

## **Quadrant II – Transcript and Related Materials**

**Programme: Bachelor of Science (Second Year)**

**Subject: Geology**

**Paper Code: (DSC) GEC - 104**

**Paper Title: Principles of Stratigraphy & Palaeontology**

**Unit: 04**

**Module Name: Human evolution**

**Module No: 38**

**Name of the Presenter: Shritesh Mhapsekar**

---

### **Notes**

#### **INTRODUCTION**

Humans are too complex to be "understood" by any one field. Thus we will look at a few major steps in the evolution. Humans are members of the order Primates which consists of about 180 species (there are 17 different orders of mammals which diverged 80-65 million years ago). Most of the synapomorphies of this order are associated with an arboreal way of life: flexible digits, forward facing eyes, vision as a primary sense.

These traits may have played a role in the evolution of brain size in the lineage leading to humans. Humans are a member of the family Hominidae which is believed to have diverged about 5 million years ago. Human evolution is the lengthy process of change by which people originated from apelike ancestors. Scientific evidence shows that the physical and behavioural traits shared by all people originated from apelike ancestors and evolved over a period of approximately six million years.

#### **Primates**

The mammalian order Primates includes the lemurs, tarsiers, monkeys, and apes. Humans are members of the ape group.

## **Derived Characters of Primates**

Most primates have hands and feet adapted for grasping, and their digits have flat nails instead of the narrow claws of other mammals. There are other characteristic features of the hands and feet, too, such as skin ridges on the fingers (which account for human fingerprints). Relative to other mammals, primates have a large brain and short jaws, giving them a flat face. Their forward looking eyes are close together on the front of the face. Primates also exhibit relatively well-developed parental care and complex social behaviour.

The earliest known primates were tree-dwellers, and many of the characteristics of primates are adaptations to the demands of living in the trees.

### **Humans are mammals that have a large brain and bipedal locomotion.**

In our tour of Earth's biodiversity, we come at last to our own species, *Homo sapiens*, which is about 200,000 years old. When you consider that life has existed on Earth for at least 3.5 billion years, we are clearly evolutionary newcomers.

### **Anatomical changes**

Human evolution from its first separation from the last common ancestor of humans and chimpanzees is characterized by a number of morphological, developmental, physiological, and behavioural changes. The most significant of these adaptations are:

#### **Bipedalism: humans as upright apes**

Bipedalism, walking upright on the hind limbs, has led to anatomical changes in all parts of the body. The foot became a flat platform structure with a non-opposable big toe and straight phalanges in the toes. The angle of the human knee joint shifts from being slightly splayed to being a straight hinge, and all the leg bones are longer. The hip joint faces downwards and sideways and the femur has a ball-like head that fits into it. The pelvis as a whole is short and bowl-like and the backbone adopts an S-shaped curve. The evidence for the evolution of bipedalism includes the oldest hominin skeletons, dated as 6–4Myr old, and a track way of footprints in volcanic ash dated as 3.75Myr old.

## Increased brain size

The second key human character was the increase in relative brain size that occurred much later, only about 2Myr ago with the origin of the genus *Homo*. The early bipedal humans still had rather ape-like heads with brain sizes of 400–550cm<sup>3</sup>, similar to apes. Various anatomical characters changed as a result of the increase in brain size.

## Other changes

A number of other changes have also characterized the evolution of humans, among them. An increased importance on vision rather than smell. A longer juvenile developmental period and higher infant dependency, a smaller gut; faster basal metabolism; loss of body hair, evolution of sweat glands. A change in the shape of the dental arcade from being u-shaped to being parabolic, development of a chin.

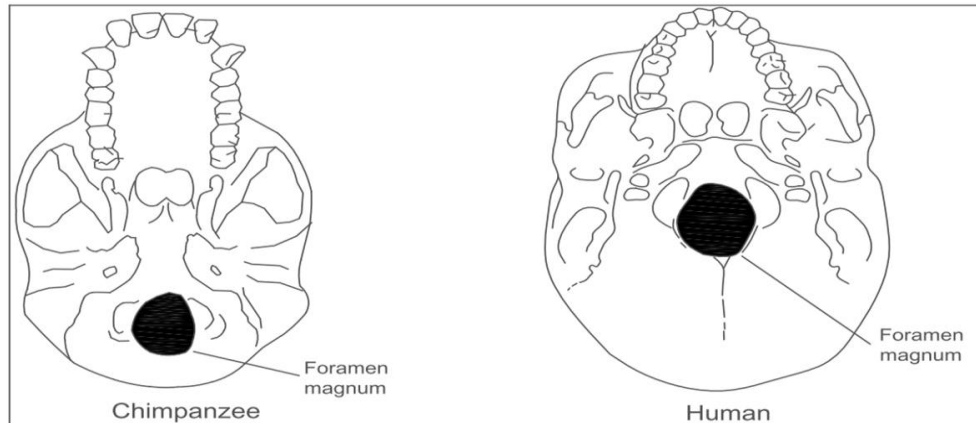
## The Earliest Hominins

The study of human origins is known as paleoanthropology. Paleoanthropologists have unearthed fossils of approximately 20 extinct species that are more closely related to humans than to chimpanzees. These species are known as hominins. Since 1994, fossils of four hominin species dating to more than 4 million years ago have been discovered.

The oldest of these hominins, *Sahelanthropus tchadensis*, lived about 6.5 million years ago. *Sahelanthropus* and other early hominins shared some of the derived characters of humans.

For example, they had reduced canine teeth, and some fossils suggest that they had relatively flat faces. They also show signs of having been more upright and bipedal than other apes. One clue to their upright stance can be found in the foramen magnum, the hole at the base of the skull through which the spinal cord exits.

In chimpanzees, the foramen magnum is relatively far back on the skull, while in early hominins (and in humans), it is located underneath the skull. This position allows us to hold our head directly over our body. The pelvis, leg bones, and feet of the 4.4-million-year-old *Ardipithecus ramidus* also suggest that early hominins were increasingly bipedal. While nearly hominins were showing signs of bipedalism, their brains remained small—about 300–450 cm<sup>3</sup> in volume, compared with an average of 1,300 cm<sup>3</sup> for *Homo sapiens*.



## **Ardipithecus**

Ardipithecus, the earliest known genus of the zoological family Hominidae (the group that includes humans and excludes great apes) and the likely ancestor of Australopithecus, a group closely related to and often considered ancestral to modern human beings. Ardipithecus lived between 5.8 million and 4.4 million years ago, from late in the Miocene Epoch (23 million to 5.3 million years ago) to the early to middle Pliocene Epoch (5.3 million to 2.6 million years ago).

The genus contains two known species, *Ar. ramidus* and *Ar. kadabba*. Originally described as one of the earliest ancestors of humans after they diverged from the chimpanzees. Behavioral analysis showed that Ardipithecus could be very similar to chimpanzees, indicating that the early human ancestors were very chimpanzee-like in behavior.

## **Australopiths**

The fossil record indicates that hominin diversity increased dramatically between 4 and 2 million years ago. Many of the hominins from this period are collectively called australopiths. The earliest member of the group, *Australopithecus anamensis*, lived 4.2–3.9 million years ago. Australopiths got their name from the 1924 discovery in South Africa of *Australopithecus africanus* (“southern ape of Africa”), which lived between 3 and 2.4 million years ago.

With the discovery of more fossils, it became clear that *A. africanus* walked fully erect (was bipedal) and had human-like hands and teeth. However, its brain was only about one-third the size of the brain of a present-day human.

In 1974, in the Afar region of Ethiopia, paleoanthropologists discovered a 3.2-million-year-old *Australopithecus* skeleton that was 40% complete. “Lucy,” as

the fossil was named, was short—only about 1 m tall. Lucy and similar fossils have been given the species name *Australopithecus afarensis* (for the Afar region). Fossils discovered in the early 1990s show that *A. afarensis* existed as a species for at least 1 million years.

### **Early-Homo**

*Homo habilis*, (Latin: “able man” or “handy man”) extinct species of human, the most ancient representative of the human genus, *Homo*. *Homo habilis* inhabited parts of sub-Saharan Africa from roughly 2.4 to 1.5 million years ago (mya). These fossils, ranging in age from about 2.4 to 1.6 million years, show clear signs of certain derived hominin characters. Many features of *H. habilis* appear to be intermediate in terms of evolutionary development between the relatively primitive *Australopithecus* and the more-advanced *Homo* species. Compared to the australopiths, *H. habilis* had a shorter jaw and a larger brain volume, about 600–750 cm<sup>3</sup>. Sharp stone tools have also been found with some fossils of *H. habilis*.

### **Homo erectus**

*Homo erectus*, (Latin: “upright man”) extinct species of the human genus (*Homo*), perhaps an ancestor of modern humans (*Homo sapiens*). *H. erectus* most likely originated in Africa. Regardless of where it first evolved, the species seems to have dispersed quickly, starting about 1.9 million years ago (mya) near the middle of the Pleistocene Epoch, moving through the African tropics, Europe, South Asia, and Southeast Asia. The brain was smaller and the teeth larger than in modern humans. *H. erectus* appears to have been the first human species to control fire, some 1,000,000 years ago.

### **Neanderthals**

In 1856, miners discovered some mysterious human fossils in a cave in the Neander Valley in Germany. The 40,000-year-old fossils belonged to a thick-boned hominin with a prominent brow. The hominin was named *Homo neanderthalensis* and is commonly called a Neanderthal.

Neanderthals were living in Europe by 350,000 years ago and later spread to the Near East, central Asia, and southern Siberia. They had a brain as large as that of present-day humans, buried their dead, and made hunting tools from stone and wood. But despite their adaptations and culture, Neanderthals apparently became extinct about 28,000 years ago.

## **Homo sapiens**

Homo sapiens, (Latin: “wise man”) the species to which all modern human beings belong. Homo sapiens is one of several species grouped into the genus Homo, but it is the only one that is not extinct. Humans (Homo sapiens) are the most populous and widespread species of primates, characterized by bipedality and large complex brains enabling the development of advanced tools, culture and language.

Humans evolved from other hominins in Africa several million years ago. H. sapiens emerged around 300,000 years ago. Anatomically, modern humans can generally be characterized by the lighter build of their skeletons compared to earlier humans. Modern humans have very large brains, which vary in size from population to population and between males and females, but the average size is approximately 1300 cubic centimeters.