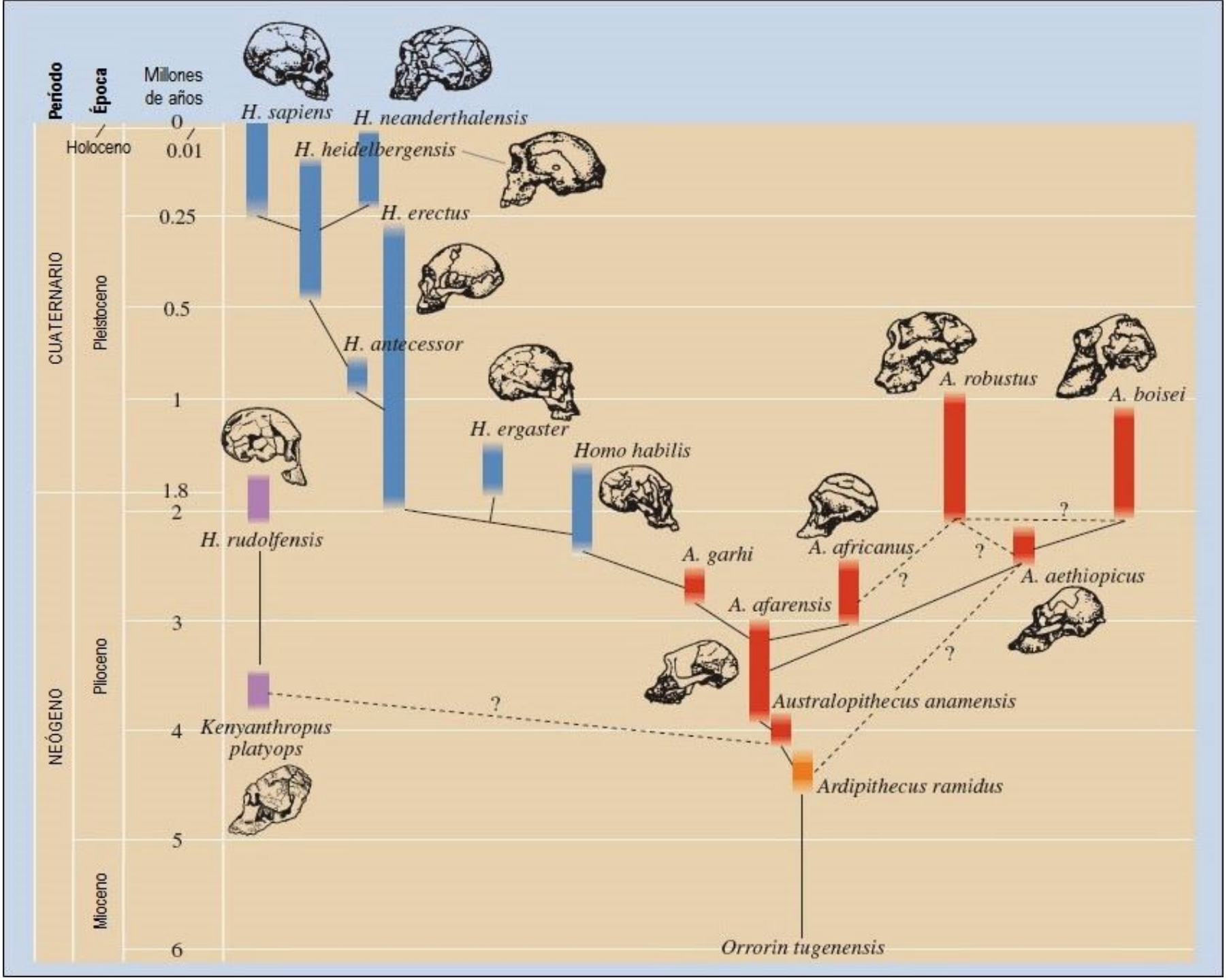

Período
Época
Millones de años
CUATERNARIO
NEÓGENO
Holoceno
Pleistoceno
Plioceno
Mioceno
0
0.01
0.25
0.5
1
1.8
2
3
4
5
6
H. sapiens
H. neanderthalensis
H. heidelbergensis
H. erectus
H. antecessor
H. ergaster
Homo habilis
H. rudolfensis
A. garhi
A. africanus
A. robustus
A. boisei
A. afarensis
A. aethiopicus
Australopithecus anamensis
Kenyanthropus platyops
Ardipithecus ramidus
Orrorin tugenensis
?

Starter

- What traits make us humans?
- Who are our early ancestors?

The stages of anthropogenesis

Human Biological Evolution

Learning objective

- to describe the stages of anthropogenesis

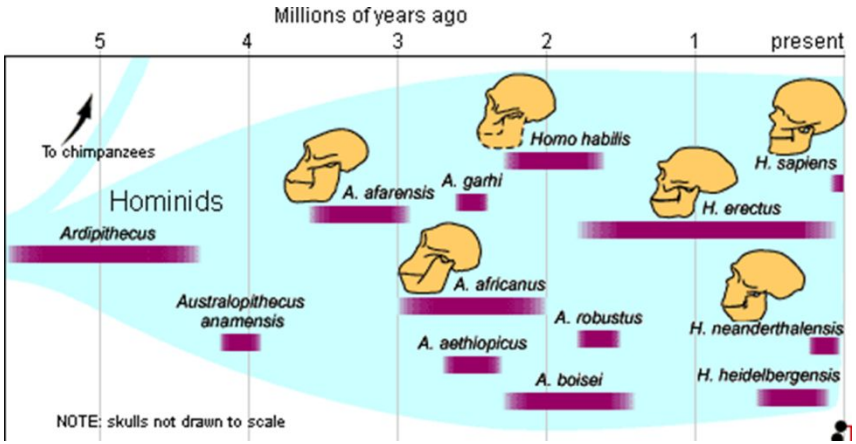
Success criteria

1. Knows the main stages of anthropogenesis.
2. Describes each stage of anthropogenesis.
3. Proves every step of anthropogenesis.

Terminology

- Apes, homo, hominids, million years ago, modern human and apes, dryopitecus, ramapithecus, Australopithecus africanus, Homo habilis, H. erectus, H. heidelbergensis, Homo neanderthalensis, Homo sapiens, Cro-Magnon, Homo sapiens, modern; over the brow arches, jaw, skull shape, volume and size of the brain, uprightness of bipedalism, tools, woody and terrestrial life,

Introduction…

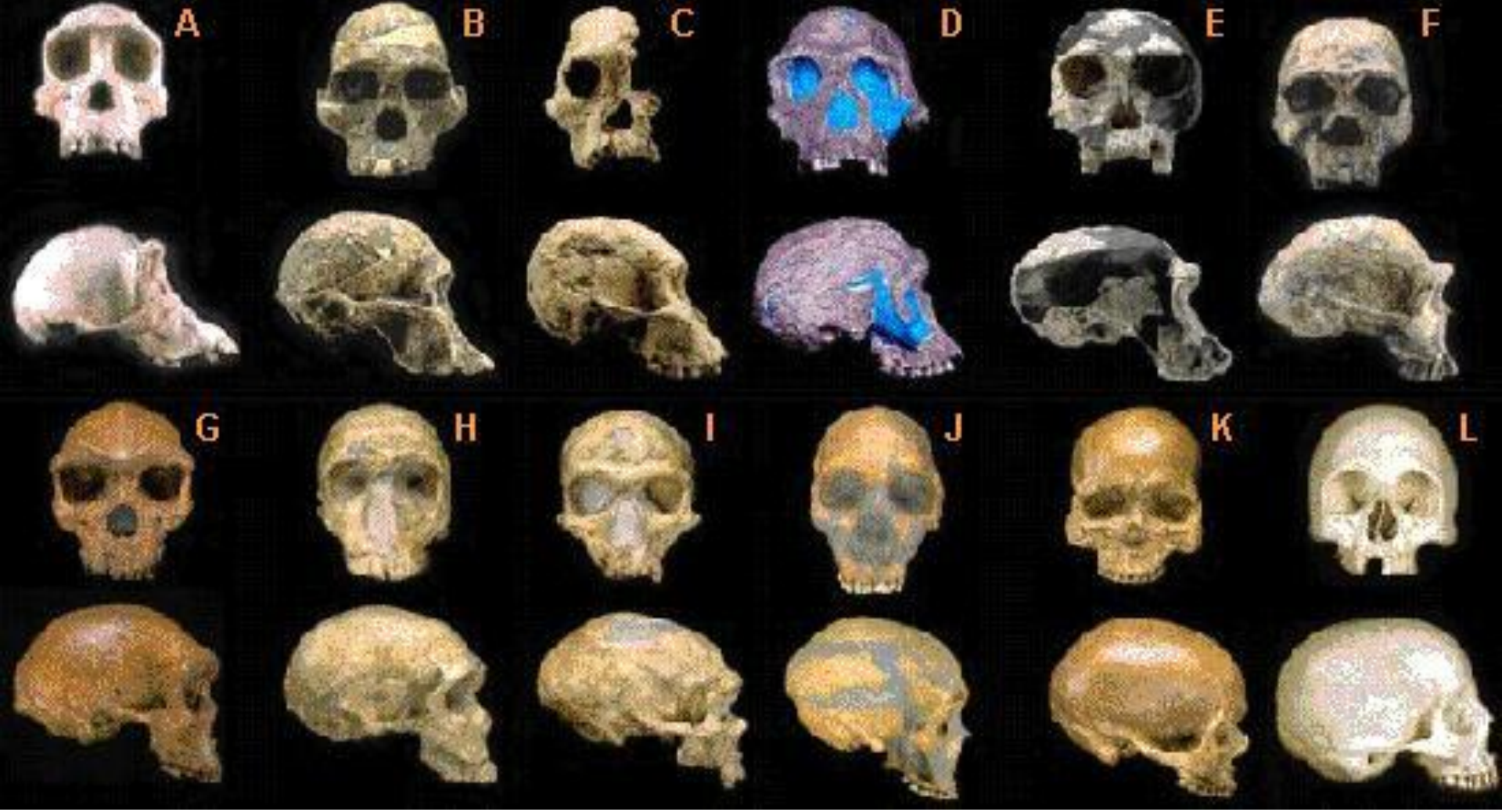


- Many different human-like species existed over the **4-8 million years since our lineage split from apes** – collectively, we call these species hominids.
- Some of these species would have lived at the same time, and not all of them are the direct ancestors of modern humans.
- We don't know the exact progression from species to species that led to modern humans. There are many different ideas, and as new fossils are discovered the gaps become filled and the picture becomes clearer.

The Imaginative Road to Homo Sapiens

L.D.Smart

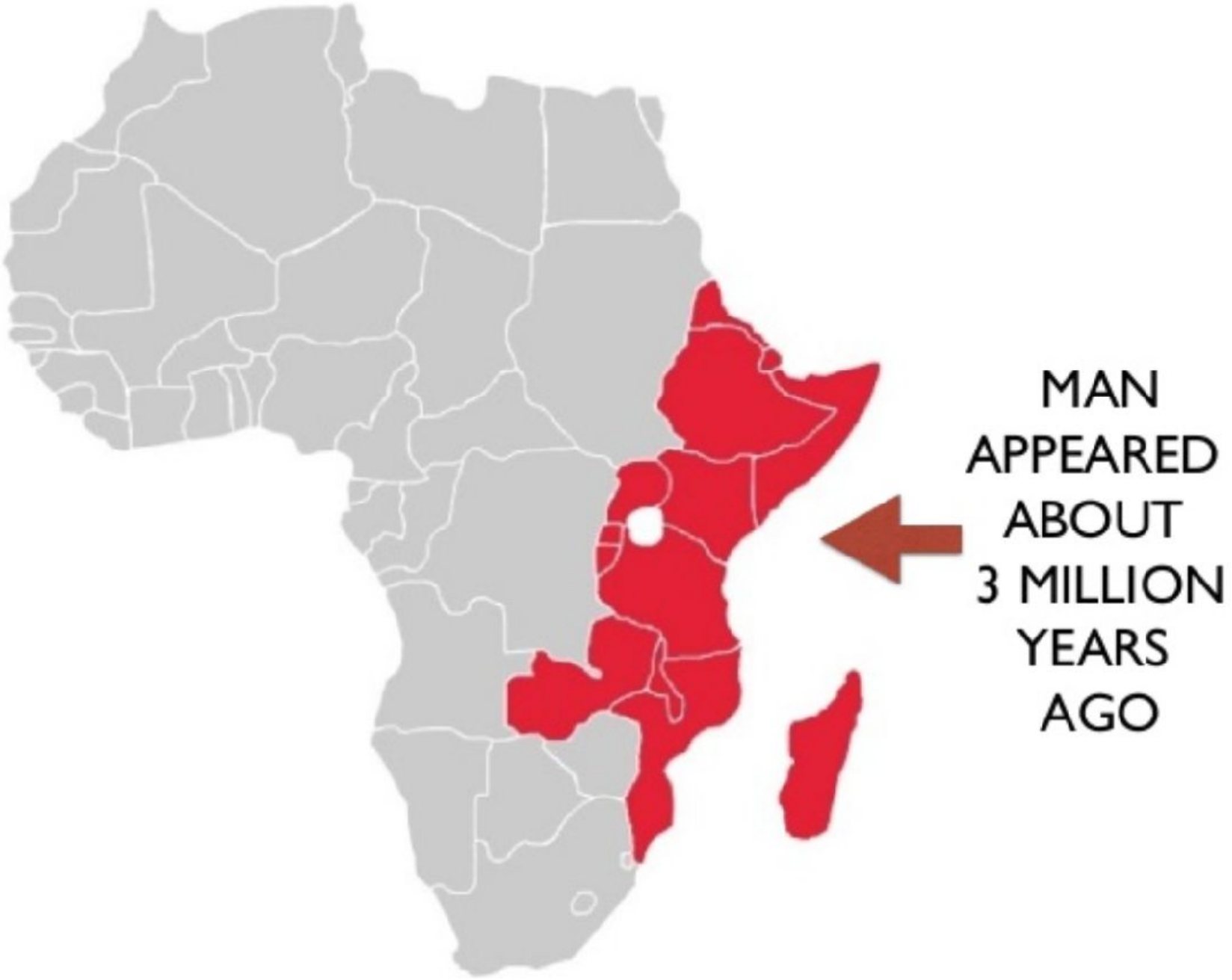
(after "Early Man", Life Nature Library, 1969 p:41-45)



A. Pan troglodytes, chimpanzee, modern
B. Australopithecus africanus. Australopithecus africanus, STS 5, 2.6 My
C. Australopithecus africanus. Australopithecus africanus, STS 71, 2.5 My
D. Homo habilis, KNM-ER 1813, 1.9 My
E. H. habilis, OH24 , 1.8 My
F. H. ergaster. H. ergaster (H. erectus)
G. H. heidelbergensis, "Rhodesia man," 300-125ky
H. Homo neanderthalensis. Homo neanderthalensis, La Ferrassie 1, 70ky
I. H. neanderthalensis. H. neanderthalensis, La Chappelle-aux-Sts, 60ky
J. H. neanderthalensis. H. neanderthalensis, Le Moustier, 45ky

CLASSIFICATION

PHYLUM	:CHORDATA
CLASS	:MAMMALIA
ORDER	:PRIMATES
SUB ORDER	:ANTHROPOIDEA
GENU	:HOMO
SPECIES	:SAPIENS


MAN
APPEARED
ABOUT
3 MILLION
YEARS
AGO

PROPLIOPITHECUS

- **APE-LIKE PRIMATE.**
- **SHORT ARMS.**
- **LIVED IN OLIGOCENE PERIOD**
- **ANCESTORS OF MODERN APES AND MAN.**

DRYOPITHECUS

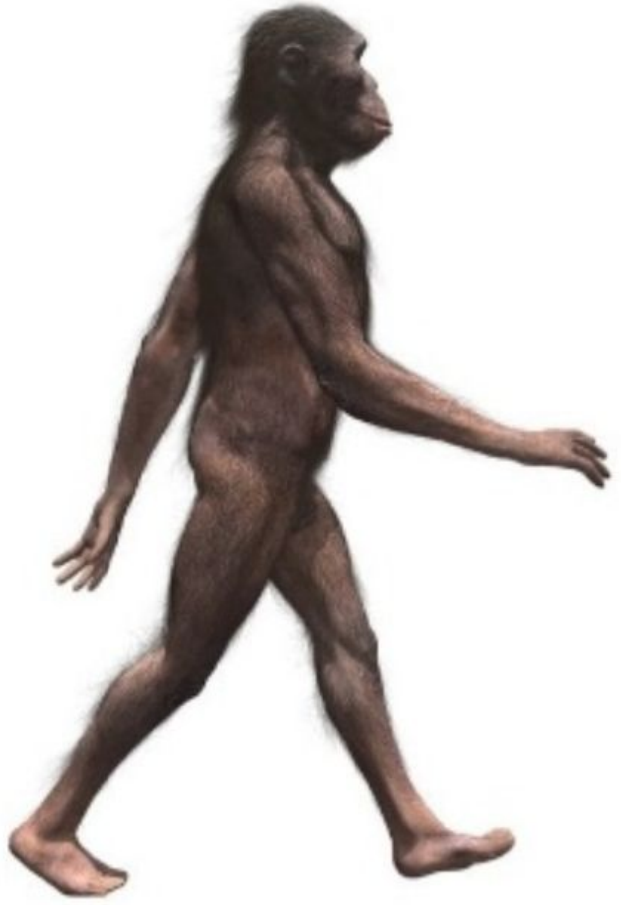
- LIVED IN MIOCENE PERIOD.
- DESCENDED FROM PROPLIOPITHECUS.
- FORE LIMBS SHORTER THAN HIND LIMBS.
- DISTANT ANCESTOR OF MAN.

RAMAPITHECUS

- APE-MAN.
- LIVED IN LATE MIOCENE AND EARLY PLIOCENE PERIOD.
- FOSSIL CONTAINS ONLY JAWS AND DENTITION.
- COLLECTED FROM INDIA AND AFRICA.
- DIRECT ANCESTOR

AUSTRALOPITHECUS

- **APE-MAN.**
- **CONNECTING LINK BETWEEN MAN AND APE.**
- **AUSTRALOPITHECUS AFRICANUS IS A COMMON FOSSIL.**



HUMAN CHARACTERS OF AUSTRALOPITHECUS

- **ERECT POSTURE WITH 4 FT HEIGHT.**
- **BIPEDAL LOCOMOTION.**
- **BASIN-LIKE PELVIC GIRDLE.**
- **DENTITION LIKE MAN.**
- **HANDS USED FOR NON-LOCOMOTORY FUNCTIONS.**

HOMO ERECTUS

- **FIRST TRUE MAN.**
- **PRIMITIVE MAN.**
- **CONNECTING LINK BETWEEN APE-MAN AND MODERN MAN.**
- **ALSO CALLED JAVA MAN.**
- **LIVED IN JAVA AND PEKING.**

FEATURES OF HOMO ERECTUS

- **BIPEDAL LOCOMOTION.**
- **TALLER THAN AUSTRALOPITHECUS.**
- **FLATTENED SKULL.**
- **CANNIBALISTIC.**
- **THEY WERE HUNTERS AND GATHERERS.**
- **LESS BODY HAIR AND BLACK.**

NEANDERTHAL MAN

- ADVANCED PRIMITIVE MAN.
- FOUND IN NEANDER VALLEY.
- ORIGINATED 1,50,000 YEARS AGO.
- EXTINCT 25,000 YEARS AGO.
- HOMO NEANDERTHALENSIS

FEATURES OF NEANDERTHAL MAN

- **SLIGHTLY SHORTER THAN MODERN MAN.**
- **LOW FOREHEAD.**
- **LARGE TEETH.**
- **SKILLFUL USE OF TOOLS.**
- **DEVELOPED SPEECH.**

CRO-MAGNON MAN

- EXTINCT MODERN MAN.
- ORIGINATED 3 MILLION YEARS AGO.
- EXTINCT 20,000 YEARS AGO.
- LIVED IN OLD STONE AGE.
- LIVED IN CAVES.
- THEY WERE HUNTERS AND

Ardipithecus ramidus…

- Fossils found in Ethiopia
- Sometimes classed as an early *Australopithecus*.
- May represent the earliest stage of homonin evolution.
- Many features showing adaptation both to bipedalism and brachiation

The Australopithecines

were the earliest known pre-humans.

All of the various species lived in Africa.

Australopithecus = “southern ape man”

They mostly lived in the East African Rift Valley and in Southern Africa.

- They were all bipedal with brains slightly bigger than a chimps, smaller canines and possibly using wooden tools like chimps do.

- Their fossils show that bipedalism preceded increased brain size.

- Bipedalism freed up the hands.

- Australopithecines can be described as either gracile (slender) or robust (heavily built) according to their skull and dental structure.

- The robust types were specialist herbivores and an evolutionary side-branch.

Australopithecines can be described as either gracile (slender) or robust (heavily built) according to their skull and dental structure.

The robust types were specialist herbivores and an evolutionary side-branch.

Australopithecus afarensis

'Lucy' is the best known example.

Had an ape-like face with low forehead, brow ridges, flat nose and no chin. Otherwise human-like. 1-1.5m tall. Brain volume 400-500cc. Gracile.

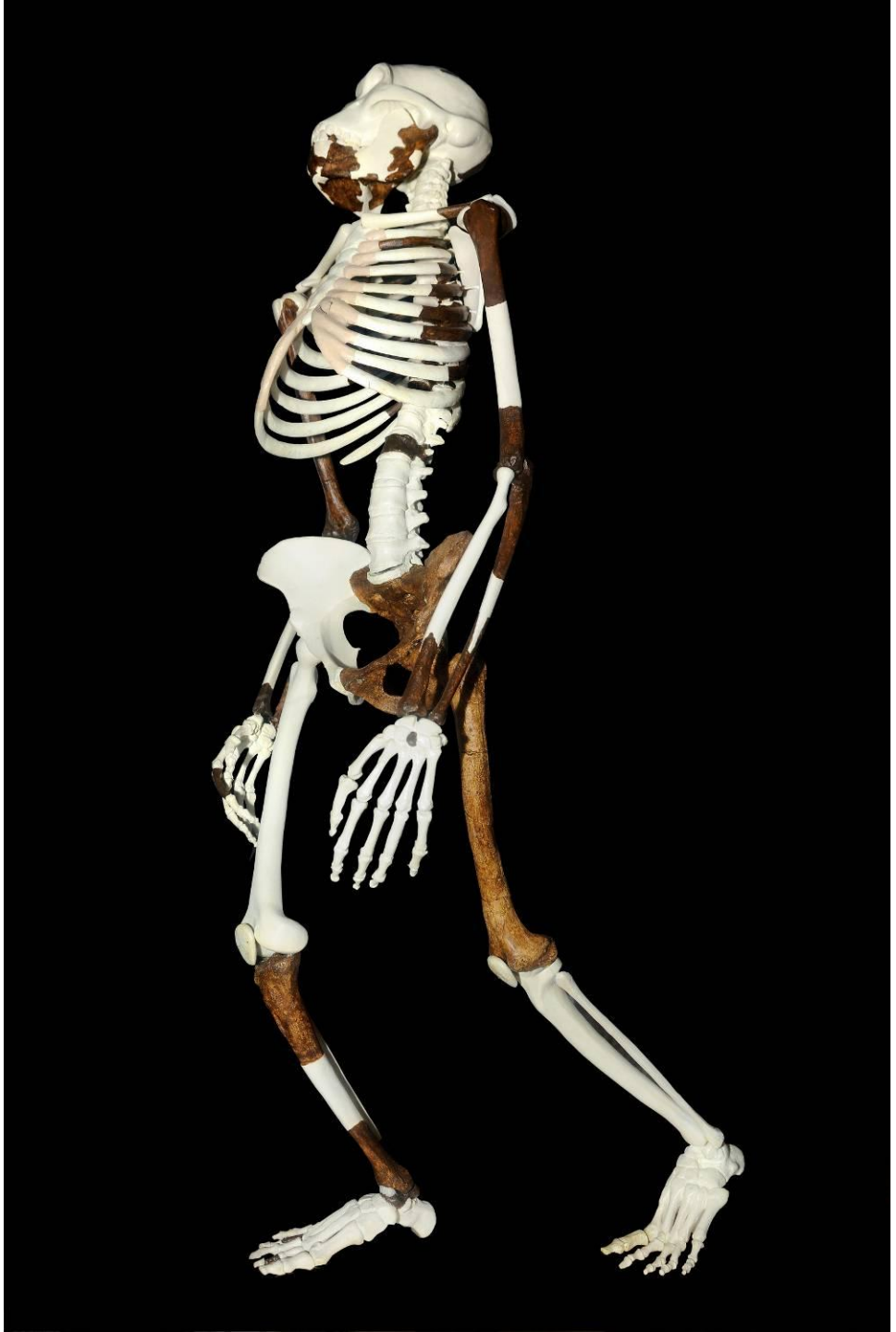
Sexual dimorphism with males taller than females.

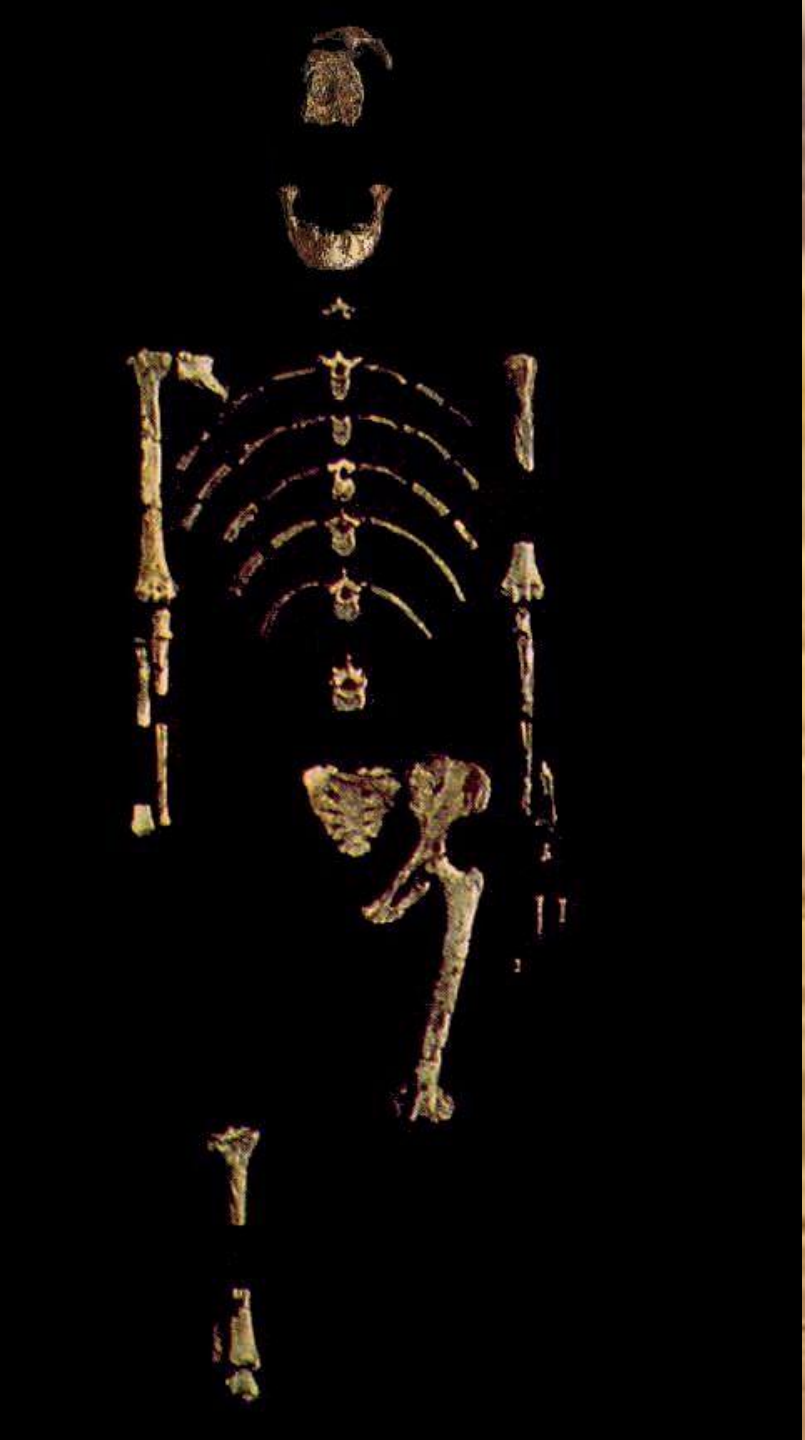
- One of the most important hominid fossils ever discovered is that of “Lucy”.

- Lucy was discovered by Donald Johansson in Hadar, Ethiopia, in 1974. As the team examined the fossil that night, the song “Lucy in the sky with diamonds” was playing, so they named the fossil Lucy.

- Lucy belongs to the species ***Australopithecus afarensis,*** and lived 3.2 million years ago. She stood around 1.1 metres (3.5 feet) tall and she walked upright on two legs, although she probably had a less graceful gait than us, since she walked with her legs bent.

- This discovery confirmed that bipedalism evolved very early in our evolutionary history.





Laetoli footprints…

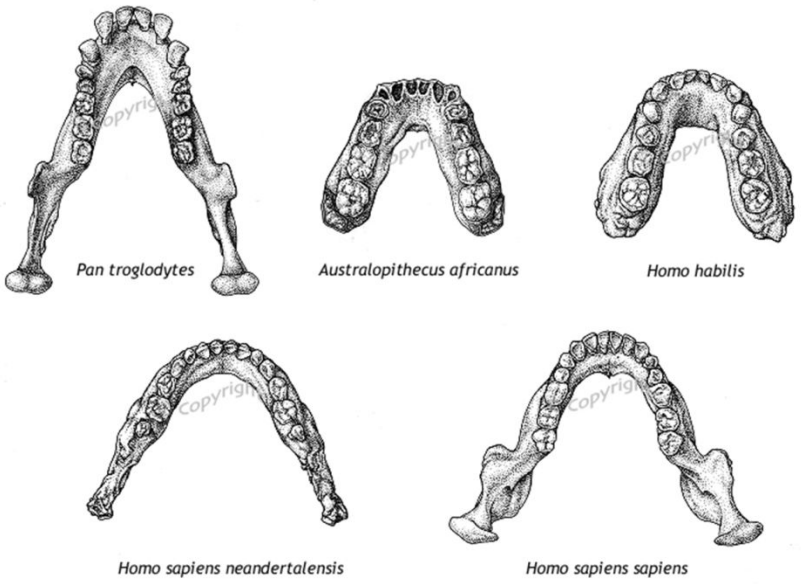
A few years after Lucy was found, a set of footprints were discovered in hardened ash in Tanzania. These footprints date to 3-4 million years ago and were probably also made by Australopithecines.

The creature that made these footprints undoubtedly walked upright further confirming that our ancestors were bipedal several million years ago.

More recently discovered fossils dating back 5-6 million years also show signs of being bipedal.

The shift to bipedalism was a highly significant event in our history as it freed the hands to use tools.

- Tooth rows almost parallel.
- Finger bones longer than in humans and slightly curved as in apes.
- Lived 3-4mya.

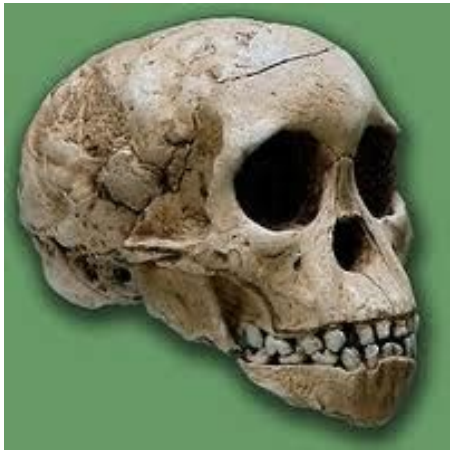


Australopithecus afarensis

- ***Australopithecus afarensis:*** lived 3.2 million years ago. Stood around 1.1 metres (3.5 feet) tall and was bipedal but was also arboreal. Herbivorous. Brain volume 400-500cc. Lucy is the best-know specimen (+ Laetoli footprints). Gracile (lighter build)

Australopithecus africanus

Less ape-like than *A. afarensis* with a higher forehead, less obvious brow ridges, small canines, larger molars, no diastema and human-like jaw shape. 1.1 – 1.4m tall. Cranial volume 400-500cc. Gracile.

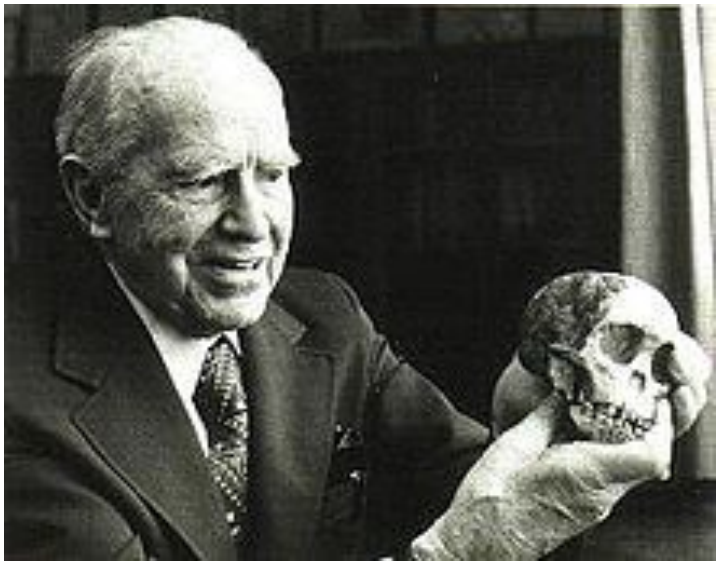


The Taung child

Australopithecus africanus…

Fossils found in caves in Africa and identified by Raymond Dart in 1924 – first *Australopithecine* fossils found (nicknamed the Taung child).

Controversial because scientists thought large brains evolved before bipedalism.



Probably some sexual dimorphism but less than *A. afarensis*. Lived 2.5-3mya

For your notes – Gracile *Australopithecines*

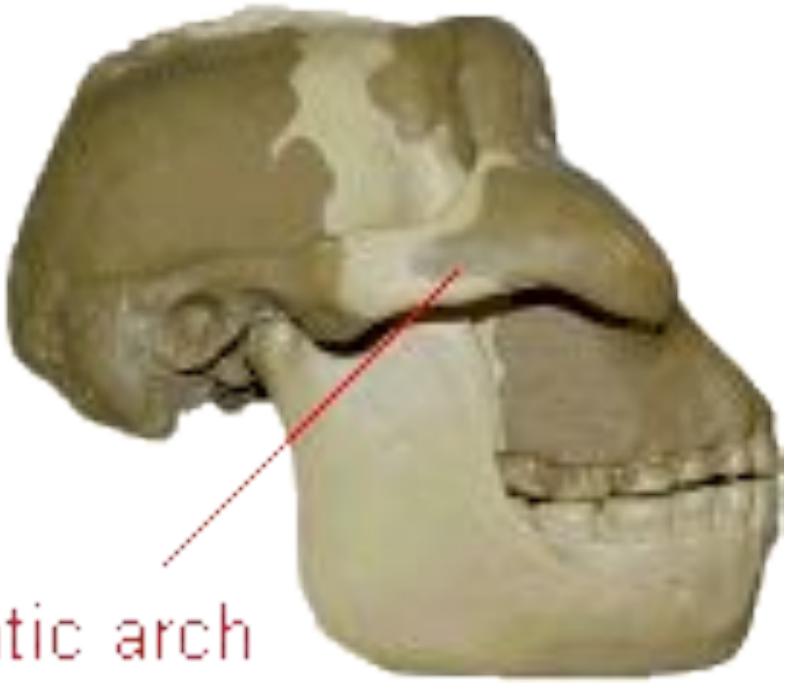
- ***Australopithecus afarensis****:* lived 3.2 million years ago. Stood around 1.1 metres (3.5 feet) tall and was bipedal but was also arboreal. Herbivorous. Brain volume 400-500cc. Lucy is the best-know specimen (+ Laetoli footprints).
- *Austalopithecus africanus:* lived 3-2.3 mya. Bipedal, males 1.4m tall, females 1.2m tall. Larger brain than *A.afarensis* and more modern tooth and facial shape. Cranial volume 400-500cc. Taung child is best-known speciment.

Robust *Australopithecines*

- May also be classified in the genus *Paranthropus*.
- Includes *A. robustus* and *A. boisei*.
- Both had huge molars and mandibles. A sagittal crest and wide cheek bones suggests large temporal muscles.

Robust *Australopithecines*

- Probably fed on tough vegetation as seen by microwear pattern on teeth.
- NB a sagittal crest is not evidence of a herbivorous diet – lions and tigers have very large sagittal crests.



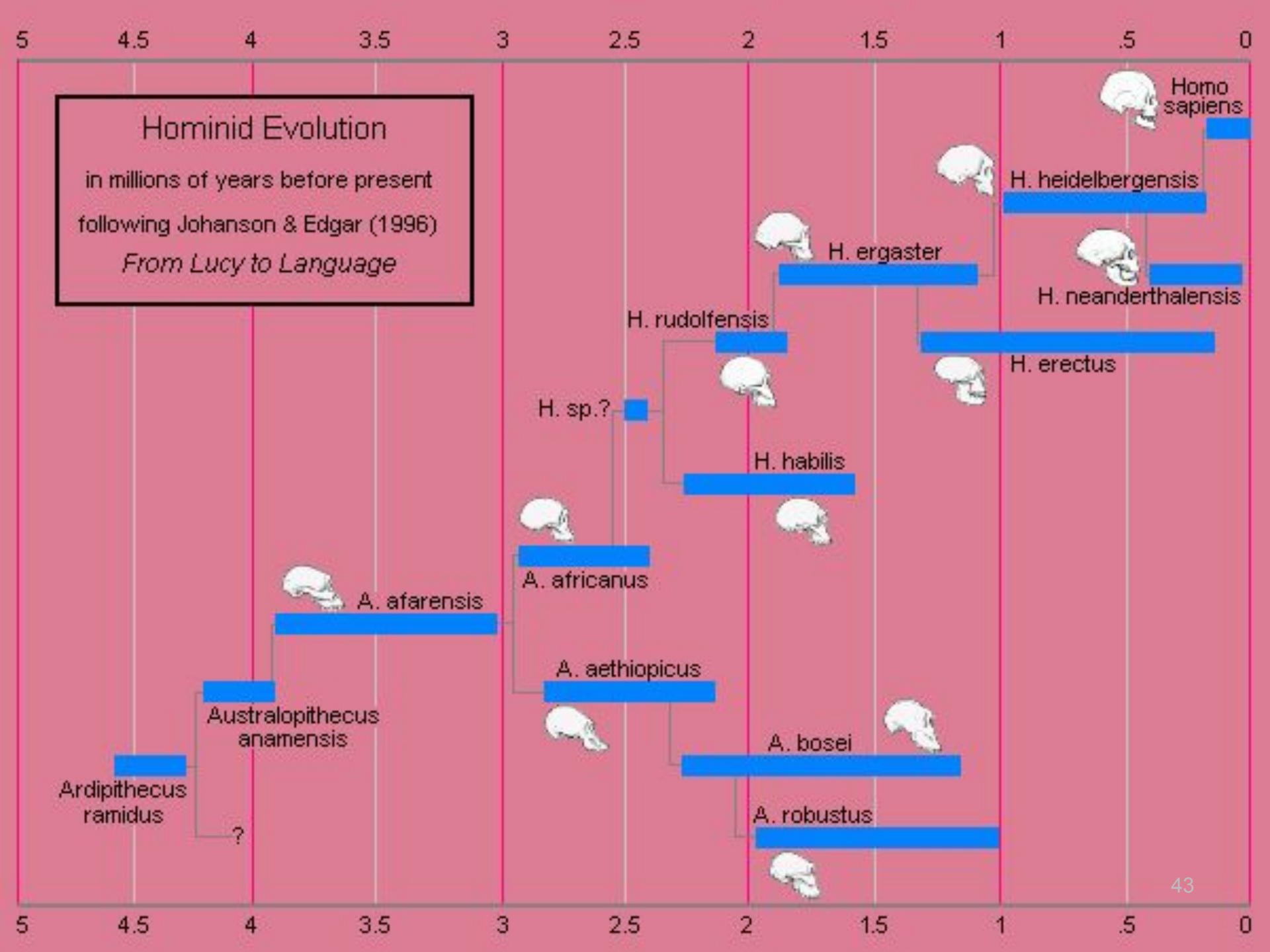
zygomatic arch

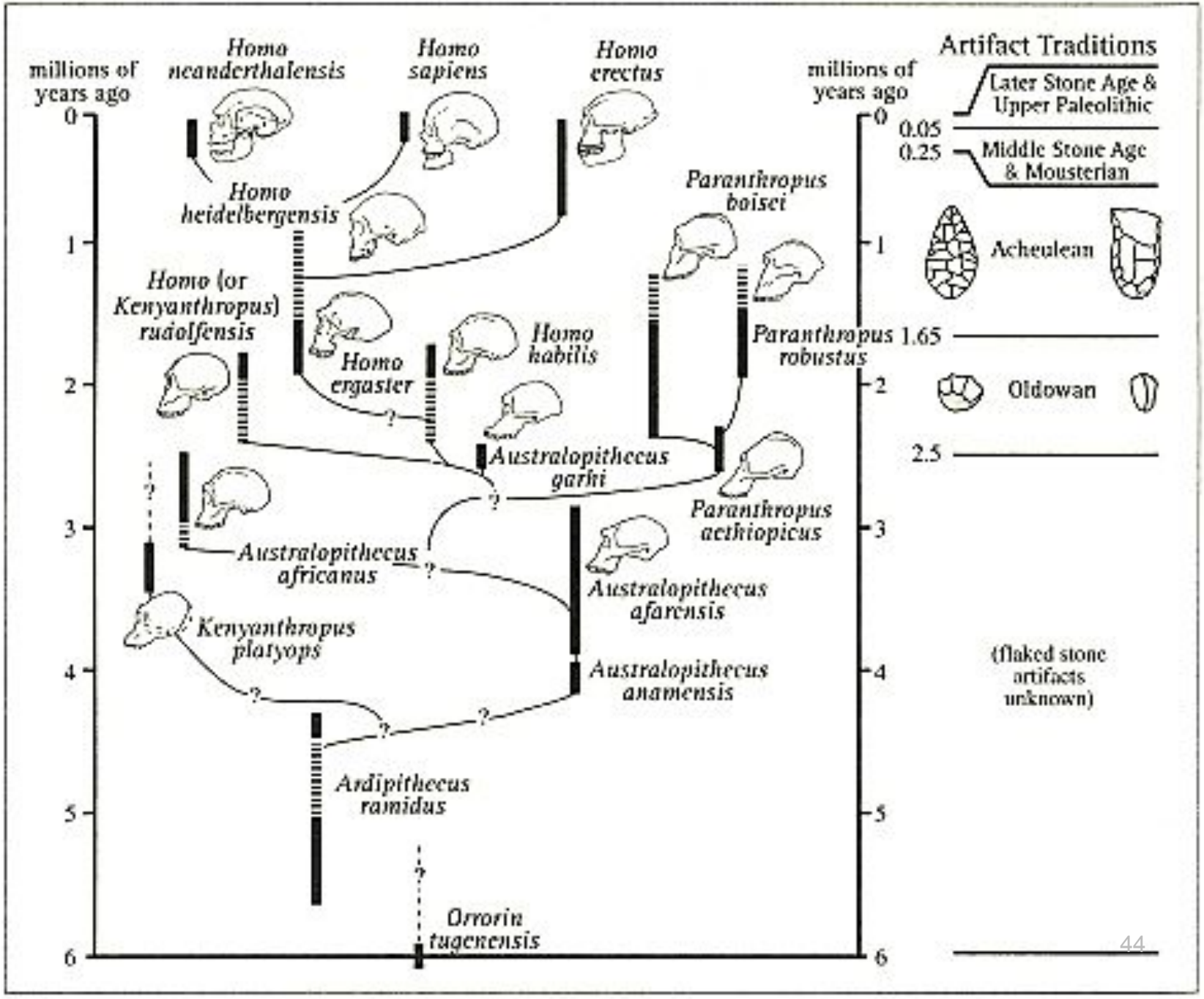
A. boisei

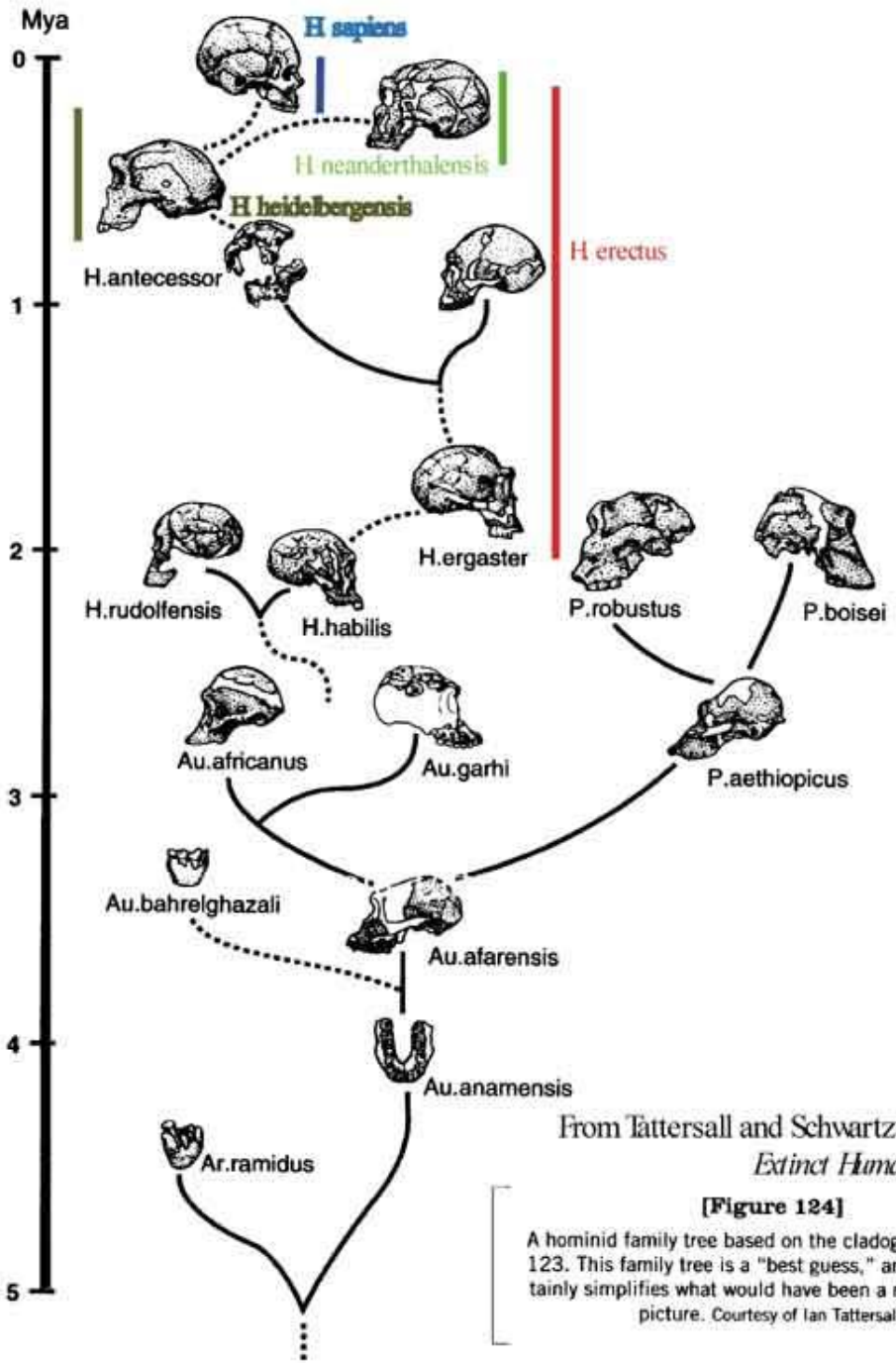
A. robustus

For your notes:

- *A. robustus* lived 1.3 - 2 mya, cranial capacity of 450 - 550cc, height 1.1 - 1.3m. Lived in Southern Africa.
- *A. boisei* lived 1.2 – 2.4mya, cranial capacity of 500 – 530cc, height 1.2 – 1.4m. Discovered in Olduvai Gorge in Tanzania.


Hominid Evolution
in millions of years before present
following Johanson & Edgar (1996)
From Lucy to Language
5
4.5
4
3.5
3
2.5
2
1.5
1
.5
0
Homo sapiens
H. heidelbergensis
H. ergaster
H. neanderthalensis
H. rudolfensis
H. erectus
H. sp.?
H. habilis
A. africanus
A. afarensis
A. aethiopicus
Australopithecus anamensis
A. bosei
Ardipithecus ramidus
?
A. robustus


millions of years ago
0
1
2
3
4
5
6
Homo neanderthalensis
Homo sapiens
Homo erectus
Homo heidelbergensis
Homo (or Kenyanthropus) rudolfensis
Homo ergaster
Homo habilis
Australopithecus garhi
Paranthropus boisei
Paranthropus robustus
Paranthropus aethiopicus
Australopithecus africanus
Australopithecus afarensis
Kenyanthropus platyops
Australopithecus anamensis
Ardipithecus ramidus
Orrorin tugenensis
Artifact Traditions
Later Stone Age & Upper Paleolithic
0.05
0.25
Middle Stone Age & Mousterian
Acheulean
1.65
Oldowan
2.5
(flaked stone artifacts unknown)



From Tattersall and Schwartz (2000)
Extinct Humans

[Figure 124]

A hominid family tree based on the cladogram in Figure 123. This family tree is a "best guess," and almost certainly simplifies what would have been a more complex picture. Courtesy of Ian Tattersall.

Bipedalism

was the most important event in human evolution because it freed up the hands.

The large brain was able to take advantage of this opportunity.

All primates have an upright posture.

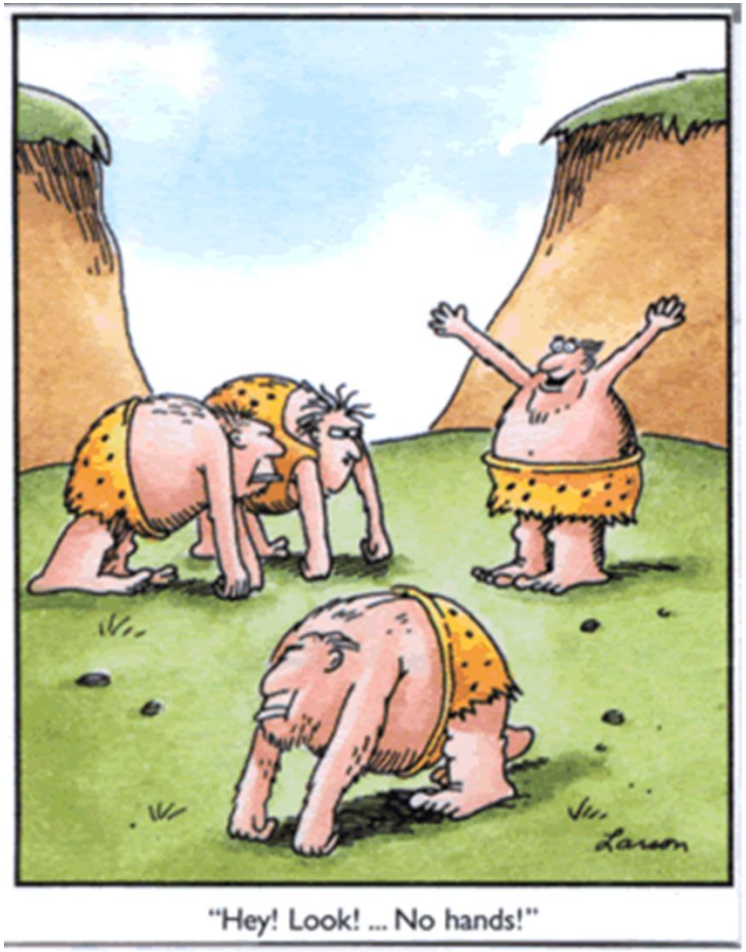
The probable selection pressure for bipedalism was environmental change due to climate change.

Tectonic changes caused the uplift of the Himalayas and changes in ocean currents leading to a cooler and drier Earth.

This may have been the cause of the African forests receding and being replaced by grassland.

Advantage of bipedalism

- More energy-efficient at walking speed than knuckle walking. Also generates less heat.
- Freed up hands for carrying offspring, food and tools.

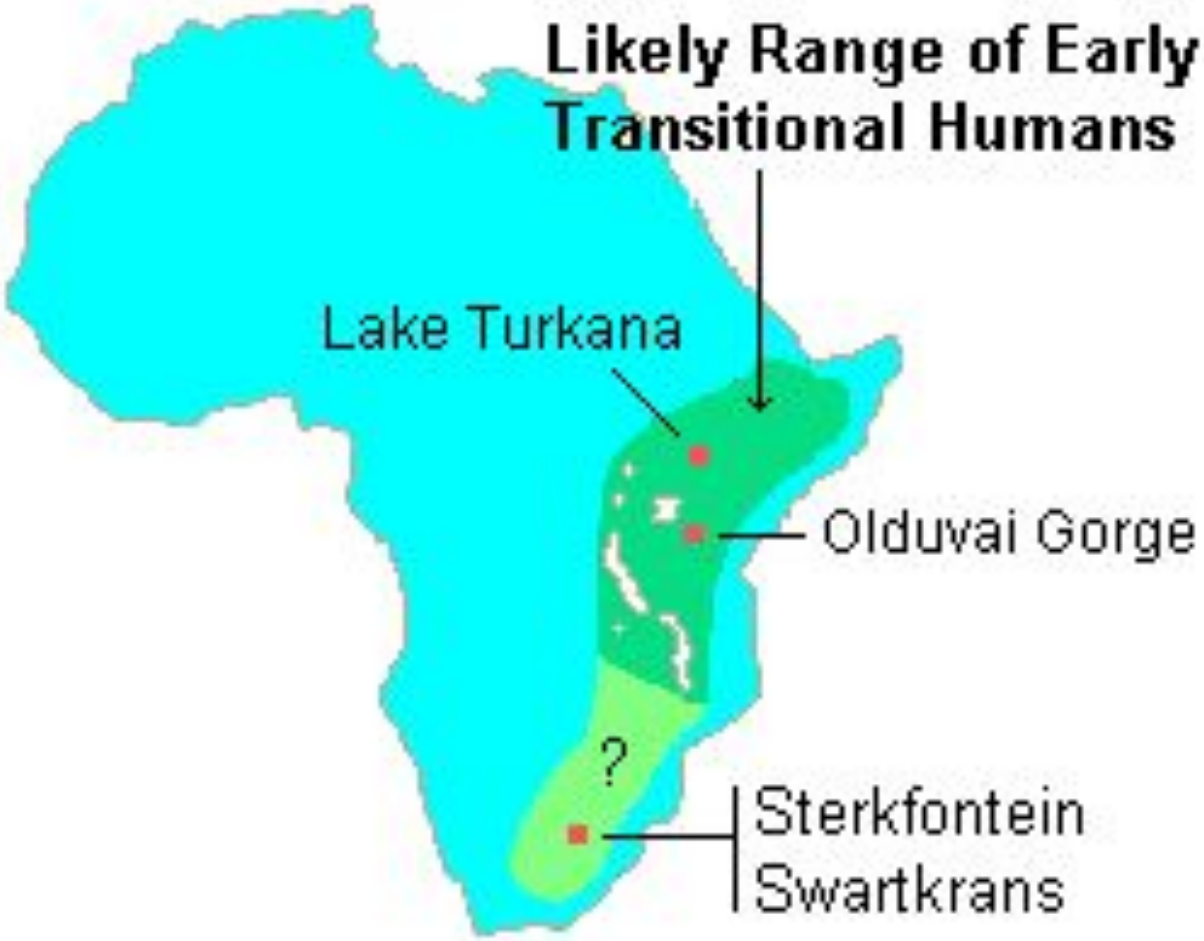


"Hey! Look! ... No hands!"

- Keeps body cool with less direct surface area exposed to the sun and greater air flow in drier air to increase sweat evaporation.
- Gave greater height for easier detection of food and predators. Upright stance may be more intimidating.

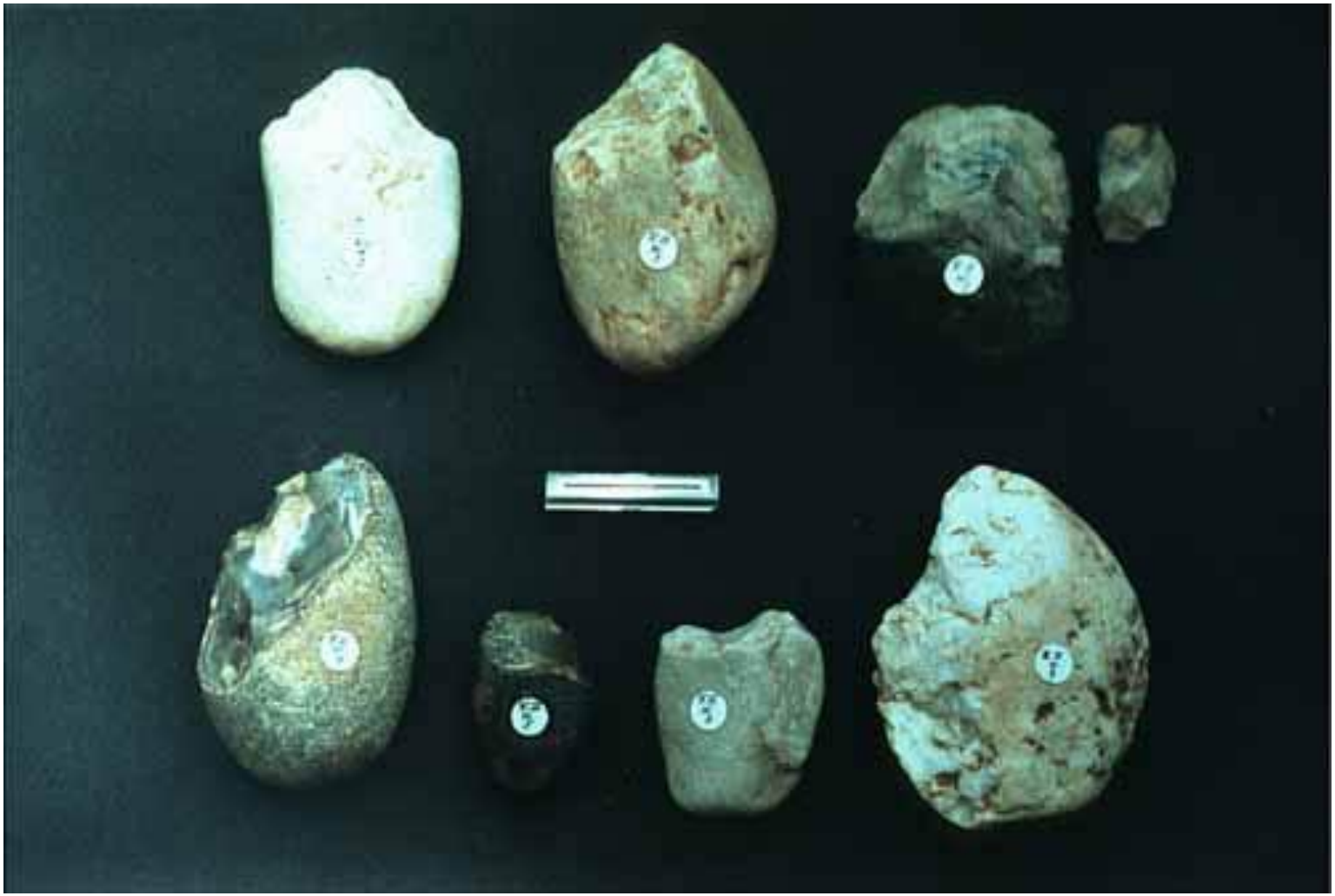
Homo habilis

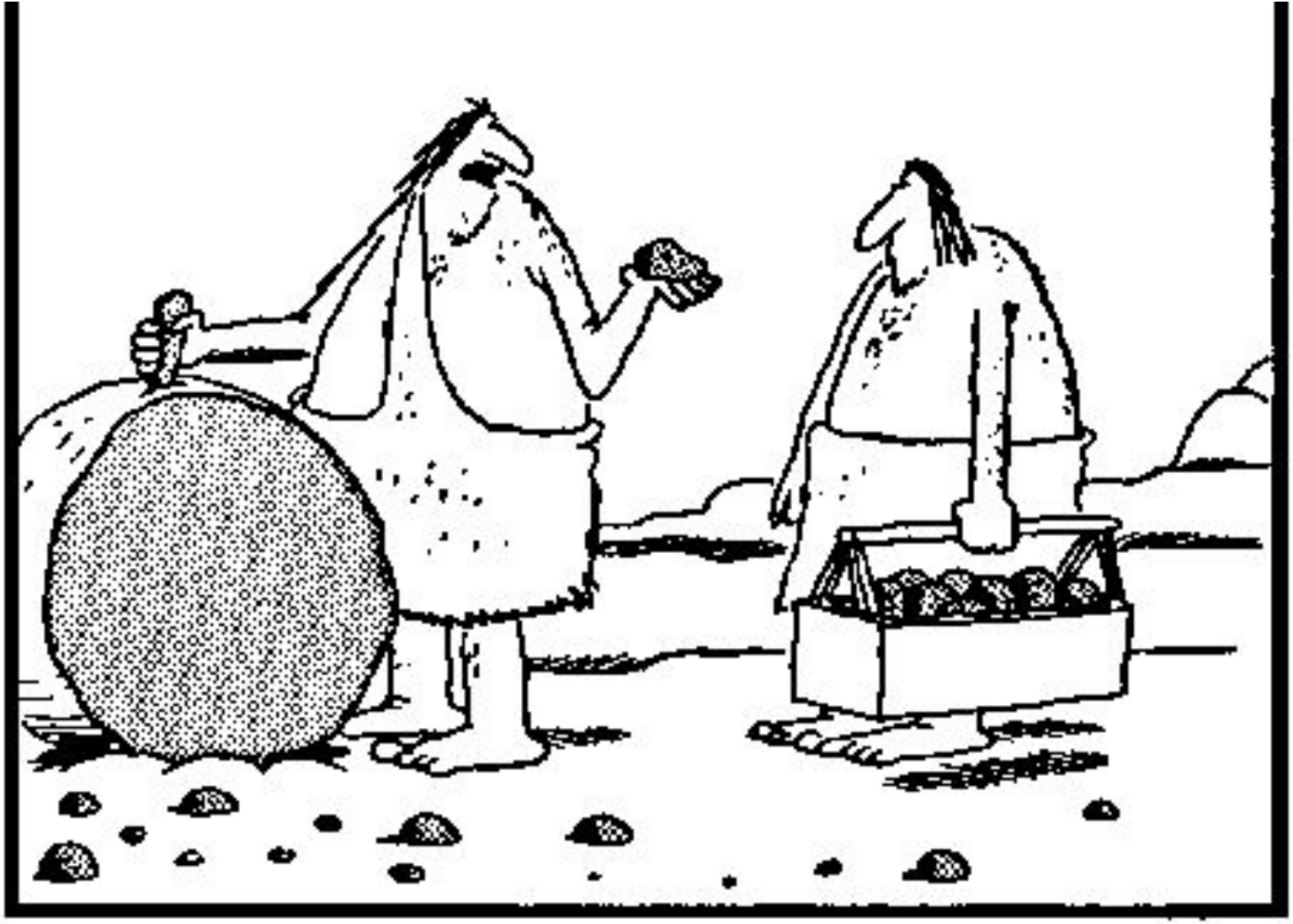
- Rounded skull still with brow ridges. Some development of Broca's region suggesting language.
- Small jaw, incisors and canines suggesting an omnivorous diet.


Likely Range of Early
Transitional Humans
Lake Turkana
Olduvai Gorge
?
Sterkfontein
Swartkrans

- 1.5 - 2.4mya in eastern Africa
- Cranial volume 500 – 650cc.
- 1 – 1.3m tall.
- Made stone and bone Oldowan tools.
- Some evidence of cooperative hunting and scavenging for food.

Oldowan tools





"So what's this? I asked for a *hammer*!
A hammer! *This* is a crescent wrench! ...
Well, maybe it's a hammer. ... Damn these stone tools."

Scavenging

was a way of finding food during times of shortage.

Following other scavengers made it easy to find carcasses. Using stone tools made it easy to break open bones for marrow.

Homo erectus

- 1.8mya to ~300 000ya.
- Cranial volume 750 – 1250cc.
- No sagittal crest. Prominent brow ridges.
- Maybe capable of speech.
- 1.3 – 1.7m tall.

Homo erectus

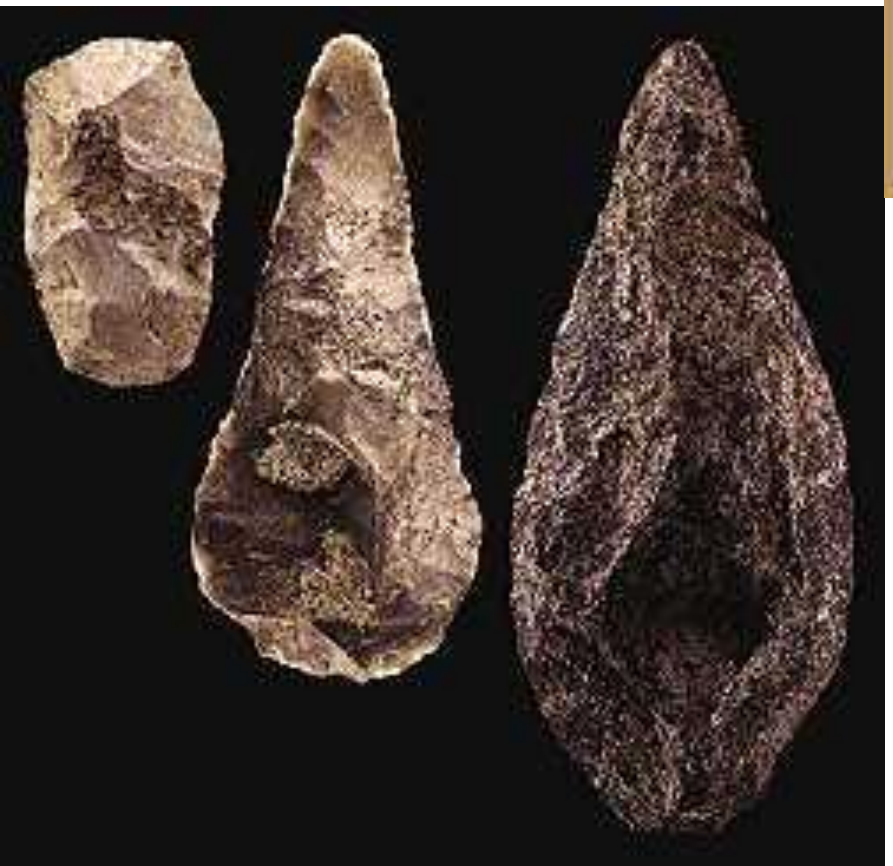
Homo sapiens

Turkana boy

Note
human-likeness
of knees, pelvis
ribcage, skull.

- Used Acheulean tools such as choppers, hand axes and scrapers. May have hunted and trapped animals.
- Used fire to cook food.
- Found in Africa, Asia and Europe.

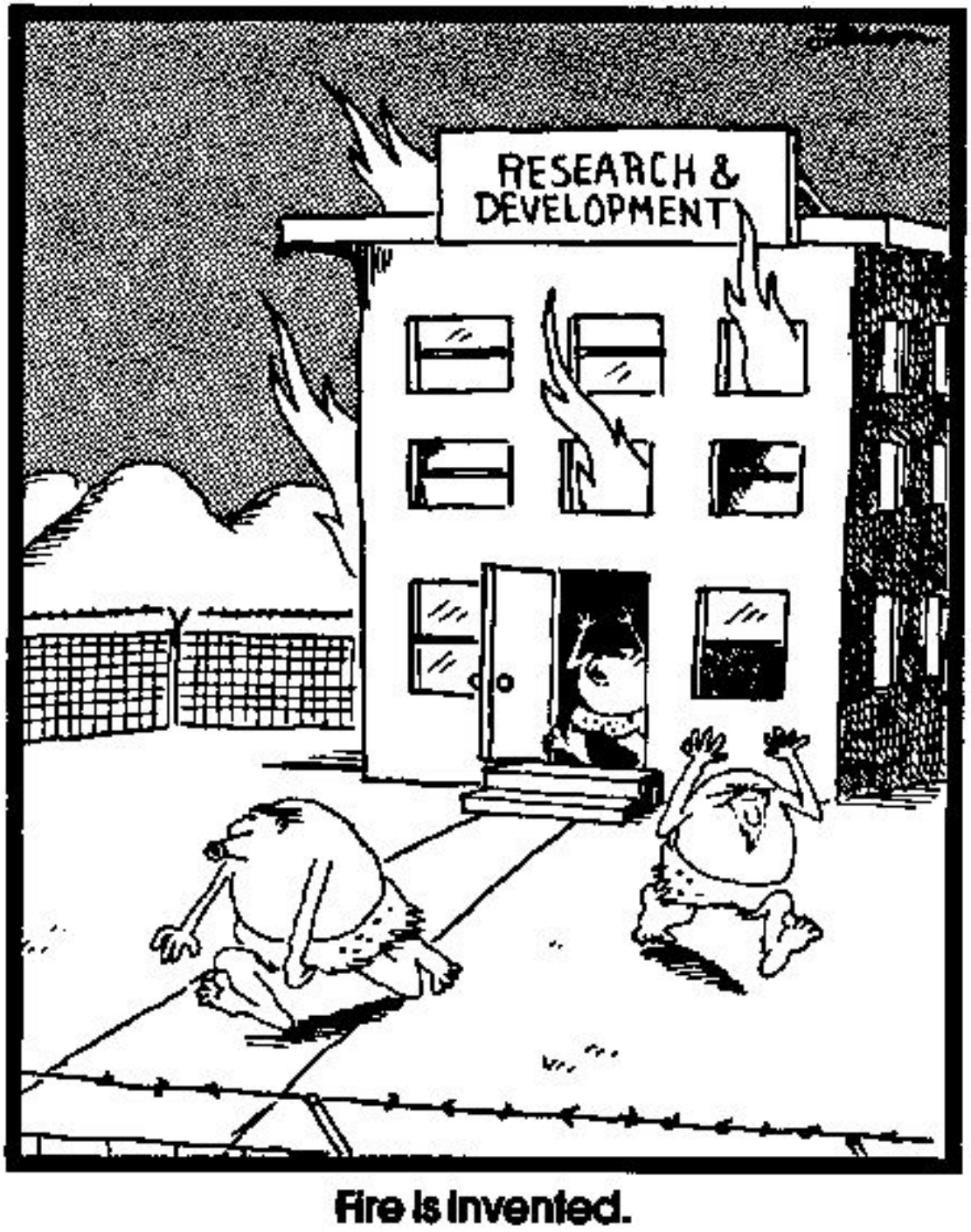
Acheulean tools



Note how they are worked all over with many small chips removed

Homo erectus range

H. erectus learned how to use and control fire.



Fire was useful for preserving food, making it taste better and killing parasites.

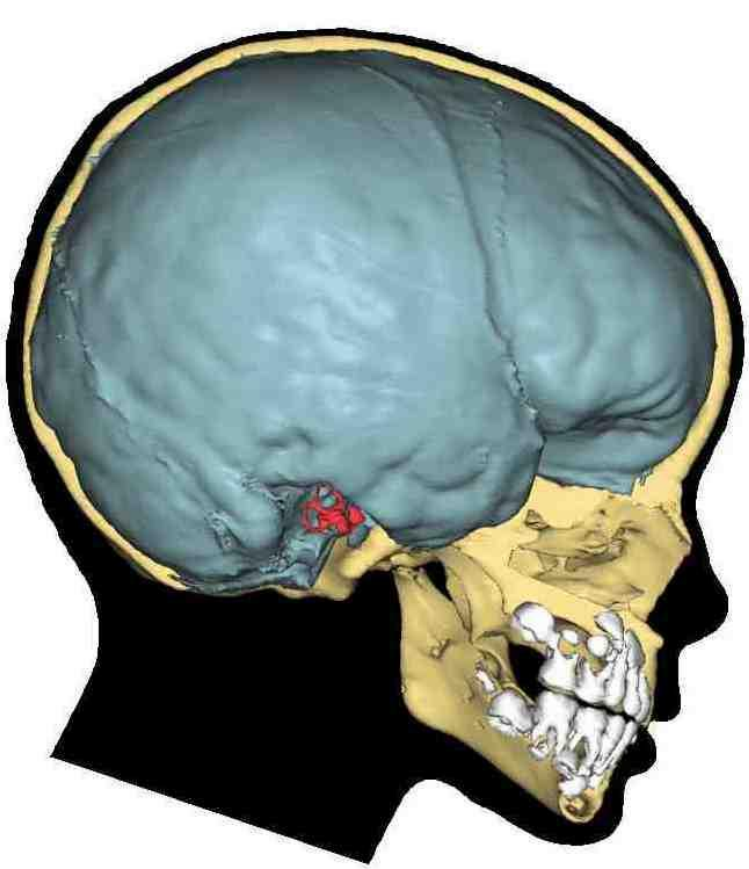
Also useful as a deterrent against predators, enabled activity at night and reinforced social bonding.

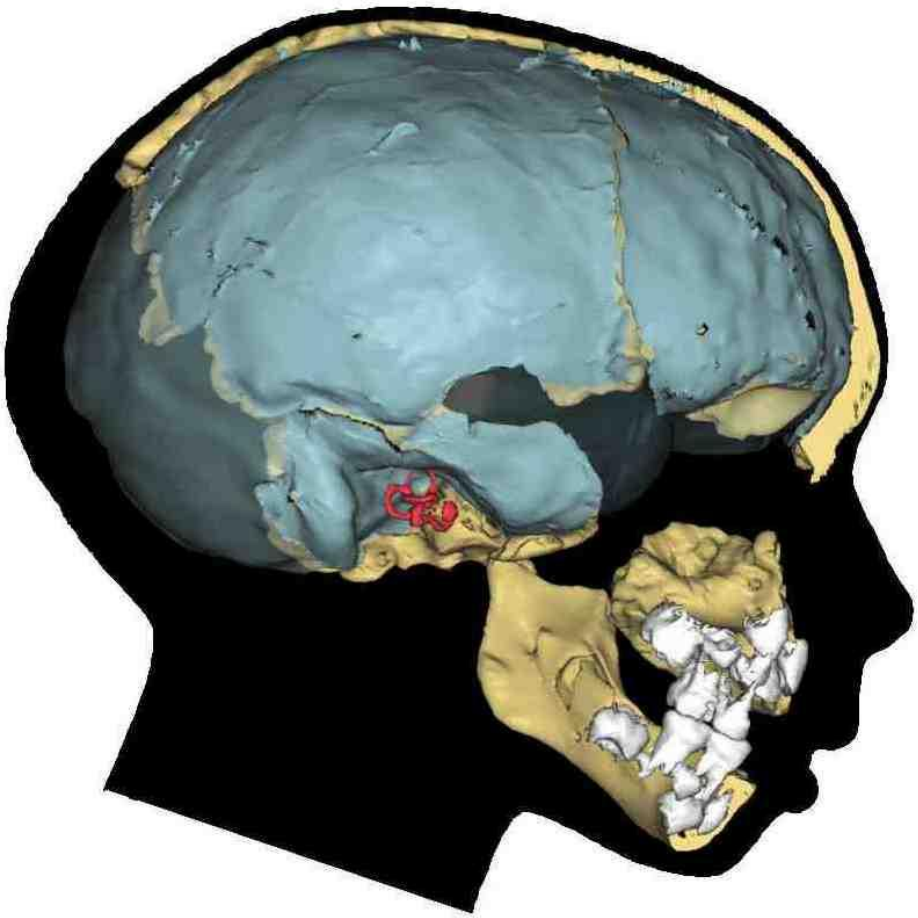
Homo neanderthalensis

- 1.5 – 1.7m tall.
- Sloping forehead with an occipital bun for attachment of strong neck muscles.

- Receding chin. Brow ridges present.

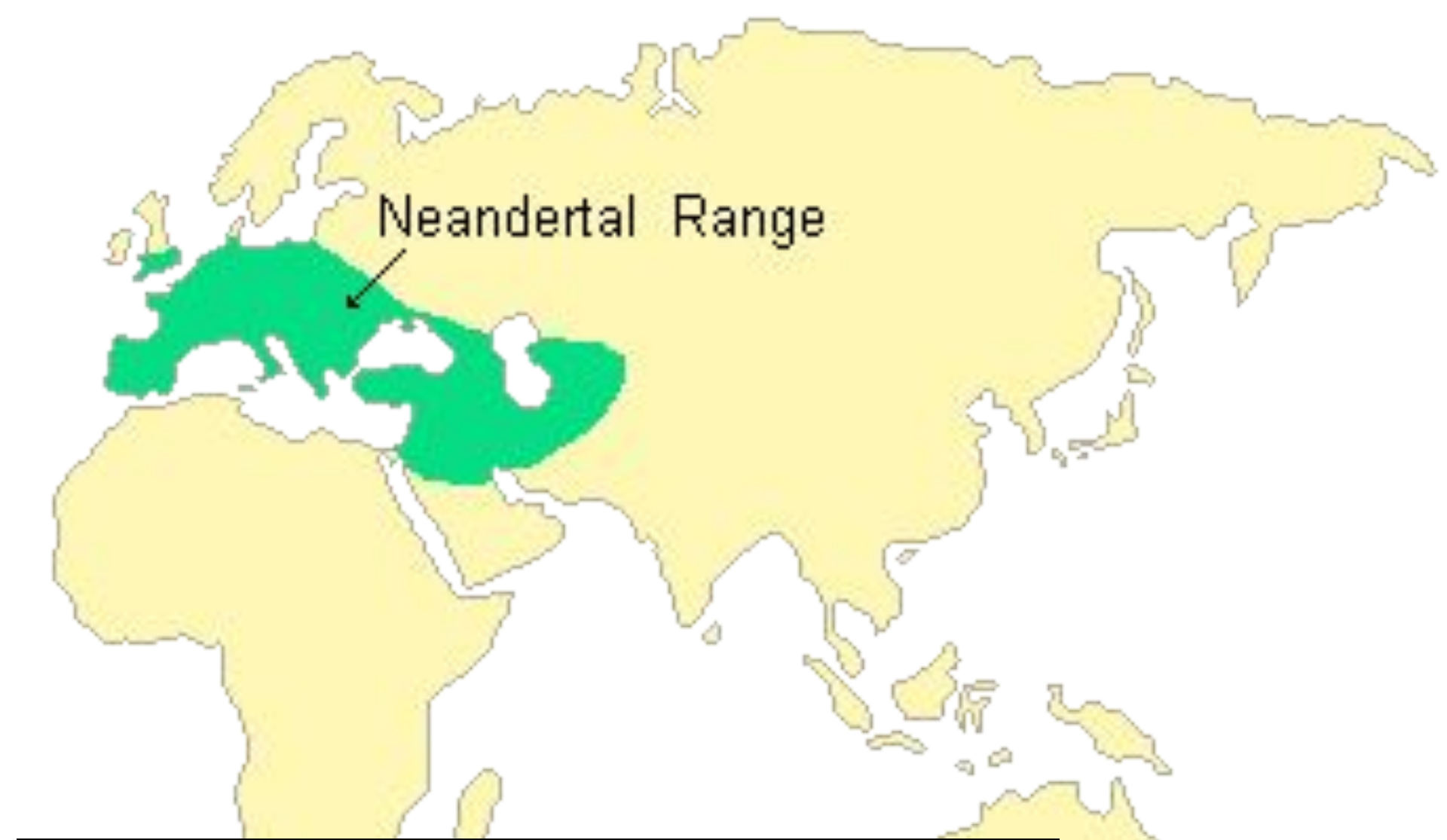
- Cranial volume 1200 – 1750cc (larger than modern humans).





- Thicker limb bones, stocky build probably a cold adaptation. Large areas for muscle attachment.
- Seemed to care for their elderly and disabled.

- Used Mousterian tools made from flint.

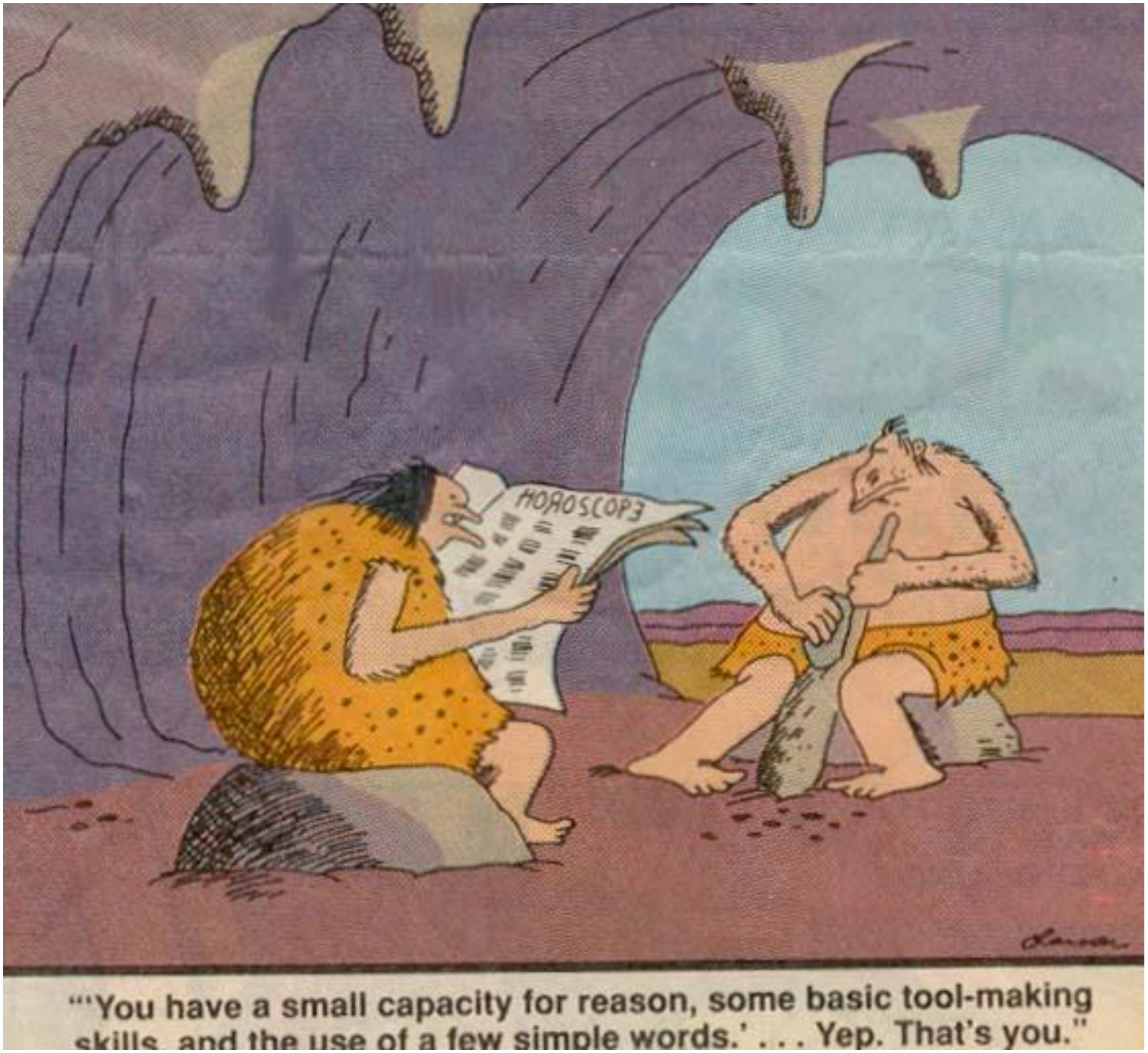


- 150 000 – 25 000ya throughout Europe.

- Buried their dead with flowers, tools, food or jewellery. This suggests they mourned their dead but may also have been to keep wild animals away or as a health precaution.
- Used fire to cook food, keep warm and deter predators.

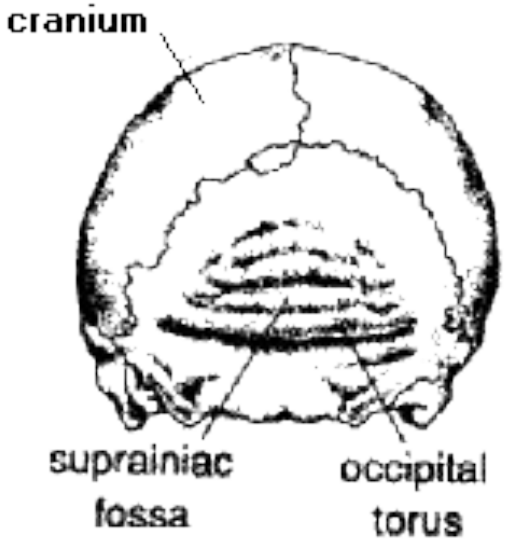
- Sometimes lived in caves and made stone walls and curtains. Made tents and clothes.

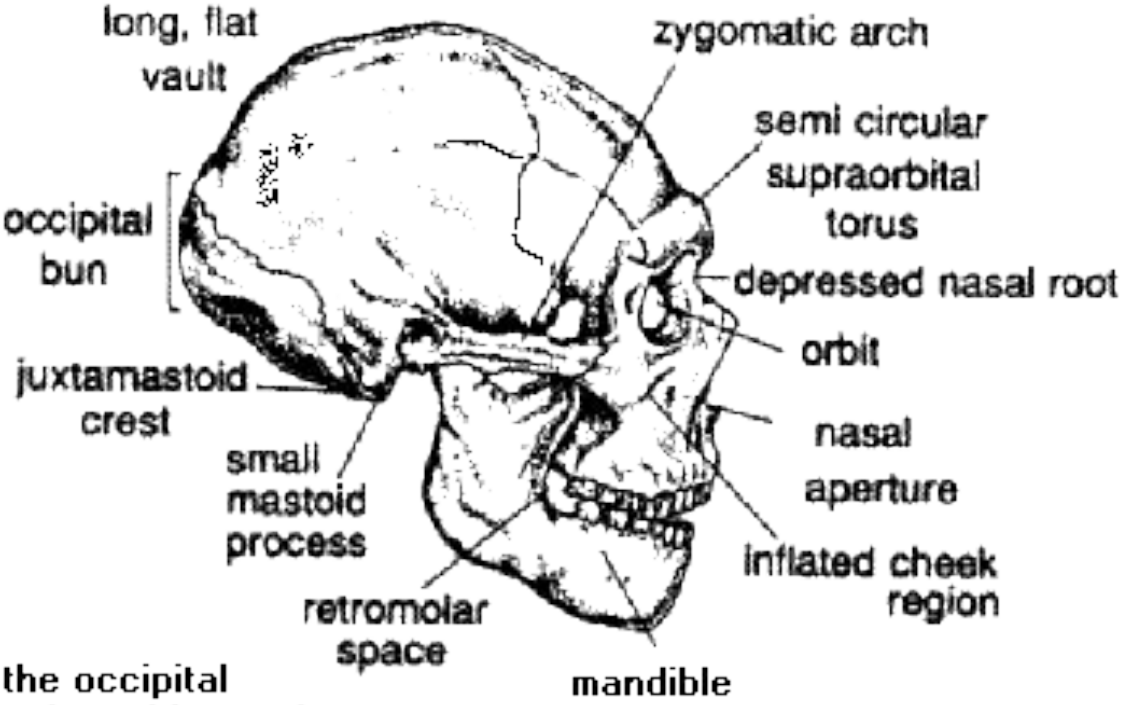
- Probably had a language as they had a hyoid bone.



"'You have a small capacity for reason, some basic tool-making skills, and the use of a few simple words.' . . . Yep. That's you."

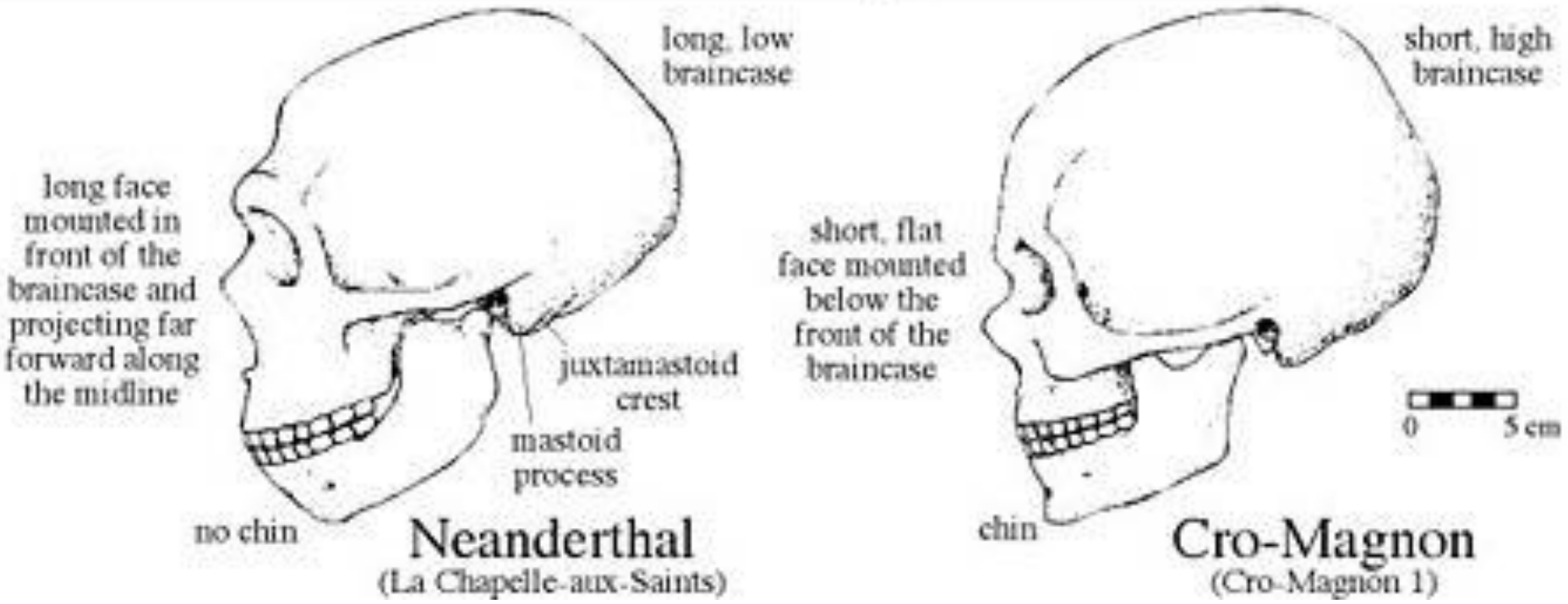
- mitDNA very different between *H neanderthalensis and H sapiens* suggesting *H sapiens* evolved in Africa and moved to Europe replacing the Neanderthals with little or no interbreeding.





NEANDERTAL SKULL

Features include, a long, low cranium, the occipital bun, the lower jaw with no chin, a heavy browridge and a large nasal opening.


long, low
braincase
long face
mounted in
front of the
braincase and
projecting far
forward along
the midline
juxtamastoid
crest
mastoid
process
no chin
Neanderthal
(La Chapelle-aux-Saints)
short, high
braincase
short, flat
face mounted
below the
front of the
braincase
0
5 cm
chin
Cro-Magnon
(Cro-Magnon 1)


approximate range
of the Neanderthals
St. Césaire
& Marillac
La Ferrassie,
Roc de Marsal,
Le Moustier &
Regourdou
Saltzgitter-Lebenstedt
Feldhofer
Spy, Scladina & Engis
Arcy-sur-Cure
La Quina
La Chapelle
Moula-Guercy
Subalyuk
Tata
Divje Babe
Krapina
& Vindija
Molodova
Kiik-Koba, Buran Kaya,
Prolom & Zaskal'naya
Rozhok
Sukhaya Mechetka
Il'skaya
Mezmaiskaya
Teshik-Tash
El Castillo
Gorham's Cave
& Forbes Quarry
Zafarraya
Combe Grenal
& Pech de l'Azé
Ouatari
& Bresil
Bacho Kiro
Shanidar
Karaïn
Dederiyeh
Umm El Tlel
Bisitun
& Warwasi
Amud,
Tabun &
Kebara

- Skeletons have been found with Neanderthal and human DNA suggesting some interbreeding may have occurred.

Homo sapiens

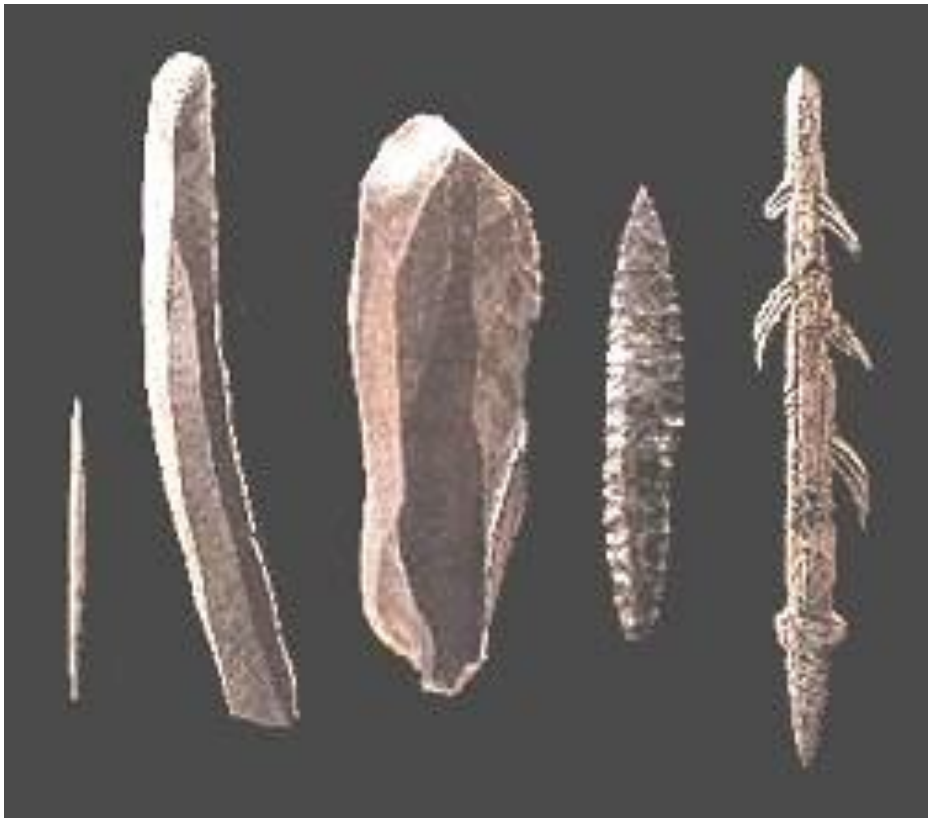
- Appeared about 160 000ya in Africa and spread to Asia, Europe, Australia and America.
- *H sapiens* reached Europe about 35 000ya.

- They buried their dead.
- Earliest humans were long limbed and gracile. 1.6 – 1.85m tall.

Cranial volume 1200 – 1700cc. No brow ridges, high forehead, well-developed chin, long nose, small teeth and V-shaped jaw.

- The expansion of the frontal lobe of the brain enabled the development of imagination so hominids could use abstract thought to solve problems and avoid selection pressures.

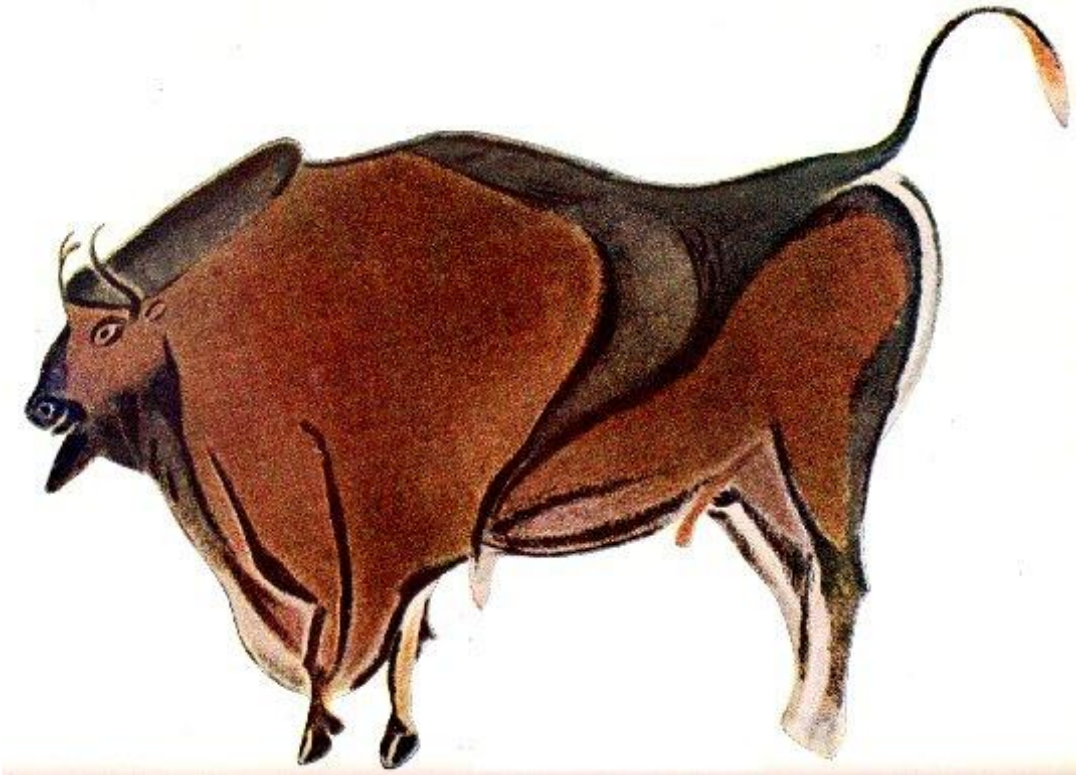
- Cro-Magnon man made Upper Palaeolithic tools including fish hooks, harpoons and needles.



2 left = Middle Palaeolithic

3 right = Upper Palaeolithic

- They lived in caves and shelters, made clothes, painted on cave walls and made statues from bone and clay.



- There are very few physical differences between Cro-Magnon man and modern humans.
- The only real difference between Cro-Magnon man and humans is the long period of cultural evolution.