

<http://tgesbiology.weebly.com/4-human-evolution.html>

# HUMAN EVOLUTION

Unit 1 chapter 4

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## THE SCOPE OF SYLLABUS

Human evolution: *Dryopithecus*, *Australopithecus*, *Homo erectus*, *Homo neanderthalensis*, Cromagnon man and *Homo sapiens*; differences between apes and man.

Evolution of man - brief idea of ancestors leading to man of today; comparison and homology in chromosomes of apes and man.

## THE FIRST HUMAN FOSSIL EVIDENCE

Found in Java, Indonesia

*Homo erectus* skull, Known as Java Man, this early human species was identified based on fossil evidence first found in 1891 in archaeological sites along the Solo River, East Java, Indonesia. This specimen is the Sangiran 17 skull, found in 1969 in the Sangiran Cave, Central Java. It has been dated to between 1.3 and 1 million years ago, though estimates vary.



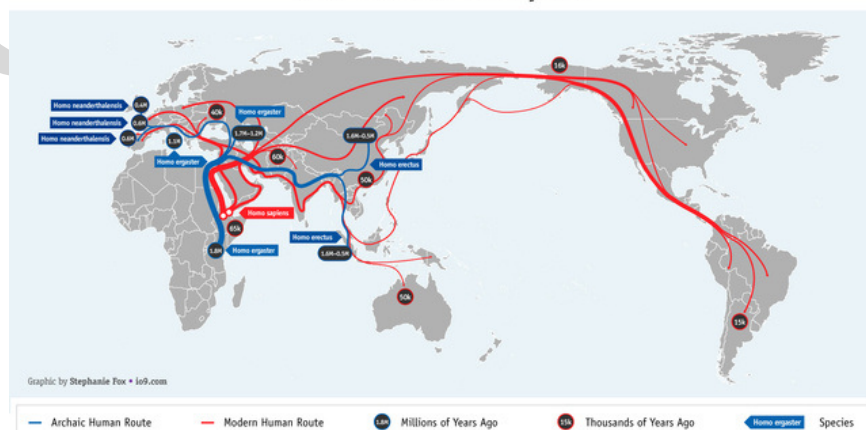
## EUGENE DUBOIS (1858-1940)

- In September 1890, his workers found a human, or human-like, fossil at Koedoe Broeboes. This consisted of the right side of the chin of a lower jaw and three attached teeth.
- In August 1891 he found a primate molar tooth. Two months later and one meter away was found an intact skullcap, the fossil which would be known as Java Man.
- In August 1892, a third primate fossil, an almost complete left thigh bone, was found between 10 and 15 meters away from the skullcap



## Human evolution- when and where.

### The Human Diaspora



## FACTORS RESPONSIBLE FOR HUMAN EVOLUTION

- Increased aridity of climate.
- Dwindling of forests and replacement by grasslands
- Reduction in number of trees.

### EARLY HUMAN ANCESTORS

#### *Dryopithecus*

The fossils were discovered from rocks of Miocene age (20 mya). These resembled the great apes. Their arms and legs were of equal length. They had semi-erect posture, large canines, and without brow ridges.



#### *Australopithecus (African ape man)*

Two million years ago fossil baby skull called Tuang baby was discovered by **Raymond Dart** and named it (*Australopithecus africanus*).

*Australopithecus* were about 150cm and its skull was like that was like that of modern apes with cranial capacity of 600cc. They lived during Pliocene and the Pleistocene in Africa.

**Donald Johanson** discovered another species of *Australopithecus* fossil “Lucy” in 1976.

#### Simian characters:

1. Small in size, average height- 4feet
2. Face prognathous.
3. Chin absent, forehead low.
4. Bulge of occipital region small.
5. Eyebrow ridges projected over the eyes.
6. Cranial capacity about 600 cc

#### Human characters:

1. Walked completely straight
2. Vertebral column with distinct lumbar curve
3. Pelvis broad and basin like.
4. Teeth man-like with dental arch in the form of parabola.
5. Simian gap between incisors and canine absent.
6. Canines man-like and did not project beyond the level of other teeth



#### *Advanced Australopithecus – Homo habilis*

**Louis Leakey** discovered the fossils of Homo habilis or the handy man in 1960.

These were found in rocks 1.6 to 1.8 million years old in east Africa. They were slightly more advanced than *Australopithecus*.



### Characters of *Homo habilis*

1. They were 120 -150cm tall.
2. They had cranial capacity of 730cc.
3. They had human like body with an ape like head.
4. They walked erect with bipedal gait.

They lived in caves were herbivores and used tools of stones to dig out tubers and led community life. They are regarded as the last of the Australopithecus. They originated about 3.5 million years ago

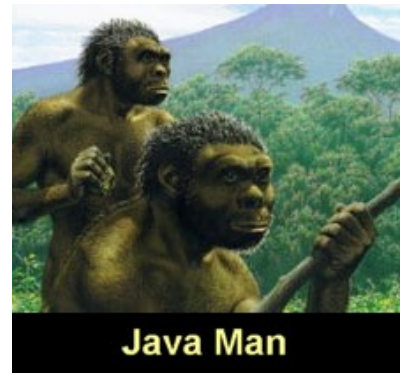
### *Homo erectus erectus (Java ape man)*

**Eugene Dubois** discovered the fossil, in 1891. Dubois named the fossils as *Pithecanthropus erectus* or Java ape-man. Later, **Mayer** (1950) renamed it as *Homo erectus*. They lived 1.7million years ago (Pleistocene) on the banks of Solo River in Java.

#### Characters-

1. They stood upright to a height of 150cms.
2. They had receding forehead with prominent brow ridges
3. The jaws were prognathous without a distinct chin.
4. The cranial capacity was 900cc.

They were hunters and food gatherers, used stone tools for hunting, lived in caves, learned the use of fire for cooking and used animal skin for clothing themselves and probably used sign language.



Java Man

### *Homo sapiens neanderthalensis (Neanderthal man)*

**C. Fuhirott** discovered fossil in 1856.

They arose about 1,00,000 years ago and became extinct 25,000 years ago.

#### Characters-

- Thick skull bones.
- Low slanting forehead.
- Strong lower jaw muscles and no chin.
- Short of stature 1.5 to 1.6m height.
- Semi-erect stooping posture.
- Cranial capacity of 1450cc.



*Homo neanderthalensis*



They used flint tools and animal skin for clothing. They buried the dead and performed ceremonies and constructed dwelling structure.

State three structural features by which *Neanderthal* man differed from *Homo sapiens*. 3M2007

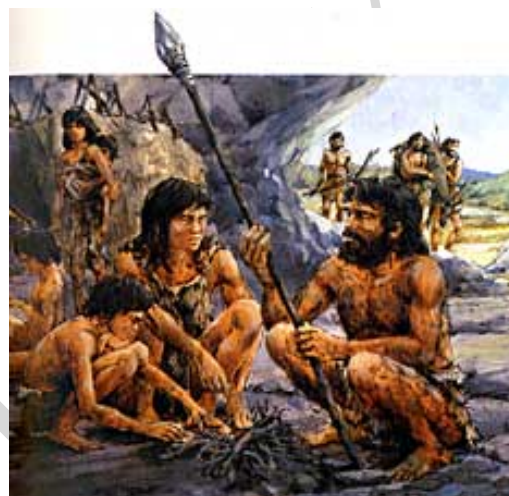
### ***Homo sapiens fossilis (early modern man or cro-magnon man)***

**Mac Gregor** discovered fossil in 1868 from the caves of northwest Italy.

They originated 50,000 years ago and existed for about 30,000 years. They became extinct 10-20 thousand years ago.

#### **Characters-**

- They were about 1.8m tall.
- They had perfect posture.
- The cranial capacity was 1660 cc.
- They are prominent chin and narrow elevated nose.
- Face was prognathous.



They were cave dwellers and hunters; they buried the dead and could make paint. They learnt to shape stones and bones into excellent tools. They had religious beliefs and burial customs. They developed the Paleolithic culture.

Give the characteristics of cro-magnon man.

4M ISC 2005

Give reasons to show that Cro-magnon man is the direct ancestor of man today.

4M ISC 2002

### ***Homo sapiens sapiens (Modern man)***

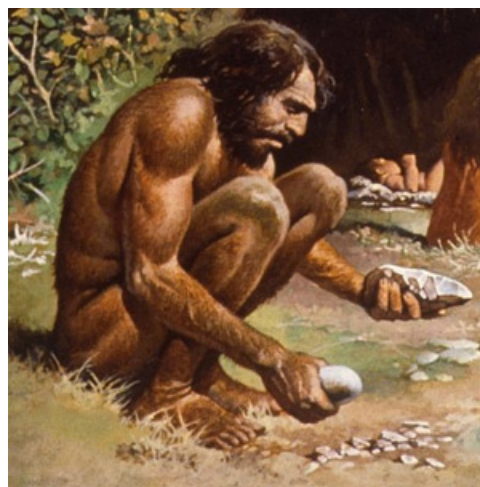
It is the living modern man, evolved 25 thousand years ago. Their evolution includes cultural evolution rather than anatomical evolution. He learned to cultivate plants and domesticate animals. Modern man is associated with Neolithic culture. They settled down near lakes and ocean shores to catch fishes, and also started domesticating plants and animals.

The modern man is known to have appeared around the Caspian Sea and evolved into following races-

Negroid- Africa and Malaysia.

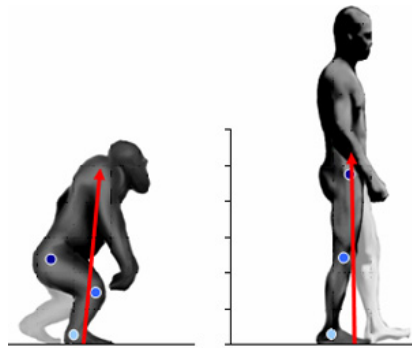
Caucasian- Europe and North America.

Mongoloids- China, Siberia and Japan.

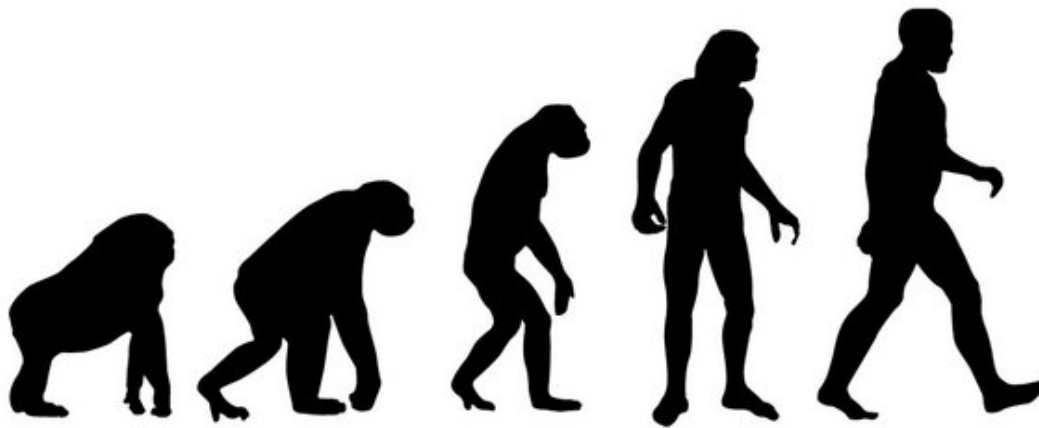


## CHARACTERS THAT DIFFERENTIATE APES AND HUMANS

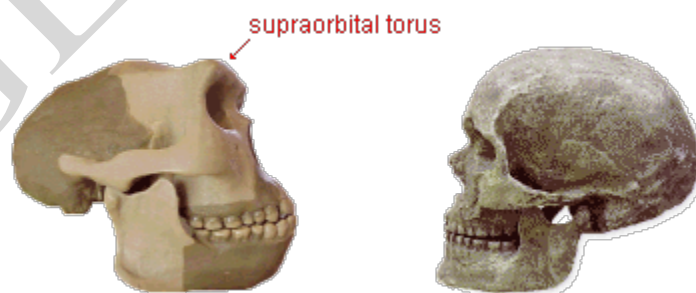
1. Erect posture: Bend posture to straight or erect posture.



2. Bipedalism: Walking on all four limbs to walking on two legs.



3. Supraorbital ridge reduction: Apes have prominent supra-orbital ridge.



4. Prognathous to orthognathous:



Face of apes protrudes out into a muzzle due to the broad and long teeth row.

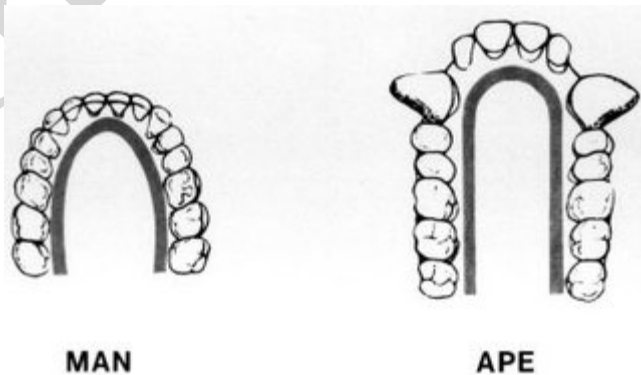


In *Homo sapiens* here is a prominent chin and is without a muzzle.

5. Opposable thumb- that helps in grasping.



6. Shape of the jaw



The dental arch is in the shape of parabola in apes whereas it is U shaped in humans

### Other trends in Human evolution

- Development of distinct lumbar curve.
- Development of broad pelvic bones
- Acetabular cavities shifted inside, to give straight posture.
- Increase in size of cranial cavity
- Flattening of face
- Straightening of forehead
- Narrowing of nose
- Thinning of jaw bones
- Reduction in jaw musculature
- Reduction in size of canines
- Loss of tail
- Articulated speech

State the main morphological changes that occurred in the ancestors of modern man. 3M 2011

State two similarities between the chromosomes of man and apes. 2M 2011

Differentiate between apes and man with respect to the following characteristic- 4M 2009

a. Posture, b. cranium c. brow ridges d. locomotion

What are the characteristics that have developed in human beings during evolution? 4 M 2004

### Cultural evolution in man

Cultural evolution started in the Pleistocene period with the early human ancestors leading a community life.

They lived in caves to protect themselves from the predators.

They started using tools for digging tubers etc. for food. They then started making tools for hunting animals.

As evolution took place in the late Pleistocene, they used fire for defense and cooking.

These early humans also used sign language for communication.

The tools were more sophisticated and animal skin used for clothing.

They followed religious customs and burial patterns.





## Homology in chromosomes of man and ape

Modern man showed more of cultural evolution than anatomical evolution. For improved hunting, good tools were produced, later domestication of plants and animals led to the agricultural revolution and finally the latest industrial and scientific revolution.

The diploid chromosome number in man is 46 and that in apes (chimpanzee, gorilla and orangutan are 48. Comparing the banding technique, the pattern is similar in chromosome number 3 and 6. The nucleotide sequence between the DNA molecules is also similar. The difference between the sequence in man and chimpanzee is only 2.5%.

## Evidences in support of common ancestors

1. Anatomical: These include the various morphological similarities posture, teeth, locomotion etc. Vestigial organs present in humans are also present in apes.
2. Physiological: blood groups, menstrual cycle in female (no. of days same), gestation period (270-90 humans, 265-80 –gorilla and 210-52 chimpanzee)
3. Embryological: eggs and sperms are similar, mammae in six-week-old human embryo, hairs on the embryos

What are the chromosomal similarities found in man and apes? What do such similarities indicate? 3M 2001

Give the characteristic features that suggest a close phylogenetic relationship between man and apes. 4M 2003

Give an account of the evidence, which shows the common ancestry of man and apes. 4M 2006

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