


## Primates

### Characteristics of Primates

- Manual dexterity
  - Five digits on each hand and foot
  - Flat nails and sensitive areas on the ends of their digits
  - The first digits are opposable.

## Primates

### Senses

- Rely more on vision
- **Binocular vision** results in greater depth perception. 
- Color vision
- Decreased sense of smell
- Teeth are reduced in size and usually are unspecialized.

## Primates

### Locomotion

- Flexible bodies
- Limber shoulders and hips
- All primates except humans walk on all four limbs.

## Primates

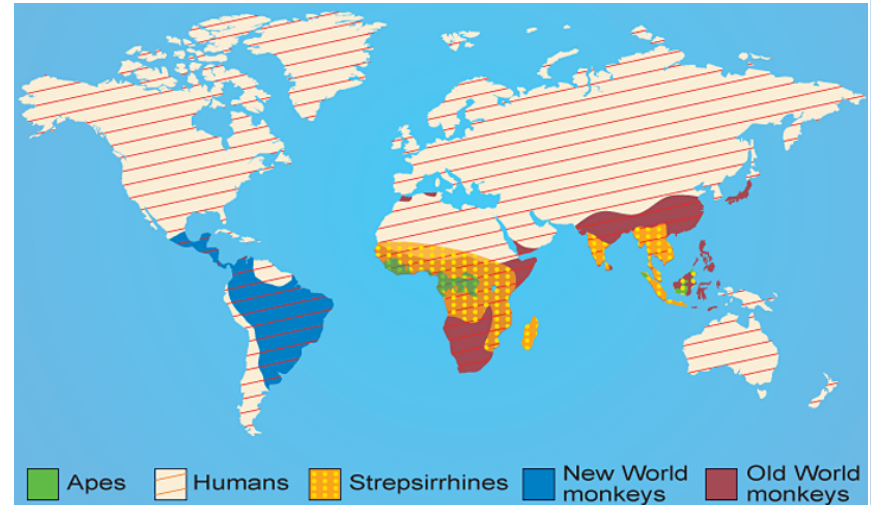
### Complex Brain and Behaviors

- Have large brains in relation to their body size
- Larger areas devoted to memory and coordinating arm and leg movement
- Problem-solving abilities
- Well-developed social behaviors

## Primates


### Reproductive Rate

- Have fewer offspring
- Newborns are dependent on their mothers for an extended period of time.
- Many are endangered.



## Primates

### Primate Groups

- **Arboreal**, or tree-dwelling 
- Terrestrial
- The strepsirrhines, or “wet-nosed”
- The haplorhines, or “dry-nosed”

**Section 1**

**Primate Evolution**

Concepts in Motion

**Visualizing Primates**



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## Primates

### Strepsirrhines

- Have large eyes and ears
- Rely predominantly on smell for hunting and social interaction
- Lemurs
- Sifakas
- Galagos
- Aye-eyes



Galago



**Section 1**

**Primate Evolution**

**Table 16.1** Characteristics of Strepsirrhines

| Group                | Active Period                    | Range                     | Characteristics   |
|----------------------|----------------------------------|---------------------------|---|
| <input type="text"/> | Large—diurnal<br>Small—nocturnal | Madagascar                | <ul style="list-style-type: none"> <li>• Vertical leaper</li> <li>• Uses long bushy tail for balance</li> <li>• Herbivores and omnivores</li> </ul> |
| <input type="text"/> | Nocturnal                        | Madagascar                | <ul style="list-style-type: none"> <li>• Taps bark, listens, fishes out grubs with long third finger</li> </ul>                                     |
| <input type="text"/> | Nocturnal                        | Africa and Southeast Asia | <ul style="list-style-type: none"> <li>• Small and slow climber, solitary</li> <li>• Lack tails</li> <li>• Some have toxic secretions</li> </ul>    |
| <input type="text"/> | Mostly nocturnal                 | Africa                    | <ul style="list-style-type: none"> <li>• Small and fast leaper</li> <li>• No opposable digit</li> <li>• Long tail</li> </ul>                        |

Lemurs

Lorises

Galagos

Aye-Ayes

Drag each option to its corresponding characteristics ↻

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## Primates

### Haplorhines

- Include tarsiers, monkeys, and apes
- The apes include gibbons, orangutans, gorillas, chimpanzees, and humans.
- The **anthropoids** are split into the New World monkeys and the Old World monkeys. 

## Primates

- The New World monkeys are a group of about 60 species of arboreal monkeys.
- They inhabit the tropical forests of Mexico, Central America, and South America.
- Most are diurnal and live together in social bands.
- Distinguished by their **prehensile tails** 

## Primates

- Old World monkeys live throughout Asia and Africa.
- Diurnal and live in social groups
- Noses tend to be narrower and their bodies are usually larger.
- None have prehensile tails, and some have no tails.
- Most Old World monkeys have opposable digits.

## **Primates**

- Apes have longer arms than legs, barrel-shaped chests, no tails, and flexible wrists.
- Highly social and have complex vocalizations
- Classified into two subcategories: the lesser apes and the great apes

## Primates

### Lesser Apes

- Asian gibbons
- Siamangs
- Generally move from branch to branch using a hand-over-hand swinging motion called brachiation



Gibbon

## Primates

### Great Apes

- Orangutans
- Gorillas
- Chimpanzees
- Humans



Orangutan

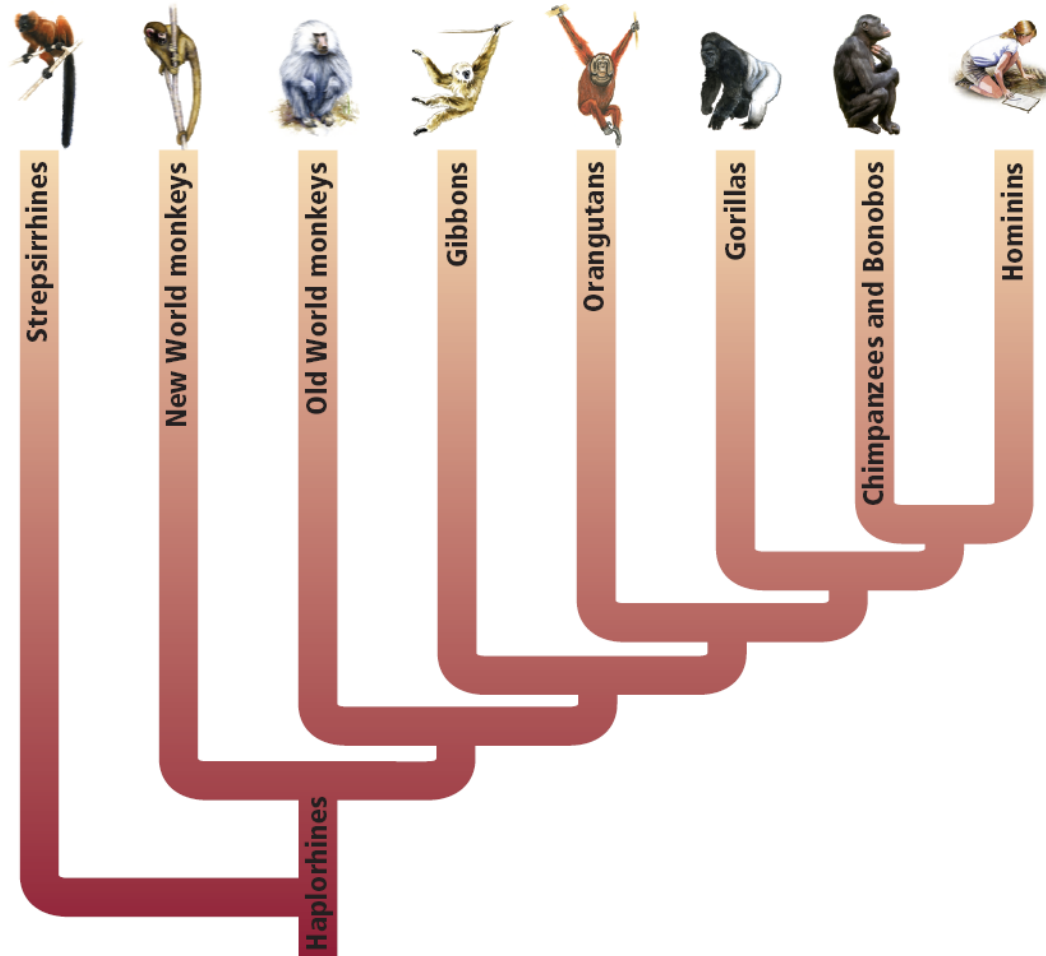
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# Primates

## Primate Evolution



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## Primates


- Primate fossils appear in the fossil record at the beginning of the Eocene, about 60 mya.
- Lemurlike primates were widespread by about 50 mya.
- By the end of the Eocene, 30–35 mya, the anthropoids had diverged and spread widely.

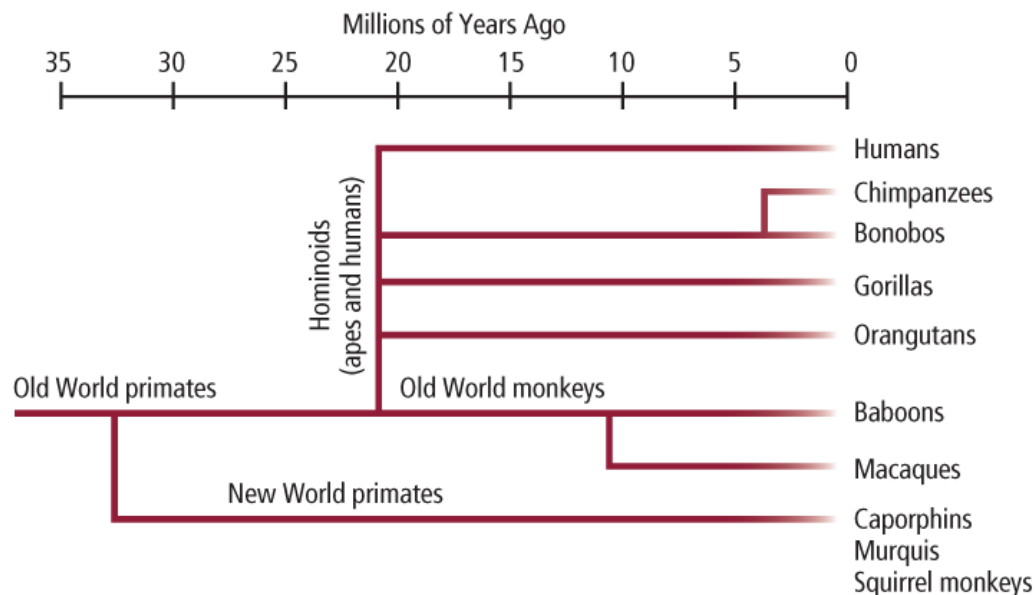
## Primates

- The end of the Eocene also saw the appearance of the monkeys.
- Many scientists hypothesize that New World monkeys evolved from an isolated group of ancestral anthropoids.
- In Africa and Asia, the anthropoids continued to evolve.

## Hominoids to Hominins

### Hominoids

- **Hominoids** include all nonmonkey anthropoids—the living and extinct gibbons, orangutans, chimpanzees, gorillas, and humans. 


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## Hominoids to Hominins

- Scientists use fossils to determine when ancestral hominoids diverged.
- Scientists also use biochemical data to.

## Hominoids to Hominins

### Hominins

- The lineage that most likely led to humans split off from the other African apes sometime between 8 and 5 mya.
- Hominins have bigger brains.
- Thinner and flatter face
- Smaller teeth
- High manual dexterity
- Bipedal 

## Hominoids to Hominins

### Chimpanzee

Skull attaches posteriorly

Spine slightly curved

Arms longer than legs and used for walking

Long, narrow pelvis

Femur angled outward

### Early hominin

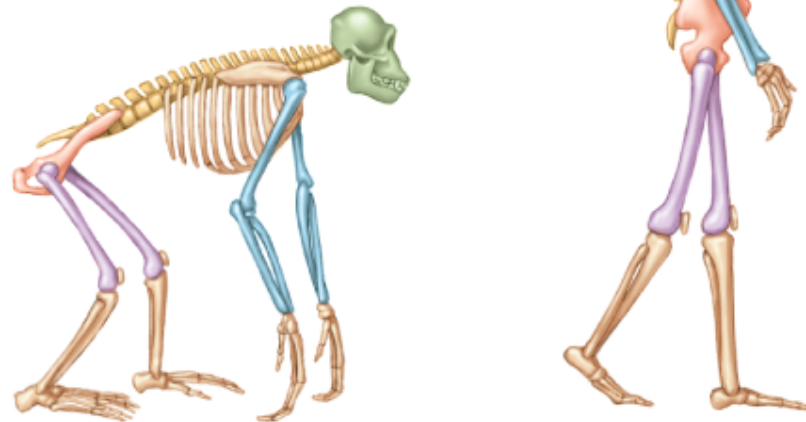
■ Skull attaches inferiorly

■ S-shaped spine

■ Arms shorter than legs and not used for walking

■ Bowl-shaped pelvis

■ Femur angled inward

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## Hominoids to Hominins

### Why bipedalism?

- A changing environment might have played only a minor role.
- Most successful hominins might have been those that evolved on the edge of the forest and savanna.

## Hominoids to Hominins

### Hominin Fossils

- **Australopithecines** lived in the east-central and southern part of Africa between 4.2 and 1 mya. 
- Small
- Apelike brains and jaws
- Teeth and limb joints were humanlike.



## Hominoids to Hominins

### Taung Baby

- The first australopithecine fossil discovered
- *Australopithecus africanus* likely lived between 3.3 and 2.3 mya.

### Lucy

- Lucy is one of the most complete australopithecine fossils ever found.
- She was a member of the species *A. afarensis*, which lived between 4 and 2.9 mya.


## Hominoids to Hominins

### *Paranthropus*

- Thrived between 2 and 1.2 mya
- An offshoot of the human line that lived alongside human ancestors but were not directly related

## Human Ancestry

### The Genus *Homo*

- The African environment became considerably cooler between 3 and 2.5 mya.
- *Homo* species had bigger brains, lighter skeletons, flatter faces, and smaller teeth than their australopithecine ancestors. 

## Section 3

# Primate Evolution



Concepts in Motion

**Table 16.2**

**Characteristics of the Homo species**

| Species              | Time in fossil record         | Characteristics  |
|----------------------|-------------------------------|--|
| <input type="text"/> | 2.4–1.4 million years ago     | <ul style="list-style-type: none"> <li>• Average brain had a capacity of 650 cm<sup>3</sup></li> <li>• Used tools</li> </ul>   |
| <input type="text"/> | 1.8–1.2 million years ago     | <ul style="list-style-type: none"> <li>• Average brain had a capacity of 1000 cm<sup>3</sup></li> <li>• Had thinner skull bones</li> <li>• Had humanlike nose</li> </ul>                                   |
| <input type="text"/> | 1.8 million–400,000 years ago | <ul style="list-style-type: none"> <li>• Average brain had a capacity of 1000 cm<sup>3</sup></li> <li>• Had thinner skull bones</li> <li>• Used fire</li> </ul>  |
| <input type="text"/> | 300,000–200,000 years ago     | <ul style="list-style-type: none"> <li>• Average brain had a capacity of 1500 cm<sup>3</sup></li> <li>• Buried their dead</li> <li>• Possibly had a language</li> </ul>                                    |
| <input type="text"/> | 195,000 years ago to present  | <ul style="list-style-type: none"> <li>• Average brain has a capacity of 1350 cm<sup>3</sup></li> <li>• Does not have browridge</li> <li>• Has a small chin</li> <li>• Has language and culture</li> </ul> |

Homo habilis

Homo erectus

Homo sapiens

Homo neanderthalensis

Homo ergaster

Drag each option to its corresponding characteristics ↻

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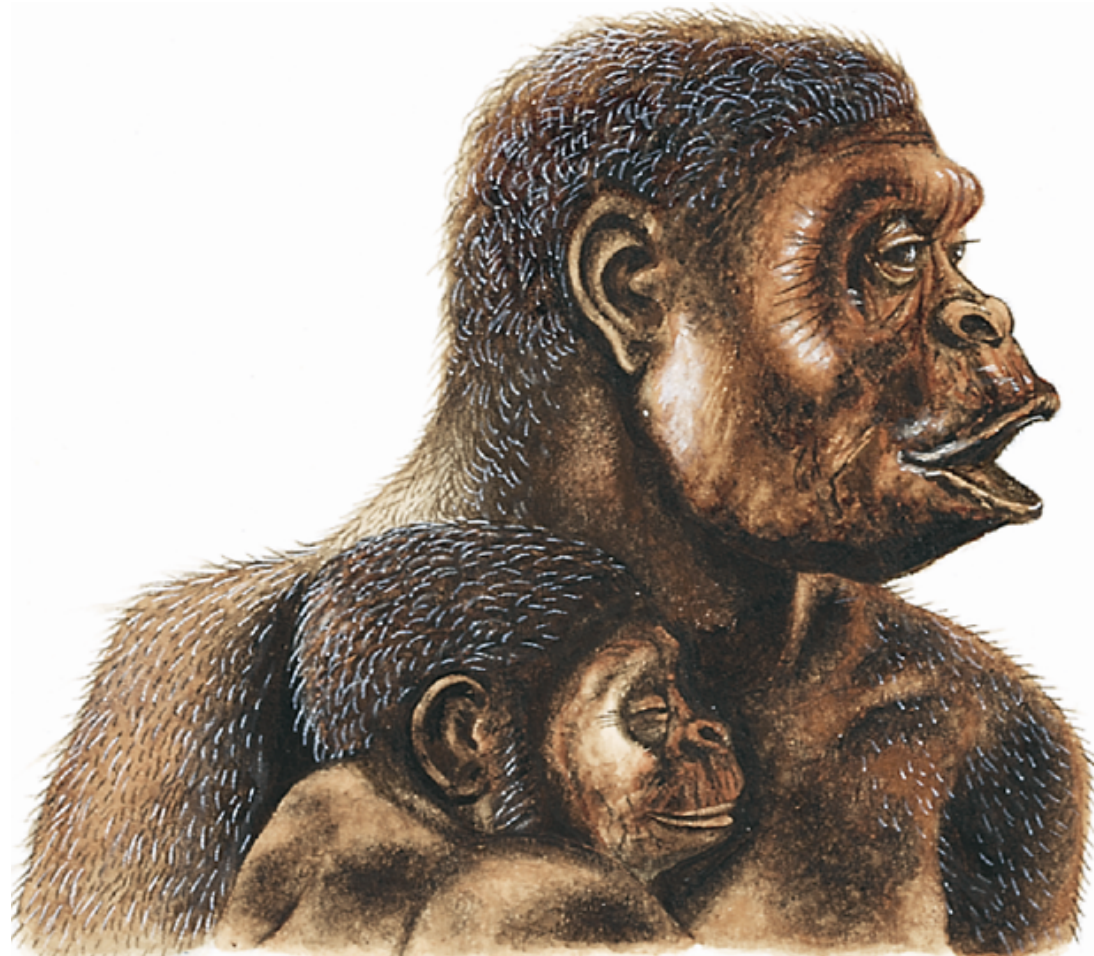
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## Human Ancestry

- *Homo habilis* lived in Africa between about 2.4 and 1.4 mya.
- Brain averaged 650 cm<sup>3</sup>
- Smaller brow
- Reduced jaw
- Flatter face
- More humanlike teeth
- Small, long-armed, and retained the ability to climb trees

## Human Ancestry



*Homo habilis*

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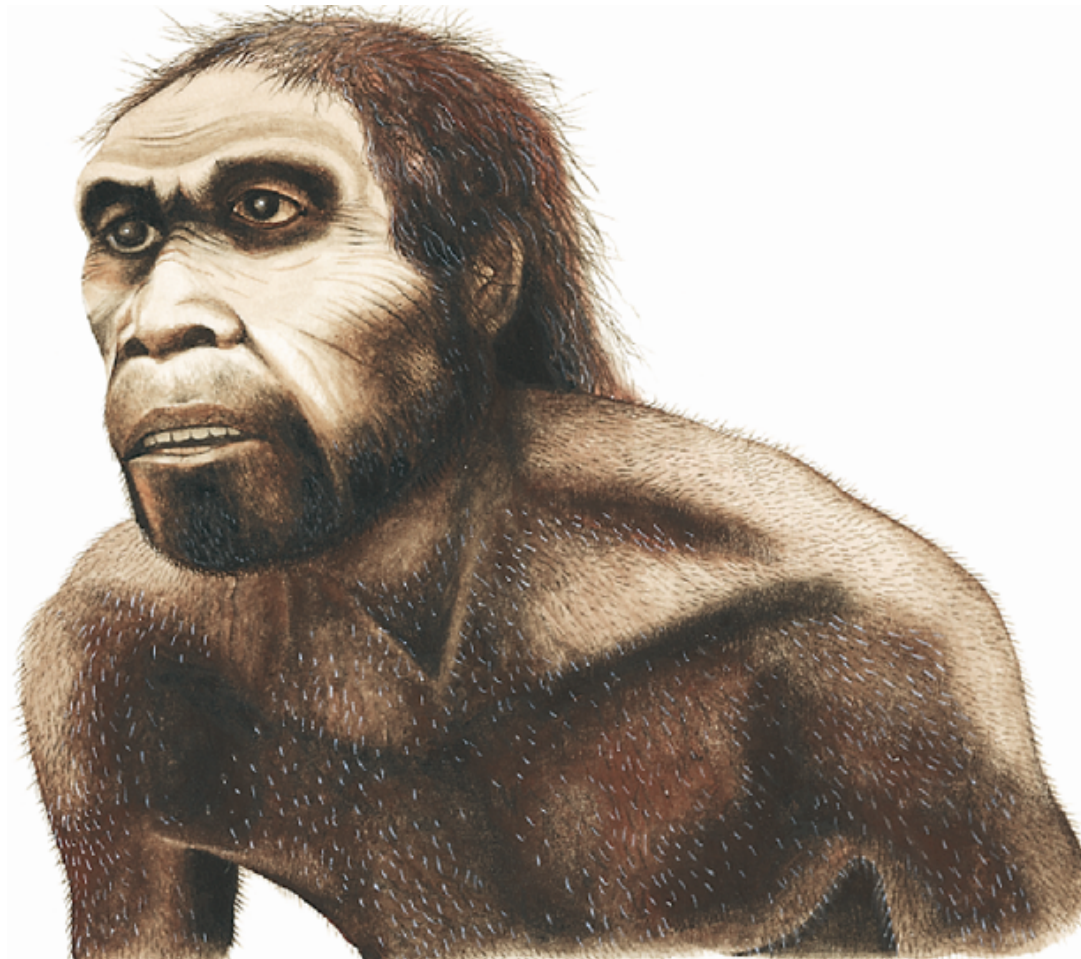


## Human Ancestry

- *Homo ergaster* emerged within 500,000 years of *H. habilis*.
- Taller
- Lighter
- Longer legs and shorter arms
- Brain averaged 1000 cm<sup>3</sup>



## Human Ancestry



*Homo ergaster*

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## Human Ancestry

- *H. ergaster* appears to have been the first African *Homo* species to migrate.
- Eurasian forms of *H. ergaster* are called *Homo erectus*.
- *H. erectus* lived between 1.8 million and 400,000 years ago.

## Human Ancestry

### *Homo erectus*

- Larger than *H. habilis*
- Brain capacity ranged from about 900 cm<sup>3</sup> to about 1100 cm<sup>3</sup>
- Longer skull, lower forehead, thicker facial bones, and a prominent browridge

## Human Ancestry

- *Homo floresiensis* lived about 18,000 years ago.
- About 1 m tall
- Brain and body proportions like all the australopithecines.

## Human Ancestry

- *Homo neanderthalensis* evolved exclusively in Europe and Asia about 200,000 years ago.
- Shorter but had more muscle mass
- Larger brains than modern humans
- Thick skulls, bony browridges, and large noses



## Human Ancestry

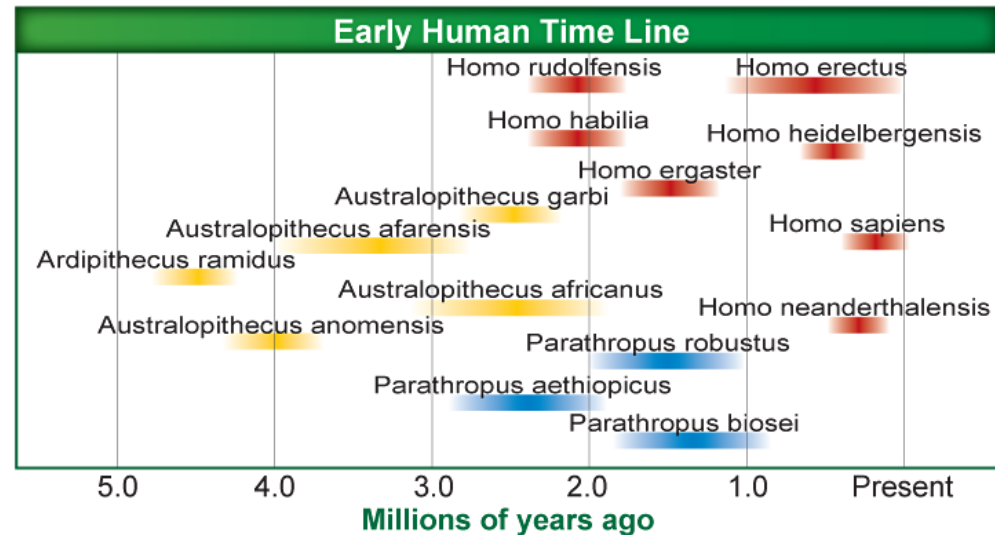
### Emergence of Modern Humans

- *Homo sapiens* is characterized by a more slender appearance than all other *Homo* species.
- Thinner skeletons, rounder skulls, and smaller faces with prominent chins
- Their brain capacity averages 1350 cm<sup>3</sup>.
- Appeared in the fossil record, in what is now Ethiopia, about 195,000 years ago

## Human Ancestry

### Out-of-Africa Hypothesis

- 200,000 years ago, a morphologically diverse genus of hominins were present.
- 30,000 years ago, only modern humans remained.
- Modern humans evolved only once, in Africa, and then migrated.



## Human Ancestry

### “Mitochondrial Eve”

- Mitochondrial DNA changes very little over time.
- The population with the most variation should be the population that has had the longest time to accumulate diversity.
- *H. sapiens* emerged in Africa about 200,000 years ago from a hypothetical “Mitochondrial Eve.”

## Human Ancestry

### Cro-Magnons

- Early modern humans expressed themselves symbolically and artistically.
- Developed sophisticated tools and weapons
- The first to fish, the first to tailor clothing, and the first to domesticate animals