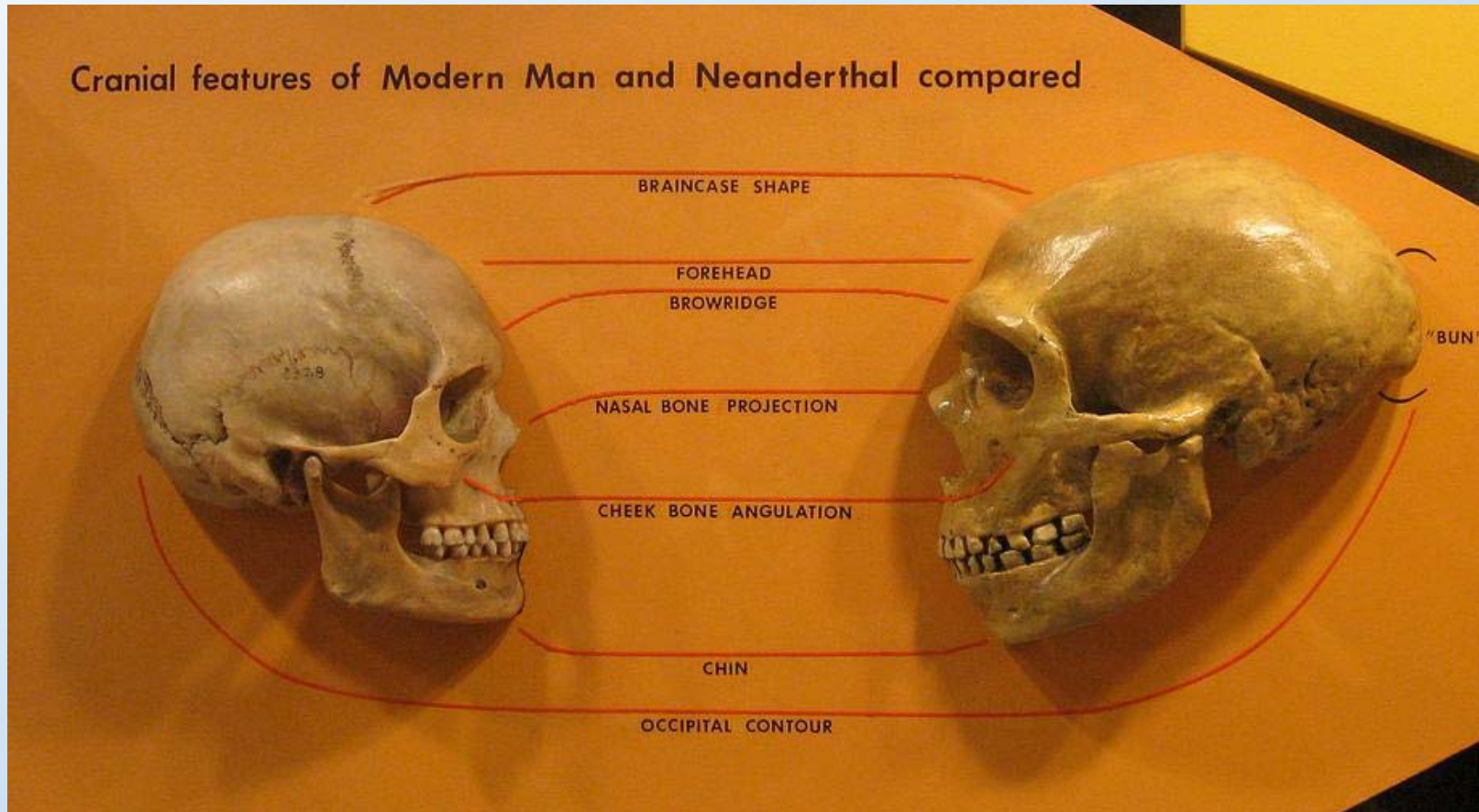




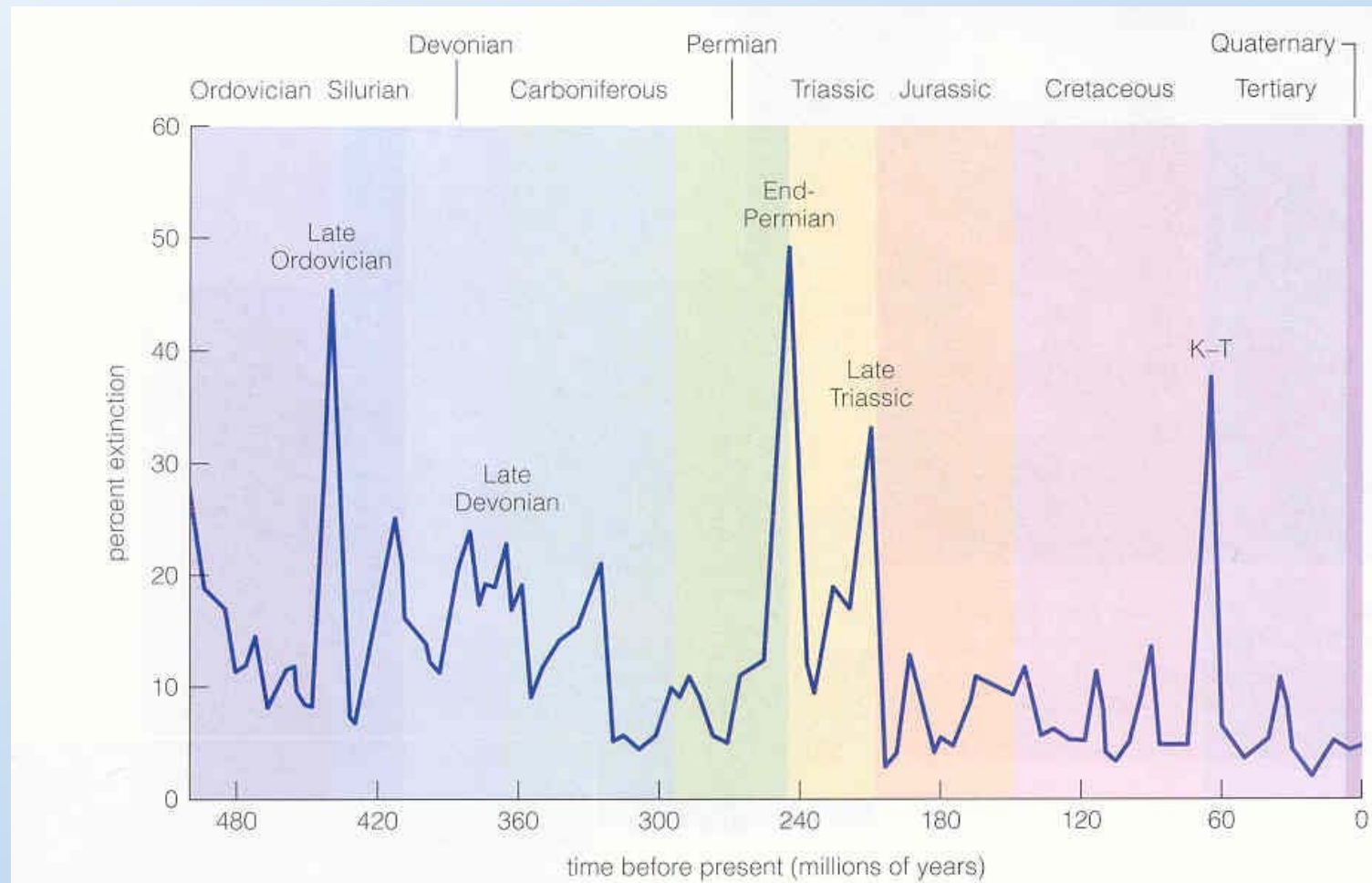
Human Evolution



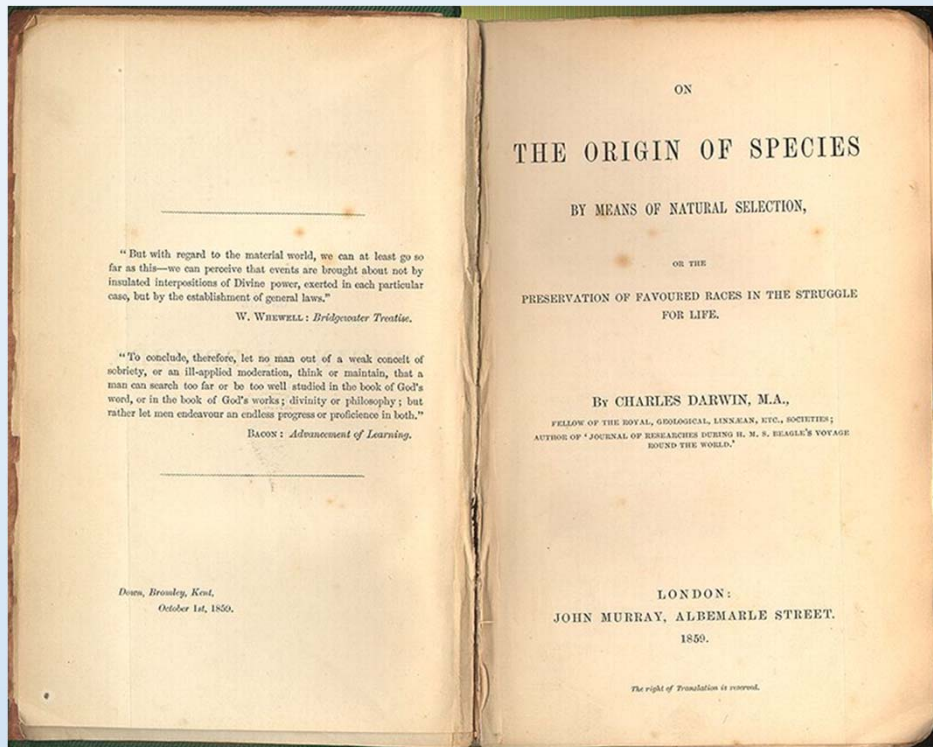
Homo sapiens neanderthalensis



Mass Extinctions

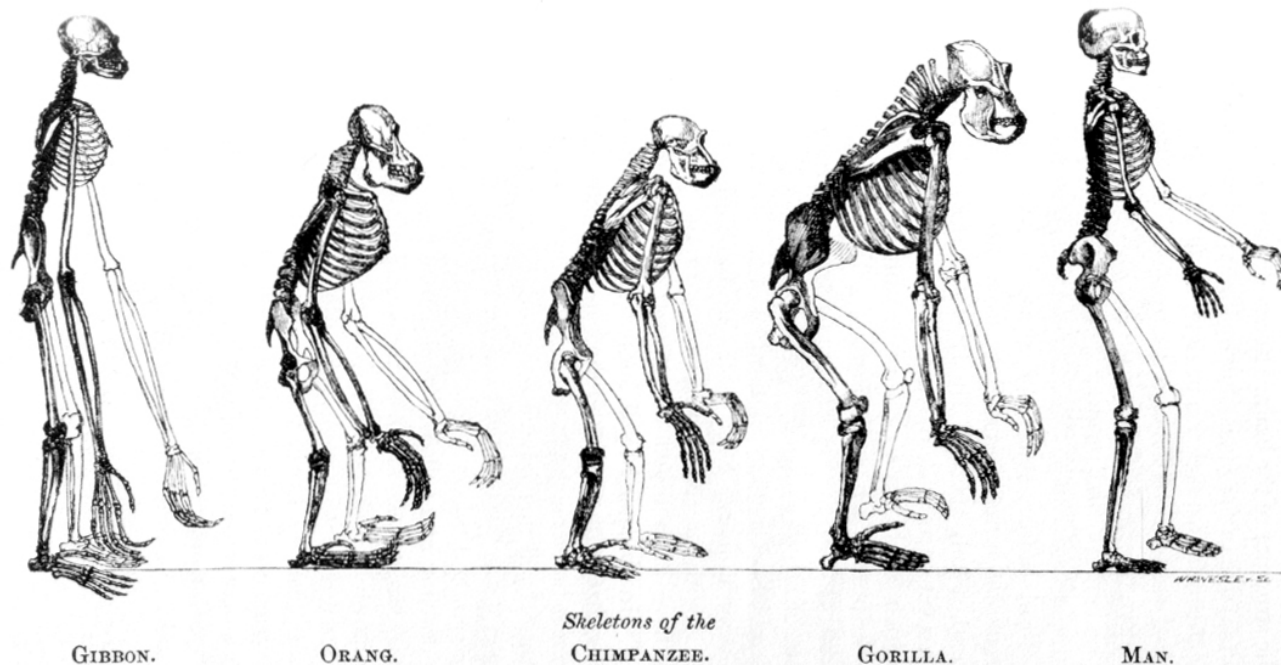


First Theories of Human Evolution



- Charles Darwin
 - *On the Origin of Species* (1859)
 - First to link biological diversity to evolution
 - *The Descent of Man, and Selection in Relation to Sex* (1871)
 - Described human evolution
 - Saw aesthetic factors (“looks”) as sexual attractors
- These scientists wrote about human evolution before human fossil evidence was ever discovered

First Theories of Human Evolution

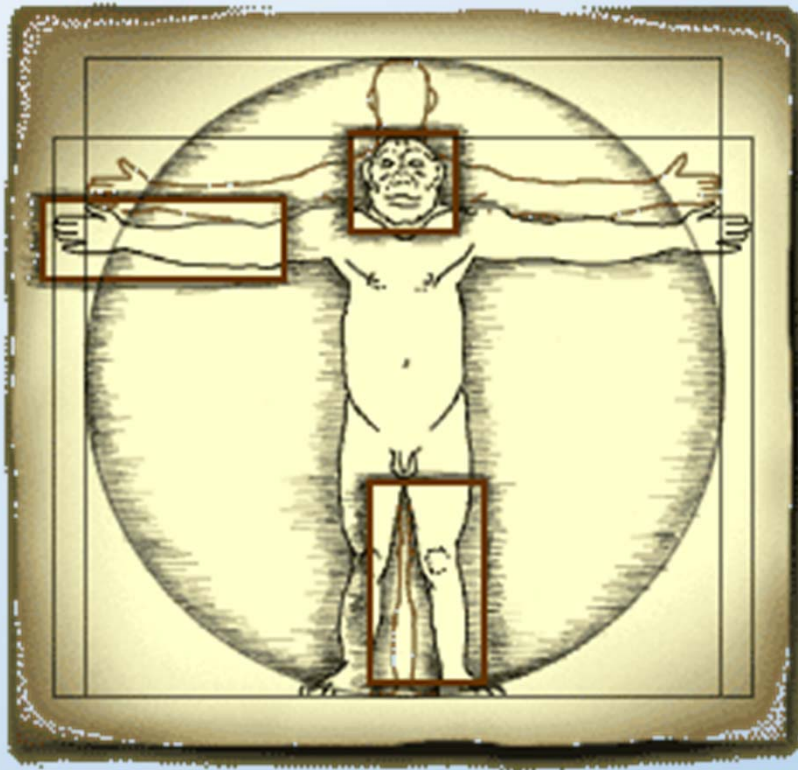


Photographically reduced from Diagrams of the natural size (except that of the Gibbon, which was twice as large as nature), drawn by Mr. Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

Thomas Huxley
**Evidence as to Man's
Place in Nature (1863)**
First book to describe
human evolution

- These scientists wrote about human evolution before human fossil evidence was ever discovered

What is a Hominid?



Bipedalism

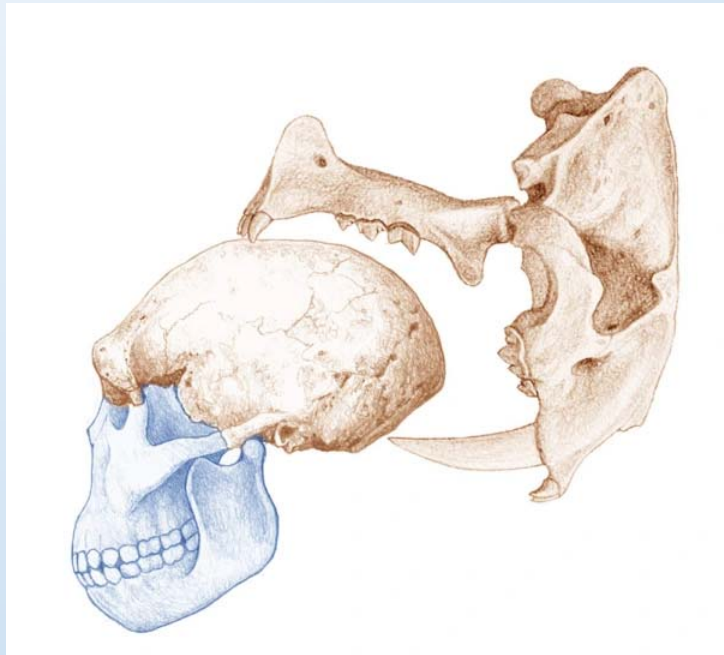
|

Arboreal Arms

|

Teeth

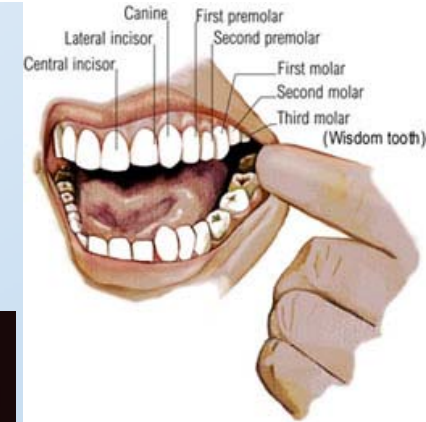
The human predator



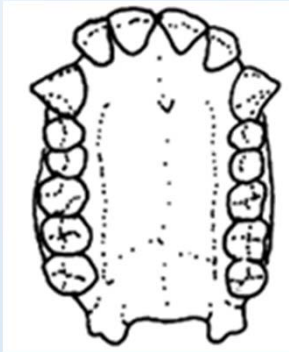
hominid skulls from Dmanisi, labelled as D2280

What exactly evolved? A summary...

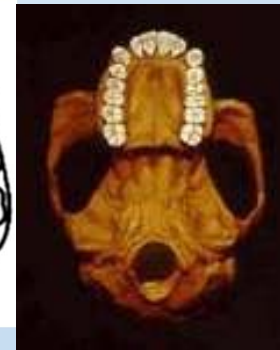
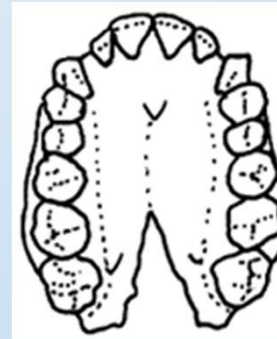
TEETH



Chimp



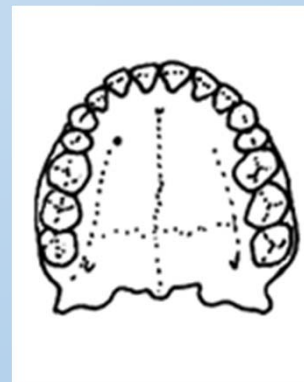
A. africanus



Homo erectus

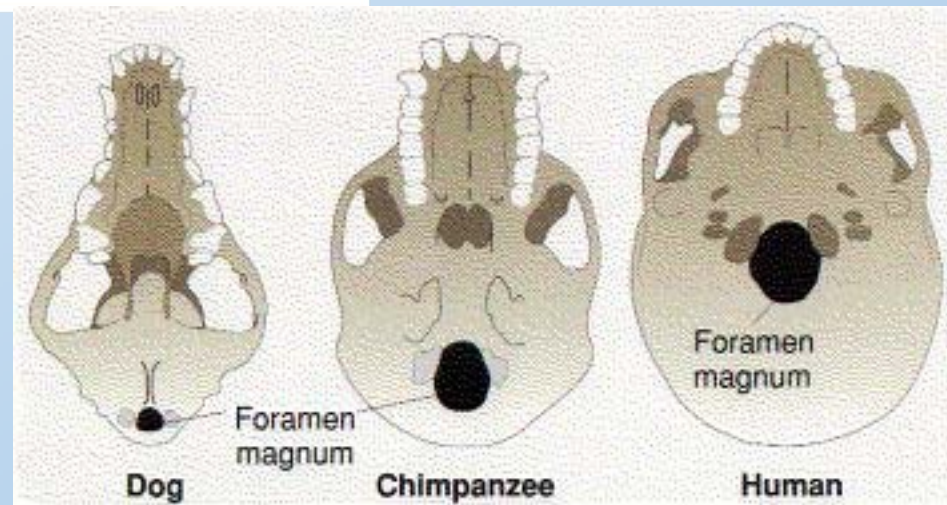
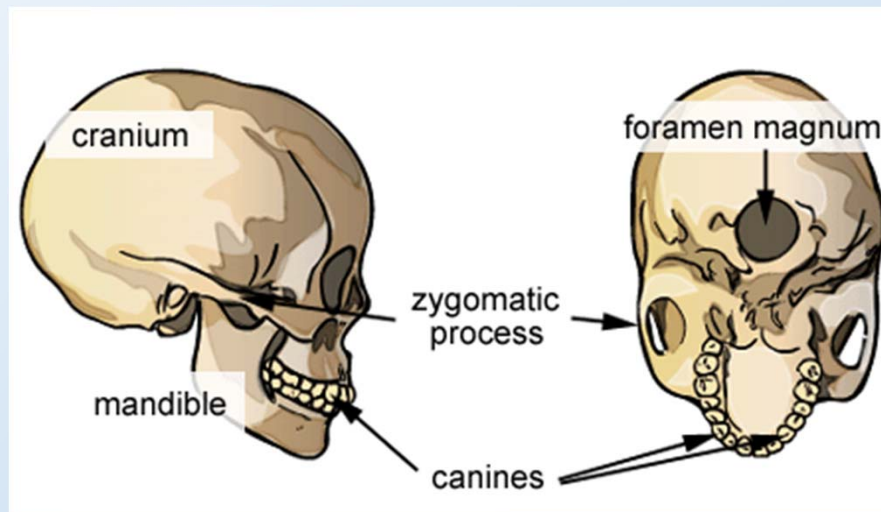


Modern *homo sapiens*



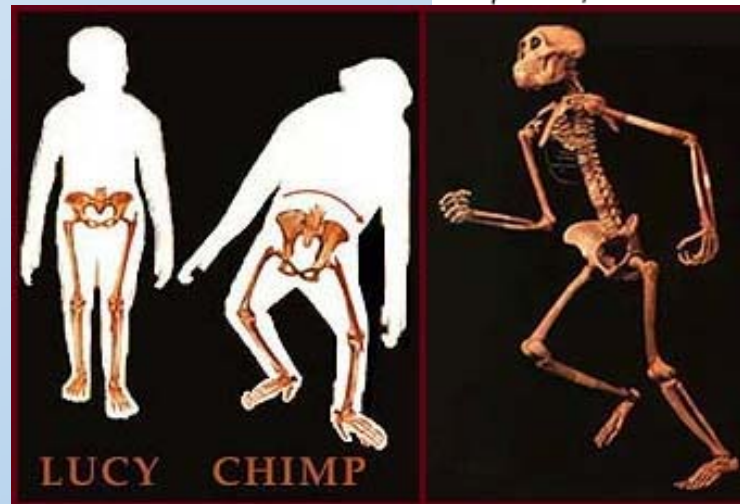
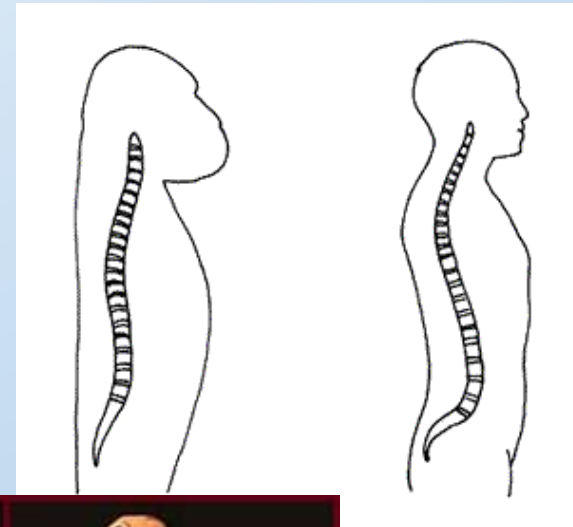
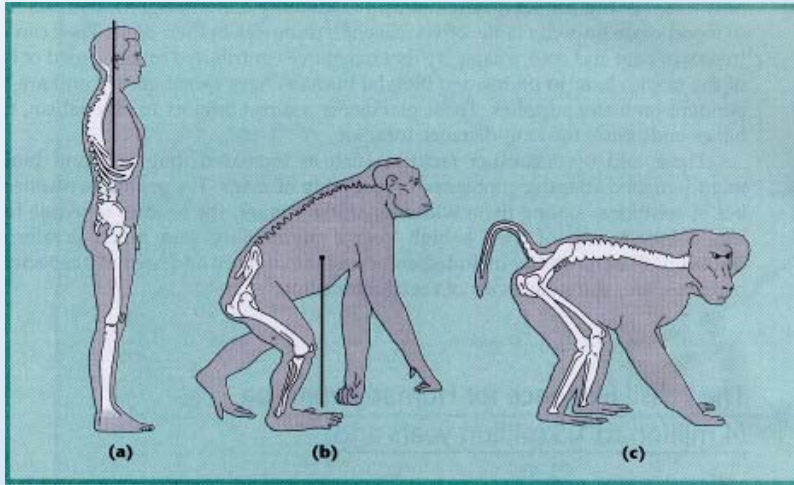
What exactly evolved? A summary...

Skeletal Features, including:



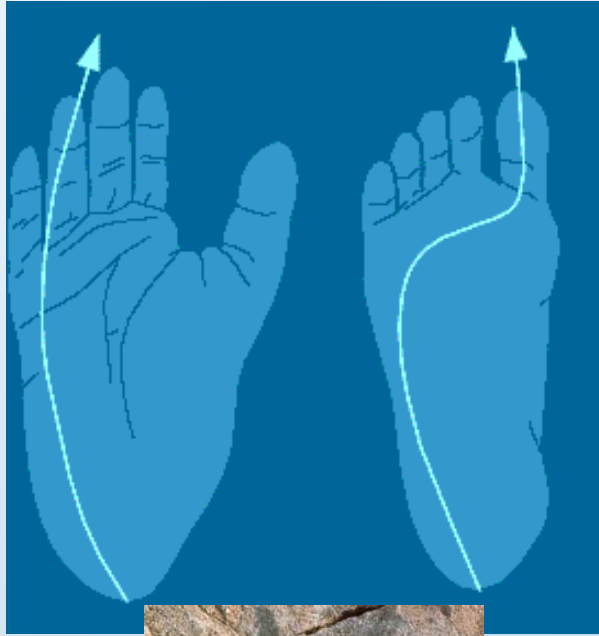
What exactly evolved? A summary...

BIPEDALISM: SPINAL COLUMN

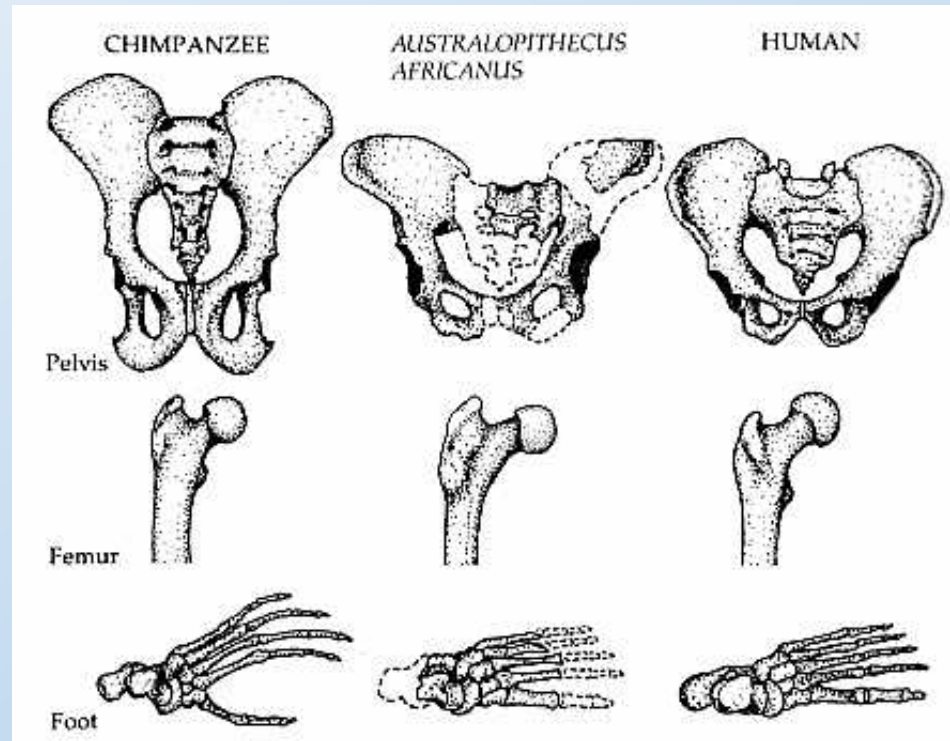


What exactly evolved? A summary...

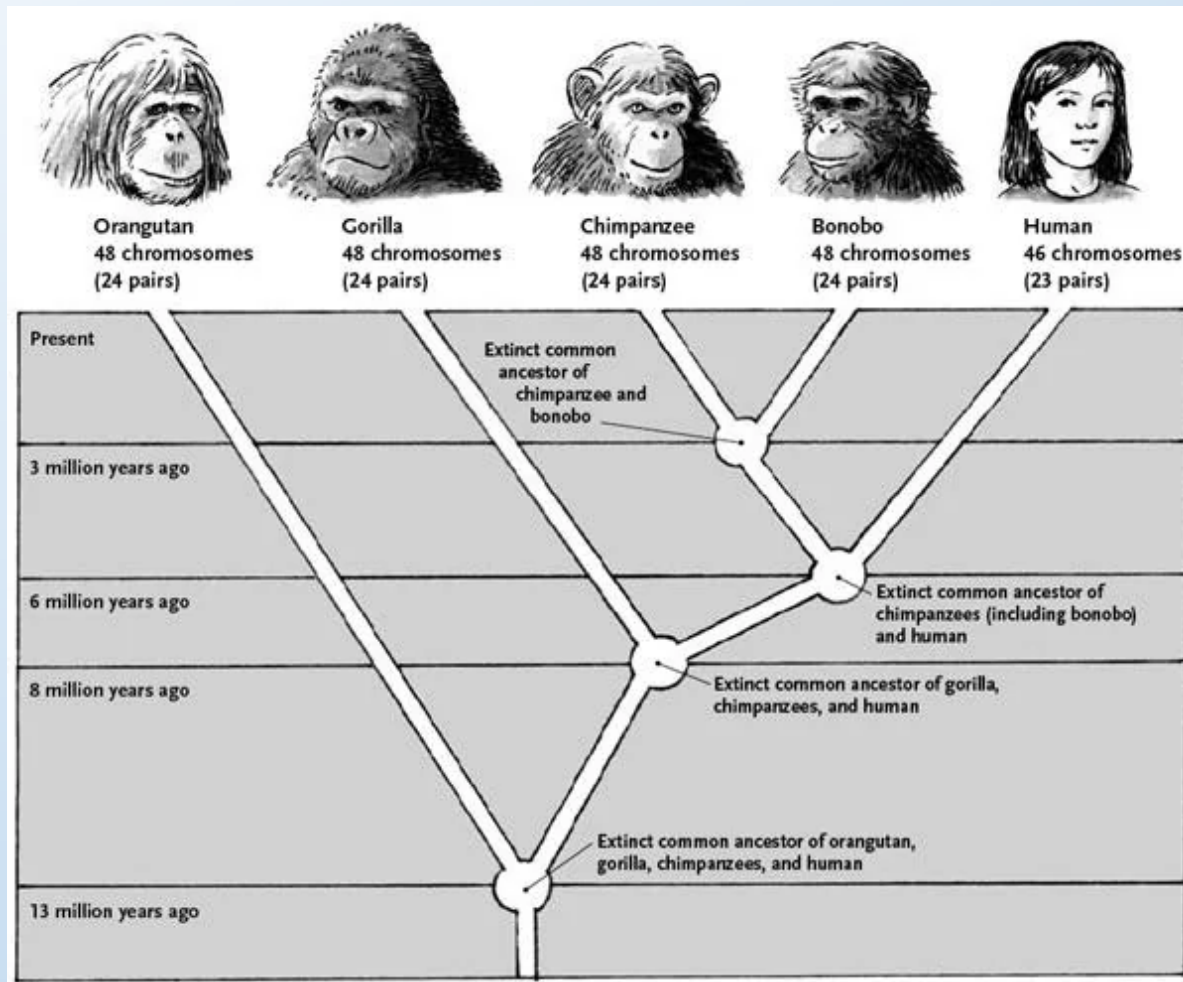
BIPEDALISM: LIMBS and SKELETAL CHANGES



Laetoli footprint



Main branches of ape-human evolution



Are we still evolving?

Microevolution: change in gene frequency - YES

Macro evolution : formation of species - NO



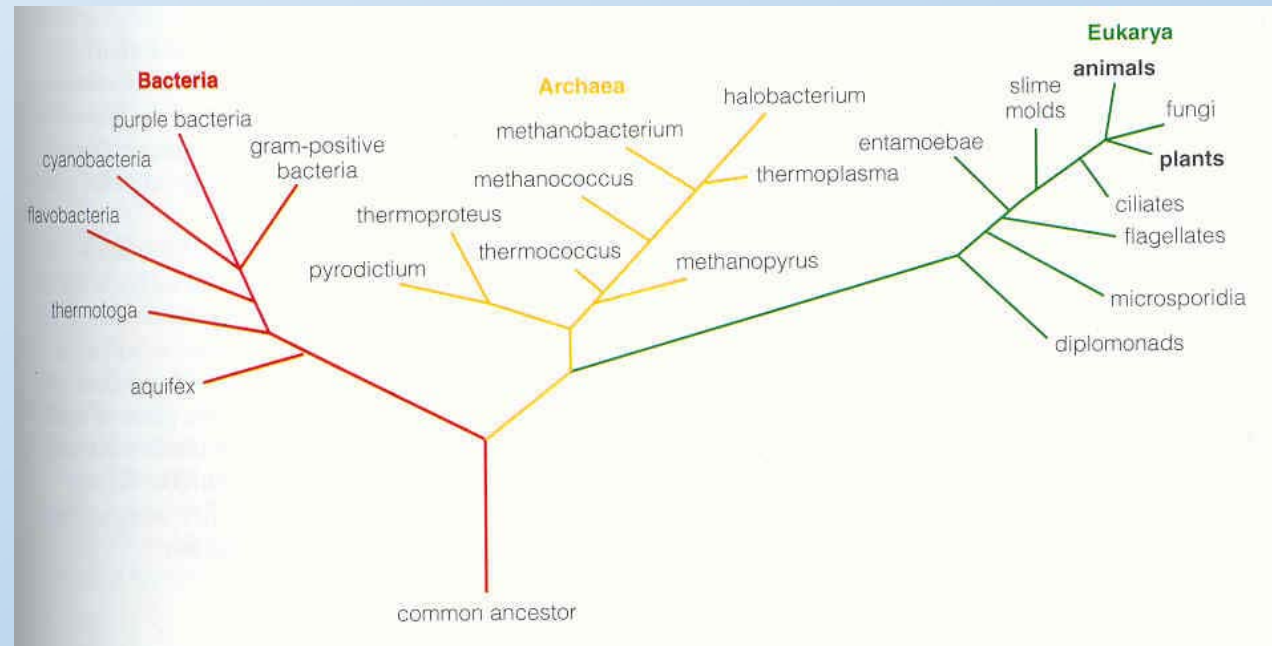
Are we still evolving?

- Some parts of Africa have seen an increase in the frequency of a gene called *CCR5-32*
- Protects against infection with HIV-1.
- May have been selected for during bubonic plague



Living Fossils

- Bacteria and Archaea: genetic material NOT separated from rest of cell
- Eukarya: DNA separated from rest of cell by membrane
- Extremophiles (live near deep-sea vents or in hot springs) closest to root of tree of life



Brachiation:

- Grip
- Stereo vision



BECOMING HUMAN

PROLOGUE EVIDENCE **ANATOMY** LINEAGES CULTURE



▼ CLOSE EXHIBIT

Nº 1 { How Are We Like Other Primates?

HUMANS ARE MEMBERS of the biological order Primates. This highly diverse group includes prosimians, monkeys, apes, and humans. Although they are very different from each other, all primates share many important similarities that make us, as a group, distinct from other animals.

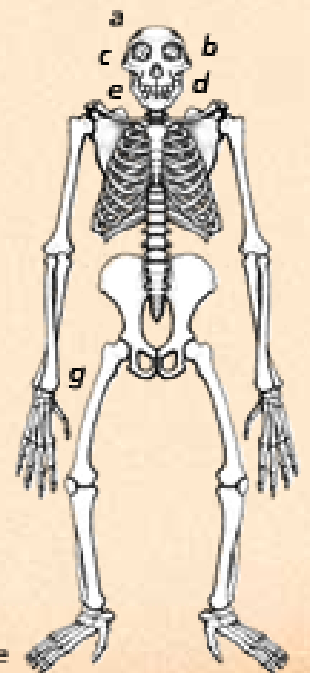
Examine these skeletons to see what features humans share with the other primates.

[LEARN MORE](#)

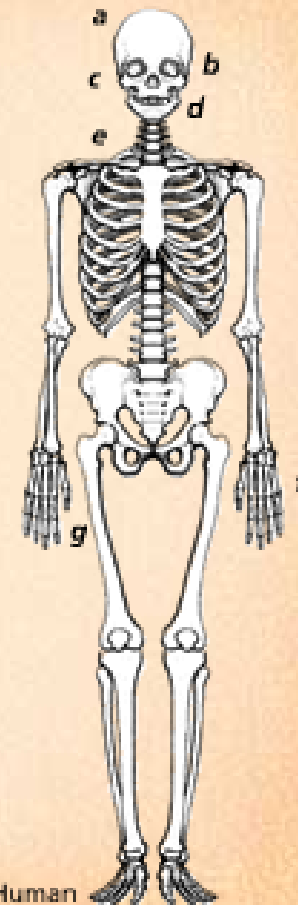
introduction

- a. brain*
- b. eyes*
- c. nose*
- d. teeth*
- e. clavicle*
- f. hands*
- g. thumbs*

Chimpanzee



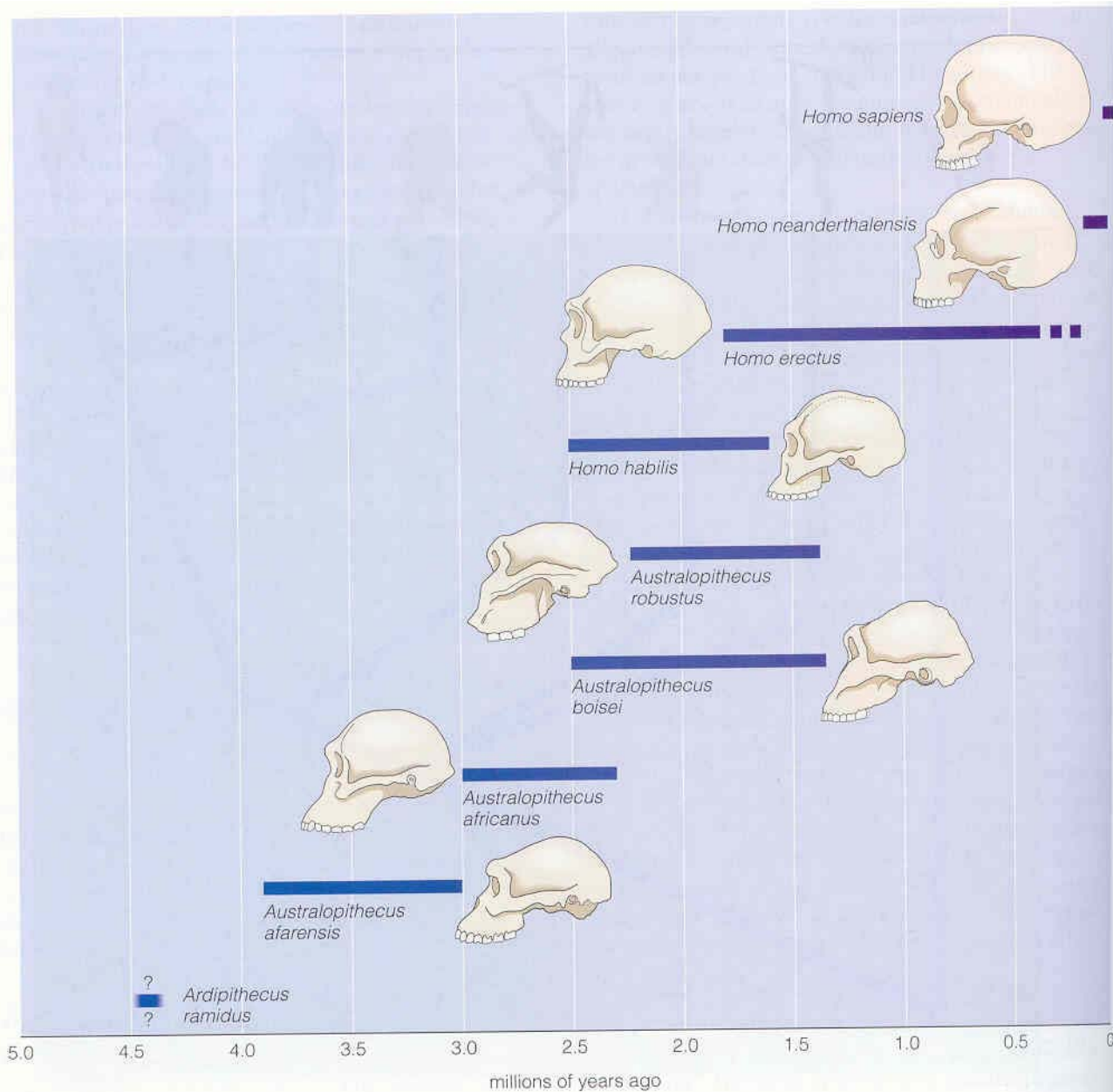
Human



[RELATED EXHIBITS](#) ▲

[Click for } HOMINID PROFILES](#) [HELP](#)

Emergence of Humans



Human Evolution:

7 Key Species

Australopithecus afarensis

A. africanus

A. robustus

Homo habilis

H. erectus

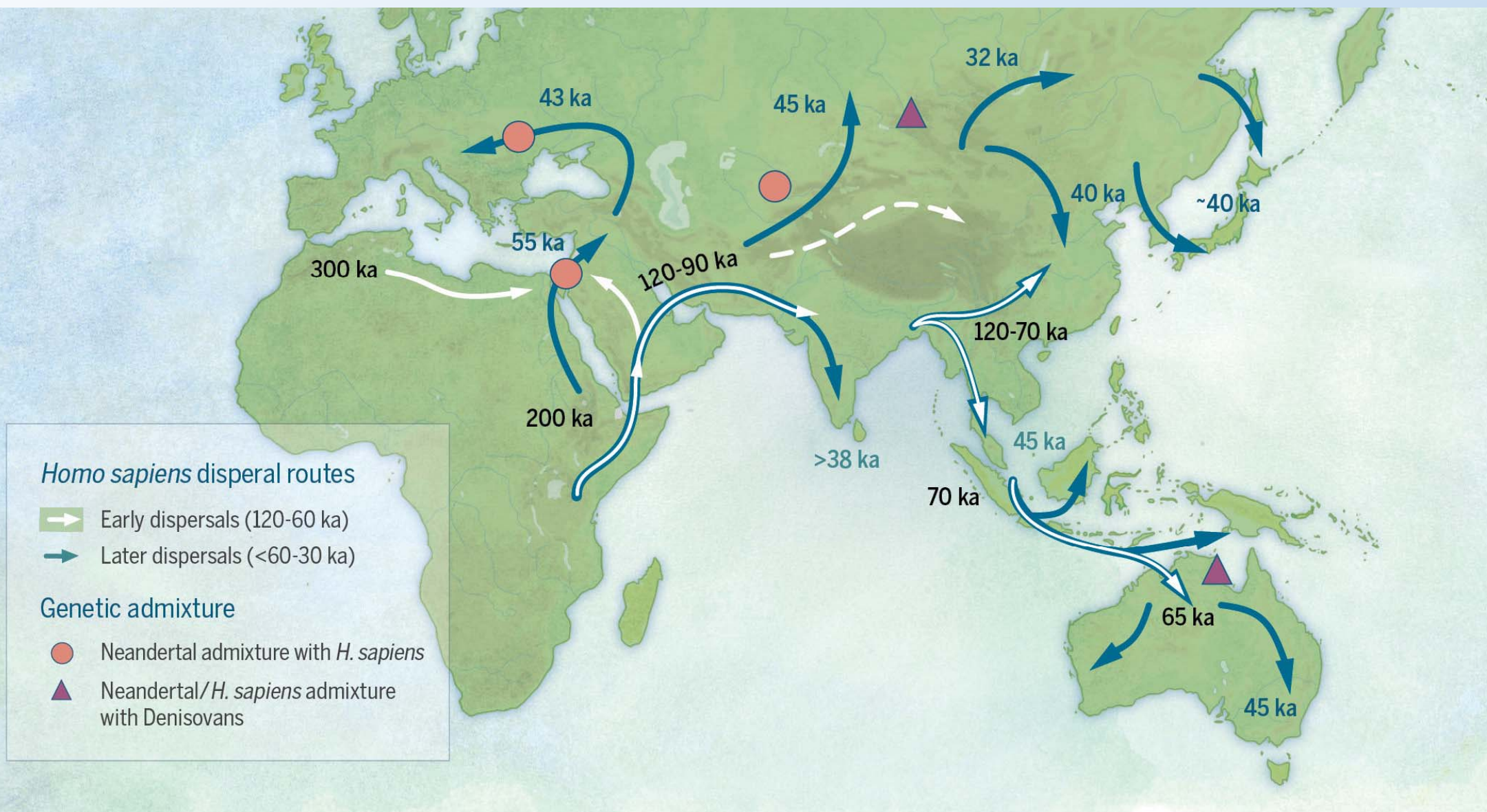
H. neanderthalensis

H. sapiens



Humans – *Homo sapiens*

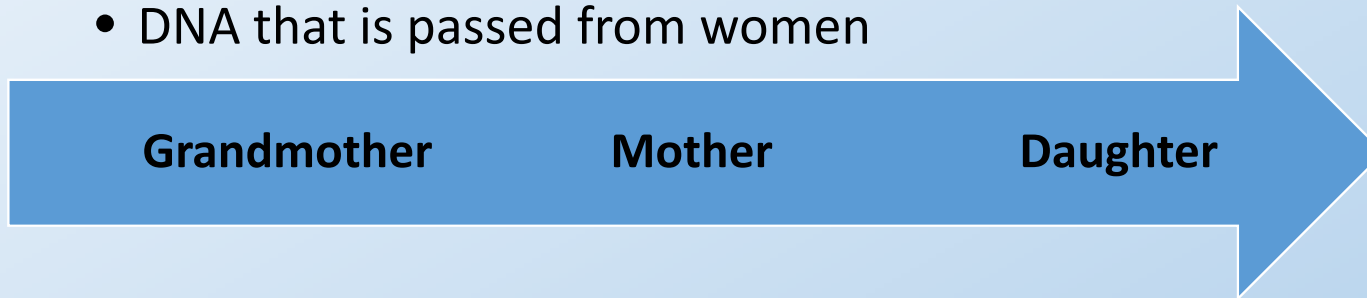
- “Homo” (Latin) means “man” or “human”
- “Sapiens” (Latin) means “wise” or “intelligent”
- “Homo sapiens” = “wise man” or “wise human”
- Humans and Neanderthals both considered “sapiens”
- Anatomically modern humans in Africa by 200,000 years ago



Mitochondrial “eve”

- **Mitochondrial DNA**

- DNA that is passed from women



- **Mitochondrial “Eve”**

- Lived 60,000 to 250,000 years ago
 - Most recent common female ancestor of all living humans
 - Lived in or around modern-day Tanzania in Africa
 - She was part of a group of early humans
 - But only her mitochondrial DNA survives today

Y-chromosomal “Adam”

- **Y-chromosome**

- DNA that is passed from men



- **Y-chromosomal “Adam”**

- Circa 60,000 years ago
- Most recent common male ancestor of all living humans
- Lived in Africa
- He lived as part of a group of early humans
 - But only his Y-chromosome survives today

Humans – *Homo sapiens* – “Us”

- **Fully modern humans (like us) in Africa by around 60,000 years ago**
 - Descendants of Mitochondrial Eve and Y-chromosomal Adam
 - Culture, language, music, etc.
- **“Out of Africa” theory**
 - **Archaeogenetics** (analysis of ancient and modern DNA) shows that humans began spreading throughout, and out of, Africa beginning around 60,000 years ago
- **Early human migrations**
 - Humans left southeastern Africa and spread throughout the continent
 - Humans traveled along the Indian Ocean to reach Australia
 - By 10,000 years ago, modern human beings had spread all over the globe

Australopithecus africanus

Southern

Ape

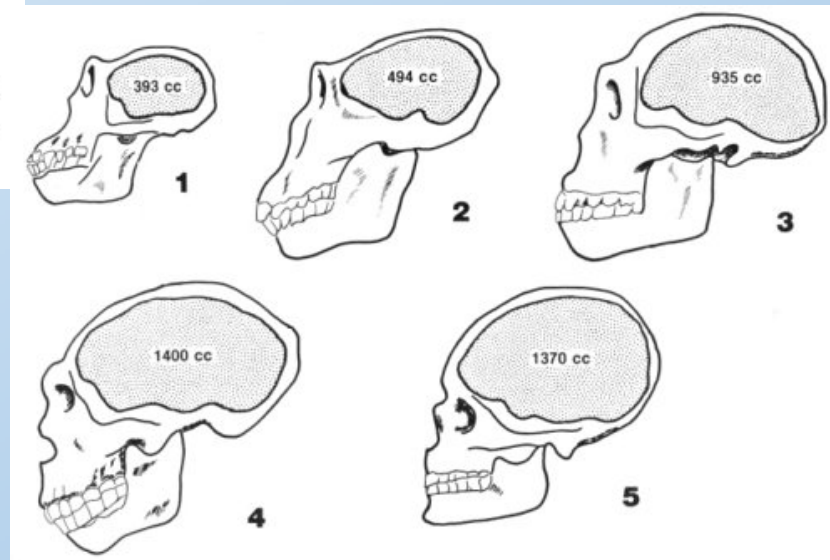
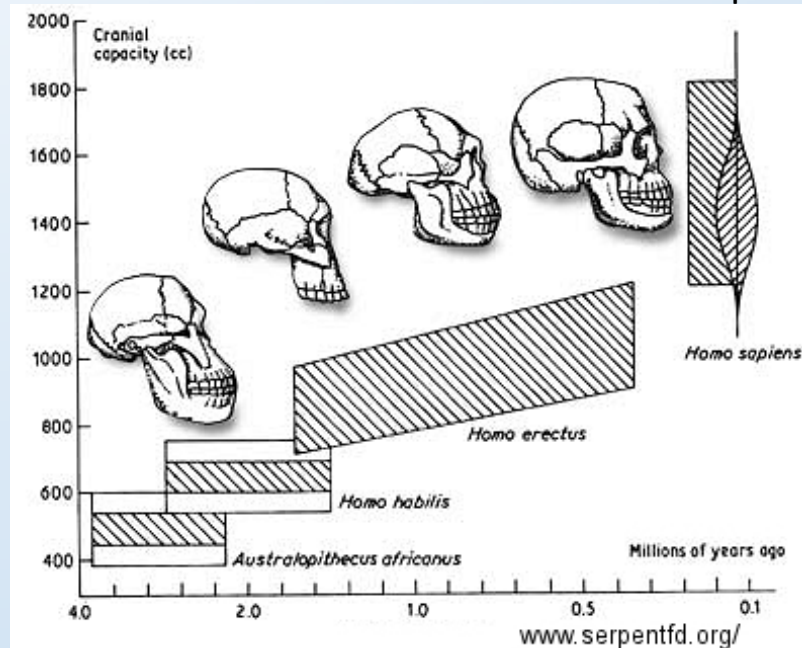
of

Africa

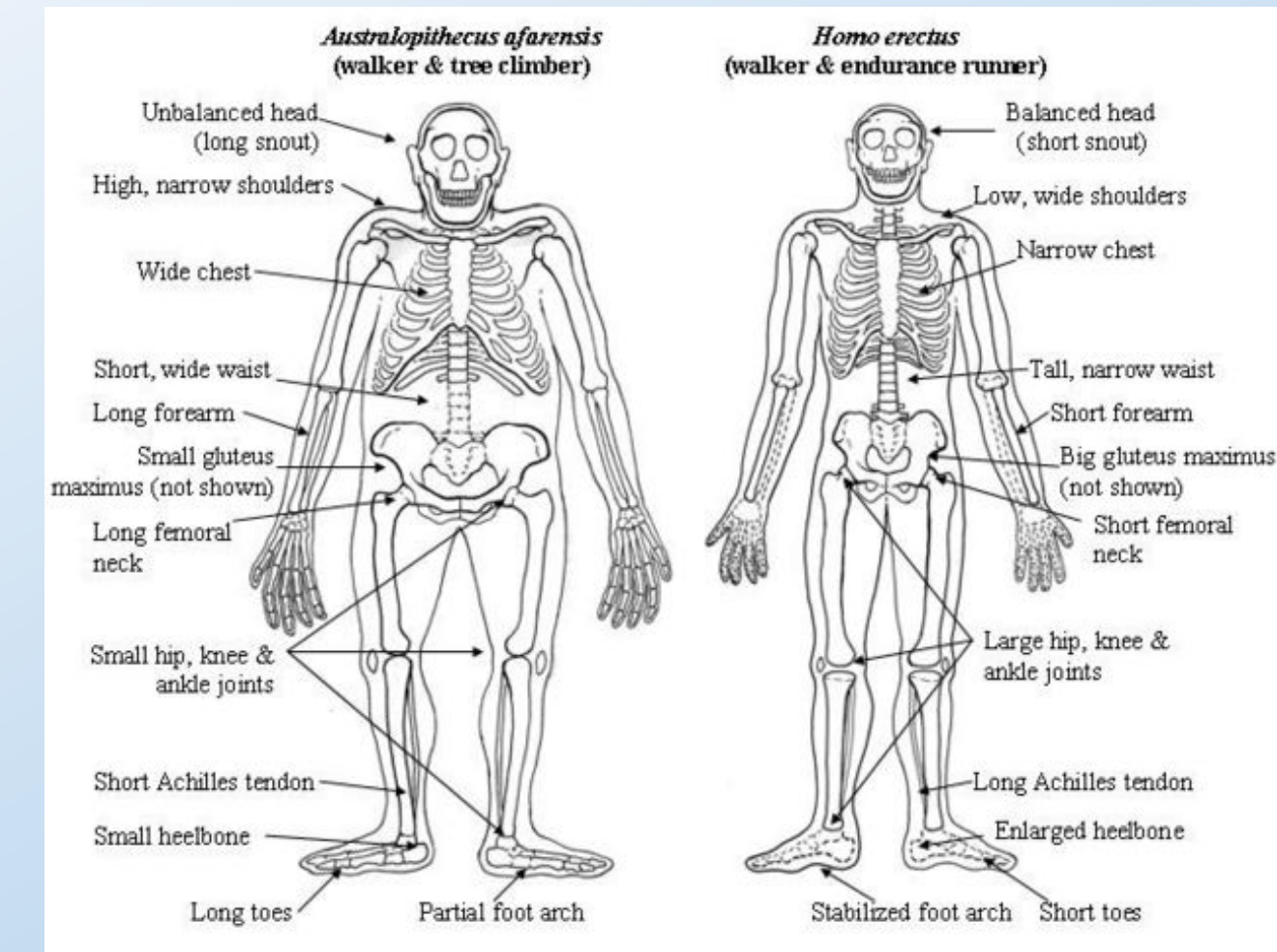


What exactly evolved? And why are these features so important? A summary...

Cranial Capacity | Brain Size

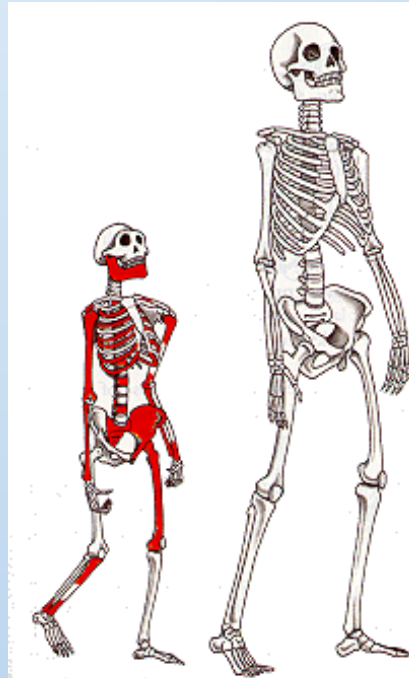
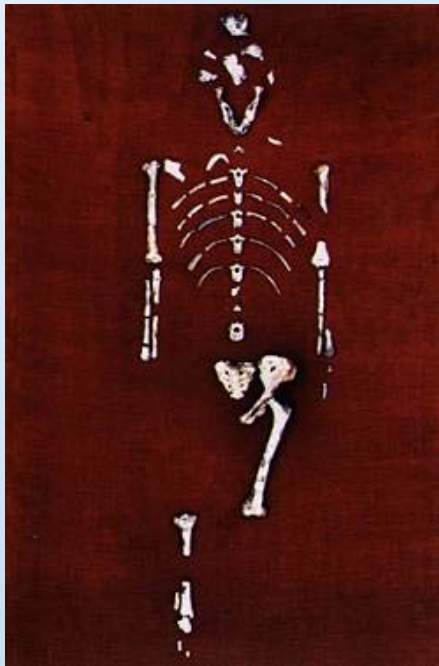


What makes Australopithicene different from Homo?

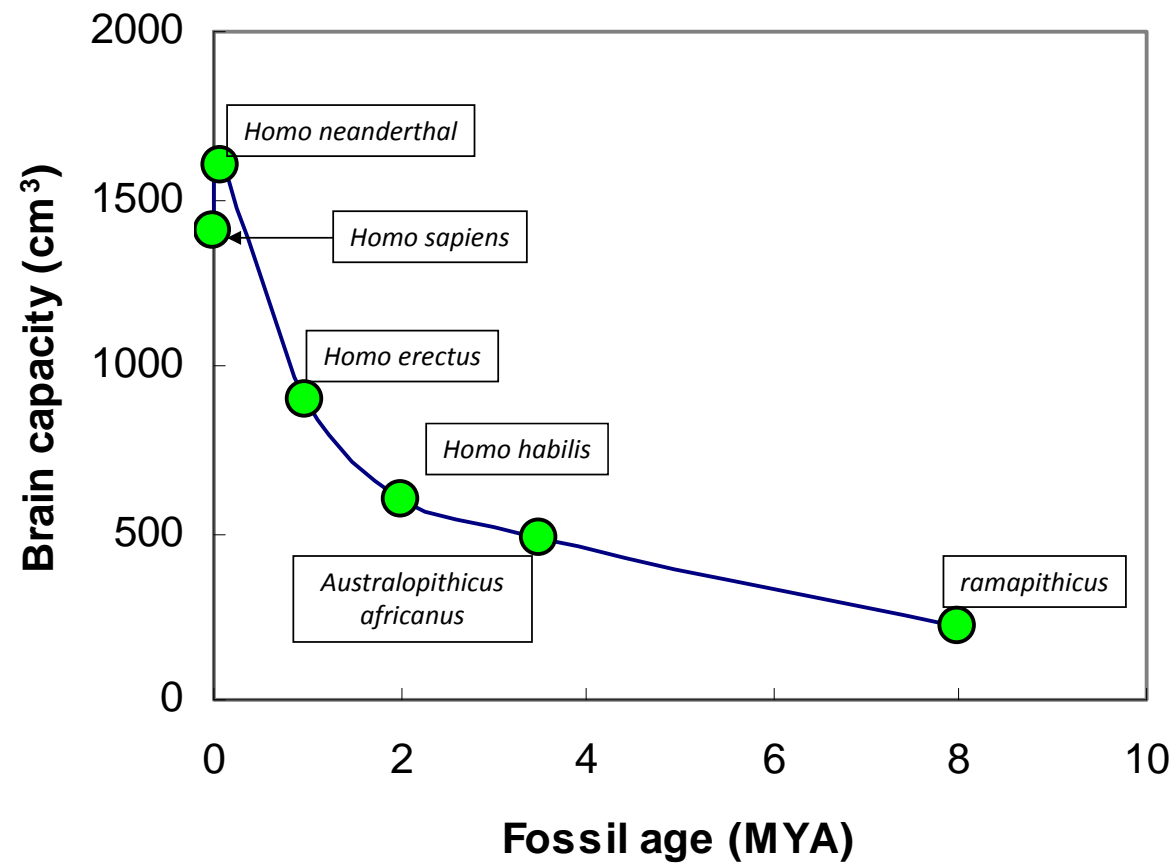


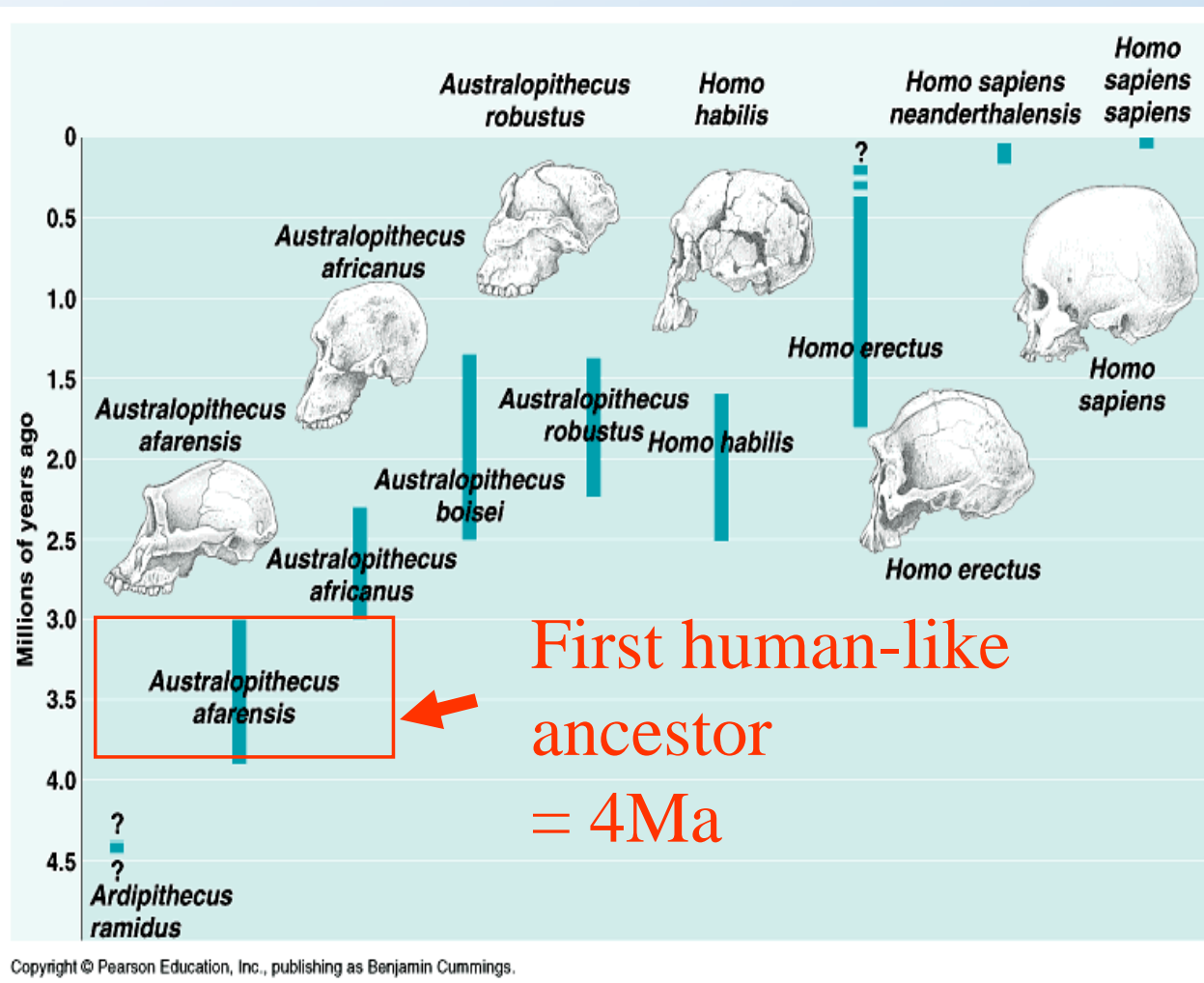
Australopithecus afarensis

Lucy, discovered in Ethiopia in 1974.



Ancient Walkway
Laetoli **Tanzania**





Homo habilis – “The Handy Man”



- 2.5-1.6 million years ago (in existence for 400,000 years)
- Brain size: highly variable from 500-800cc.
- Where: Throughout Africa
- First evidence of stone tool production and usage. (Sterkfontein)
- Sites: Sterkfontein, and Great Rift Valley: Omo, Hadar (Ethiopia), Olduvai Gorge (Tanz), Koobi Fora (Kenya)
- Fossil remains are very poor. Unknown whether evolved from *A. africanus* or *A. afarensis*.

Homo erectus - “Upright Man”

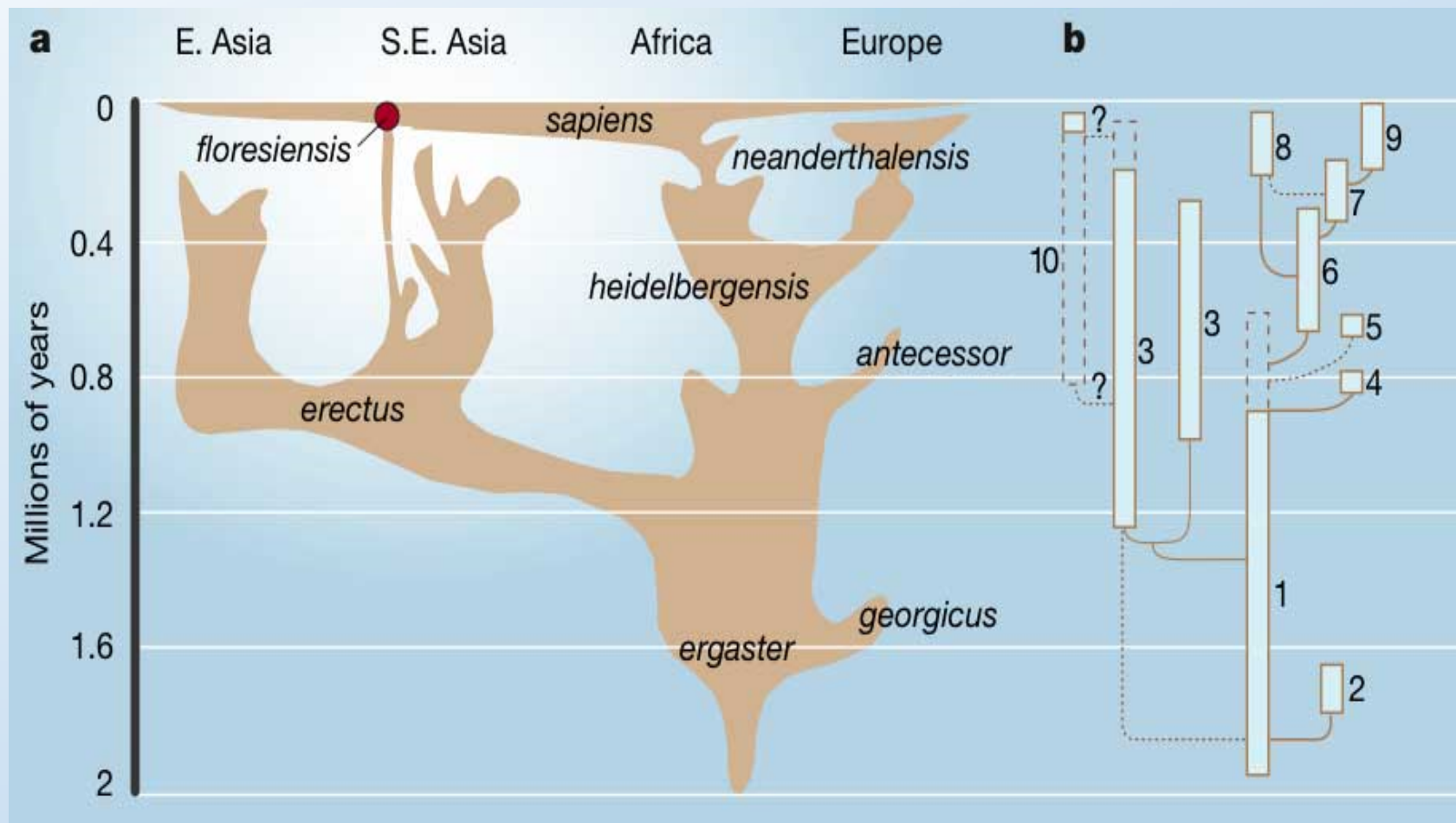


- 1.8 million – 400,000 years ago
- Brain size: 780-1225 cc (about 75% of *H. sapien* brain size)
- Where: Throughout Africa, China, Java
- Average height: 1.79m = 5'10"
- Skull: forehead less sloping and teeth smaller than *H. habilis*
- Tools: more sophisticated stone tool technology, from Oldowan to Acheulean (bifacial)
- First use of controlled fire ~ 790,000 years ago
- First hunter-gatherer society, infrequent group hunting
- Crude shelters, possibility for language usage
- Evidence of migration
- Sites: Lake Turkana (Kenya), Choukuotien – Peking Man (China), Java Man (Indonesia)

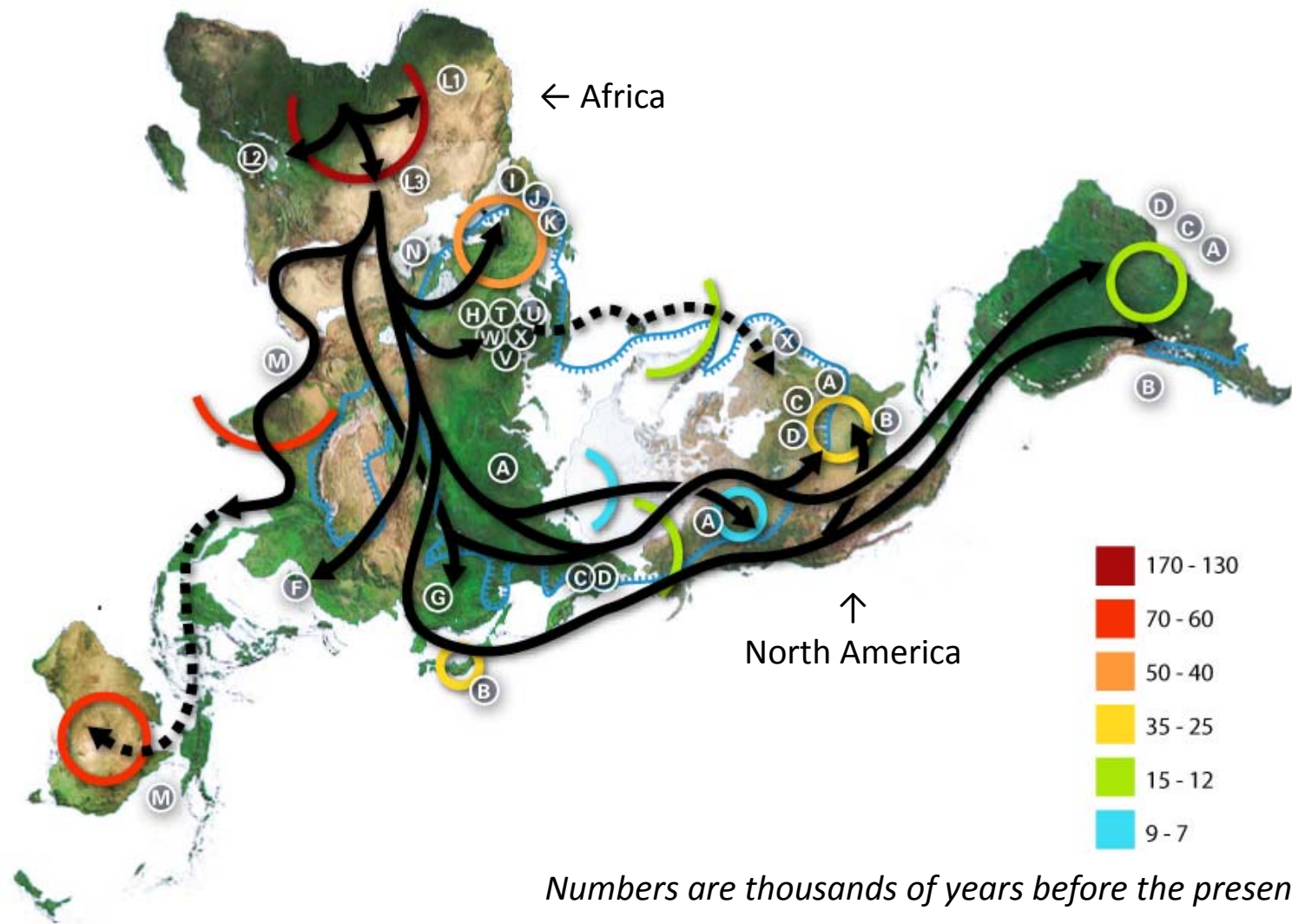
Homo neanderthalensis: “Neanderthals”



- 250,000 – 24,000 years ago
- Coexistence with *H. erectus* and *H. sapiens*. Are we related to Neanderthals? What happened to them?
- Brain capacity: 1200-1750 cc – larger than *Homo sapiens*!
- Average male height: 1.65 m tall (5' 5") ; Average female height: 1.53 to 1.57 m tall (5'–5'2").
- Skeletal differences: larger cranium, elongated skull, short but robust builds, and large noses — traits selected by nature in cold climates. Occipital bun. Hyoid bone.
- Where: Europe and western Asia
- Stone tool technology: Mousterian, characterized by Levallois technique (soft hammer percussion)
- whether modern man evolved from this hominid -- or was the Neanderthal a separate branch that became extinct?
- Burial of dead, personal adornment, clothing, simple language, ritual behavior, use of symbols
- Sites: Shanidar Cave (Iraq) flower burials – 60,000 years old, Kebara Cave (Israel) – 60,000 y.o., La Ferassie (France) oldest / most complete skeletons – 72,000 y.o.



Early Human Migrations: Route of mtDNA



Human Evolution

- ***Homo habilis***

- 2.4 to 1.4 million years ago
- Fossils found in southern and eastern Africa
- Used simple bone and stone tools
- Nicknamed “handy man”

- ***Homo erectus***

- 1.8 million years ago to 70,000 years ago
- First human ancestor to walk fully upright
- Some made complex stone tools
- Example – “Peking Man”
- Descendants were humans and Neanderthals

Neanderthals

- *Homo sapiens neanderthalensis*
- Circa 400,000 to 30,000 years ago
- Lived in Europe and Asia
- **Archaeogenetics** – analysis of ancient and modern DNA
 - Comparison of human and Neanderthal DNA shows that humans are not descended from Neanderthals
 - Genes reveal that Neanderthals had red hair and fair skin
 - Fair skin developed to aid in the absorption of Vitamin D from the sun in areas far north of the equator
 - **Convergent evolution** – different species (such as humans and Neanderthals) developing same characteristic(s)