Cenozoic Era: Age of Mammals

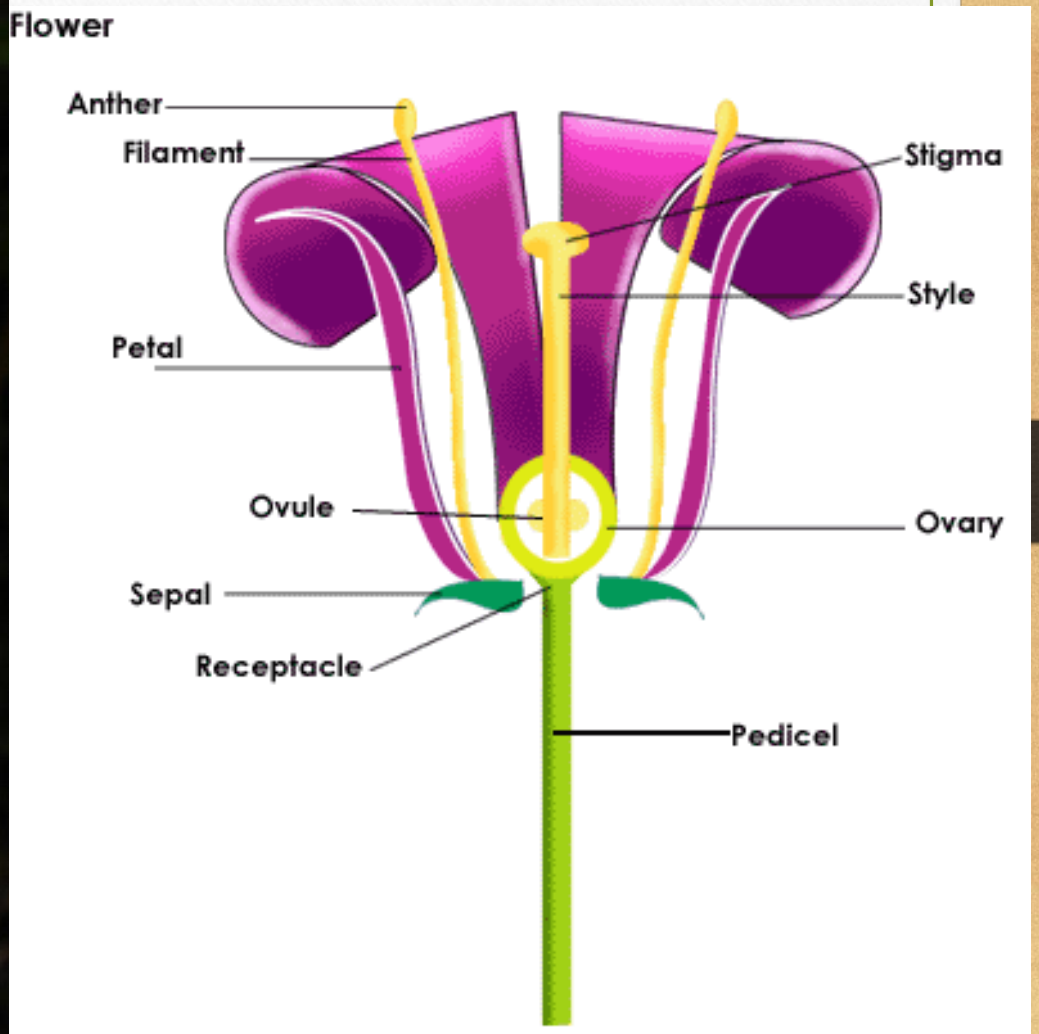
65.5 milllon years-Present

Cenozoic Era

- The Cenozoic era, or "era of recent life," encompasses the past 65 million years of Earth history
- It is during this span that the physical landscapes and life forms of our modern world came into being
- The Cenozoic era is shorter than the other eras, but it possesses a rich history because of the completeness of the geological record improves as time approaches the present
- The Cenozoic era is divided into two periods of very unequal duration, the Tertiary period (63 million years) and the Quaternary period (2 million years)

Cenozoic Life

- **Mammals** replaced reptiles as the dominant land animals
- The Cenozoic is often called the "age of mammals" because land mammals came to dominate land life
- It could also be called the "age of flowering plants" because angiosperms came to dominance
- **Angiosperms**—flowering plants with covered seed—replaced gymnosperms as the dominant land plants
- The advances in seed fertilization and dispersal allowed angiosperms to experience a development and expansion as the Mesozoic came to a close
- Development of flowering plants strongly influenced the evolution of birds and mammals


Flower
Anther
Filament
Stigma
Style
Petal
Ovule
Ovary
Sepal
Receptacle
Pedicel

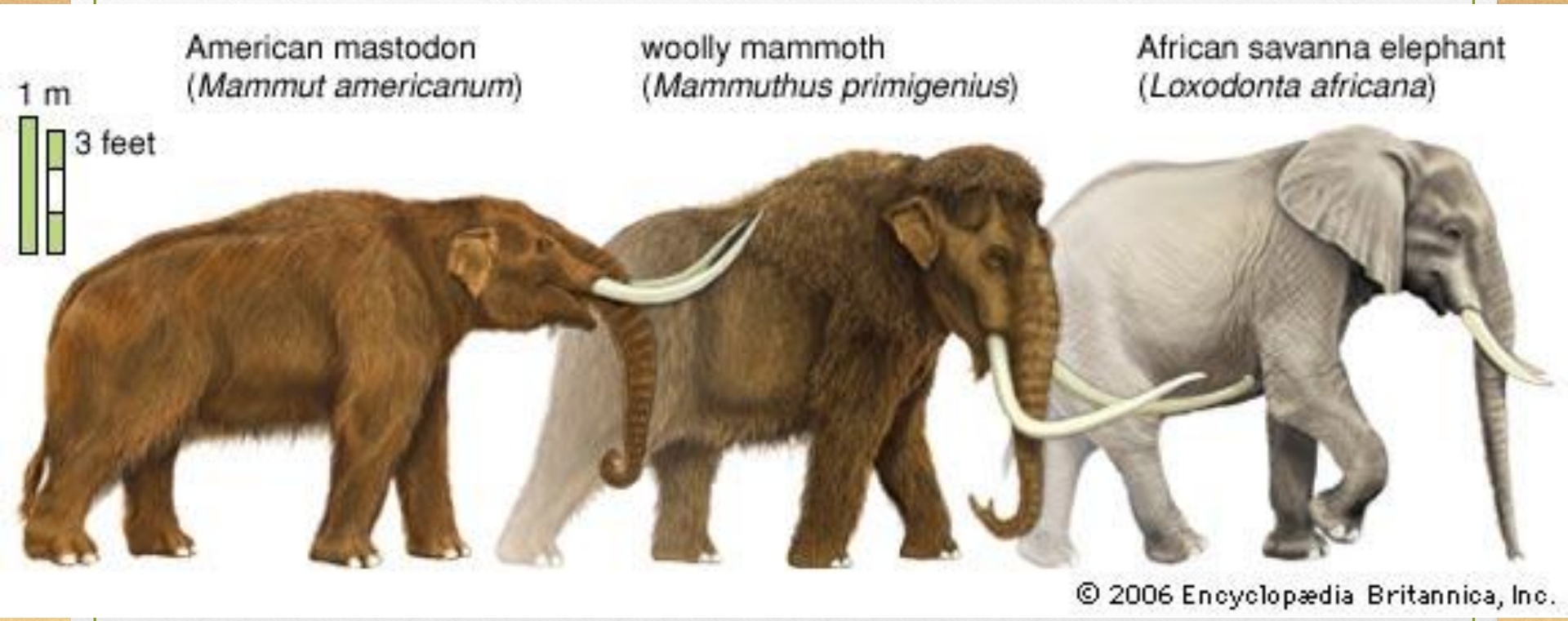
Mammals Replace Reptiles

- Back in the Mesozoic, an important evolutionary event was the appearance of primitive mammals in the late Triassic, about the same time that the dinosaurs evolved
- Because mammals are warm-blooded, they could survive in cold regions and search for food during any season or time of day; they also adapted insulating body hair and more efficient lungs and hearts
- These adaptations allow mammals to lead more active lives than reptiles
- Their development and specialization took 4 principal directions: (1) increase in size, (2) increase in brain capacity, (3) specialization of teeth to fit certain diets, (4) specialization of limbs to particular environments

Large Mammals and Extinction

- Some groups of mammals became very large
- Many large forms of mammals were common as recently as 11,000 years ago; however, a wave of late Pleistocene extinctions rapidly eliminated these animals from the landscape
- In North America, the mastodon and mammoth, both huge relatives of the elephant became extinct; as well as saber-toothed cats, giant beavers, large ground sloths, horses, camels, giant bison, and some others
- Some scientists believe that early humans hurried the decline of these animals by selectively hunting large forms

Large Mammals



- Birds
- It was not easy to classify the birds and therefore the Ornithologist had to rely on some of the prominent patterns, such as the nature of the building of the nests and feathers and sounds of birds. They identified 32 rank belonging to birds all belong to the three groups of birds flying **Flying birds** and **non-flying birds** Flightless birds (ratites) and **penguins**. During the study of the fossil record, it is clear that the first appearance of the current birds was in the early modern era as they formed the form of these flying objects during the Cretaceous evolution and adaptation in the modern era

- . During the Palaeocene and the Eocene there were some non-flying birds which are considered predators as well as Early, the species of non-flying birds then descended and few species remained in South Africa such as the ostrich and Rhea in South America, the Emus and Kiwis in Australia. The oldest known penguins in the rock record were in the Palaeocene in New Zealand and developed in the early and middle Cenozoic and previously could fly and swim as long as 2 m and 35 kg. Then, and change in degrees of cold that evolved penguin into a water, then the muscles of the wings are changed . It does not allow him to fly, but his solid bones remain an effective tool in swimming and diving for a depth of 300 meters

Cenozoic Era
Divided into two unequal parts

- **Teritary**
- More than 95% of the Cenozoic era belongs to this period.
- This period expands from 65 million years ago until 1.8 million years ago.
- The tertiary time period is sub-divided into two divisions the Paleogene and Neogene.

- **Quaternary**
- This time period is only the last one and a half million years. It only includes that last 1.8 million years until present time.

Divisions of the Tertiary era Paleogene

- **The Paleocene Epoch**

65 to 54.8 mya

Began after the extinction of the dinosaurs. Mainly nocturnal mammals that cowered in the shadows of the dinosaurs evolved. Most mammals were tiny and rodent like. With time they grew.

- The cousins of dinosaurs, the reptiles lived on in the form of turtles, crocodiles, lizards and snakes.

Divisions of the Tertiary era
Paleogene

- **The Eocene Epoch**

54.8 to 33.7 mya

The oldest known fossils of the modern order of mammals appear during this time period.

Vivveravus, a small Mongoose-like carnivore from the Eocence of North America.

The first clear development of the mammals appeared at the beginning of the Palaocene and was 11 new classes of the most important rabbits, rodents, laziness monkey, (sloths) edentates, meat feeders, Primates and all are still alive until yet

- Eocene

The first grasses appeared during this period. This provided a food source for the herbivores and allowed adaptation to life on the savanna and prairie.

This period was also a period when flowering plants thrived.

The climate was warm and such trees as the beech, elm, chestnut, magnolia, redwood, birch and cedar evolved during this time.

- There are seven new orders appeared during the Eocene and still exist until now. in order to spread the number of species of herbaceous species with the remarkable disappearance of some reptiles. The most important of these species are old Horses, Rhinos and Tapirs. And even the Oligocene and the process of return of water patterns as a result of the increase of marine environments and thus emerged strikingly large marine life within the group of whales Cetaceans and the most important species, Wales, Dolphines, and the group of fins foot Pinnipeds such as Sea lions, walruses and herbs such as Sea cows, the first whales appeared in the middle Eocene with long 20 m and weigh 135 metric tons.

Whales: another study of convergent evolution

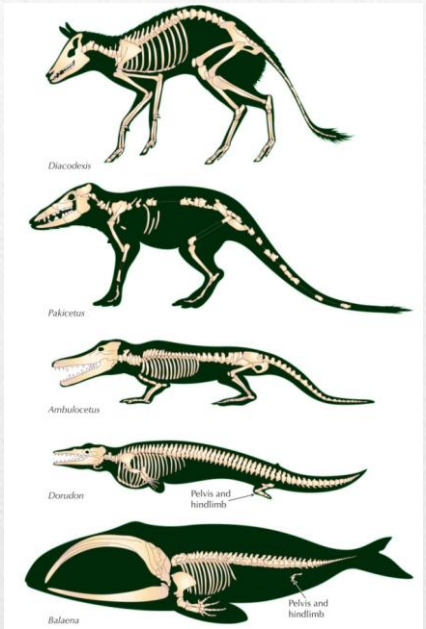


FIGURE 3.18. A series of fossils from the Eocene (~50 Mya) hippo-like artiodactyl (*Diacodexis, top*) to a skeleton of the modern whale (e.g., *Balaena, bottom*) shows how mammals adapted to life in the sea. Among the most important changes, the pelvis and hindlimbs were reduced, the tail was lengthened for swimming, and the jaws were modified for feeding on plankton.

3.18, redrawn from de Muizon C., *Nature* **413**: 259–260, © 2001 Macmillan, www.nature.com

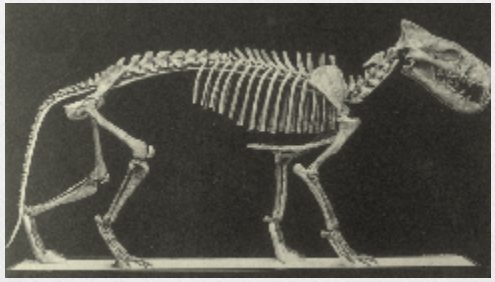
- Eocene hippo-like terrestrial mammals to Oligocene marine mammals
- Evolution of whales stumped Darwin
- Molecular biology and discovery of transitional forms helped explain history

Divisions of the Tertiary era Paleogene

- **The Oligocene Epoch**

33.7 to 23.8 mya

The Oligocene is a short span of time. Major changes occurred during this time. They include the appearance of elephants, early horses and many grasses and plants.



- Oligocene

- Come from the Greek word oligos (meaning few) and ceno (meaning new).
- Often considered as an important window of environmental transition from the tropical Eocene and the cooler Miocene.
- Temperate woodlands replaced tropical and sub-tropical forests. Plains and deserts became more commonplace.
- Modern elephants, rhinoceros and ape primates appeared during this time.

- Increasing in the mammals and appearance new types such as pigs, deer and rhinoceros with an enormous increase of herbal and herbaceous plants

Divisions of the Tertiary era Neogene

- **The Miocene Epoch**

23.8 to 5.3 mya

The Miocene was a time of warmer global climates than those in the preceding Oligocene, or the following Pliocene.

Animals that existed during this time era are much like the ones pictured here. This odd-toed hoofed mammal, underwent rapid evolution during this time period.

- Miocene

Comes from Greek word meion(less) ceno (new) because of smaller proportion of modern sea invertebrates than the subsequent Pliocene Epoch.

Mammals such as wolves, horses, and deer as well as birds evolved during this time.

A major expansion of grasslands occurs as forests declined in cooler and dryer climate.

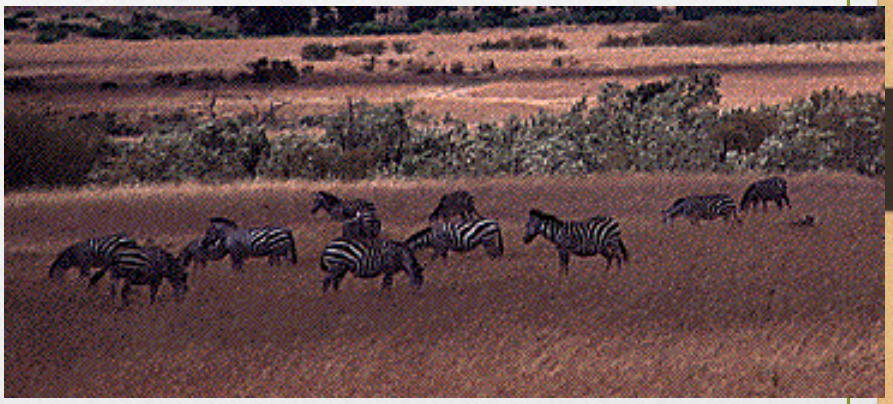
Divisions of the Tertiary era
Neogene

- **The Pliocene Epoch**

5.3 to 1.8 mya

The Pliocene was a time of global cooling after the Miocene period.

This era contributed to the enormous spread of grasslands.



- Pliocence

Comes from the Greek word pleion (more) and ceno (new). It means the continuation of the recent in reference to the fact that mammals were essentially modern in form.

The climate was cool and dry. The climate reduced tropical vegetation and shrank tropical forest.

Coniferous forests, tundra, grasslands, dry savannahs and deserts filed land space during this time.

The Quaternary Period
1.8 million to Present

- This period began less than 2 million years ago and marked the origin of the close human ancestors as well as the modern forms of animals we see today.