International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Tracing the Human Lineage: Fossil Clues and the Evolutionary Ascent of the Brain

Robin Ghosh

Abstract: ***In the long history of "Organic Evolution" each modern species has its own chapter of evolution. Our own species, Homo sapiens, is, by far, the best evolved species of nature. It has its own evolutionary (phylogenetic or genealogical) history. We already know that, for a successful existence, fins and gills evolved in fishes, wings evolved in insects, birds and bats, and hairs and mammary glands, etc. evolved in mammals. Similarly, evolution of brain has been the main and most significant event in human evolution. That is why, "Man" has emerged as the wisest and supreme being of nature and the human brain qualifies as, so far, the best achievement of evolution. In fact, this is the very basis of naming the present human species as Homo sapiens (sapient = wise). Evolutionary histories or genealogies are mainly framed on the basis of fossils. So scanty, scattered and incomplete our records of excavated fossils are that we can generally frame only plausible genealogies which are, obviously, subject to periodical changes as new fossil finds are added to our records. So is the case with human genealogy also which forms the subject matter of this chapter.***

Keywords: Evolution, organic evolution, Intelligence, grasping, sensitivity

1. Research Methods

Research Methods were adopted in consequences of the paragraphs noted in this article so nothing is left out. Everything is detailed in the article in different paragraphs.

Human Characteristics of Evolutionary Significance

As already explained, **Organic Evolution** envisages evolution of every modern species by gradual modifications in the body organization of simpler, ancestral forms. Obviously, human genealogy must be traced to such ancestral forms which displayed the first signs of human characteristics. To understand human genealogy, therefore, it is necessary to first enumerate the important **evolutionary characteristics of modern "Man"** as follows, and also to know the position of human species in the taxonomic hierarchy.

(1) Intelligence

The **modern "Man"** excels all other animals in intelligence. Only **"Man"** is capable of abstract thinking and planning, logical and syllabic speech, and physical expression of emotions by means of facial muscles.

Since the seat of intelligence in animal body is the cerebrum of brain, it follows that, in comparison to all other animals, the **"Man"** has proportionately the largest brain with most complex cerebrum, especially the **neopallium of the cerebrum** having numerous sulci (folding of grey matter). With increasing brain size in human evolution, the volume of cranial cavity and size of skull also increased to accommodate the brain. Consequently, the head became more clearly marked off from the trunk. The cranial capacity of **modern "Man"** is about 1450 to 1500 (average 1475) cubic centimeters.

(2) Erect Posture and Free Hands

Modern "Man" is the only **bipedal animal** in strict sense, moving upright and erect on two legs (hindlimbs), and using the hands (forelimbs) for purposes other than locomotion. **"Man"** achieved **bipedalism** through a series of important evolutionary changes in the body anatomy as follows :

1) The main body or trunk shortened, while the limbs elongated. The fingers and toes attained flat nails in place of claws.
2) The legs elongated relatively more to support the body weight. Their soles flattened toes shortened and the hallux became non-opposable. All these features are adaptations for a **plantigrade locomotion.**
3) To accommodate the viscera in a shorter trunk, the thoracic part flattened into a broad chest by flattening of sternum. The pelvic girdle also broadened and became basin-shaped for the same purpose.
4) To support the erect trunk, and the upright head on top of it, the vertebral column became shorter, stouter and 'S-shaped' by flexing at two places. The lumbar vertebrae reduced in number to 4 or 5 from 6 or 7, and these too started fusing into a single piece, like sacral and tail vertebrae.
5) The skull shifted to an apical position on top of the vertebral column and became upright due to a forwards and downwards shifting of foramen magnum.
6) The face gradually became erect (= **orthognathous,** instead of prognathous) due to a reduction in length of jaw bones. Moreover, it acquired a forehead to make more space for the brain. It also acquired a chin. Development of orbital or brow ridges above the eyes is also an evolutionary characteristic of **"Man"**, but these first became more prominent in monkeys and apes, and then reduced during the evolution of human species.
7) In accordance with reduced jaws, the teeth lines became semicircular instead of U-shaped. The number of teeth also reduced to 32 from 36. The canines became almost equal to other teeth. The diastema was lost. The dental formula became 2, 1, 2, 3 from an ancestral formula of 2, 1, 3, 3. The molars acquired five cusps **(quinquetubercular)** instead of original three. Such a dentition gradually evolved for an omnivorous (= generalized) diet from an original insectivorous diet through a herbivorous diet.
8) Tail has been lost.

(3) Grasping

Food is the first basic need of every organism. Hence, when hands became free from locomotion, these were first employed for obtaining food from the environment. For this, the hands became adapted for grasping things. These elongated and became very mobile. The rounded hinge articulation of the head of radius with humerus at the elbow, as well as a gliding carpal joint, were acquired by the hands for a free **pronation-supination movement** from the originally fixed pronate condition. The fingers also became longer, more mobile and grasping, developed flat nails, and acquired tactile sensitivity at their tips. The thumb or pollex became opposable, i.e., at right angels to remaining fingers, a condition which is very necessary for grasping.

(4) Sensitivity

Simultaneously with the evolution of bipedal gait upon openland, the sense of vision became highly developed. The eyes gradually became larger and shifted to a frontal position to attain a 3-dimensional binocular (= stereoscopic) vision. Both rods and cones developed in the eyes. The neck also became more mobile to rotate the head for vision in different directions.

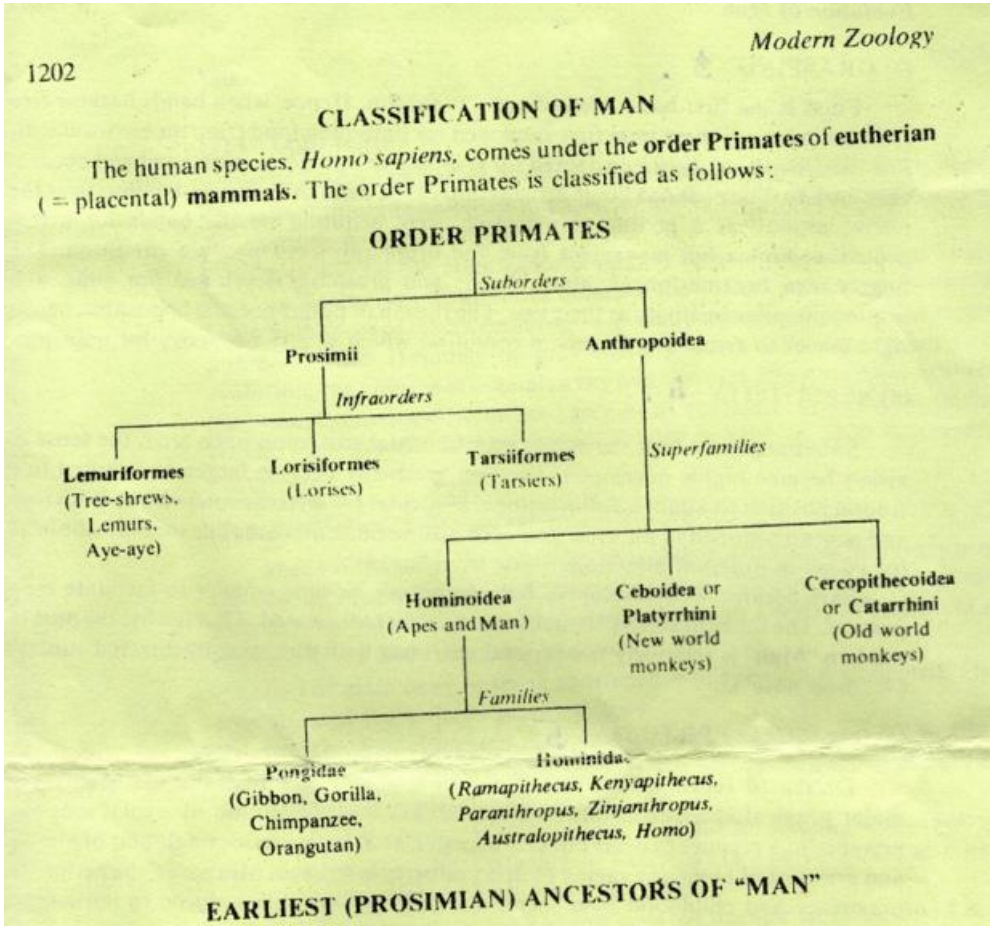
Ears became well-developed, but ear pinnae became smaller to facilitate erect posture. The sense of smell (= olfaction), however, decreased. That is why, the nose of **modern "Man"** is relatively smaller and narrower with downwardly directed nostrils **(= "drop nose")**.

(5) Reduced Fertility

Decreased reproduction rate is an evolutionary characteristic of **"Man"**. The major physical changes in this connection have been formation of scrotal sacs and presence of a prepuce to delay puberty in males, and single uterus, single pair of nipples and presence of hymen in vagina to delay puberty in females. Moreover, the periods of pregnancy and childhood have increased, and the litter has reduced to normally a single child at a time. Monogamy, i.e. living of male and female individuals together as a couple, continuous gametogenesis in gonads throughout the year (not seasonal breeding), and a menstruous cycle in females have been the other evolutionary characteristics concerning reproduction.

(6) Culture

Increasing intelligence during human genealogy has been the basis of evolution of culture, which is an exclusive feature of "Man". By using its intelligence, "Man" made use of tools and fire, and developed, first a group life and gossip, and then a well-organized society, art, religion, culture, agriculture, animal husbandry, horticulture, language, and reading and writing.



(7) The Elephant Shrews

Since some characteristics of **modern "Man"** are common to all primates, the primates have a common ancestry (monophyletic origin). Man's genealogy can, therefore, be traced back to the ancestors which gave rise to the primates. The evolutionary history of eutherian mammals dates back to early **Cretaceous period** about 10 crore years ago. The

earliest eutherians were small and **generalized shrew-like terrestrial insectivores**. By the end of Cretaceous, these diversified, giving rise to a variety of eutherians at the dawn of **Palaeocene epoch**, about 6.30 crore years age. The insectivores which displayed first indication of the evolutionary line of premates were like the present-day **jumping shrews (elephant shrews-Macroscelididae)** of Africa. These (Fig. 38.1A) had a small body, long tail and snout, digitigradespes, abdominal testes, and coneless eyes. The relatively larger size of their eyes and cranial cavity, lesser mammary glands (only one to three pairs), and reduced litter (maximum three offsprings at a time) indicated the beginning of primate line from these.

(8) The Tree Shrews

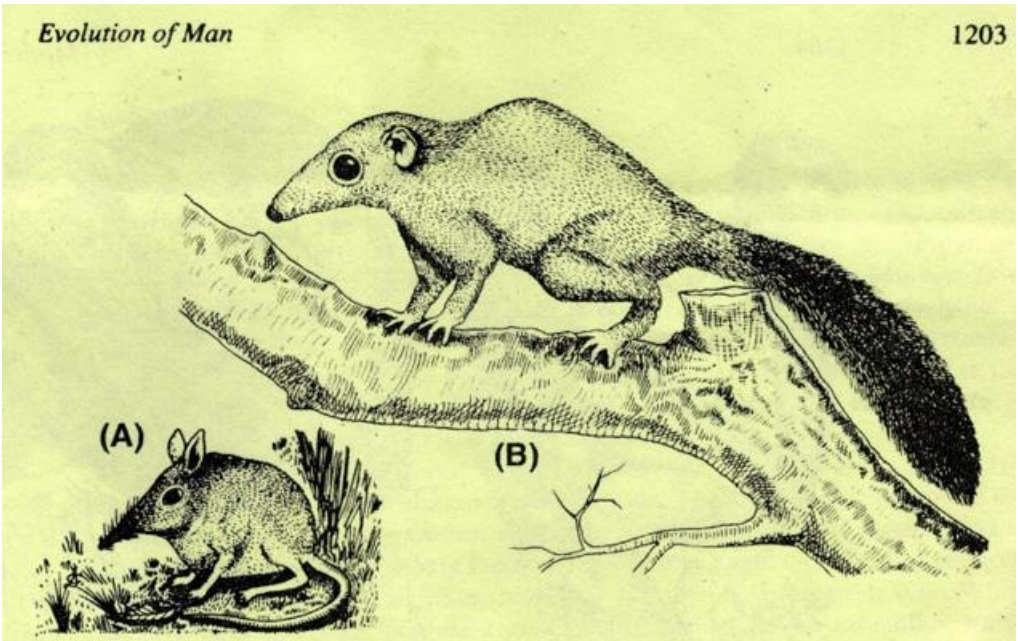


Fig. 38.1 A An elephant shrew; B. tree shrew

From the elephant shrew-like ancestors, the evolution of primates first advanced towards an arboreal mode of life. About six crore years ago, in the **early Palaeocene,** the first prosimian primates arose from the elephant shrew-like ancestors. These were long-tailed (Fig 38.1 B), squirrel-like, semiarboreal forms, resembling the present-day **tree shrews** of Oriental region (India and Malaya). These shrews displayed some advancement in primate characteristics. For example, their snout was relatively shorter, olfactory receptors were reduced, testis sacs had formed, and the eyes had shifted somewhat towards the front and possessed both cones and rods in their retina. Moreover, these shrews had become omnivorous, feeding upon fruits besides the insects. However, their digits still had claws and not nails.

(9) The Lemurs and Tarsiers

During the **Paleocene,** the ancestral tree shrews diversified along three evolutionary lines, one of tree shrews and lemurs, second one of lorises and the third one of tarsiers.

Modern lemurs (genus Lemur) (Fig. 38.2) are to-day found in Madagascar. The largest of these. Idri idri is endangered. Lorises (genus Loris) occur in Africa and Asia, including South India. Both lemurs and lorises are arboreal and omnivorous forms with a long bushy tail. Ancestral lemurs and lorises displayed important advancement in primate evolution, especially in the structure of their limbs. Their digits were strong and mobile, thumbs (pollex and hallux) opposable for grasping by both hands and feet, and all digits, except the second toes, had nails in place of claws.

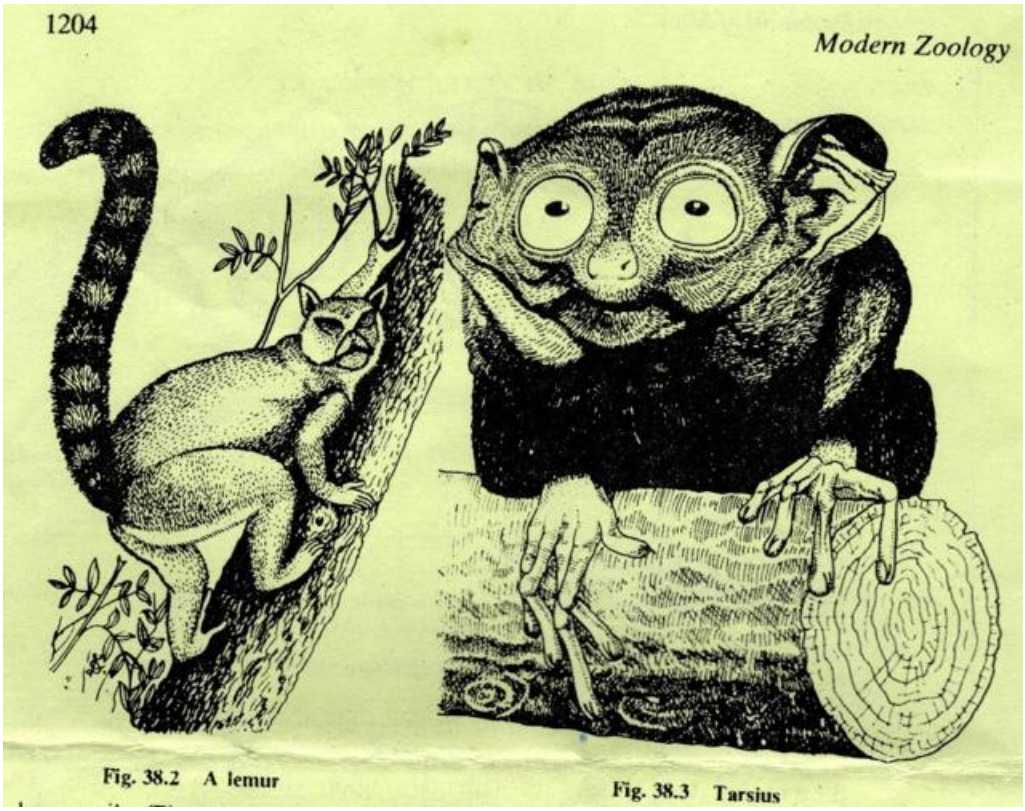


Fig. 38.2 A lemur

Fig. 38.3 Tarsius

Tarsiers are to-day represented by a single genus, Tarsius (Fig. 38.3), found in East Indies. Their characteristics are intermediate between lemurs (and lorises) and anthropoids. These have a monkey-like head with relatively a larger brain, smaller and quite erect face, and a monkey-like nose. Their neck is highly mobile. It can rotate the head so much (almost through 1800) that the head can face backwards. The eyes are enormous and spherical like those of the owls, and both eyes face almost forwards. Their tail has fewer hairs. Hands are small. All digits, except second and third toes have nails. These tarsiers mostly live in pairs and the females undergo menstruous cycles. Thus, the ancestral tarsiers attained considerable advancement in primate characteristics.

Abstract
ANTHROPOID ANCESTORS OF MAN
Anthropoid primates include monkeys, apes and man.

(10) Monkey Stock

Ancestral prosimians enjoyed a successful existence of about 2.5 crore years in ropical forests of **Paleocene** and **Eocene epochs**. About four crore years ago in Eocene, two divergent evolutionary lines of moneky-like forms with binocular vision originated from tarsioid ancestors. One of these lines led to the evolution of the ancestors of present-day **New World Monkeys**, i.e., the **Platirrhini** (= flat nose mokeys) or **Ceboidea** of South and Central America. The second line led to the evolution of the ancestors of present-day **Old World Monkeys (Cercopithecoidea** or **Catarrhini,** i.e. the **narrow-nose monkeys)** and the **hominoids (apes** and **man**).

The **New World Monkeys** possess a flat nose with widely separated and outwardly directed nostrils. Their tail is long, sensitive and prehensile for grasping the branches of trees, but their limbs are non-grasping because of non-oposable thumbs and mostly clawed digits. Furthermore, they have retained theprimitive dentition of prosimian ancestors, consisting of 36 teeth with three premolars and 3 molars in each half of a jaw, and with the molars having only 3 or 4 cusps.

Contrary to the **New World Monkeys**, the **Old World Monkeys** possess a narrow nose with closely placed and downwardly directed nostrils **(= drop nose)**. Their tail is generally short and not prehensile, but their limbs, having opposable thumbs and nailed digits, are well-adapted for grasping. Their dentition, consisting of 32 teeth and two premolars and three molars in each half of a jaw, is more like that of man and unlike that of their prosimian ancestors. Sharp divergence of these monkeys from ceboids, and closer resemblance with man, is further shown by their relatively better developed brain, smaller ear pinnae, pronate-supinate pes, lesser lumbar vertebrae, sensitive finger tips, presence of both rods and cones in the retina of eyes, four or five cusps upon molars, continuous spermatogenesis, menstruation and developed facial muscles for expression of emotions by facial gestures.

Oligopithecus : As is obvious from above account, the evolutionary line of **Old World Monkeys** led to the evolution of apes and man. The earliest fossil monkey of this line on our record is Oligopithecus, excavated in 1961 from the **Oligocene** rocks of **Faiyum Depression** in the **Sahara Desert** near **Cairo** in **Eqypt** (Africa). It is regarded the common ancestor of all Catarrhine and Hominoid Anthropoids (Old World Monkeys, apes and man), because it possessed 32 teeth and 4-cusped molars, with a dental formula of 2, 1, 2, 3. Its canines were, however, somewhat larger than other teeth.

11. Ape Stock

The Modern Apes: The existing apes are al classified under the **family Pongidae** and include: (i) the small-sized and arboreal modern apes, **Gibbons** (genus *Hylobates*) of Southern China and Indomalaya, and (ii) the large and heavy, semilarboreal **Great Apes-Gorilla** and **Chimpanzee** (genus Pan) of African forests, and Orangutan (genus Pongo) of Malaya, Sumatra and Borneo.

Apes differ from **Old World Monkeys** principally in their dentition and mode of locomotion. Being comparatively larger in size, these cannot walk upon tree branches. Instead, these swing from branch to branch by means of their grasping forelimbs which are, therefore, longer than legs and strongly muscular. When they walk upon land, the long forelimbs prop up the front body, producing semierect posture (Fig. 38.4 A).

A close phylogenetic relationship of **apes** with **man** is revealed by their following characteristics:

1) Absence of a tail.
2) Relatively larger head and longer neck and limbs.
3) Broadened chest due to flattening of sternum.
4) Smaller lumbar region due to reduced number (4 or 5 instead of 6 or 7) of lumbar vertebrae.
5) Prominent browridges above the eyes.
6) Hairs of forearms being directed towards the elbow instead of towards the writs.
7) Molar teeth with 5 instead of 4 cusps.
8) Relatively larger brain and cranial cavity; efficient memory.
9) Capability of communication by some sounds (= vocal means).
10) Highly developed facial musculature for expression of rage, surprise, pleasure and laughter by facial gestures.
11) Inclusion of meat in the diet.
12) Tendency to live in pairs as couples; menstruation in females.

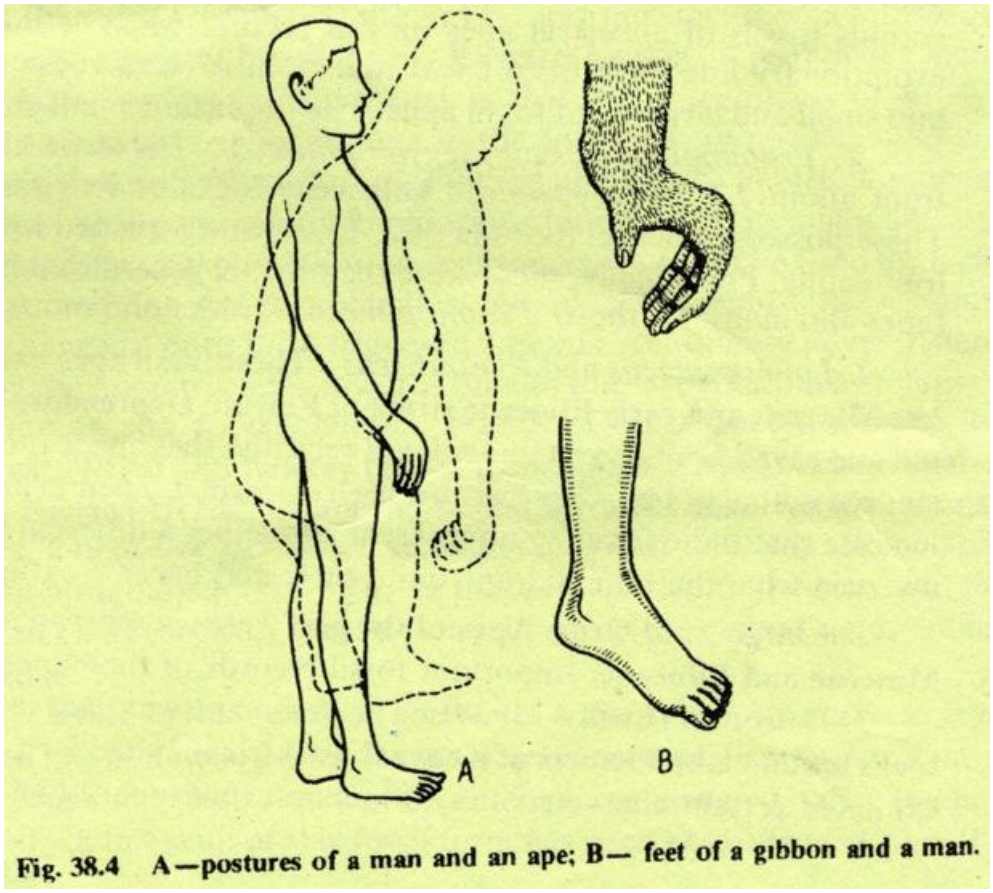


Fig. 38.4 A—postures of a man and an ape; B— feet of a gibbon and a man.

Above resemblances between apes and man lead to the conclusion that **today's apes and man are 'cousins'** descended from common ancestors. It may be noted that all the four limbs of **Gibbons** and **Orangutan** are of grasping type with opposable thumbs (Fig. 38.4 B). In **Gorilla** and **Chimpanzee,** each pes has only a semiopposable thumb. That is why, Gorilla and Chimpanzee are regarded less distant cousins of modern **man** in comparison to other apes of today.

To trace the genealogy of **Modern man** from ancestral mokeys onwards, palaeontologists have been continuously trying to analyse and interpret the various fossils of ancestral apes on our record. Most of the **fossil apes** of human evolutionary line have been excavated from **African rocks.** These can be divided into small and large-sized fossil apes. The important small-sized fossil apes are:

1) *Propliopithecus and Aegyptopithecus :* These fossil apes were excavated from about 2.5 Crore years old **Oligocene** rocks of **Faiyum depression** in **Africa**. These possessed dental formula of 2, 1, 2, 3 and 5-cusped lower molars suitable for fruit-eating. Presumably, these were the original generalized

forerunners of ominids (apes and man). Of these, Propliopithecus is older and more generalized.

2) *Limnopithecus* and *Pliopithecus :* These fossil apes have been excavated from **late Miocene** and **early Pliocene** strata of **Faiyum Depression**. These possessed a short tail and seven lumbar vertebrae. Until recently, these were thought to be ancestors of modern gibbons. This view has now been discarded. Their primitive characters, in fact, indicate that these fossil apes represent altogether a different line of evolution which diverged from the hominid line quite early and became extinct during **Pliocene**.

The large-sized Great Apes of the past were widespread in the Old World during Miocene and Pliocene. Important fossil records of these are:

3) *Proconsul* (**Leaky** – 1930): This fossil ape was excavated from early **Miocene** rocks around **lake Victoria of Kenya (East Aftica)**. It had 5-cusped molars. Its feet also exhibited certain characteristics of human evolutionary line. However, since it had rather a pointed snout and moved upon land on all the four limbs, it hardly counts amongst the direct ancestors of man.
4) *Dryopithecus* : This fossil ape is known from **middle Miocene** and **early Pliocene** rocks of **North Africa** and **Europe**. It was a developing type of ape, combining characteristics of Old World Monkeys, Great Apes and Man. It had frontally broadened jaws, semierect gait, large canines and 5-cusped molars. Browridges were absent.
5) ***Shivapithecus* :** This fossil ape was excavated from **Miocene-Pliocene** (1.30 to 0.5 crore years ago) rocks of **Shivalik Hills** in **India**. It was quie like Dryopithecus. Characteristics of its forelimbs, skull and brain were like those of monkeys, whilst the face, jaws and teeth resembled those of apes. Presumably, both Dryopithecus and Shivapithecus were descrendents of a common. Proconsul-like ancestor, and were themselves the ancestors of modern apes. It is presumed that human line of evolution separatd from the ape lilne with the advent of Shivapithecus about 1.20 crore years ago.

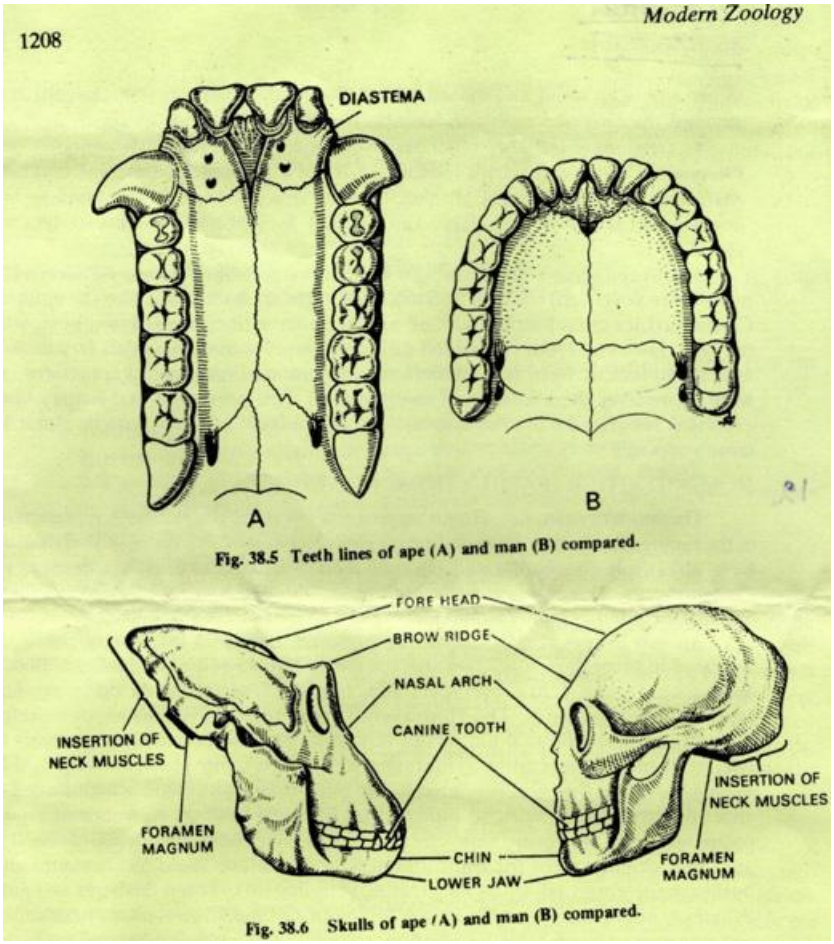
12. Hominid Stock (Family Hominidae)

The modern **man**, i.e., *Homeo sapiens sapiens* is the only existing representative of the family Hominidae. Its evolutionary characteristics which distinguish it from apes have already been enumerated. Besides genus *Homo,* five extinct genera, *viz., Ramapithecus, Kenyapithecus, Paranthropus, Zinjanthropus and Australopithecus* are also included in family **Hominide**.

Ancestral apes flourished during **Miocene** mainly in Africa and India, but migrated to other parts also. Towards the **close of Miocene** and **beginning of Pliocene apochs** i.e., about 1.20 crore years ago, tropical forests started being gradually replaced by grassy lands. The Herbivorous great apes of **Pliocene** were, therefore, forced to give up arboreal life, adopt terrestrial life and include meat in their diet due to dwindling vegetation. Hunting and defence upon grassland required fast movements, and that was presumably the most important factor which forced our ancestors to adopt an upright, bipedal gait. **Richard Leakey**, a prominent modern palaeontologist, however, says, "My theory is that the descendents of 40-50 kg. apes that climbed trees for fruits and nuts in the forests were too heavy to climb bushes in the grassy lands. So they started standing up to reach the fruits and nuts." Whatever might have been the reason for adopting bipedal gait, its major advantage was freedom of hands from locomotion, so that the hands could be used for picking fruits or hunting, and for defence. Such a use of hands smust have required intelligence and, hence, it must have triggered a rapid evolutionary development of the brain, leading the ancestral apes towards human line of evolution as follows:

1. *Ramaithecus* and *Kenyapithecus*, Fossils of these ancestral forms were excavated by **Lewis** (1930) and **Leakey** (1955) from about 1.2 to 1.4 crore years old **Miocene rocks** of **Kenya (Africa)**, **China** and **India (Shivalik Hills)**. Relatively smaller and delicate jaws, a man-like dentition, semicircular teeth line (fig. 38.5), arched palate and a more upright face (Fig. 38.6) in these fossils, led to the view that these hominids were man's earliest direct ancestors, qualifying as the earliest representatives of **family Hominidae**.

2. *Ramapithecus* being older than *Kenyapithecus*, a theory of *Shivapithecus – Ramapithecus* – **man** line of human evolution was widely accepted. However, this theory was propounded when our fossil records of *Ramapithecus* included only a few bone fragments. Recently, a full skull of this fossil form has been excavated in China. The molars in this find closely resemble those of Dryopithecus. Naturally, this discovery has rendered the theory of Shivapithecus – Ramapithecus – **man** genealogy very doubtful. It has indicated that both Shivapithecus and Ramapithecus were more likely to be the ancestors of ape line which led to the evolution of modern **Orangutan**. When proved, this contention will necessitate shifting of Ramapithecus to ape stock from the hominid stock.



The missing links: Also, the biochemical studies have revealed that human proteins, particularly the blood proteins, are quite like those of the apes, especially those of **Gorilla** and **Chimpanzee**. Also, the geneticists have discovered that we are genetically only about one per cent different from Gorilla and Chimpanzee, and this small difference really accounts for all human civilization-art, literature and science. This discovery has thrown into turmoil the widely accepted palaeontologists' claim that the evolutionary split between apes and hominids came around 1.5 crore years ago. Geneticists claim that the mere one per cent genetic difference is a strong evidence to indicate that apes and man parted only about 50 to 60 lac years ago and not earlier as envisaged in *Shivapithecus – Ramapithecus* – **man** theory.

Our hunt for **Man's genealogy** is hindered by rarity of fossil traces of about 80 lakh years from late Miocene to early Pliocene, during which the evolutionary split of ape and hominid lines must have occurred according to recent biochemical and genetic evidences. This 80 lakh years' gap has not, so far, yielded any useful hominid fossils.

The hominid fossil record starts improving from about 40 lac years ago when the ape-like forms, known as **Australopithecines**, came on to the evolutionary scene as follow:

2. *Australopithecus* : **Raymond Dart** (1942) excavated a fossil baby skull **(Tuang baby)** from **Pliocene rocks** near **Tuang** in **Africa**. After reconstructing the skull, **Dart** concluded that it belonged to a form which was a direct hominid ancestor of man, a **primitive hominid**. He named it *Australopithecus africanus*. A number of other fossils of this form were later excavated from 32 to 36 lakh years old **Pliocene rocks** in various parts of **Africa**.

The dentition and body height (120 cm.) and weight (40 Kg.) of Australopithecus indicate its close phylogenetic relationship with man. Unlike the earlier, ancestral apes, Australopithecus was omnivorous with meat as main diet, and capable of side-to-side chewing. Short, upright face and downwardly directed foramen magnum in its fossil skulls clearly point to an upright posture and bipedal gait in this hominid.

Heaps of sticks, bones, crude stones, etc., have been found with some fossils of Australopithecus, indicating that this primitive hominid collected these things from its surroundings and used these as tools in hunting and defense.

3. *Paranthropus* and *Zinjanthroups* : **Robert Broom** (1936 and onwards) excavated fossils of *Paranthropus* from 10 to 18 lakh years old **Pleistocene rocks of Africa**. Similarly, fossils of an ancestral form, named *Zinjanthropus*, were excavated by **Leakey** (1959) from about 15.5 lakh years old **Pleistocene rocks**. These two forms have been included, together with Australopithecus, in a separate subfamily, **Australopithecinae**, under the family **Hominidae**. These were relatively more robust (about 70 kg.) and taller (1.5 to 1.55 meters) than *Australopithecus*, resembling forms like modern Gorilla. Moreover, the hallux in these was possibly opposable like the pollex, nose was flattened, chinabsent, brow-ridges developed, lower haw and teeth stronger, and

the dentition was quite suitable for a herbivorous diet of hard roots and nuts.

"Lucy" and "WT 1500" : Very recently, **Donald Johanson** (1974) an American anthropologist has discovered, in **Ethiopia**, an almost complete skeleton relatively of 30-35 lakh years old female fossil hominid resembling *Australopithecus*, but more ape-like. He has named this fossil as **"Lucy"** (*Australopithecus afarensis*). About four years ago from now, **Kamoya Kimeu** discovered fossil skull of a boy near **Lake Turkana** in **Northern Kenya**. This fossil presumably belongs to a 16 lakh years old hominid ancestor which has been prosaically named **WT 1500**. Fossils of Lucy and WT 1500 have led to a theory that, about 30 to 40 lakh years ago, the early **Australopithecines** split into two diverging evolutionary lines of robust and gracile forms. The **Robust forms** developed powerful jaws and teeth suitable for a diet of roots, seeds and nuts, but became extinct about 10 lakh ago. *Paranthropus* and *Zinjanthropus* were probably representatives of this line. The line of more lightly built **gracile forms** led to the evolution of **man**.

13. PREHISTORIC MAN

The **cranial capacity** is about 1475 cubic centimeters (average) in modern man. As compared to this, the cranial capacities of Gorilla, Chimpanzee and Orangutan are respectively 510, 410 and 450 c.c. In Australopithecus, it was about 500 c.c., indicating that there was hardly any brain growth when bipedalism first appeared upon the evolutionary scene. However, there is a theory that the freedom of hands from locomotion and their use in handling **'tools'** for hunting and defence by *Australopithecus* required intelligence to regulate and augment the work of hands, and that this requirement led to a rapid growth of brain, culminating into the modern man, *Homosapiens sapiens*, which is, therefore, the wisest animal species upon present earth. A number of other species of *Homo* appeared and became extinct from time to time on the evolutionary scene before the origin of *Homo* sapiens. These extinct species are called **prehistoric species of man**. Some of these might have evolved as direct ancestors of modern man, while others might have evolved upon short offshoots diverging from the main line of human evolution. The important prehistoric species of **Homo** are as follows :

1) *Homo habilis* **(the tool-maker)**: Leaky (1960) excavated 16 to 18 lakh years old hominid fossils from **Pleistocene rocks** of **Olduvai Gorge** in **East Africa**. Later (1964), he and his associates assigned these fossils to the genus *Homo* under the specific name of *Homo habilis* **(handy man)**, because heaps of tools found with these fossils included deliberately sharpened **stones**, indicating that this prehistoric man was capable of **"making tools"**. This species was presumably somewhat older than *Zinjanthropus* and an early representative of the line along which the **gracile Australopithecines** had evolved. Like *Australopithecus*, *Homo habilis* was about 1.2 to 1.5 meters tall and weighed 40 to 50 Kg. Also, it lived in open grassy lands, moved erect and was omnivorous, but had a larger brain than that of **Australopithecus**, with a 700 c.c. cranial capacity. The lower jaw was lightly built. The dentition was more like that of modern man.
2) *Homo heidelbergensis*: A European discovery of prehistoric man came from **Heidelberg** in **Germany** in 1907, in the form of a fossil of toothed lower jaw. It was assigned to this new species. It also belonged to about 10 lakh years old **middle Pleistocene**. This jaw is heavy, but with man-like dentition. Presumably, it evolved along an offshoot of main human evolutionary line.
3) *Homo erectus erectus* **(Java ape man)** : In 1891, **Eugene Dubois** excavated some fossils (a skull, a thigh bone and two teeth) from about 17 lakh years old **Pleistocene rocks** in **central Java**. Characteristics of these fossils indicated a prehistoric man closely related to Homo *heidelbergensis*. **Dubois** named it *Pithecanthropus erectus*. Several other fossils of this form were excavated in different parts of **Java** in subsequent years and the original species was renamed *Homo erectus erectus* by **Mayer** (1950).

Java ape man (Fig. 38.7) was presumably characterized by:

1) 1.65 to 1.75 metres tall body weighing about 70 Kg.
2) Legs long and erect, but body slightly bent when moving.
3) Slightly prognathous face with inconspicuous chin and somewhat broader and flattened nose.
4) Forehead low and receding, but brow-ridges high like those of apes.
5) Skull cap thick and heavy, flattened in front, Cranial capacity 800 to 1000 c.c. (average 900 c.c.).
6) Lower jaw large and heavy.
7) Teeth large, but quite like those of modern man, except larger canines of the lower jaw.
8) Lips thick and protruding.

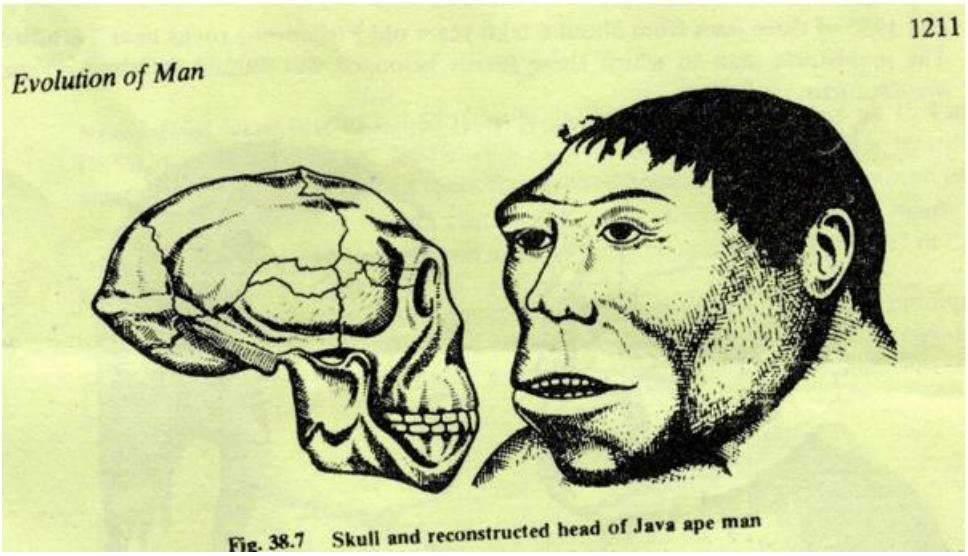


Fig. 38.7 Skull and reconstructed head of Java ape man

Java ape man moved erect, made more sophisticated tools of **stones** and **bones**, including axes, and lived in small groups in caves. It was **omnivorous** with meat as the main diet. Evidences of **cannibalism** have been found. Possibly, this was the first prehistoric man to make use of **fire** for hunting, defence and cooking.

1. *Homo erectus pekinensis* **(Perking man)**: From Java, the story of human evolution continued in China. After studying several fossil teeth found in a cave near **Peking** in **China**, **Davidson Black** (1927) concluded that these belonged to a different species of *Homo* quite similar to **Java ape man**. He named it *Sinanthroupus pekinensis*. **Mayer** (1950) considered it to be a subspecies, like Java ape man and renamed it as *Homo erectus pekinensis*. Fossils of Peking man were excavated from about 6 lakh years old **Pleistocene rocks**.

Placing **Java ape man** and **Peking man** as subspecies of *Homo erectus* has a sound basis because of close similarities between these. The body structure was quite similar in both. Being about 1.55 to 1.65 metres tall, **Peking man** (Fig. 38.8) was somewhat shorter, lighter and weaker. Its lower jaw was also lighter. The only noticeable difference of Peking man from Java ape man was its large cranial capacity which ranged from 850 to 1300 cc (average 1075 c.c. – about 165 to 325 c.c. more).

Like **Java ape man**, the **Peking man** was **omnivorous** and **cannibal**. There is a clear evidence of use of **fire** by it. It has been confirmed that both Java and Peking men used to live in caves in small groups or tribes like the present-day bandits. Since group-life demands some communication, especially during activities like hunting, fighting, etc., some sort of nonsyllabic and nonarticulate language was used by these prehistoric men. The tools of Peking man were relatively more sophisticated, including sharp, chisel-like tools not only of bones and stones, but also of **quartz** (Fig. 38.9).

2. *Homo erectus mauritanicus* **(Atlantic or Ternifier man)** : Discoveries which confirm the existence of Homo erectus in **Africa** came from the excavations in 1954 and 1955 of three jaws from about 6 lakh years old **Pleistocene rocks** near **Ternifire**. The prehistoric man to which these fossils belonged was named as *homo erectus mauritanicus*.

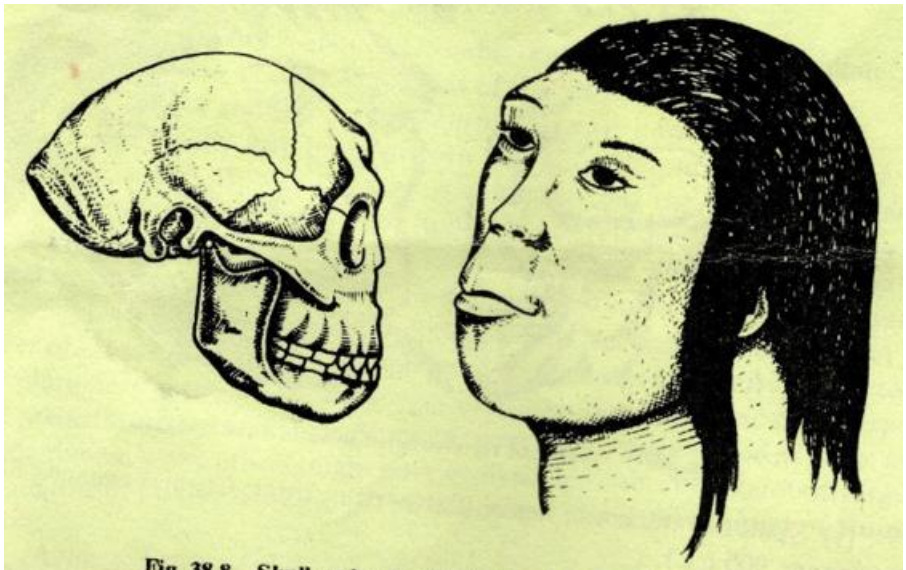


Fig. 38.8 Skull and reconstructed head of Peking man.

Fig. 38.9 Tools of Prehistoric men

2. Summary

14. MODERN MAN

All forms of **prehistoric men** from Java ape man to Ternifier man were considerably similar in body-built, was of life and culture, and existed almost simultaneously in different parts of the world. These are regarded as direct ancestors of the modern man. Homo sapiens. Fossils of a form intermediate between *Homo erectus* and *Homo sapiens*, known as **archaic modern man (presapiens)** have been found as far apart as **Britain** and **China**. **Leakey**, therefore, holds that "erectus migrated from Africa throughout the world and developed into sapiens independently in several places". **Dr. Chris Stringer** of Natural History Museum, London, however,holds a different, possibly better, view, "*Homo erectus* changed into *Homo sapiens* in one particular region and then migrated to different parts of the world." The modern man *(Homo sapiens)* includes the following subspecies:

(1) *Homo sapiens neanderthalensis* **(Neanderthal Man)** : Fossils of the archaic modern man merge into those of **Neanderthal man** in Europe and West Asia. Fossils of **Neanderthal** were first obtained from **Neander Valley** in **Germany** by **C. Fuhlrott** (1856). Later, many other fossils were excavated in various countries by different palacontologists. Although all these fossils have been assigned to a common subspecies of Homo sapiens, these clearly fall into two categories – an **"early"** and **"generalized" "preneanderthal" a**nd a later type, recognized as **"extreme"** or **"classic Neanderthal"**.

The **"preneanderthal"** lived about 1.5 lakh years ago. It had arched cranium and forehead (Fig. 38.10) flattened and erect face, moderate browridges, all equal-sized molars, and a heavy lower jaw with a small, protruding chin. Its cranial capacity was between 1400 to 1450 c.c.

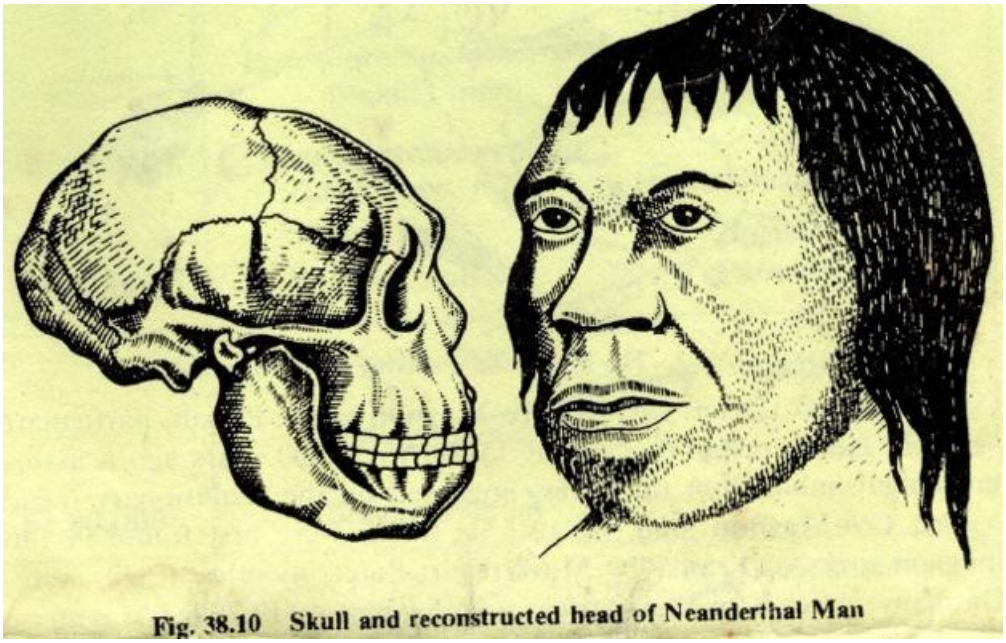


Fig. 38.10 Skull and reconstructed head of Neanderthal Man

The **"Classic Neanderthal"** appeared about 70-80 thousand years ago and became extinct 35,000 years ago. It was stronger with a better body-built, but somewhat shorter (about 1.55 to 1.65 metres tall) in size. It had more prominent browridges, a low and sloping forehead, a broader nose, inconspicuous chin, somewhat shorter legs, slightly arched thigh bones and more powerful molars. Its cranial capacity was generally larger, often somewhat larger even than that of existing man, ranging between 1350 and 1700 c.c.

"Preneanderthal man" had, on one hand, several characteristics resembling those of the existing man, suggesting that it was out direct ancestor. On the other hand, some of its characteristics point out its continuity with **"classic Neanderthal"**. Considering the "classic Neanderthal", some of its characteristics were remarkably different from those of *Homo erectus* and some from those of the man of to-day. These facts indicate that the "preneanderthal" was an ancestor of the direct evolutionary line of man, but the "classic form" diverged from "preneanderthal" along a dead offshoot of the main line, becoming adapted for a rough and cold climate. This contention is supported by a number of other Neanderthal fossil finds some of which combined the characteristics of "preneanderthal" and "classic Neanderthal" on one hand, and of "preneanderthal" and the man of to-day on the other.

Speech centres had developed in the Neanderthal man. Hence, these were capable of communicating with each other by some sort of syllabic language. This led to the development of a primitive sort of social life associated with some *"Division of Labour"*, religion and culture. These were the first human beings to believe in *"Immortality of Soul"*. That is why, evidences of **"ceremonial burial"** of dead bodies have been often found with their fossils. They used to make tools of bones, stones, quartz and also of flint (Fig. 38.11). They also used to build huts and wear clothes of animal skins.

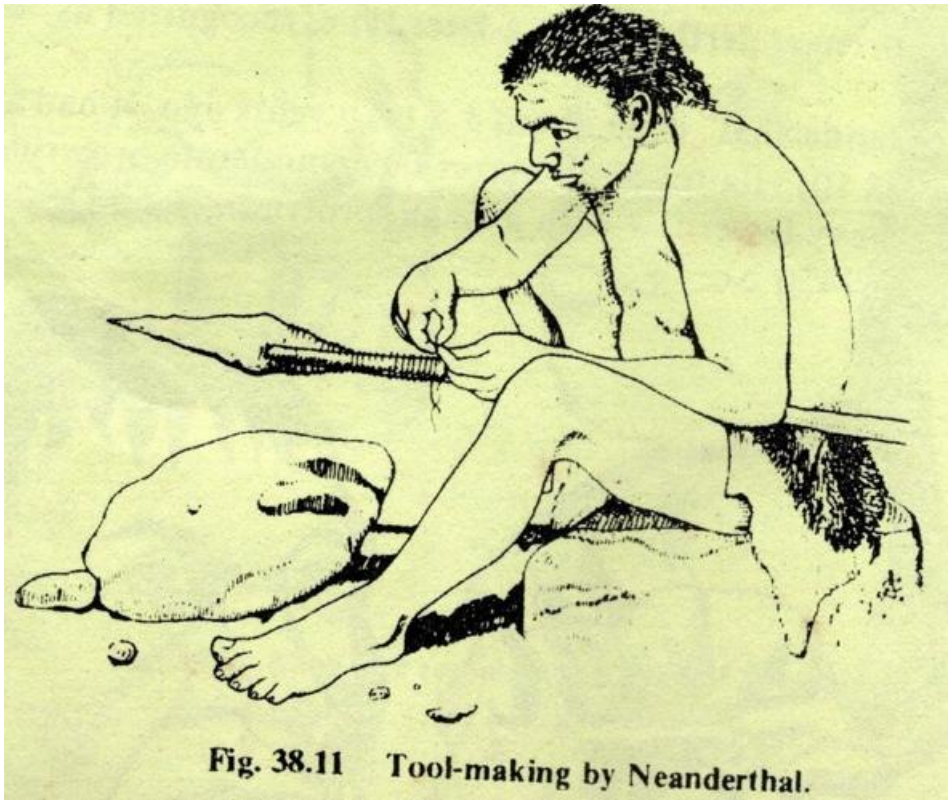


Fig. 38.11 Tool-making by Neanderthal.

(2) *Homo sapiens fossilis* **(Cro-Magnon man)**: Fossils, particularly those excavated in Israel, reveal that about 35,000 to 50,000 years ago a man, anatomically indistinguishable from ourselves, appeared on the evolutionary scene. It has been named **Cro-Magnon man**, because its fossils were first found in 1868 from **Cro-Magnon rocks** of **France** by **MacGregor**. Later, its other fossils were excavated in Germany. Czechoslovakia, Africa and other parts of France. It was an early type of the present man. It became extinct about 11,000 or 10,000 years ago, after changing into the man of to-day. Thus, it is regarded as the most recent ancestor of to-day's man. It has, therefore, been assigned the subspecies name of *Homo sapiens fossilis*.

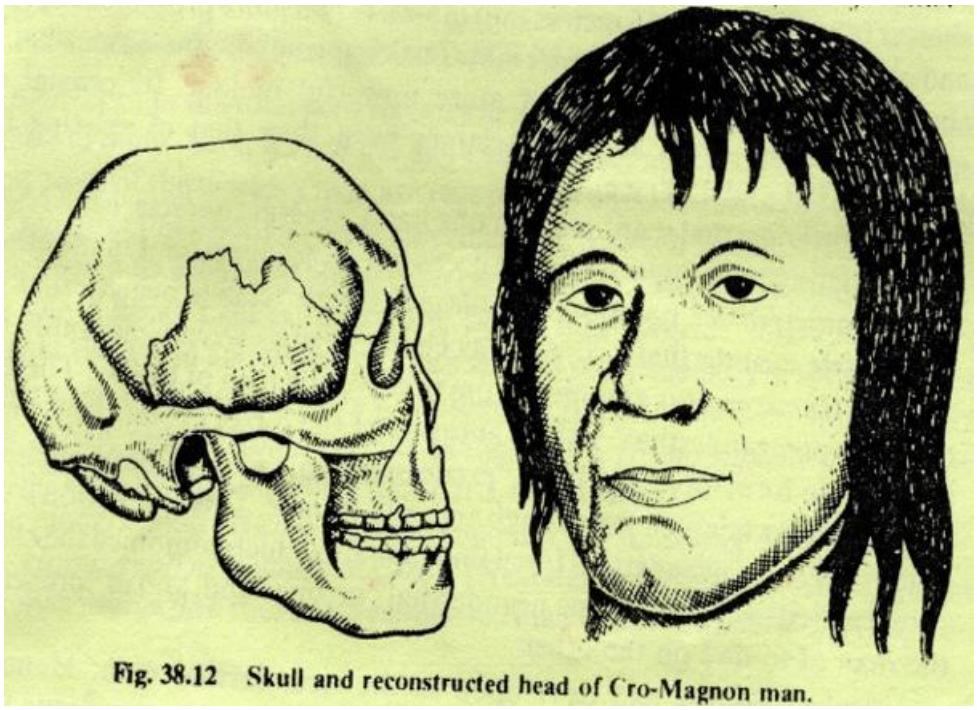


Fig. 38.12 Skull and reconstructed head of Cro-Magnon man.

The Cro-Magnon man had, like us, about 1.8 metres tall, well-built body. Its face was perfectly orthognathous with a narrow, elevated nose, broad and arched forehead, moderate browridges (Fig. 38.12), strong jaws with man-like dentition, and a well-developed chin. Its cranial capacity was, however, more than ours, being about 1600 c.c. It is, therefore, believed that **Cro-Magnon** was more intelligent and cultured than the man of to-day. It could walk and run

faster, lived in families in caves and was omnivorous. It made excellent tools and ornaments, not only of stones and bones, but also of elephant tusks. Its tools included spears, bows and arrows. Use of skin-clothes is also confirmed. They used to domesticate dogs and hunt in groups. Cave paintings, done by Cro-Magnon man, have been discovered.

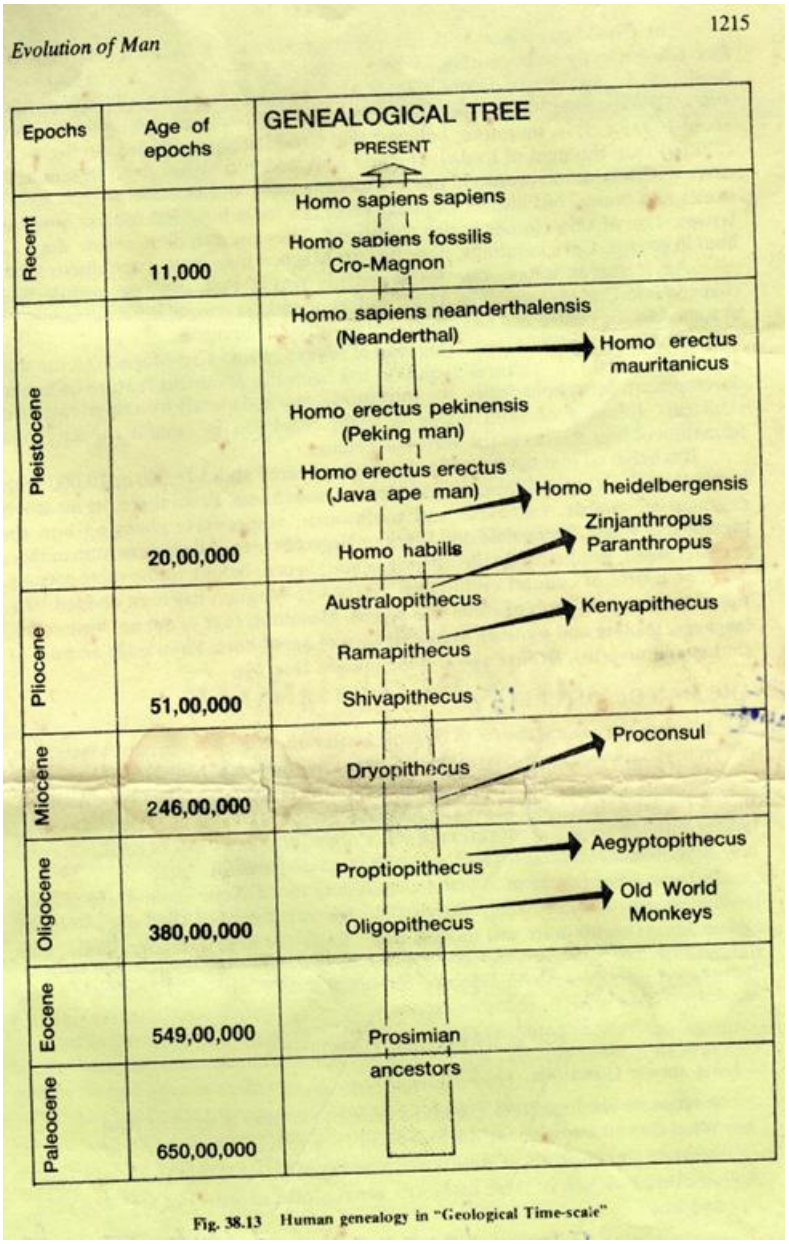


Fig. 38.13 Human genealogy in "Geological Time-scale"

As it stands today, our fossil records reveal that the "preneanderthal" changed into Cro-Magnon (Fig. 38.13) independently at several different centres or at some specific centre and later migrated to different countries.

(3) *Homo sapiens sapiens* (**the man of today**) : From Cro-Magnon to the man of today (Fig. 38.13), cultural evolution has been the dominant feature of human development. Morphologically, the transition is marked merely by a slight raising of skull cap, thinning of skull bones, a slight reduction in cranial capacity, and formation of four flexors in the vertebral column.

It is believed that the man of today first appeared about 11,000 or 10,000 years ago in the region around **Caspian** and **Mediterranean seas**. From there, its members migrated westwards, eastwards, and southwards, respectively changing into the present-day **White, Mongoloid** and **Black** or **Negroid races**. All modern human races can interbreed, producing fertile offsprings and, hence, belong to the same species.

The course of cultural evolution since the Cro-Magnon has been divided into **Palaeolithic** (age of tools of stone and bones), **Mesolithic** (age of animal husbandry, language, reading and writing), **Neolithic** (age of agriculture, knowledge and use of clothes and utensils) **Bronze age** and the present **Iron age**.

Language Style

The language and style in this article is followed what Words Worth gave in his solitary Reaper – "It is the language of common man", and there is nothing verbose about it.

3. Conclusion

The Man of Future

Whereas the natural course of Organic Evolution depends upon natural selection of "genic variations", according to the changing environmental conditions, the human evolution is perhaps going to be significantly influenced by its cultural evolution. Increasing capacity of man to tamper with and pollute the environment, and even to tamper with the genetic constitution of other organisms, as well as, of itself in future, may supersede the natural forces that guide Organic Evolution.

In the natural course of evolution, according to the American anthropologist, Dr. Sapiro, the present man is likely to change into a man of the future – Homo sapiens futuris – with taller and hairless body, tomb-like head and larger brain and with no fifth toe. Who knows when the time for talking would come up with the ape, our ancestors. Though it is a remote cry.

References

[1] Intelligence
[2] Effect Posture and free hands
[3] Grasping
[4] Sensitivity
[5] Reduced Fertility
[6] Culture
[7] Elephant Shrews
[8] The Tree shrews
[9] The Lemurs and Tarsus
[10] The Monkey Stock
[11] Ape Stock
[12] Hominid Stock (Family Homini
[13] Prehistoric man
[14] Modern Man
[15] The Man of future