Human Ancestry (Learning Objectives)

1. Identify the characters shared by all primates and relate them to the function they served in their common ancestor.

2. Learn the fields study of Human evolution

3. Identify the primates that are grouped together as anthropoids, hominoids, and hominids

4. Explain the two hypothesis for the dispersal of human from Africa to the rest of the world

5. Learn the features of hominins that distinguish them from other hominoids. Explain the importance of bi-pedalism for evolution of human species.

6. Relate the diet of primates and hominoids to their habitat. Explain how change of diet influenced dispersal of human species.

7. Recognize the evolution of several extinct hominid species, the scientific names of modern humans, and the latest species that became extinct approximately 30,000 years ago.

8. Review the common behavioral features of *Homo sapiens* and *Homo neanderthalensis*.

Use the PowerPoint presentation, your textbook, and the documentary [http://www.becominghuman.org/](http://www.becominghuman.org/)
Human Evolution

- Paleontology: Prehistoric times using fossil records
- Anthropology: Study of human culture or development with a historical comparative approach
- Molecular Evolution: Protein and DNA sequences, and Chromosomes
Molecular Evolution

Field of study using comparison of:
- DNA and protein sequences
- Chromosome banding
- Genome structure

Mutations occur in DNA over time
Comparing two DNA sequences
- Fewer changes indicate closer relation and more recent divergence
- More changes, more ancient divergence
Human Evolution

The human story begins with our primate heritage

Primates had evolved as small arboreal (tree-dwelling) mammals ~65 million years ago

Primates includes the lemurs, tarsiers, monkeys, and apes
Primate characters include
- Limber joints
- Grasping hands and feet with flexible digits
- A short snout
- Forward-pointing eyes that enhance depth perception

The squirrel-sized slender Loris
Three groups of primates

- Prosimians
  - Lorises, pottos, and lemurs
- Monkeys
  - New World monkeys
  - Old World monkeys
- Hominoids (apes)
  - Gibbons
  - Orangutans
  - Gorillas
  - Chimpanzees
  - Humans

Ancestral primate

Millions of years ago
The lorises, lemurs, and pottos make up the oldest group of primates.

The tarsiers form a second group of primates.
The anthropoid group includes monkeys and apes.
Hominoids or apes include
- Gibbons
- Orangutans
- Gorillas
- Chimpanzees
- Bonobos
- Hominins, including Humans
Three groups of primates

- Prosimians
  - Lorises, pottos, and lemurs
- Anthopoids
  - Monkeys
    - New World monkeys
    - Old World monkeys
  - Hominoids (apes)
    - Gibbons
    - Orangutans
    - Gorillas
    - Chimpanzees
    - Humans

Ancestral primate

Dryopithecus

Aegyptopithecus
Comparing Chimps and Humans

• We have more in common with chimpanzees than any other animal

• DNA hybridization and protein comparisons reveal that chimps and humans share 98.7% of their gene-encoding proteins

• Comparison of insertions and deletions (indels) suggests that our similarity is only about 96.6%!
Hominin

Ancestor to humans

Fossils from 4-19 MYA scarce

6 MYA hominin line broke off from apes

At least three candidates for first hominin

Ardipithecus kadabba (from Ethiopia)
Sahelanthropus tchadensis (from Chad)
Orrorin tugenensis (from Kenya)
Figure 16.3

Hominins

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Today

Gorilla

Chimpanzee

Bonobo

Neanderthals

Homo sapiens sapiens

Homo sapiens

Cro-magnons

Australopithecus boisei

Australopithecus robustus

Homo erectus

Homo habilis

Australopithecus garhi (2.8–2.5 MYA)

Australopithecus africanus (2.8 MYA)

Australopithecus afarensis (4.0–2.7 MYA)

Australopithecus anamensis (4.1 MYA)

Ardipithecus ramidus (4.4 MYA)

Ardipithecus kadabba (5.8–5.5 MYA)

Sahelanthropus tchadensis (6.0–7.0 MYA)

Orrorin tugenensis (6.0 MYA)

Common ancestor of apes and humans
Our Most Recent Ancestors

BRANCHING OF HUMANS FROM CHIMPS
- Sahelanthropus tchadensis
- Orrorin tugenensis
- Ardipithecus kadabba
- Australopithecus anamensis
- A. afarensis (Lucy)
- A. garhi
- Homo habilis
- H. erectus
- H. neanderthalensis
- H. floresiensis (the Hobbit)
- H. sapiens

Meat eater
Cave dweller, intense care for young
Social, male/female bonds, used fire, left Africa

Figure 16.9
Major milestones in hominid evolution included:

- The appearance of bipedalism
- A larger brain
- Parental care

Bipedalism preceded the evolution of the enlarged brain

Hominid traits include:

- Language and symbolic thought
- The use of complex tools
- Social grouping & pair-bonding

http://www.msnbc.msn.com/id/36783026/ns/technology_and_science-science/
Human Traits???

• Verbal communication using speech and language
  – a genetic trait in humans, the *FOXP2* gene (100,000 years ago)
  – a prerequisite for the development of **human culture**
  – relies fine control of the larynx and mouth, absent in chimpanzees and other great apes

• Agriculture about 10,000 to 15,000 years

• Complex tools
Human Migration Out of Africa

Two main hypotheses have been proposed to explain the expansion of modern humans from Africa into rest of the world

1. Out of Africa or replacement hypothesis
2. Multiregional hypothesis

Comparison of mtDNA, Y chromosome and autosome sequences supports the Out of Africa hypothesis
1. Out of Africa or replacement hypothesis
   - Within Africa, *Homo sapiens* evolved from *Homo erectus*
   - Descendants migrated from Africa about 56,000 years ago to replace hominids living in Europe, Asia, and Middle East

2. Multiregional hypothesis
   - *Homo erectus* migrated out of Africa to Europe, Asia, and Middle East
   - Evolution of *Homo sapiens* occurred in multiple locations with interbreeding between populations
Neanderthals Revisited

Neanderthals had variants of the *FOXP2* gene
- Possible speech

Some had mutations in the *MC1R* gene
- Had pale skin and red hair

Figure 16.19
Human Lineage Markers

Mitochondrial DNA (mtDNA)
- Used to trace maternal lineage
- Lack of DNA repair in mitochondria leads to a faster mutation rate

Y chromosome
- Sons inherit it from their fathers
- Used to trace male lineage
– The Neanderthals preceded *H. sapiens* into Europe and became extinct about 30,000

Becoming Human

http://www.becominghuman.org/