MAMMALS
WHAT MAKES A LIVING MAMMAL?

- Hair

- Sweat glands, including those that produce milk (mammary glands)
CHARACTERISTICS OF MAMMALS
(ALSO FOUND IN OTHER ORGANISMS)

- Four-chambered hearts
- Air breathers
- Endotherms that generate body heat internally
Mammary glands and hair are not preserved in the fossil record.

The first ancestors of mammals diverged from ancient reptiles during the Permian Period, 290–250 mya.

For millions of years, various mammal-like reptiles lived alongside dinosaurs.
The first true mammals appeared during the late Triassic period, about 220 mya

- Small, resembling modern tree shrews

When the dinosaurs disappeared, mammals underwent a burst of adaptive radiation

We define fossilized animals as “mammals” based on the presence of specific bones

Living mammals use two bones for hearing that were used for eating by their ancestors
During continental drift, three groups of mammals became isolated from one another about 60 mya.

Surviving members continue to inhabit Earth today:
- Monotremes
- Marsupials
- Placental mammals
The mammalian body has adapted in varied ways to a great many habitats.
BODY TEMPERATURE CONTROL: ENDOTHERMS

- Do not rely on the sun to keep warm

- **Subcutaneous fat**: layer of fat cells beneath the skin that helps conserve body heat

- Many also have sweat glands that help cool the body

- **Homeostasis**: The ability of mammals to regulate their body heat
As mammals evolved, the form and function of their jaws and teeth became adapted to eat foods other than insects.

- Teeth
- Digestive tract
• All mammals use lungs to breathe

• Lungs are controlled by two sets of muscles

• **Diaphragm**: large, flat muscle at the bottom of the chest cavity that contracts during breathing, pulling the bottom of the chest cavity down and increasing its volume
CIRCULATION

- Two completely separate loops
- Four chambered heart
- Efficient at transporting materials throughout the body
EXCRETION

• The kidneys of mammals help maintain homeostasis by filtering urea from the blood, as well as by excreting excess water or retaining needed water

• Allows them to live in many habitats
Mammals have the most highly developed brains of any animals.

- **Cerebrum**: thinking and learning
- **Cerebellum**: controls muscular coordination
- **Medulla oblongata**: involuntary body functions, such as breathing and heart rate
MOVEMENT

• Mammals have evolved a variety of adaptations that aid in movement

• Backbone that flexes vertically and side to side

• Shoulder and pelvic girdles have become more streamline
Internal fertilization

Male deposits sperm inside the reproductive tract of the female, where fertilization occurs

Classified into three groups based on their modes of development and birth

Many newborn mammals can stand up and move on their own a short time after birth

Some cannot and depend on their mother for food and protection
Mammals

**Vertebrates**

- **Common characteristics**
  - Hair or fur
  - Specialized teeth
  - Endothermic
  - Mammary glands

**Types:**
- **Monotremes** – eggs
- **Marsupials** – pouches
- **Eutherians** – placental mammals

A single brown bat can catch 1,200 mosquito-sized insects in one hour.

There are fewer than ten venomous mammals, including several species of shrew and the monotreme platypus!

Aquatic mammals have fins that evolved from legs.

All mammals (even whales & dolphins) must breathe air.

A newborn kangaroo is about one inch in length.

Mammals are the only animals with hair.

Cheetahs cannot roar—they chirp!

The American opossum gives birth just 12 days after conception.

Bats are the only mammal capable of flight.

A large kangaroo can cover more than 30 feet with each jump.

Reaching up to 140 lbs., the capybara is the largest rodent in the world.
# DIVERSITY OF MAMMALS

<table>
<thead>
<tr>
<th>Order</th>
<th>Approximate Number of Living Species</th>
<th>Main Characteristics</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monotremata</td>
<td>3</td>
<td>The only egg-laying mammals; once widespread, now found only in Australia and New Guinea</td>
<td>Platypus, echidnas</td>
</tr>
<tr>
<td>Marsupialia</td>
<td>280</td>
<td>Primitive mammals; have an abdominal pouch in which young are reared</td>
<td>Kangaroos, koalas, opossums</td>
</tr>
<tr>
<td>Rodentia</td>
<td>1,814</td>
<td>Small herbivores with chisel-like, incisor teeth that grow continuously</td>
<td>Squirrels, rats, mice, beavers, porcupines</td>
</tr>
<tr>
<td>Chiroptera</td>
<td>986</td>
<td>The only flying mammals; elongated fingers that support a thin wing membrane; mainly fruit or insect eaters; many fly at night, navigating by sonar</td>
<td>Bats</td>
</tr>
<tr>
<td>Insectivora</td>
<td>390</td>
<td>Small, chiefly night-active mammals; feed on insects; sharp-nosed; spend most of their time underground; the most primitive placental mammals</td>
<td>Moles, shrews, hedgehogs</td>
</tr>
<tr>
<td>Carnivora</td>
<td>240</td>
<td>Land-living predators; teeth adapted for seizing prey and shearing flesh; there are no native families in Australia</td>
<td>Dogs, bears, cats, wolves, otters, weasels</td>
</tr>
<tr>
<td>Primates</td>
<td>233</td>
<td>Largely tree dwellers; binocular vision and an opposable thumb; large brains; the end product of a line that branched off early from other mammals; retains many primitive characteristics</td>
<td>Prosimians, apes, monkeys, humans</td>
</tr>
<tr>
<td>Artiodactyla</td>
<td>211</td>
<td>Hooved mammals with two or four toes; large herbivores; most are grazers</td>
<td>Sheep, pigs, cattle, deer, giraffes</td>
</tr>
<tr>
<td>Cetacea</td>
<td>79</td>
<td>Aquatic, streamlined bodies; front limbs modified into broad flippers; no hind limbs; nostrils are blowholes on top of head; hairless except for muzzle</td>
<td>Whales, dolphins, porpoises</td>
</tr>
<tr>
<td>Lagomorpha</td>
<td>69</td>
<td>Rodentlike mammals with four upper incisors, rather than the two seen in rodents; hind legs often longer than forelegs, an adaptation for jumping</td>
<td>Rabbits, hares, pikas</td>
</tr>
<tr>
<td>Pinnipedia</td>
<td>34</td>
<td>Marine carnivores with limbs modified for swimming; feed mainly on fish</td>
<td>Seals, sea lions, walruses</td>
</tr>
<tr>
<td>Edentata</td>
<td>30</td>
<td>Mostly insect eaters; many are toothless, but some have degenerate, peglike teeth</td>
<td>Sloths, antelopes, armadillos</td>
</tr>
<tr>
<td>Perissodactyla</td>
<td>17</td>
<td>Hooved mammals with one or three toes; herbivores with teeth adapted for chewing</td>
<td>Horses, zebras, rhinoceroses, tapirs</td>
</tr>
<tr>
<td>Proboscidea</td>
<td>2</td>
<td>Enormous herbivores with long trunks; two upper incisors elongated as tusks; the largest living land animals</td>
<td>Elephants</td>
</tr>
</tbody>
</table>
DIVERSITY OF MAMMALS

• Class Mammalia contains about 4500 species

• Diversity is astonishing!

• Best way to characterize mammals: by the way they reproduce and develop
MONOTREMES

• Lay eggs

• Share two notable characteristics with reptiles:
  – The reproductive system and the urinary system open into a cloaca similar than that of reptiles
  – Reproduction resembles that of reptiles, as the female lays soft-shelled eggs incubated outside of her body

• The young are nourished by their mother’s milk
MONOTREMES

- Three species exist today
  - Duckbill platypus
  - Two species of spiny anteaters, or echidnas
- Found in Australia and New Guinea
**Echidna (four species)**
- aka “spiny anteater”
- Females lay eggs directly into a rudimentary pouch, where they are incubated and nursed after hatching.

**Platypus (only one species)**
- Many sensitive electroreceptors in bill
- Males have venomous spurs on hind feet

**Monotreme** – ("single hole")
- Egg-laying mammals
- “Single opening” – urinary, defecatory, and reproductive systems all empty into the same opening called the cloaca
- Soft-shelled eggs are nourished by the mother internally for a time and then incubated outside the body until they hatch.
- After hatching, the young are nourished by mother’s milk, which they lick from pores on the surface of her abdomen.
- Only found in Australia and New Guinea
• Bear live young that complete their development in an external pouch

• The tiny embryo leaves the mother’s body, crawls along her fur and into a pouch

• Marsupium: the pouch in which the embryo feeds on milk for several months

• Kangaroos, koalas, wombats
**PLACENTAL MAMMALS**

- **Placenta**: organ in placental mammals through which nutrients, oxygen, carbon dioxide, and wastes are exchanged between embryo and mother.

- Mice, cats, dogs, whales, elephants, humans, sea lions, etc.
Marsupials

- Cloaca for urination & defecation, but separate opening for reproductive tract
- Very short pregnancies (typically 4 – 5 weeks)
- Embryo is very under-developed at birth
- Newborn uses forelimbs to climb into pouch and attach to a nipple.
- A few species do not have pouches (i.e. numbats).

Examples:
- Koalas
- Kangaroos
- Opossums
- Tasmanian devils
- Wombats
- Sugar gliders
- Numbats
- Tasmanian tigers
## Placental Mammals

<table>
<thead>
<tr>
<th>Order</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edentata</td>
<td>Toothless or with poorly developed teeth that lack enamel; found only in the Western Hemisphere</td>
</tr>
<tr>
<td>Macroscelidea</td>
<td>Ground-dwelling insect eaters; long, flexible snout; hop about somewhat like small kangoaroos</td>
</tr>
<tr>
<td>Scandentia</td>
<td>Omnivorous; small, squirrel-like mammals; long snout, sharp teeth; live mainly on the ground, despite their name</td>
</tr>
<tr>
<td>Pholidota</td>
<td>Body covered with overlapping scales; no teeth; very long tongue for capturing ants</td>
</tr>
<tr>
<td>Hyracoidea</td>
<td>Rabbitlike body; short ears; four hoofed toes on front feet; three hoofed toes on back feet</td>
</tr>
<tr>
<td>Dermoptera</td>
<td>Squirrel-like; glide on a sheet of skin stretching between their forelegs and hind legs</td>
</tr>
<tr>
<td>Tubulidentata</td>
<td>Nocturnal; piglike body; big ears; long snout used to feed on ants and termites</td>
</tr>
</tbody>
</table>
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:
1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:
1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. **Rodents** (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. **Chiropterans** (928 species) – bats
3. **Insectivores** (429 species) – shrews, hedgehogs, moles
4. **Carnivores** (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. **Primates** (236 species) – lemurs, tarsiers, monkeys, chimpanzees, gorillas, humans
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. Primates (236 species) – lemurs, tarsiers, monkeys, chimpanzees, gorillas, humans
6. Artiodactyls (220 species) – cattle, sheep, goats, pigs, ibex, giraffes, hippopotami, camels, antelopes, deer, gazelles
**Placental Mammals**

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

**Some of the major classes of eutherians:**

1. **Rodents** (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. **Chiropterans** (928 species) – bats
3. **Insectivores** (429 species) – shrews, hedgehogs, moles
4. **Carnivores** (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. **Primates** (236 species) – lemurs, tarsiers, monkeys, chimpanzees, gorillas, humans
6. **Artiodactyls** (220 species) – cattle, sheep, goats, pigs, ibex, giraffes, hippopotami, camels, antelope, deer, gazelles
7. **Lagomorphs** (80 species) – hares, rabbits
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. Primates (236 species) – lemurs, tarsiers, chimpanzees, gorillas, humans
6. Artiodactyls (220 species) – cattle, sheep, goats, ibex, giraffes, hippopotami, antelope, deer, gazelles
7. Lagomorphs (80 species) – hares, rabbits
8. Cetaceans (78 species) – whales, dolphins, porpoises
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. Primates (236 species) – lemurs, tarsiers, monkeys, chimpanzees, gorillas, humans
6. Artiodactyls (220 species) – cattle, sheep, goats, pigs, ibex, giraffes, hippopotami, camels, antelope, deer, gazelles
7. Lagomorphs (80 species) – hares, rabbits
8. Cetaceans (78 species) – whales, dolphins, porpoises
9. Xenarthrans (29 species) – sloths, anteaters, armadillos
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. Primates (236 species) – lemur, tarsiers, monkeys, chimpanzees, gorillas, humans
6. Artiodactyls (220 species) – cattle, sheep, goats, pigs, ibex, giraffes, hippopotami, camels, antelope, dear, gazelles
7. Lagomorphs (80 species) – hares, rabbits
8. Cetaceans (78 species) – whales, dolphins, porpoises
9. Xenarthrans (29 species) – sloths, anteaters, armadillos
10. Perissodactyls (18 species) – horses, tapirs, rhinoceroses, zebras
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. Primates (236 species) – lemurs, tarsiers, monkeys, chimpanzees, gorillas, humans
6. Artiodactyls (220 species) – cattle, sheep, goats, pigs, ibex, giraffes, hippopotami, camels, antelope, deer, gazelles
7. Lagomorphs (80 species) – hares, rabbits
8. Cetaceans (78 species) – whales, dolphins, porpoises
9. Xenarthrans (29 species) – sloths, anteaters, armadillos
10. Perissodactyls (18 species) – horses, tapirs, rhinoceroses, zebras
11. Sirenians (5 species) – manatees, dugongs
Placental Mammals

- Placenta – organ that facilitates exchange of nutrients and wastes between mother’s blood and the embryo’s
- Allows for longer period of development and protection in the womb

Some of the major classes of eutherians:

1. Rodents (2024 species) – mice, rats, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas
2. Chiropterans (928 species) – bats
3. Insectivores (429 species) – shrews, hedgehogs, moles
4. Carnivores (271 species) – dogs, cats, foxes, bears, raccoons, weasels, seals, walruses
5. Primates (236 species) – lemurs, tarsiers, monkeys, chimpanzees, gorillas, humans
6. Artiodactyls (220 species) – cattle, sheep, goats, pigs, ibex, giraffes, hippopotami, camels, antelope, deer, gazelles
7. Lagomorphs (80 species) – hares, rabbits
8. Cetaceans (78 species) – whales, dolphins, porpoises
9. Xenarthrans (29 species) – sloths, anteaters, armadillos
10. Perissodactyls (18 species) – horses, tapirs, rhinoceroses, zebras
11. Sirenians (5 species) – manatees, dugongs
12. Proboscideans (2 species) – elephants
**FUN FACTS ABOUT ANIMALS**

- The oldest living sponges are thought to be over 1500 years old.  
**Hummingbirds are the only birds that can fly backwards.**
- Bengal tigers are the most water loving of the big cats. They will even chase prey into the water.
- An ostrich's eye is bigger than its brain.
- Camels have three eye lids.
- **Only adult male crickets can chirp.**
- A beaver can hold it's breath for 45 minutes.
- No two zebras have the same striped pattern.
- A goldfish has a memory span of three seconds.
- The cheetah is the only cat that can’t retract its claws.
- A chameleon's tongue can be twice the length of its body.
- The longest recorded life span of a tapeworm was 35 years!
- An elephant calf can weigh up to 260 pounds when it is born.
- **Flying squirrels don’t really fly, they glide from branch to branch.**
BIOGEOGRAPHY OF MAMMALS

• Similar ecological opportunities on the different continents have produced some striking examples of convergent evolution in mammals
PRIMATES AND HUMAN ORIGINS

• Our species *Homo sapiens* belongs to the order that also includes:
  
  • Lemurs
  
  • Monkeys
  
  • Apes
PRIMATES AND HUMAN ORIGINS

• Binocular vision
• Well developed cerebrum
• Fingers and toes
• Arms that can rotate their shoulder joints
FINGERS, TOES, AND SHOULDERS

• Normally have 5 flexible fingers that can curl around objects

• Most also have flexible toes

• Flexible digits enable many primates to run along tree limbs and swing from branch to branch with ease
Arms are well adapted to climbing because they can rotate in broad circles.

Opposable digits (i.e. the thumb) allows primates to hold objects firmly in their hands or feet.
The large and intricate cerebrum of primates enables them to display more complex behaviors than any other mammals.

Elaborate social behaviors:
- Adoption of orphans
- Warfare between rival primate troops
Most have a flat face

Both eyes face forward with overlapping fields of view

The ability to merge visual images from both eyes, thereby providing depth perception and a three-dimensional view of the world

Good for judging the location of tree branches, from which many primates swing
• **Prosimians**: primates that evolved from two of the earliest branches look very little like typical monkeys

• **Anthropoids**: members of the more familiar primate group that includes monkeys, apes, and humans
With few exceptions, those alive today:

- Small, nocturnal primates
- Large eyes adapted to seeing in the dark
- Many have dog–like snouts
- Bush babies of Africa, lemurs of Madagascar, lories and tarsiers of Asia
**Anthropoids**

- Human-like primates
- Split very early in its evolutionary history into two major branches as drifting continents moved apart
- New World Monkeys
- Old World Monkeys
NEW WORLD MONKEYS

- Central and South America
- Squirrel monkeys
- Spider monkeys
- Live almost entirely in trees
- Long, prehensile tail: can serve as a fifth hand
OLD WORLD MONKEYS

- Africa and Asia
- Spent time in trees but lack prehensile tails
Hominoids/Hominids: the great apes that include:

- Gibbons
- Orangutans
- Gorillas
- Chimpanzees
- Humans
OLD WORLD MONKEYS

- Chimpanzees are humans’ closest relatives among the great apes
- Human and chimps share 98% of their DNA
Around 6 mya, the hominid line gave rise to a branch that ultimately led to the ancestors and closest relatives of modern humans.

Extinct and extant humans, chimpanzees, bonobos, gorillas, and orangutans.
WHAT IS A HOMINID?

• Large brains

• Bipedal: term used to refer to two-footed locomotion

• Oppposable thumb: thumb that enables grasping objects and using tools
Today most paleontologists agree that the hominid fossil record includes 5 genera:

- *Ardipithecus*
- *Australopithecus*
- *Paranthropus*
- *Kenyanthropus*
- *Homo*: and as many as 16 separate hominid species

This diverse group of fossils covers roughly 4.5 million years
• Genus *Homo* existed before *Homo sapiens* appeared

• About 2.5 mya a new hominid appeared in Africa

• *Homo habilis*: “handy man”; had tools made of stone and bone
**THE ROAD TO MODERN HUMANS**

- *Homo ergaster*: larger species with bigger brains and downward facing nostrils appeared in Africa about 2 mya.

- *Homo erectus*: closely related to *H. ergaster*.

- Either *H. erectus* or *H. ergaster* soon began migrating out of Africa.

- By about 1.8 mya, population of *H. erectus* were living in several places across Asia.
MULTI-REGIONAL MODEL

• How did modern *Homo sapiens* evolve from the earlier members of the genus *Homo*?

• This hypothesis suggests that *H. sapiens* evolved independently in several places around the world

• Proposes that modern humans descended directly from the far-flung population of *H. erectus* that were already living outside of Africa more than a million years
This hypothesis suggests that the first true *Homo sapiens* evolved in Africa, probably between 200,000 and 150,000 years ago.

Members of this species left Africa in one or more recent waves of migration.

These migrants replaced the descendants of *H. erectus* around the globe to find local populations of modern humans.
This hypothesis has received powerful support from genetic analysis based on DNA found in the mitochondria of cells.

The molecular data argue powerfully for a single African origin for all modern humans.

The Out–Of–Africa hypothesis is accepted by most researchers today.
The story of modern humans over the past 500,000 years involves two main groups:

- **Homo neanderthalensis**: Neanderthals flourished in Europe throughout western Asia between 200,000–30,000 years ago
  - Used tools and lived in social groups

- **Homo sapiens**: probably arose in Africa
  - Appeared in the Middle East about 100,000 years ago
  - Joined the Neanderthals and lived side-by-side for about 50,000 years
MODERN HOMO SAPIENS

• The situation dramatically changed about 50,000–40,000 years ago

• Some populations of *H. sapiens* fundamentally changed their way of life
MODERN HOMO SAPIENS

• Used new technology to make more sophisticated stone blades, elaborate tools, etc.

• Produced cave paintings

• Buried the dead with elaborate rituals
About 40,000 years ago, one group, Cro-Magnons appeared in Europe.

By 30,000 years ago, Neanderthals had disappeared from Europe.

How and why they disappeared is not yet known.

Since that time, our species has been Earth’s only hominid.
That's all Folks!