



# Human Evolution (from the time of beginning)

By:-

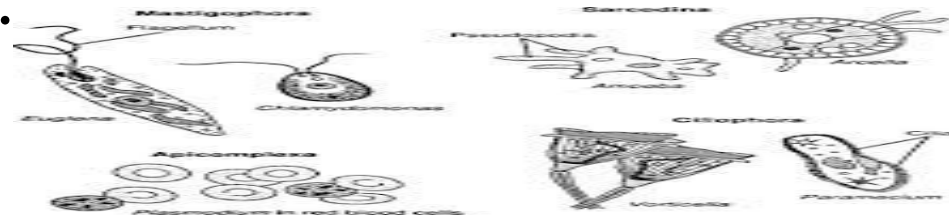
Ambrish Kumar Gupta

Principal

Kendriya Vidyalaya Rajkot.

# Introduction

- Our earth evolved- 4.6 billion years ago.
- Initially aquatic creatures- protozoa, amoeba, jelly fish etc. on earth.
- Then Amphibians
- Then Reptiles
- Mammals- around 50 millions years ago.
- Primates- around 36 millions years ago.
- Hominoids- around 24 millions years ago.
- Hominids- around 5.6 millions years ago.



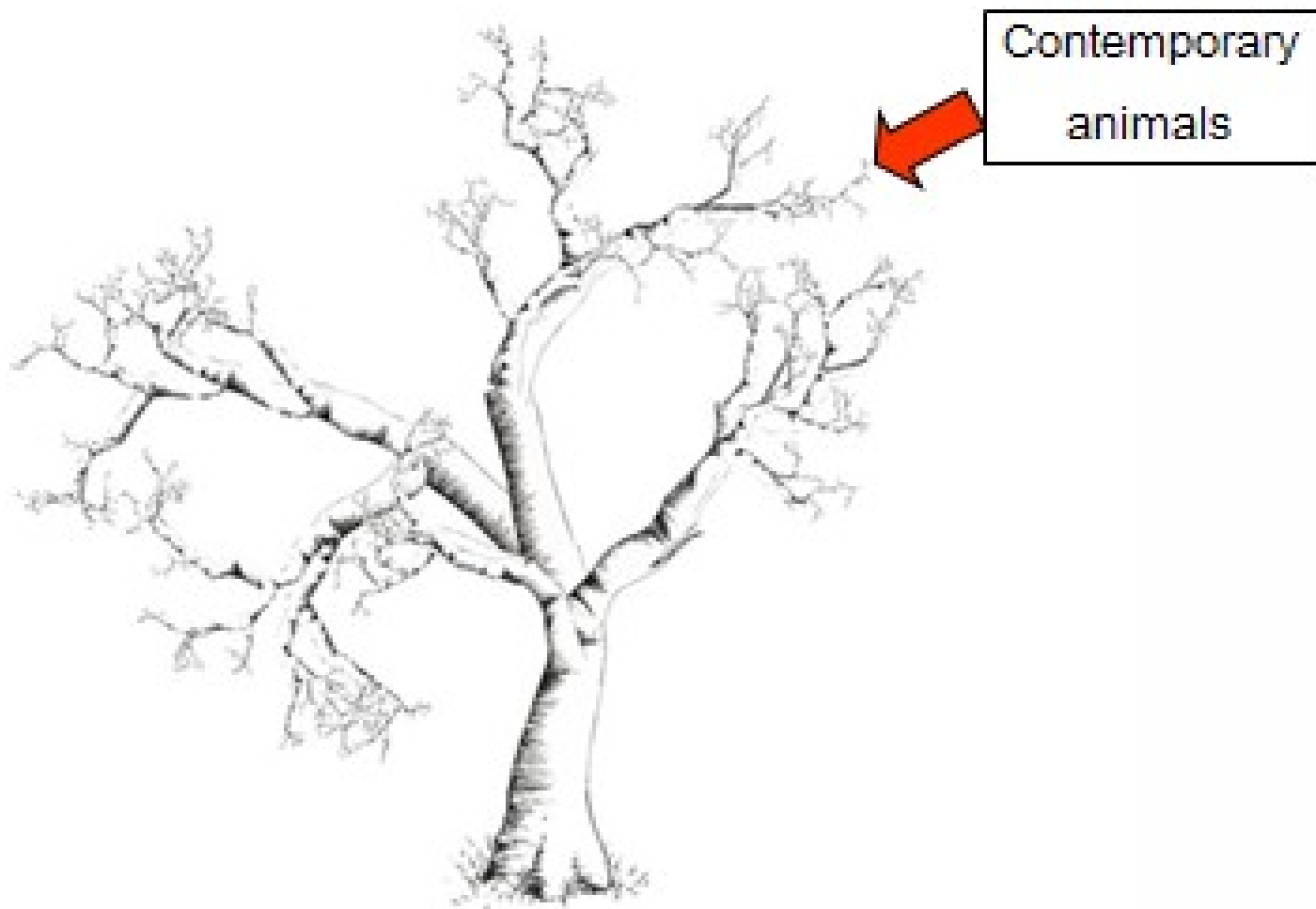
# Important Definitions

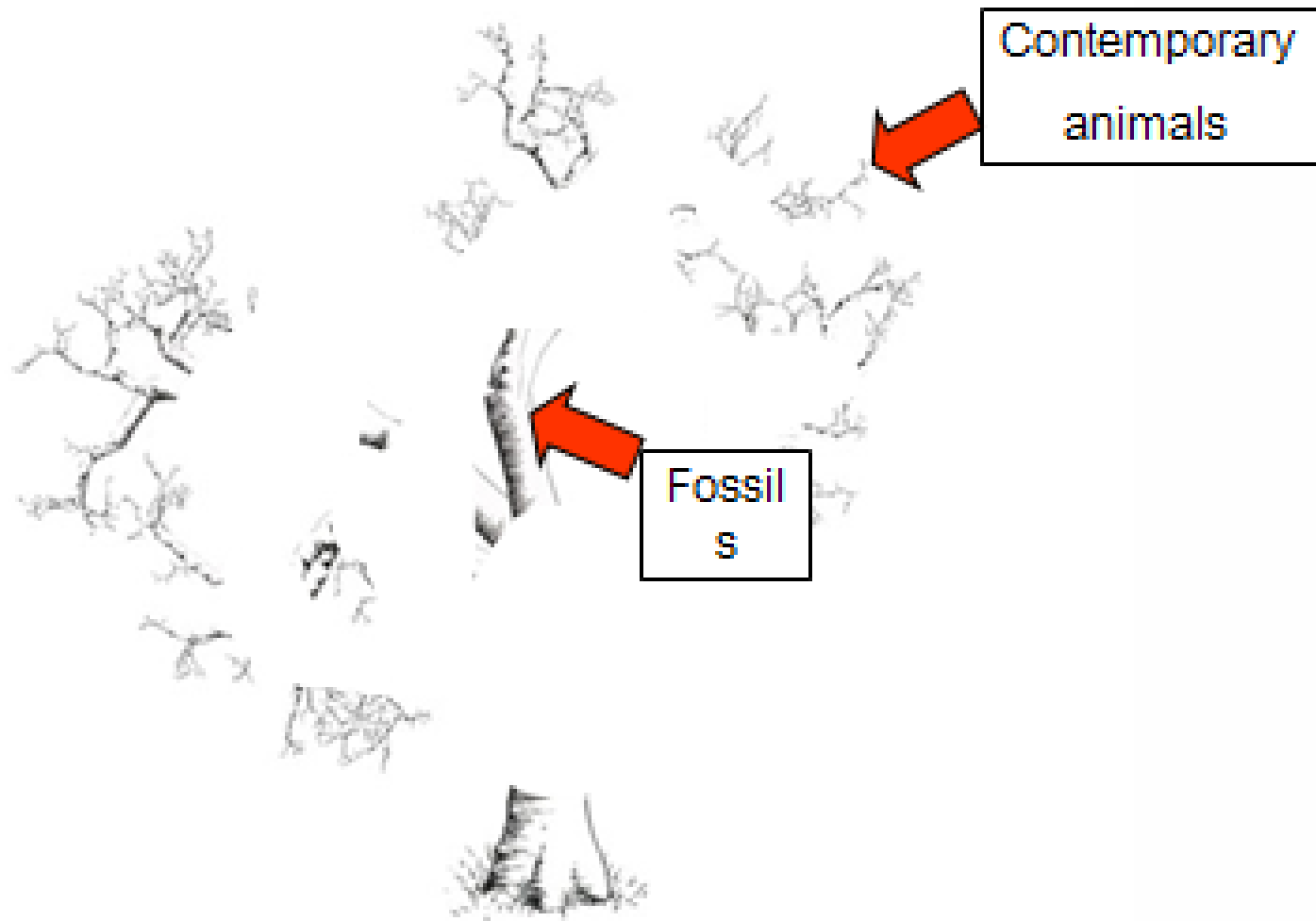
- Species is a group of organisms that can breed to produce fertile offspring. Members of one species cannot mate with those of other species to produce.
- Primates are a subgroup of a larger group of mammals. They include monkeys, apes and humans. They have body hair, a relatively long gestation period following birth, mammary glands, different types of teeth, and the ability to maintain a constant body temperature.

Who Are our Ancestors ?



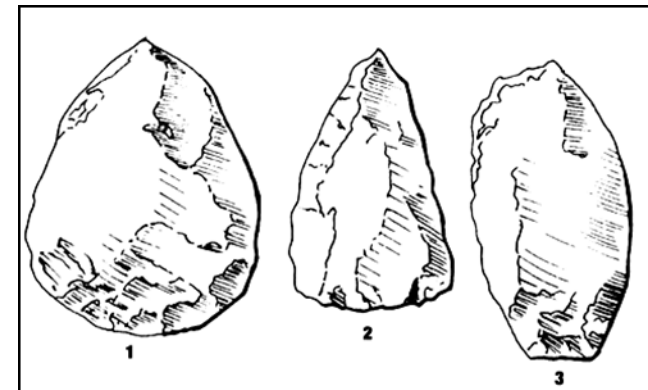
Common ancestor





# Sources of Early Humans

- Human fossils
- Stone tools
- Cave paintings
- Carbonised food grains
- Artifacts





# Dating of ancient finding

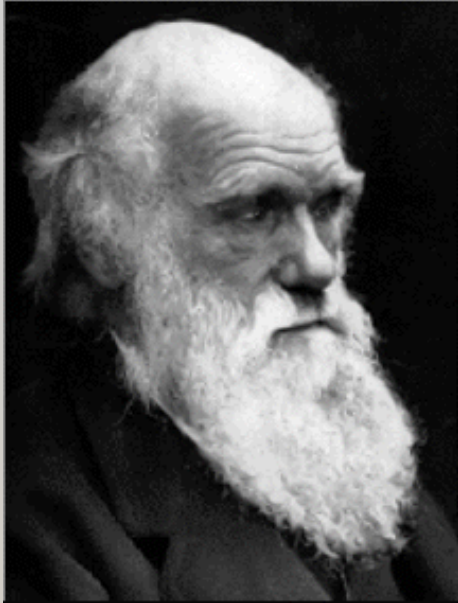
- Through direct Analysis.
- Indirectly by dating the sediments/fossils.
  - Dating Methods.
    1. C-14 methods.
    2. Potassium-Organ methods.
    3. Uranium Methods
    4. Dendrochronology. Etc.

# Creation of Human-being

- Devine theory-Most religions have stories about the creation of human beings which often do not correspond with scientific discoveries.
- Scientific theory-24 November 1859, when Charles Darwin's *On the Origin of Species* was published, marked a landmark in the study of evolution. All 1,250 copies of the first print were sold out the same day. Darwin argued that humans had evolved from animals a long time ago.

# THE THEORY OF EVOLUTION

Evolution as a theory suggests that the great variety of plant and animal life on earth developed gradually through natural processes.



Although such an idea had been suggested as early as the sixteenth century, the great English biologist Charles Darwin (1809-1882) gave the theory prominence.

The most important of Darwin's works is *On the Origin of Species by means of Natural Selection*, first published in 1859.

Darwin's examination of **geological formations**, **collection of fossils**, and **study of plants and animals** from 1831 to 1836 **led him to doubt** that divine creation had brought all species of living things into existence at one moment. His doubts challenged the traditional theory of creationism held for centuries in the western world.

# NATURAL SELECTION

Darwin's theory was based on the idea that species changed or adapted over time in response to their environment.

He based his theory on his observations that **members of a single species vary greatly in shape, size, color, and strength**. Most of these variations, he believed, could be inherited.

He also noticed that **the population of a species tended to remain the same size**, even though parents usually produced more than two offspring.

He concluded, therefore, that there had to be competition for survival. In the **struggle for survival**, his theory stated, organisms with characteristics less suited to their environments likely died without producing young. Those organisms with more useful characteristics survived and reproduced, passing on these variations to their offspring. As other descendants developed other favourable variations, they passed on these characteristics as well.

As a result, Darwin argued, organisms with more helpful characteristics survived the struggle for existence. Others died out. He called this process of *Natural Selection*.

## MORE ON NATURAL SELECTION

Darwin believed that Natural selection had other effects as well.

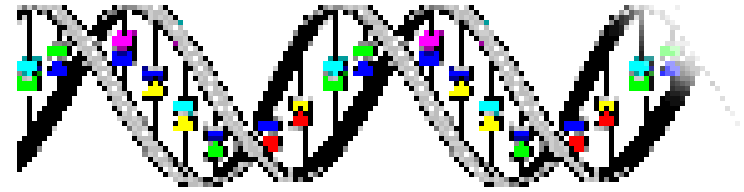
- Many newly developed organisms remained in their old habitats and crowded older forms out of existence.
- Other new organisms made their way into new surroundings, prospered, and kept adapting. Therefore, there was a steady succession of new species best suited to an environment at a particular time.

A modern extension of Darwin's theory, known as **neo-Darwinism**, suggests that evolution proceeded rapidly at some points in history, but very slowly at others, resulting in long period of little change.

It must be understood that Charles Darwin never professed that his writings provided proof of evolution or of the origin of species. They only proposed the theory and suggested that evolution might help to explain a number of mysterious facts about plants and animals.

Two later scientific developments have given the theory credibility.

First, the **science of genetics** has helped to explain the variations in each species and how these variations are passed on.



Second, **evidence gathered from fossil remains** in recent years supports Darwin's ideas.

Gaps in the theory still remain, however, and we do not have a complete record of human evolution.

# Definitions.....

- **Hominoids** are different from monkeys in a number of ways. They have a **larger body** and **do not have a tail**. Besides, there is a longer period of infant development and dependency amongst hominoids.
- **Hominids** belong to a family known as Hominidae, which includes all forms of human beings. The distinctive characteristics of hominids include a **large brain size**, **upright posture**, **bipedal locomotion** and **specialisation of the hand**.

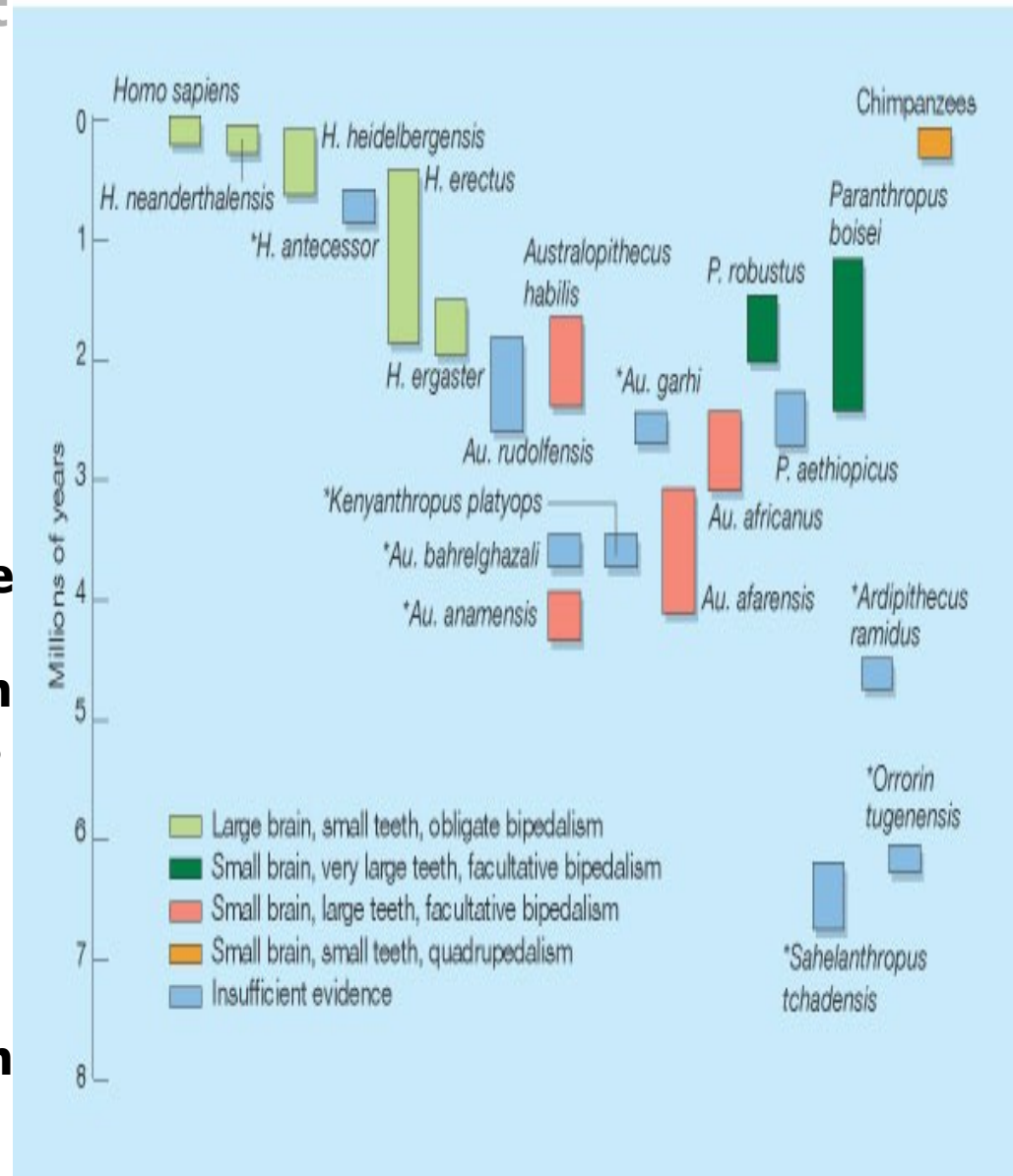
# Hominoids Vs Hominids

- Evolved from primates
  - Emerged nearby 24 mya
  - Smaller brain size
  - Heavier skull & jaw size
  - Flexible forelimbs
  - Quadrupeds
  - Fingers connected with thin layers of skin.
- Evolved from hominoids
  - Emerged nearby 5.6 mya
  - Bigger brain size
  - Smaller skull & jaw size
  - Developed hands.
  - Bipedal locomotion
  - Free fingers for independent use e.g. making tools.



# What is a Hominid?

- Modern humans & our direct and indirect ancestors **after our lineage split from the chimpanzee**
- Until recently, earliest hominids were **dated between 3.5 and 2.4 mya** & placed in the genus ***Australopithecus***
- In last few years, time range of ***Australopithecus*** **pushed back to 4.2 mya**, distribution expanded to include regions outside E. and S. Africa
- **New finds from 4.5-7 mya** are thought to be hominids that predate Australopithecines, although their status is debated



# Hominid Sites

- Earliest fossil hominid sites are in Africa
- They now span the latest Miocene to the early Pleistocene from about 6-7 mya to about 1.6 mya
- The major groups of sites are:

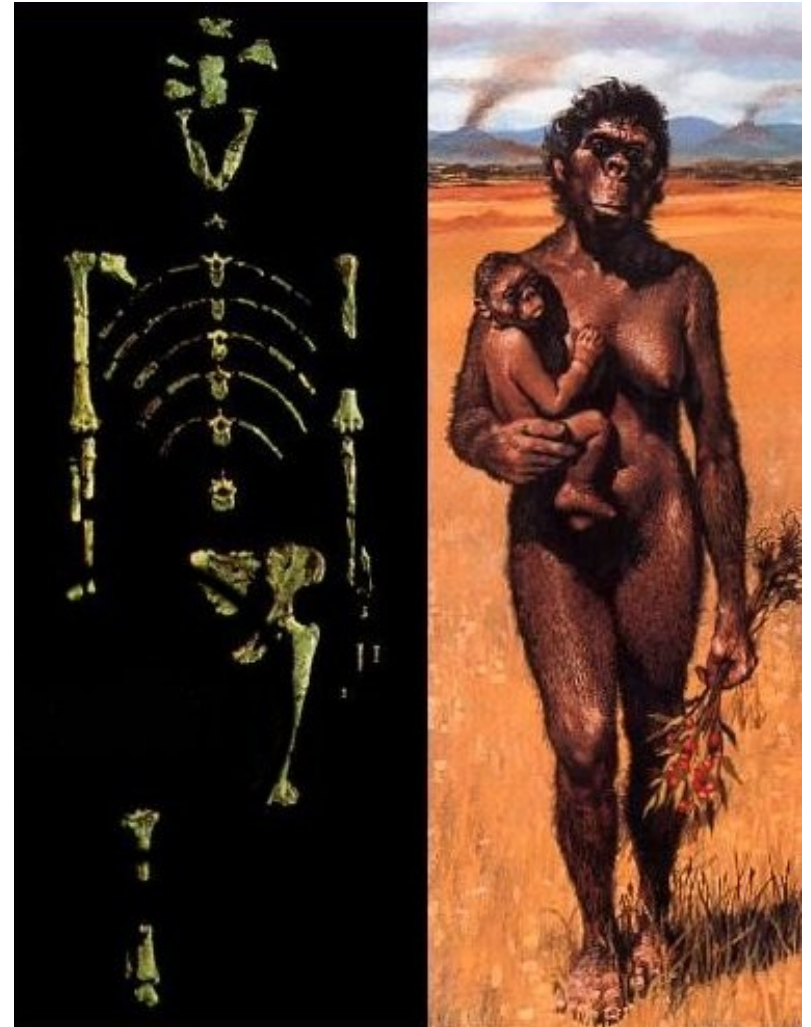
1. Ethiopia = Middle Awash valley & Hadar (*Australopithecus afarensis*)
2. Kenya = Lake Turkana
3. Tanzania = Olduvai Gorge
4. South Africa = various sites in limestone caverns centered around Sterkfontein



# What Makes A Hominid? - Bipedalism

- Primary feature distinguishing hominids from other hominoids is walking erect on two legs – erect bipedalism

- Adaptations for bipedalism in the the partial skeleton of “**Lucy**,” an australopithecine ( 3.2 mya) clearly seen in the **hip, spine and leg bones**



# Why did bipedalism become the primary adaptation of hominids?

- **Carrying** behavior
- **Reduction of overall heat stress - facilitates heat loss through convection by exposing body to air currents, only humans have sweat glands that produce moisture to cool body**
- **Most energy efficient way to travel long distances**
- **Allows for better vision in open environments & defensive action against predators by freeing hands to throw objects**

# Evidence for Early Bipedalism

- The record of bipedalism is most graphically preserved in the fossilized footprints at **Laetoli, Tanzania!**
- 3.6 million year old tracks left by 2 individuals were uncovered in volcanic ash by **Mary Leakey (1978-79)**
- **Footprints were left by 2 australopithecines in damp volcanic ash of Laetoli**
- **In the Laetoli trail, prints of the 2 individuals can be seen walking away from us**
- **Notice how close the tracks are!**

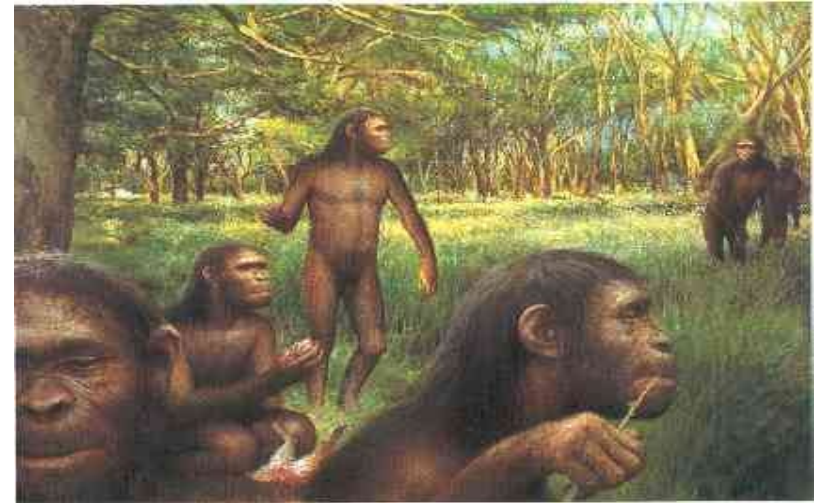
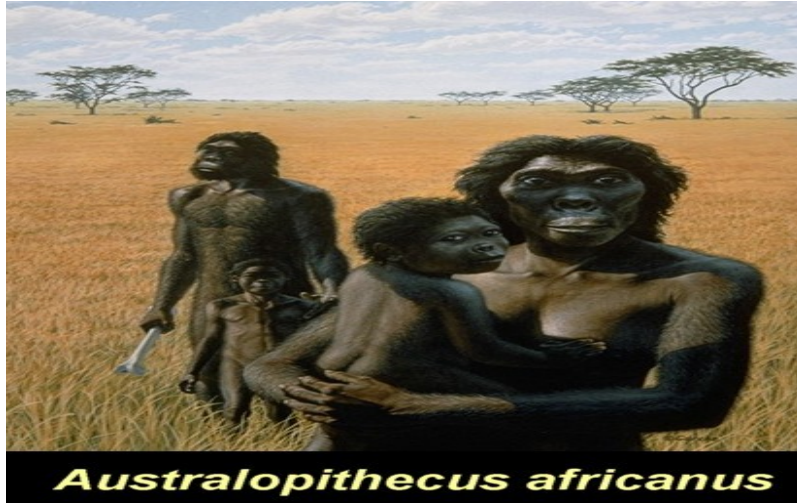


# Hominids are not the same as modern apes.

- **Modern apes like chimpanzees, gorillas, orangutans are not bipedal.**
- **Modern apes do not have a large brain case compared to ours.**
- **Modern apes do not make tools.**
- **However, chimpanzees are our closest relative - our DNA is 98% similar to theirs!**

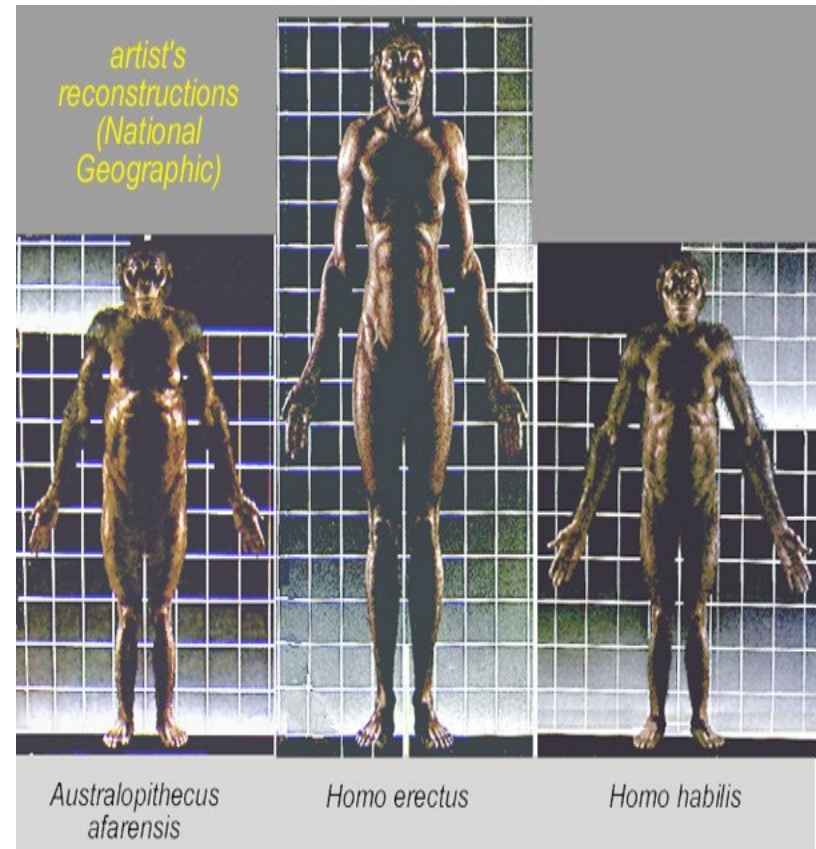


There have been at least a dozen different species of hominids over the last five million years or so.



# What is a hominid?

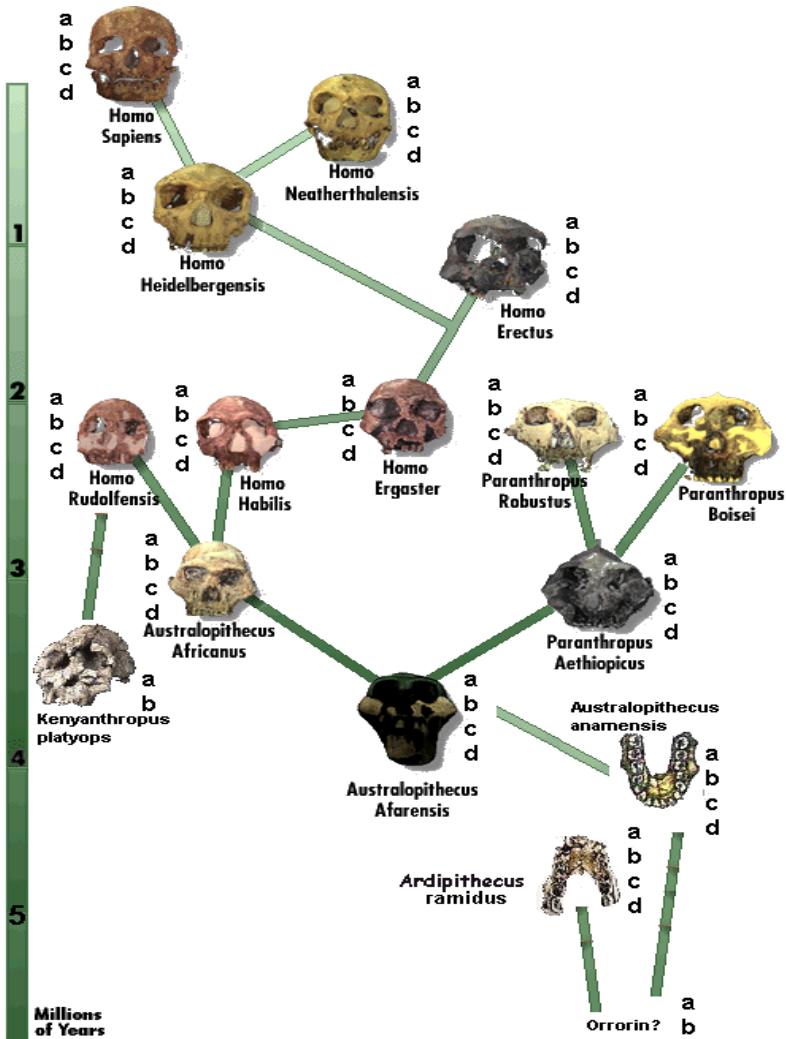
- Any human-like species, including us.
- Bipedal (walks on two legs).
- Intelligent (large brain, uses tools).





Since the first hominid fossils and artifacts were found, we have found literally hundreds of others.





Anthropologists compare the skulls, teeth, bones, and tools.

Together they begin to show our family tree - how we evolved to who we are today.

Notice that most species have gone extinct - there are a lot of “dead ends”.

We are still not exactly sure when the first bipedal hominids evolved, but an amazing discovery in 1974 proved that hominids were bipedal a lot earlier than previously believed.

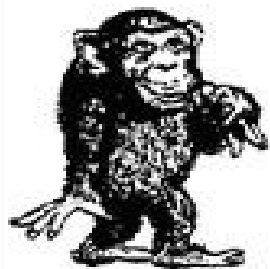
Her name was Lucy.

# Branches of Hominids.

- Hominids are further subdivided into branches, known as **genus**, of which *Australopithecus* and *Homo* are important. Each of these in turn includes **several species**. The major differences between The former has a smaller brain size, heavier jaws and larger teeth than the latter.
- Virtually all the names given by scientists to species are derived from Latin and Greek words. For instance, the name *Australopithecus* comes from a Latin word, ‘*austral*’, meaning ‘southern’ and a Greek word, ‘*pithekos*’, meaning ‘ape.’

# Classification of early human species

- On the basis of Bone structure (Skull & jaw size). Different bone structure may have evolved due to 'Positive Feedback Mechanism'.
- On the basis of typical characteristics of homo's, fossils are classified as *Homo habilis* (the tool maker), *Homo erectus* (the upright man), and *Homo sapiens* (the wise or thinking man).
- In some instances, the names for fossils are derived from the places where the first fossils of a particular type were found. So fossils found in Heidelberg (Germany), were called *Homo heidelbergensis*, while those found in the Neander valley were categorised as *Homo neanderthalensis*.



**LUCY**

Nearly all experts agree Lucy was just a 3 foot tall chimpanzee.



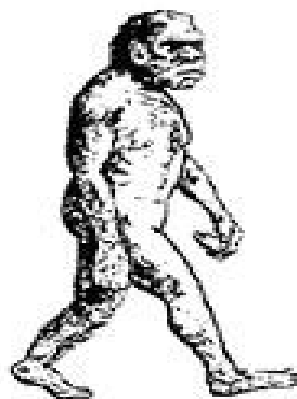
**HEIDELBERG MAN**

Built from a jawbone that was conceded by many to be quite human.



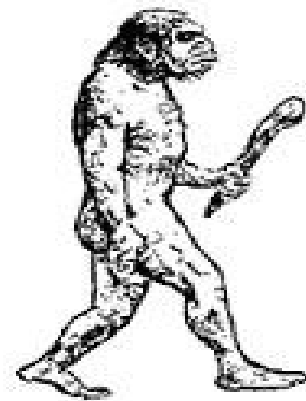
**NEBRASKA MAN**

Scientifically built up from one tooth, later found to be the tooth of an extinct pig.



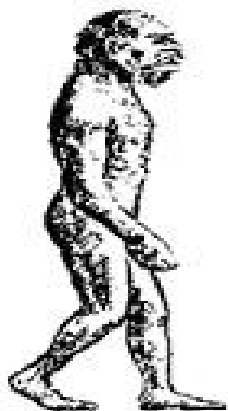
**PILTDOWN MAN**

The jawbone turned out to belong to a modern ape.



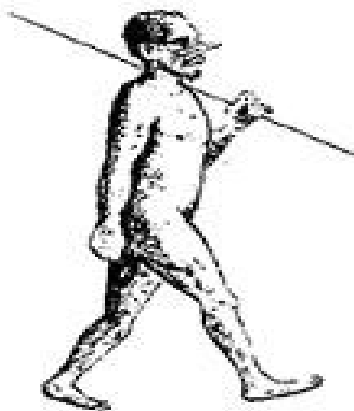
**PEKING MAN**

Supposedly 500,000 years old, but all evidence has disappeared.



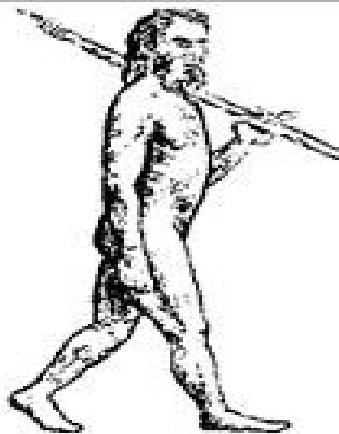
**NEANDERTHAL MAN**

At the Int'l Congress of Zoology (1958) Dr. A.J.E. Cave said his examination showed that this famous skeleton found in France over 50 years ago is that of an old man who suffered from arthritis.



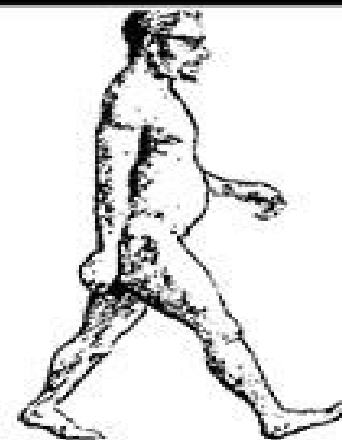
**NEWGUINEA MAN**

Dates way back to 1970. This species has been found in the region just north of Australia.



**CROMAGNON MAN**

One of the earliest and best established fossils is at least equal in physique and brain capacity to modern man... so what's the difference?



**MODERN MAN**

This genius thinks we came from a monkey.

*"Professing themselves to be wise they became fools."  
(Romans 1:22)*

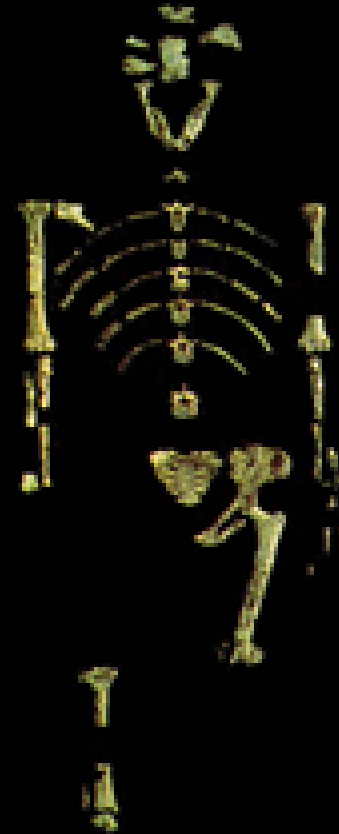
# Different species of Homo's

## Australopithicus

- 5.6 mya-3 mya.
- Found in Eastern & Southern Africa.
- Brain size- 500 cubic cm.
- First human like creature to work upright.

## *Australopithecus Afarensis*

In 1974, at Hadar, Ethiopia, Donald Johanson and his team unearthed a set of fossilized bones of a female hominid approximately 3.18 million years old. They nicknamed their discovery "Lucy". These fossilized bones led to the identification, in 1978, of *Australopithecus Afarensis*, a species that may have survived almost unchanged for 900,000 years. In Lucy's species, Johanson believed that he had found the earliest common ancestor of all later hominids. This changed with the Aramis find in 1994, and the Leaky find in 1995.





# Homo Habilis

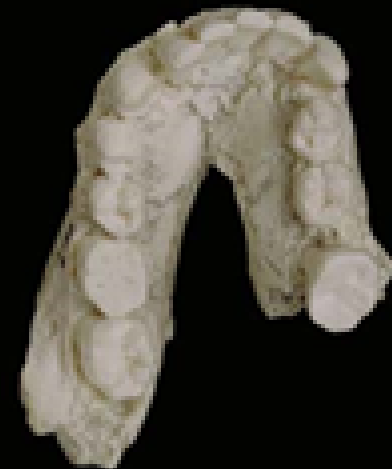
- 4.5 mya – 3.5 mya in East Africa.
- Brain size- 700 cubic cm.
- First to make stone tools.
- 1960- mary & louis leakey discovered a fossils at Olduvai Gorge and named homo habilis means ‘man of skills’.

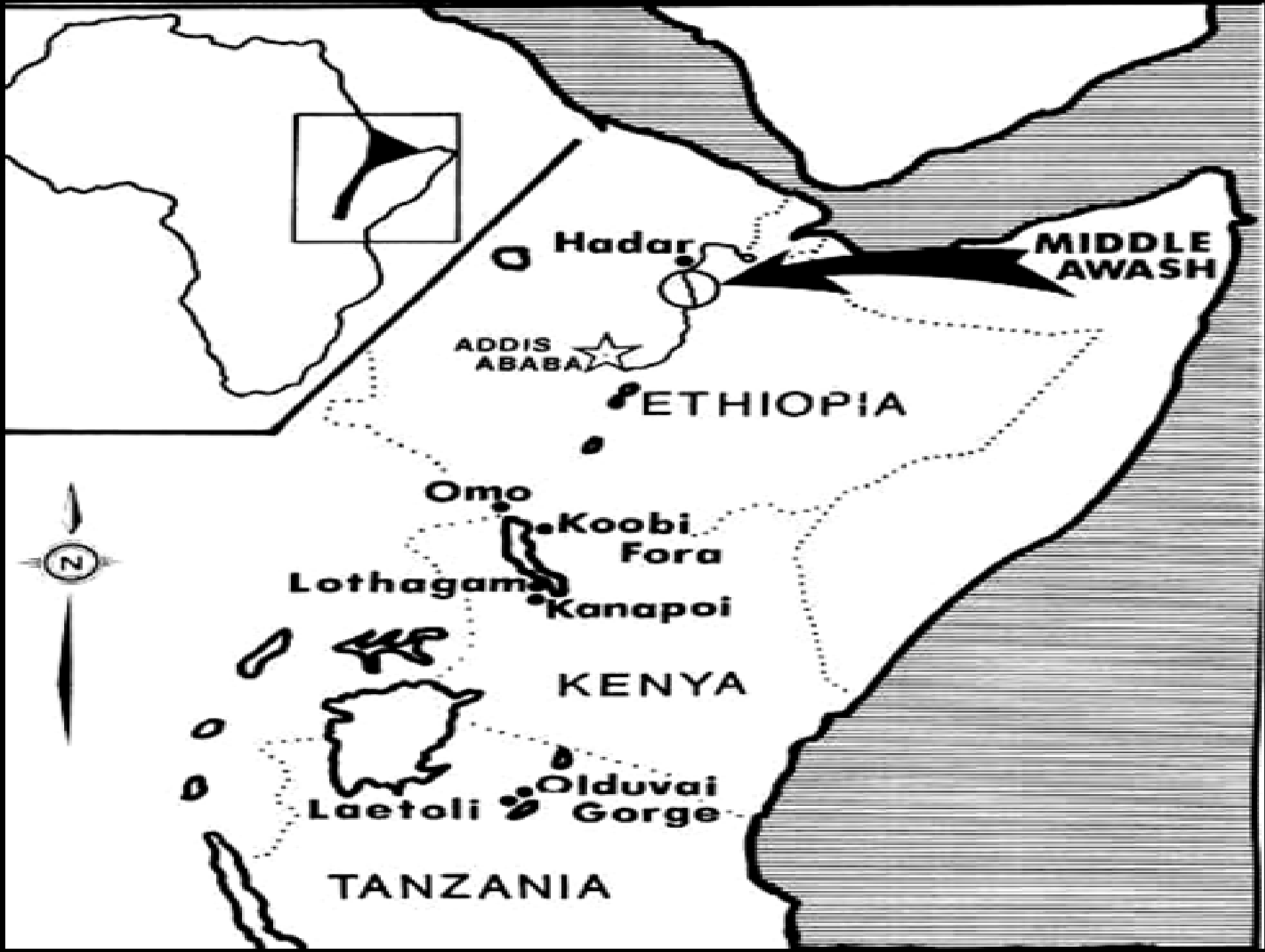
## IN SEARCH OF HOMO SAPIENS

### *Homo Habilis*

Historians believe *Homo Habilis*, or “handy man”, flourished in Africa about 2.5 millions year ago. *Homo Habilis* were the first hominids to develop and use stone tools-proof of their ingenuity and creative ability. The brain size and presence of humanlike teeth from fossil finds suggest that *Homo Habilis* might have been our human ancestor.

Many scientists believe that *Habilis* bridges the evolutionary gap between *Australopithecus* and *Homo*. Yet, the sequence of human ascent is still uncertain. Signs of co-existence have arisen.





# Homo Erectus

- 1.6 mya – 30000 BC in East Africa.
- Used intelligence to develop technology.
- First hominid to move from Africa & settled in India, China, SEA and Europe.
- Brain size- 1000 cubic cm.
- First to use fire for necessity, this helped them to settle life.
- May have developed spoken language.
- Planned group hunting with help of language.
- Might have named objects, places, animals & plants and shared ideas.

## *Homo Erectus*

*Homo Erectus* first appeared about 2 million years ago. Their species name refers to the fact that they could walk completely upright, like modern humans. Only a few dozen skulls of this species have been found, notably in Africa, Java, and China.

The first specimens were found in Java in 1891 and 1892. Called Java Man, they are about 700 000 years old.

*Homo Erectus* was the first species to use fire and the first to migrate into Europe and Asia from Africa.



# Neanderthals

- 200000 years ago – 30000 BC
- Found in East Europe & SEA.
- Brain size- 1450 cubic cm.
- First to have ritual burials.
- Cave living or temporary shelters.
- Mysteriously vanished.

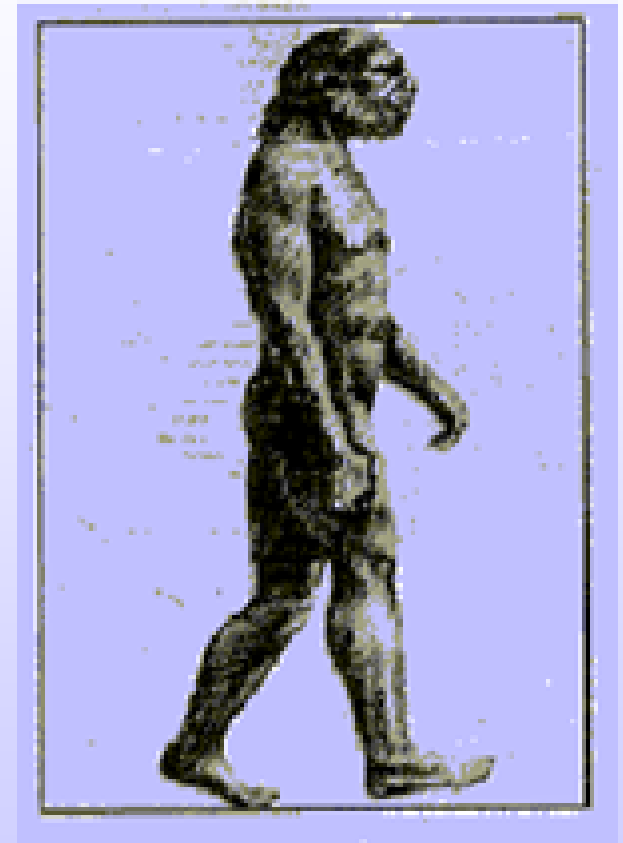
## *Neanderthals*

Located in Europe, Neanderthals first appeared about 230 000 years ago and disappeared approximately 30 000 years ago.

Quarry workers in Dusseldorf first discovered the remains of these people in the Neander Valley of German in 1856. More finds have since been located primarily in Belgium, France, and other parts of Europe.

They traveled as far as China and the Middle East. Their total population at any one time probably numbered fewer than 100 000.

It is still unclear who the Neanderthals were, scientists wonder whether they were our direct ancestor or whether they were a separate species. It is commonly held, however, that the Neanderthals were driven to extinction by modern humans.







# Cro-Magnons

- 40000 BC – 8000 BC found in Europe.
- Brain size- 1400 cubic cm. 5'5" inches length.
- Fully modern humans.
- Created Art.
- Migrated from North Africa to Europe and Asia.
- They studied animal's habit and behaviours & stalked their prey. This helped them to survive more easily and grow population.

## THE MODERN HUMAN

About 40 000 years ago, modern humans moved into Europe armed with the skills to make clothing, better shelters, and more efficient hearths.

Nineteenth-century scientists named these newcomers *Cro-Magnon* people after the French rock-shelter where three anatomically modern skeletons were discovered in 1868.

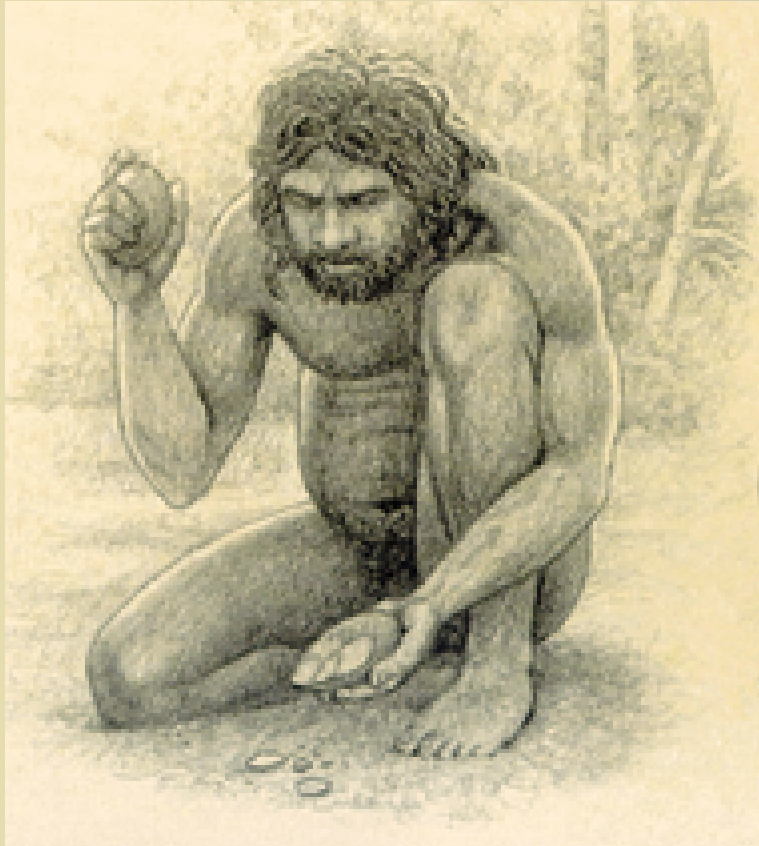
Cro-Magnons were *Homo Sapiens* who evolved in Africa and slowly pushed their way into Europe. They developed the ability to endure colder climates, even climates as cold as those found in Iceland or Greenland.

Cro-Magnon people were about as tall as modern northwestern Europeans. They also had many of the same facial and cranial features as modern northwestern Europeans.

Eventually, their successors moved into Asia. About 30 000 years ago, they crossed the Bering Strait after the retreat of the ice and entered the Americas. Others reached Australia.

With this migration, our modern human ancestors spread throughout the world.

## *Homo Sapiens*



The species name, *Homo Sapiens*, means “man who thinks”-an appropriate title for the species that formulated the spoken language and developed more sophisticated tools. The most ancient find was discovered in Hungary in 1965, dating from about 450 000 to 400 000 years ago.

Other remains of *Homo Sapiens* have been found in England, Germany, and France. These bones date from approximately 250 000 years ago, the period between the third and fourth ice ages.

There are two types of *Homo Sapiens*; the Neanderthals, or *Homo Neanderthalis*, and Modern Human, or *Homo Sapiens Sapiens*.

# THE STONE AGE

The descendants of the australopithecines lived in the period called the Stone Age. We call the period this because most of the artifacts found from this time are made of stone. Humans who lived in the Stone Age are generally classified into a group or genus called *Homo* (“man”).

Most experts divide the Stone Age into three stages:

*Paleolithic* or Old Stone Age (2 million BCE-10 000 BCE)

*Mesolithic* or Middle Stone Age (10 000 BCE-8000 BCE)

*Neolithic* or New Stone Age (8000 BCE-5000 BCE)

## Stone Tools



# Positive Feedback Mechanism

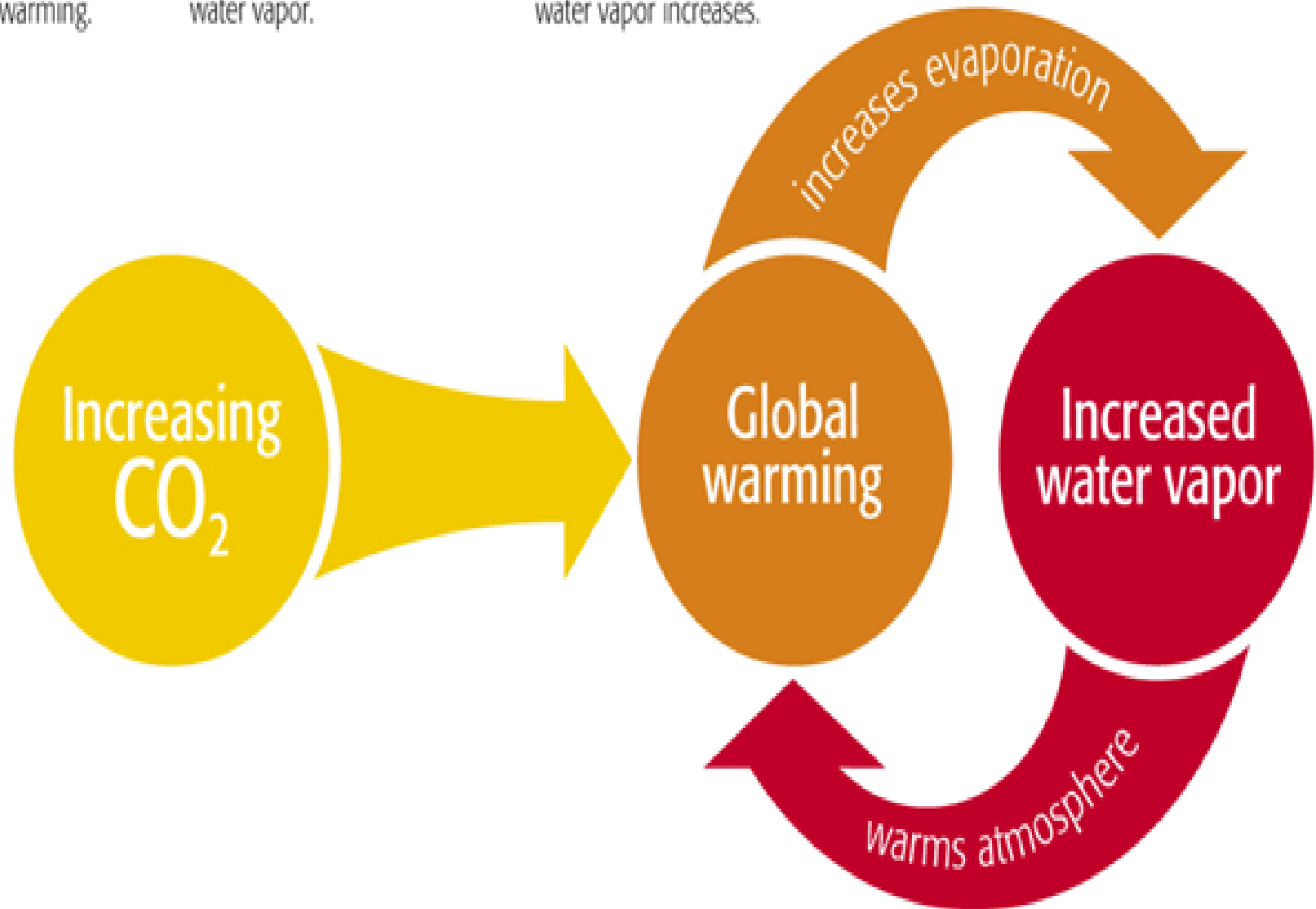
- A Positive feedback mechanism is a mechanism which **accelerates or improves the output** created by a stimulus that had been activated previously. The positive feedback mechanisms are intended to set in motion levels out of the normal ranges.
- A positive feedback mechanism allow cells to adapt to changes in . For example, **bipedalism** enabled hands to be freed for **carrying infants or objects**. In turn, as hands were used more and more, **upright walking** gradually became more efficient. Apart from the advantage of freeing hands for various uses, far **less energy** is consumed while walking as compared to the movement of a quadruped.

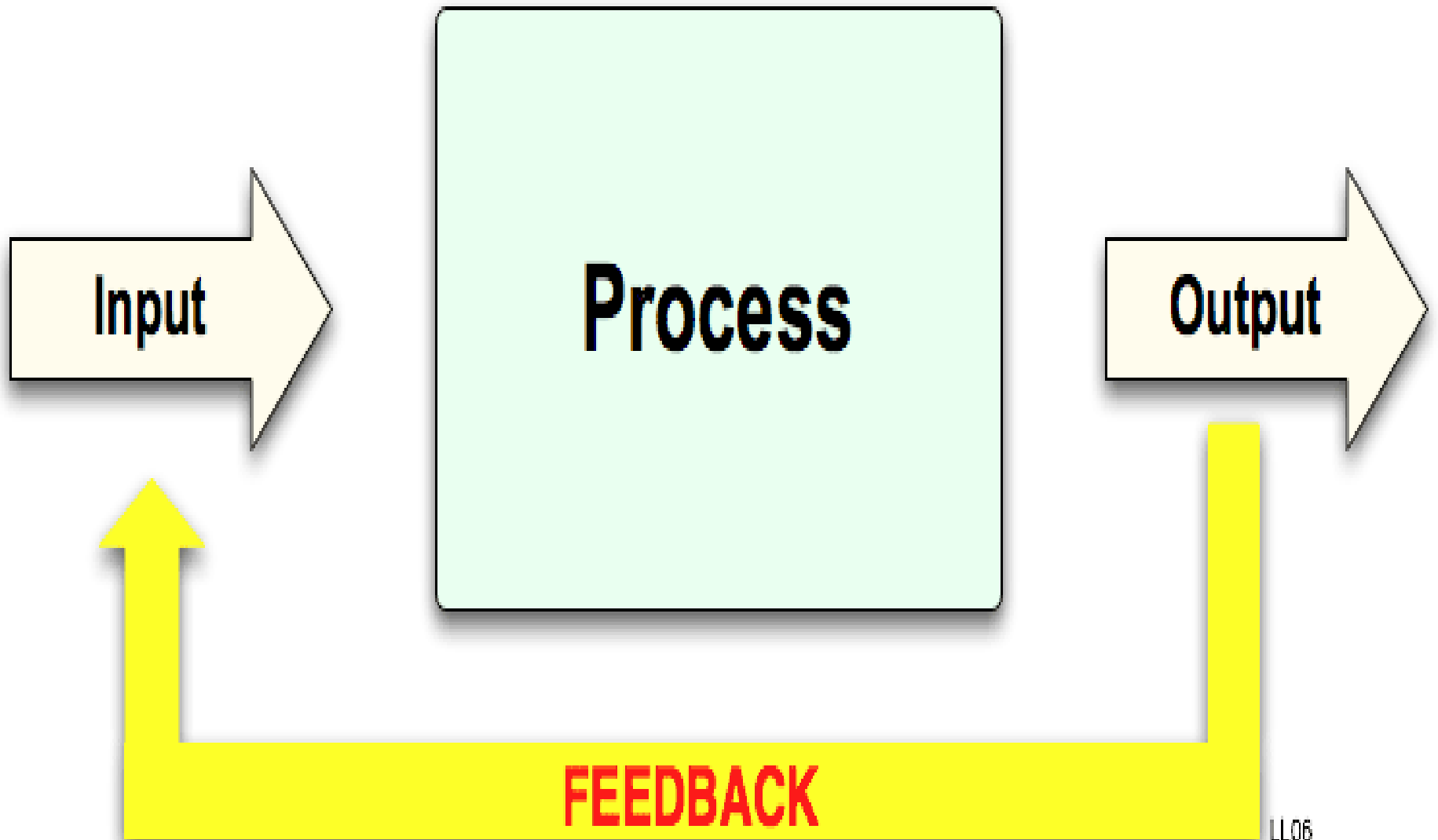
## POSITIVE FEEDBACK LOOP

Adding carbon dioxide to the atmosphere tends to warm the atmosphere, causing global warming.

The warm atmosphere causes surface water to evaporate and become water vapor.

Since water vapor is a greenhouse gas, the atmosphere tends to warm even more as water vapor increases.





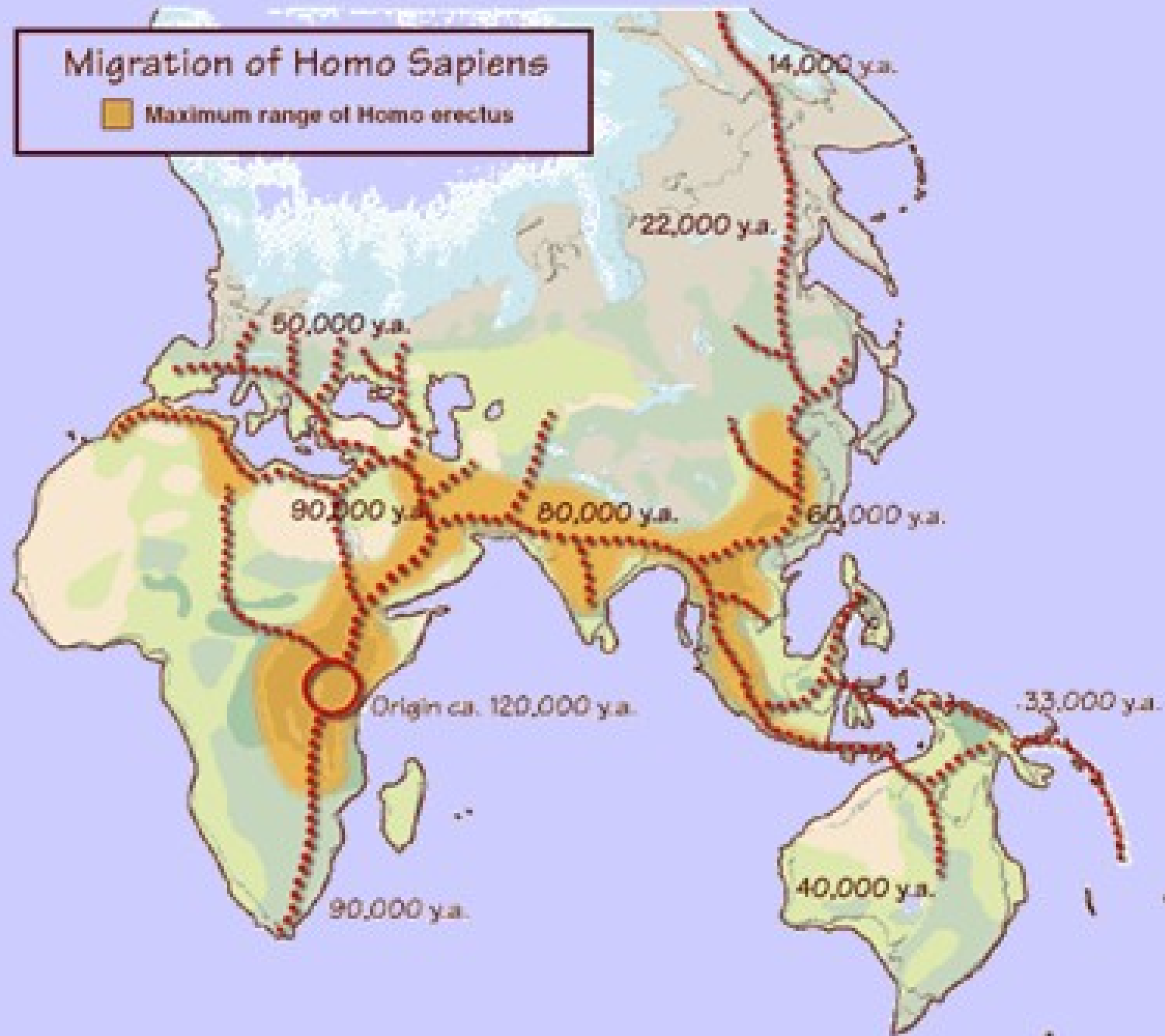
# Two theories of the place of origin of Modern Human

- **The Replacement Model** (with a single origin in Africa). - visualises the complete replacement everywhere of all older forms of humans with modern humans. In support of this view is the evidence of the **genetic and anatomical homogeneity** of modern humans. Supporters argue that the enormous similarity amongst modern humans is due to their descent from a population that originated in a single region, which is Africa. The evidence of the earliest fossils of modern humans (from **Omo in Ethiopia**) also supports the replacement model. Supporters suggest that the physical differences observed today among modern humans are the **result of adaptation** (over a span of thousands of years) by populations who migrated to the particular regions where they finally settled down.



# Migration of Homo Sapiens

■ Maximum range of Homo erectus

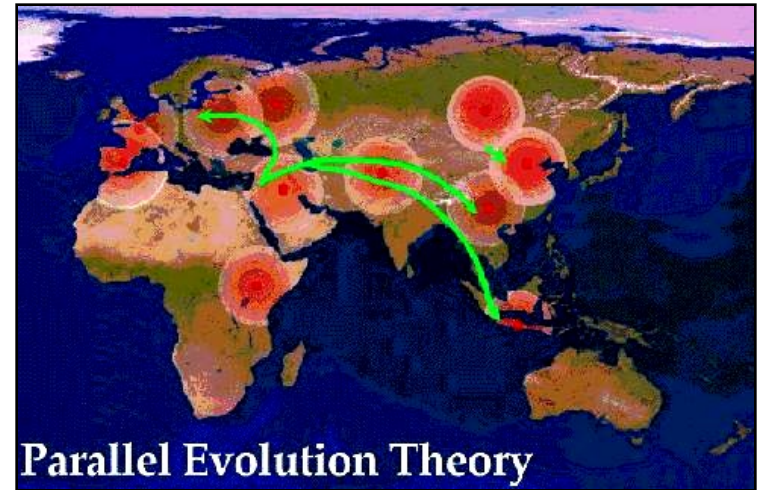
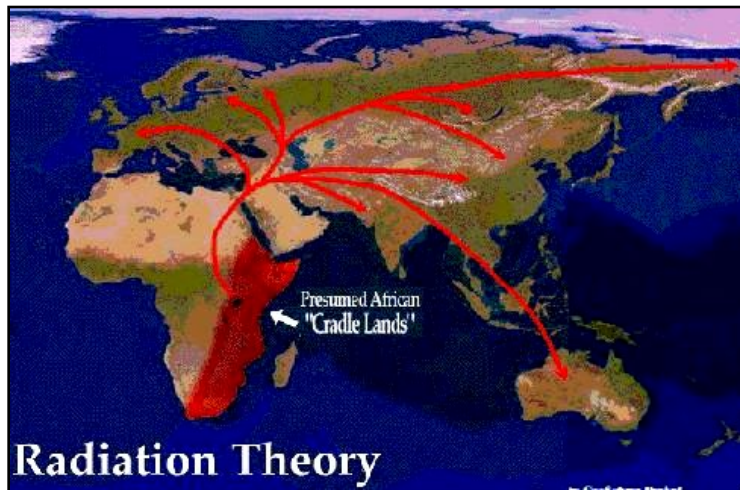


# Two theories of the place of origin of Modern Human

- **The Regional Continuity Model** (with multiple regions of origin). According to it, the archaic *Homo sapiens* in different regions gradually **evolved at different rates into modern humans**, and hence the variation in the first appearance of modern humans in different parts of the world. The argument is based on the regional differences in the features of present-day humans. These dissimilarities are due to differences between the pre-existing *Homo erectus* and *Homo heidelbergensis* populations that occupied the same regions.

# Differing Human Migration Theories

Are we all Africans "under the skin"????



# Early Humans

## Ways of obtaining foods

- **Gathering**- involve collecting plant foods such as seeds, nuts, berries, fruits and tubers.
- **Hunting**-Hunting probably began later – about 500,000 years ago. The earliest clear evidence for the deliberate, planned hunting and butchery of large mammals comes from two sites: **Boxgrove** in southern England (500,000 years ago) and **Schoningen** in Germany (400,000 years ago)
- **Scavenging**- Early hominid s scavenged or foraged for meat and marrow from the carcasses of animals that had died naturally or had been killed by another predators.
- **Fishing.**



# Early Humans

## From trees, to caves & open-air sites

- Initially peoples visited repeatedly in such areas, where food resources were abundant & left behind traces of their activities and presence, including artefacts. Early hominids probably consumed most of the food where they found it, slept in different places, and spent much of their time in trees.
- Some locations could have been shared by hominids, other primates and carnivores.

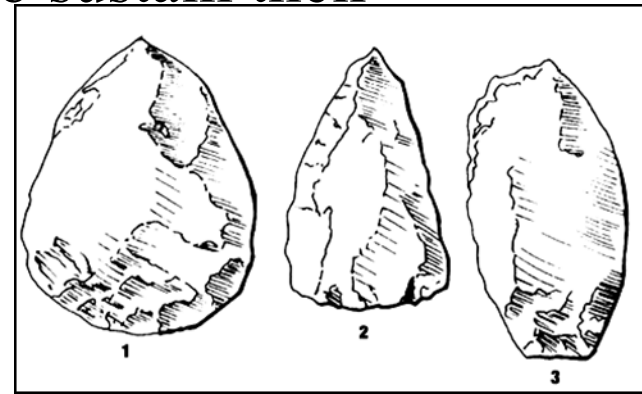
- caves and open-air sites began to be used Between 400,000 and 125,000 years ago, -Evidence for this comes from sites in Europe (**Lazaret cave** in southern France) a 12x4 metre shelter was built against the cave wall. Inside it were two hearths and evidence of different food sources: fruits, vegetables, seeds, nuts, bird eggs and freshwater fish (trout, perch and carp).
- At another site, **Terra Amata** (on the coast of southern France) flimsy shelters with roofs of wood and grasses were built for short-term, seasonal visits.



# Early Humans

## Making Tools

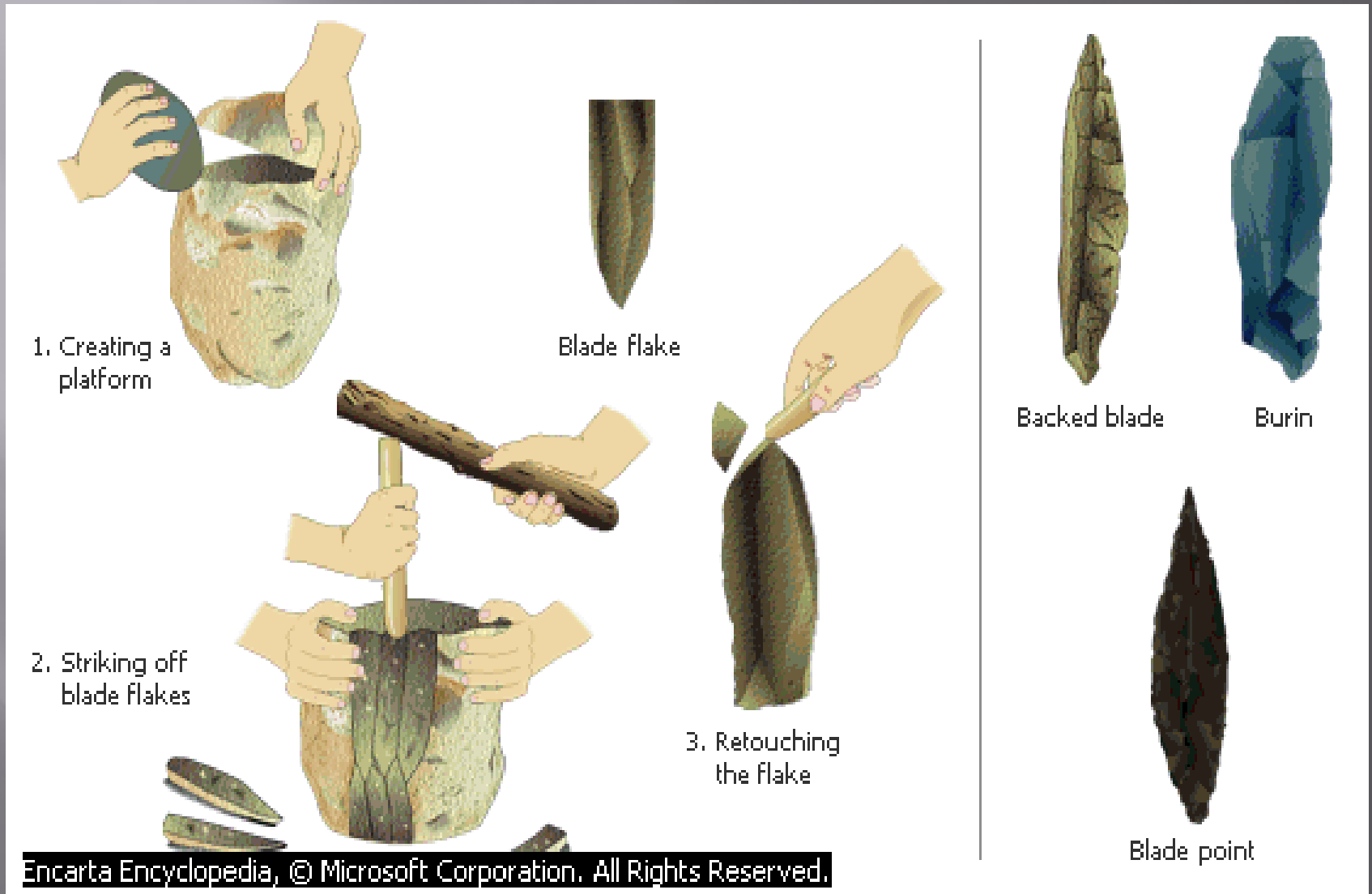
- Use of tools and tool making are not confined to humans. **Birds & Chimpanzees** are known to make objects to assist them **with feeding, hygiene and social encounters** but not known among apes because of lack of certain **anatomical and neurological** (related to the nervous system) adaptations in them.
- The earliest evidence for the making and use of stone tools comes from sites in **Ethiopia and Kenya**. It is likely that the earliest stone tool makers were the Australopithecus.
- It is possible that tool makers were **both men & women**. Women in particular may have made & used tools to obtain food for themselves as well as to sustain their children after weaning.



- About 35,000 years ago, improvements in the techniques for killing animals are evident from the appearance of new kinds of tools such as **spear-throwers and the bow and arrow**. The meat thus obtained was probably processed by removing the bones, followed by drying, smoking and storage. Thus, food could be stored for later consumption.
- There were other changes, such as the **trapping of fur-bearing animals** (to use the fur for clothing) and the **invention of sewing needles**. The earliest evidence of sewn clothing comes from about 21,000 years ago. Besides, with the introduction of the **punch blade technique** to make small chisel-like tools, it was now possible to make engravings on bone, antler, ivory or wood.



# Making Stone Blade Tools





# Modes of Communication

## Language and Art

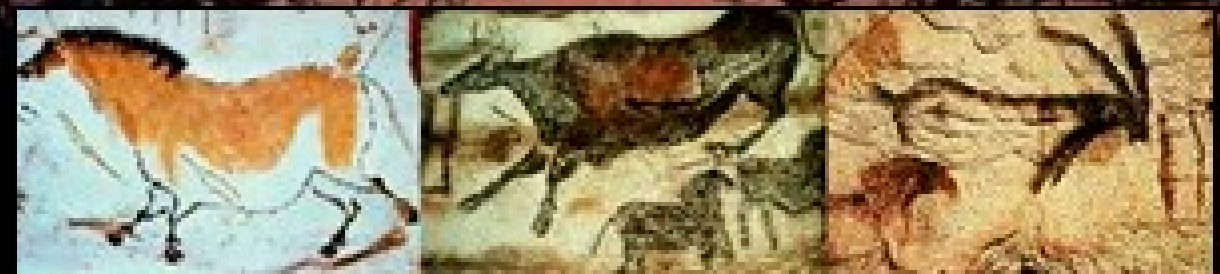
- Hominid language involved gestures or hand movements.
- Vocal but non-verbal communication such as singing, humming (around 2 mya by homo habilis).
- Small number of speech sounds in initial stage developed into language gradually (around 2 lka).
- Spoken language is closely connected with art like painting (around 40000-35000years ago). Hence both are media for communication.

- Hundreds of paintings of animals (done between 30,000 and 12,000 years ago) have been discovered in the caves of **Lascaux and Chauvet**, both in France, and **Altamira**, in Spain. These include depictions of bison, horses, ibex, deer, mammoths, rhinos, lions, bears, panthers, hyenas and owls.
- Hunting was the most important survival activity & the paintings of animals were **associated with ritual and magic**. The act of painting could have been a ritual to ensure a successful hunt. Another explanation offered is that these caves were **possibly meeting places for small groups** of people or locations for group activities. These groups could **share hunting techniques and knowledge**, while paintings and engravings served as the media **for passing information** from one generation to the next.

- Humans during this period found shelter in caves.
- Cave paintings left behind.



Purpose??



# Purpose of Painting

- Cave paintings are found in all continents.
- Cave paintings in Europe & Africa often show images of hunting & daily activities, whereas in America & Australia these tend to be more symbolic and less realistic.
- They may have been part of magical rites, hunting rituals, an attempt to mark the events during various seasons.
- More realistic theory- this was simply depiction of surrounding world.

Thank You for having  
patience

- BY-

Ambrish Kumar Gupta

Principal

Kendriya Vidyalaya Rajkot