today's man**.
 - It's fossils were **first discovered in 1868 from Cromagnon rocks of France by Mac Gregor**.
 - These succeeded neanderthals and **became extinct** about 20, 000 years ago.
 - They were **much more advanced than the neanderthals** and belonged to *Homo sapiens*.
 - Cromagnon has perfectly **orthognathous** face.
 - The **cranial capacity** was about **1650 c.c.** (thus believed cromagnon man was somewhat more intelligent and cultured than the man of today).
 - **Cro-magnon man first started cave painting** as well as **hunting** with domesticated dogs.
 - They were **omnivorous** and expressed themselves through painting and sculpture (cave paintings).
- **Modern man** (*Homo sapiens sapiens*) – First appeared about **10,000 years ago** in Asia near Caspian sea. Have **cranial capacity of 1300 - 1600 c.c.** They have developed sound into words.
- **Characteristic features of man** are –
 - Large brain and cranial cavity.
 - Foramen magnum below the brain box.
 - Bipedal locomotion and release of forelimbs for other purposes.
 - Erect posture and free hands.
 - Opposable thumbs and grasping hands.
 - Sensitivity.
 - Reduced fertility.
 - Social organization.
 - Development of speech.
 - Ability to learn and transmit experiences.
 - Binocular and stereoscopic vision.
 - Weak brow ridges and shortening of jaws.

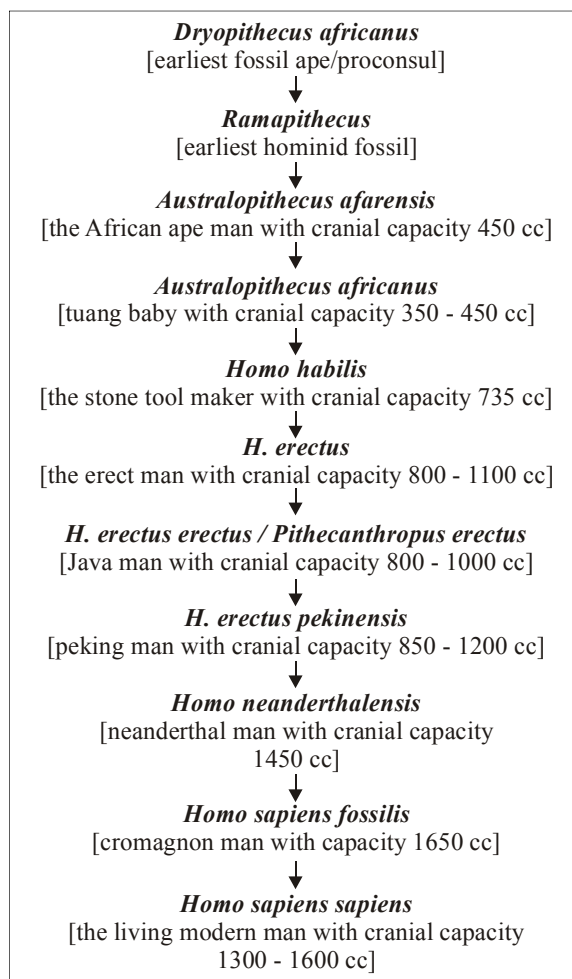


Table : Cranial capacities of apes and man.

Primates	Cranial capacities (in cubic centimetres)
Chimpanzee and Gorilla	325-510 c.c.
Australopithecus	350-450 c.c.
<i>Homo habilis</i>	735 c.c.
Java ape man	940 c.c.
Peking man	850-1200 c.c.
Heidelberg man	1300 c.c.
Neanderthal man	1450 c.c.
Cro-magnon man	1650 c.c.
Living modern man	1300-1600 c.c.

- The continent where **maximum fossils** of prehistoric man have been found is **Africa**.
- **Cradle of human evolution** is South Africa.
- **Pitldown man** is hypothetical, developed on the

basis of artefact / hoax consisting of fragments of skull at Piltdown, England.

- **Heidelberg man, Sola man, Rhodesian man and Altarutic man** are believed to be variants of *Homo erectus*.
- The entire period through which man has improved the techniques of constructing instruments has been divided into **palaeolithic, mesolithic and neolithic ages**.
- **Paleolithic** age represents **age of tools of stones and bones, cave painting in later period**.
- **Mesolithic** age represents as the **age of animal husbandary, development of language, reading and writing**.
- **Neolithic** age represents **development of agriculture, manufacture of pottery and clothes etc**.
- Neolithic has continued with **bronze age** and then **iron age**.
- **Evolutionary explosion of mammals** occurred in **palaeocene period**.
- **First man like apes** appeared in **miocene**.
- In **pleistocene**, extinction of many large mammals occurred and also referred to as **age of man**.

Table : Taxonomic position of modern humans

Kingdom	– Animalia	Intake of complex food, defaecation.
Phylum	– Chordata	Notochord, dorsal hollow C.N.S.
Sub phylum	– Vertebrata Craniata	Vertebral column Cranium (brain box)
Section	– Gnathostomata	Jaws
Superclass	– Tetrapoda	Four limbs
Class	– Mammalia	Mammary glands, hair, pinna
Infra class	– Eutheria	True placenta
Order	– Primates	Nails over the digits
Suborder	– Anthropeidea	Facial muscles for e m o t i o n a l expression
Family	– Hominidae	Erect posture, b i p e d a l locomotion
Genus	– <i>Homo</i>	Man
Species	– <i>sapiens</i>	Wise
Subspecies	– <i>sapiens</i>	

End of the Chapter
