

# What Do Fossils Tell about Extinction?

Chapter 10 Lesson 3

ByDesign Science, Level 6

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# What Do Fossils Tell about Extinction?



- ◆ In 1700, there may have been 6 billion passenger pigeons living in North America.
- ◆ By 1900, the passenger pigeon was extinct in the wild.
- ◆ In 1914, the last passenger pigeon on Earth died at the Cincinnati Zoo.
- ◆ The passenger pigeon is one of the many species that have become extinct.

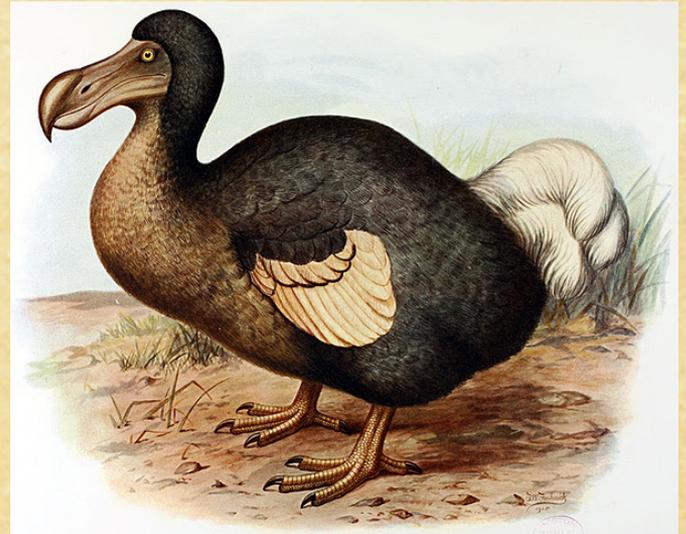
# What Do Fossils Tell about Extinction?

- ◆ Some animals have become extinct after populations declined over hundreds of years.
- ◆ Others became extinct more quickly.
- ◆ Still others appear to have become extinct as the result of a catastrophe.



# Types and Causes of Extinction

- ◆ In Lesson 1, you learned about various types of fossilized creatures, many of which no longer live on Earth – they are extinct.
- ◆ *Extinction* occurs when the last of a species dies.
- ◆ What can cause a species to completely disappear from the planet?



# Types and Causes of Extinction

- ◆ Extinctions occur at different rates.
- ◆ Extinctions in which only one or a few species disappear are called gradual extinctions.



- ◆ Extinctions in which large numbers of species suddenly die out are called mass extinctions.

# Types and Causes of Extinction



- ◆ Scientists estimate that more than 95% of all the species that have ever lived on Earth have become extinct.
- ◆ Some of these extinctions happened long ago.
- ◆ Others have occurred in the past 500 years.
- ◆ In fact, the extinction of the black rhinoceros occurred in 2011.

# Types and Causes of Extinction:

## Gradual Extinctions

- ◆ Most gradual extinctions occur when a species' environment changes.
- ◆ Suppose, for example, that a species lives in a very small area that receives much rain.
- ◆ If the amount of rainfall steadily decreased over time, the species will try to adapt by changing its behavior or perhaps migrate to another location.
- ◆ If it cannot adapt to the change in water, it will become extinct.



# Types and Causes of Extinction:

## Gradual Extinction

- ◆ Although humans are expected to care for God's Creation, some human actions can affect the survival of wild species of plants and animals.
  - ◆ Threats of pollution
  - ◆ reducing their habitat or food supply
  - ◆ cutting off wildlife passageways
  - ◆ illegal poaching
  - ◆ hunting can push species past the recovery point



# Types and Causes of Extinction:

## Mass Extinction



- ◆ Unlike gradual extinctions, mass extinctions are the result of major changes on Earth.
- ◆ Scientists have found evidence of several mass extinctions in the fossil record.

# Types and Causes of Extinction: Mass Extinction

MYA	Era	Period	Extinction events*
0	Cenozoic	Quaternary	~ 65 MYA
0		Tertiary	
100	Mesozoic	Cretaceous	~ 200-210 ~ 250
200		Jurassic	
200		Triassic	
250		Permian	
300	Paleozoic	Carboniferous	~ 360-370 ~ 440
400		Devonian	
400		Silurian	
440		Ordovician	
500		Cambrian	
600	Precambrian		

- ◆ For example, in the Paleozoic section of the geologic column, the Ordovician layers contain fossils of many marine creatures.
- ◆ But in the Silurian layers just above, 60% of those creatures no longer exist in the fossil record.
- ◆ Scientists interpret this data to mean that those species became extinct.

# Types and Causes of Extinction:

## Mass Extinction

- ◆ Because of clues in the fossil record, scientists have suggested that climate change, dropping sea levels, volcanic eruptions, or various combinations of these may have been responsible for the extinctions.



# Types and Causes of Extinction:

## Mass Extinction

- ◆ Many scientists believe that the dinosaur extinction event involved a meteorite impact that sent massive amounts of dust into the air.
- ◆ The dust would have prevented sunlight from reaching Earth.
- ◆ As a result, plants and other producers could not make food, and the animals that eat plants could not have survived.



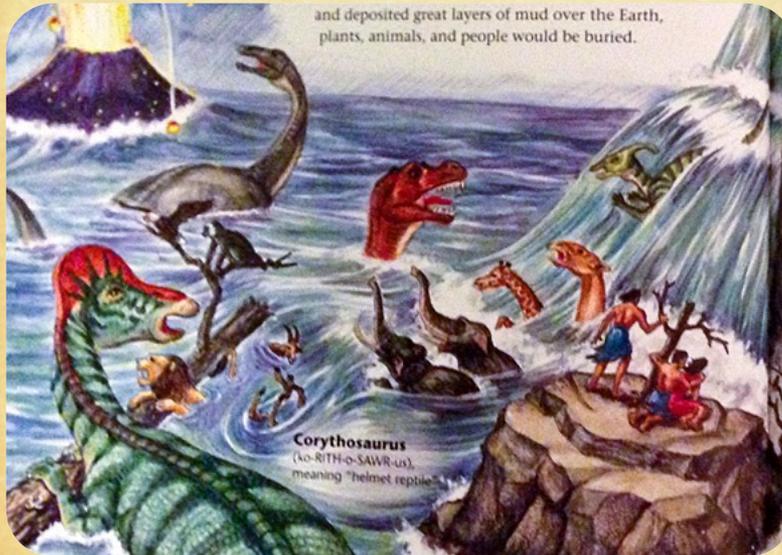
# Types and Causes of Extinction:

## Mass Extinction

- ◆ This hypothesis is based on the presence of unusually high levels of iridium in these rock layers.
- ◆ Iridium is an element that is rare in Earth's crust but is more abundant in meteorites.
- ◆ Some interesting questions exists, though.
  - ◆ Why would dinosaurs become extinct but not alligators, crocodiles, and fishes?
  - ◆ Why would one kind of clam become extinct but not another?



# Types and Causes of Extinction: Mass Extinction



- ◆ Scientists with a biblical worldview believe many mass extinctions events are linked with the Genesis Flood and the events immediately afterward.

# Almost Endangered Animals



# Extinct Animals



- ◆ Although thousands of species have become extinct throughout Earth's history, you will talk about only a few groups of them in this lesson.



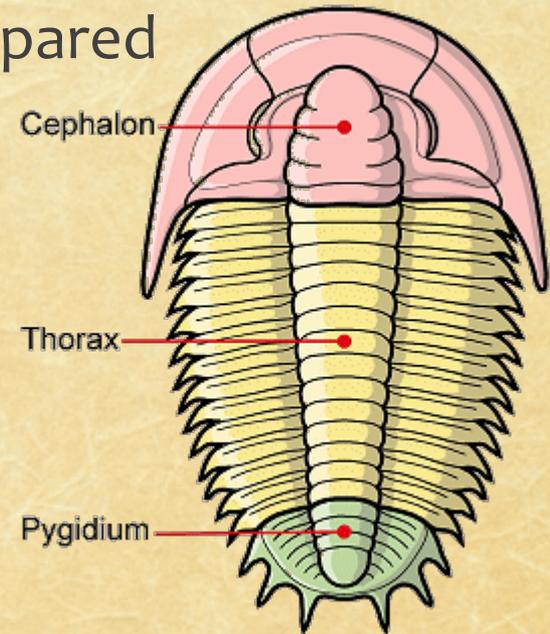
- ◆ The first group, the trilobites, consisted of small organisms that lived in shallow seas long ago.



- ◆ The other two groups included some of the largest organisms that ever lived on land, such as the dinosaurs and woolly mammoths.

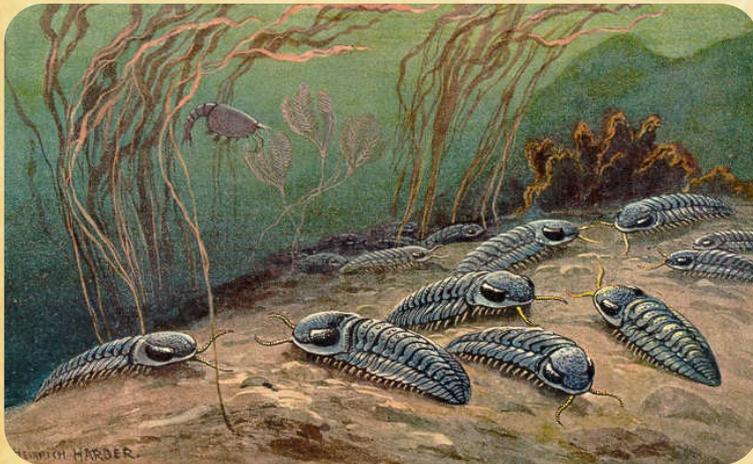
# Extinct Animals: Trilobites

- ◆ Trilobites were marine arthropods that were found preserved throughout the Paleozoic layers of the geologic column.
- ◆ Although they are sometimes compared to the horseshoe crab, trilobites are unlike any creature alive on Earth today.
- ◆ The word *trilobite* means three lobes, which accurately describes the bodies of these arthropods.



# Extinct Animals: Trilobites

- ◆ The existence of trilobites in the fossil record provides evidence that is consistent with the biblical view of Earth's history.



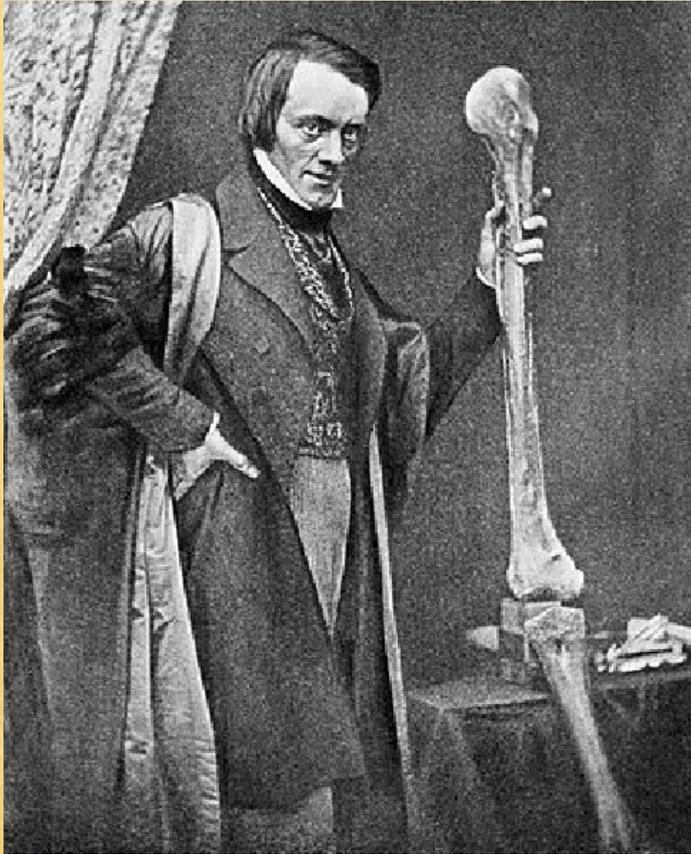
- ◆ Their complexity, their appearance early in the fossil record without evidence of evolutionary ancestors, and their amazing preservation are compatible with the biblical accounts of Creation and the Flood.

# Extinct Animals: Dinosaurs

- ◆ Dinosaurs have fascinated people for many years.
- ◆ In the nineteenth century, scientific attention turned to new discoveries made in along the coast of England.
- ◆ A 10-year-old named Mary Anne Mantell found a large reptile tooth in 1822.
- ◆ Her find was named *Iguanodon* because the teeth resemble the an iguana lizard.



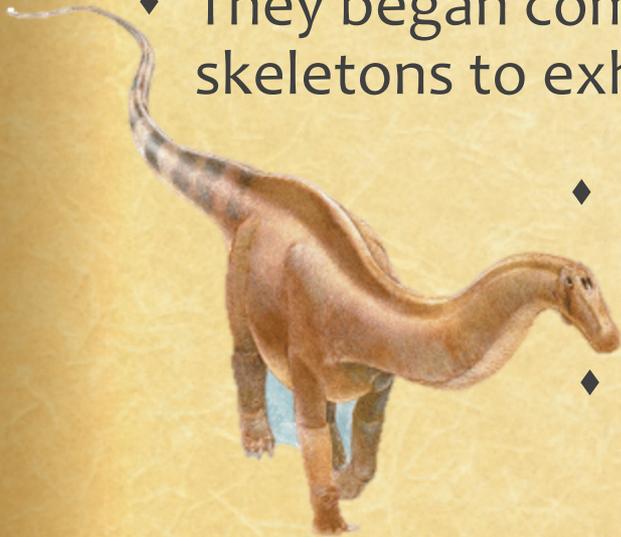
# Extinct Animals: Dinosaurs



- ◆ Sir Richard Owen studied the fossils found by Mantell and by others.
- ◆ He made models for the Crystal Palace exhibition and first coined the name “dinosaur.”

# Extinct Animals: Dinosaurs

- ◆ While scientists were studying these new finds, North America had its own dinosaur rush!
- ◆ Two important early dinosaur hunters were O. C. Marsh and Edward Drinker Cope.
- ◆ They began competing to find the biggest and best skeletons to exhibit.



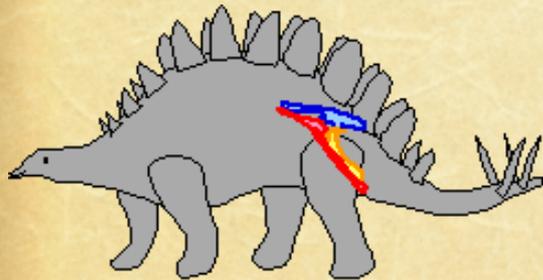
- ◆ Often in their zeal, the same dinosaur was named twice.
- ◆ For example, Apatosaurus and Brontosaurus were two names for the same animal.

# Extinct Animals: Dinosaurs

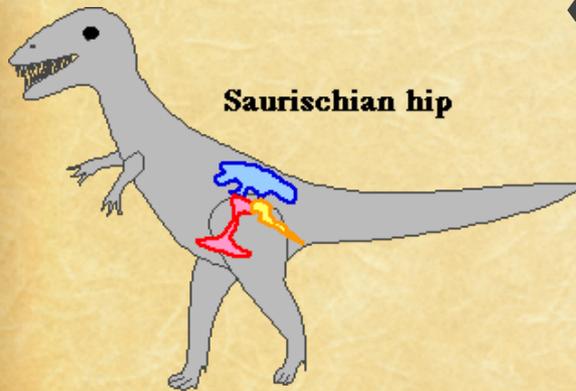
- ◆ Since these early discoveries, many dinosaur fossils have been found in every region and continent, even on Antarctica.
- ◆ Many more remain buried, waiting to be found.



# Extinct Animals: Dinosaurs



**Ornithischian hip**



**Saurischian hip**

- ◆ These reptiles probably varied greatly in size and in appearance.
- ◆ The fossil bones can provide solid data about the size and body plan of these animals.
- ◆ Scientists generally classify dinosaurs into two main groups based on the shape of their hip bones:
  - ◆ The *Ornithischian* (bird-hipped)
  - ◆ The *Saurischian* (lizard-hipped)
- ◆ Both groups stood erect with their legs held under their bodies.

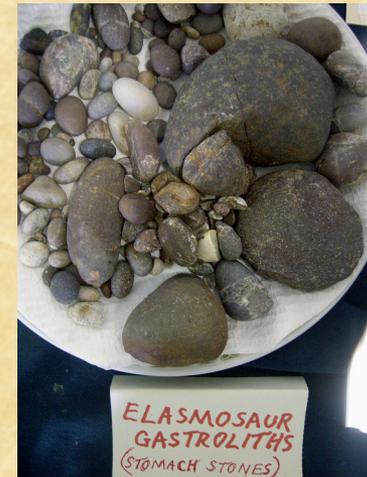
# Extinct Animals: Dinosaurs



- ◆ However, as far as their appearance and behavior are concerned, there is a lot of interpretation involved in what you see in museums or in reconstructions.
- ◆ For example, skin prints can provide clues about skin texture, but scientists must use their imaginations and knowledge about living organism to fill in missing details like coloring, striping, or camouflage patterns.

# Extinct Animals: Dinosaurs

- ◆ Footprints can help us figure out how they might have moved.
- ◆ Fossilized stomach contents can suggest what foods they ate.



# Extinct Animals: Dinosaurs



# Extinct Animals:

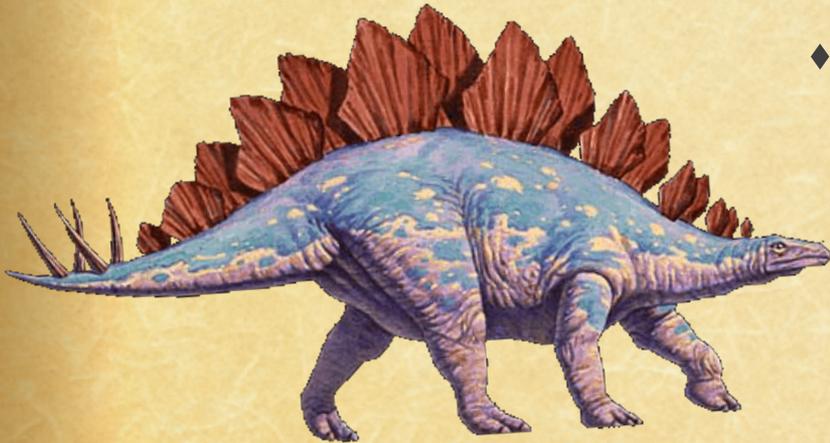
## Ornithischians Dinosaurs

- ◆ Recall that scientists generally classify dinosaurs into two groups based on skeletal features.
- ◆ The Ornithischians or **bird-hipped dinosaurs**, as their name suggests, had a hip structure like birds
- ◆ Most of these dinosaurs ate plants and many had bony plates on their skin.



# Extinct Animals: Ornithischian Dinosaurs

- ◆ Stegosaurus were one group of bird-hipped dinosaurs.
- ◆ Stegosaurus walked on four legs, had small heads, and short necks.



- ◆ Bony plates on their backs or heads are thought to have been used for defense or to perhaps regulate body temperature.

# Extinct Animals:

## Ornithischians Dinosaurs

- ◆ Hadrosaurs were another group of bird-hipped dinosaurs common in western North America.
- ◆ These animals had duck-like beaks and hundreds of teeth in their mouths.
- ◆ Fossils evidence indicates that Hadrosaurs called Maiasaura took care of their young.



# Extinct Animals:

## Saurischian Dinosaurs

- ◆ The Saurischian or lizard-hipped dinosaurs were much larger than the bird-hipped dinosaurs.
- ◆ Sauropods were among the largest lizard-hipped dinosaurs.



- ◆ One sauropod, Seismosaurus, achieved a length of 140 feet, making it the largest land vertebrate that walked on Earth.

# Extinct Animals: Saurischian Dinosaurs

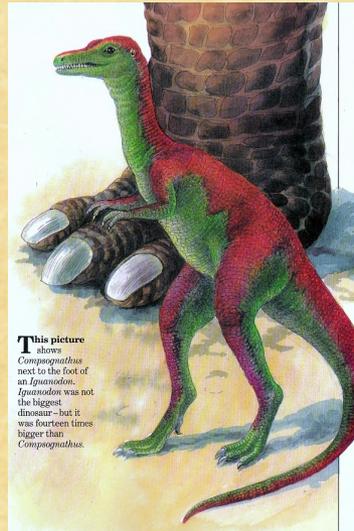
- ◆ About 150 species have been identified.
- ◆ *Theropods* were another group of lizard-hipped dinosaurs.
- ◆ Most of these animals ate meat.
- ◆ All had long tails that were thought to have been used for balance.
- ◆ Theropods are believed to have walked on their strong hind legs and use their front limbs for grasping.



# Extinct Animals: Saurischian Dinosaurs



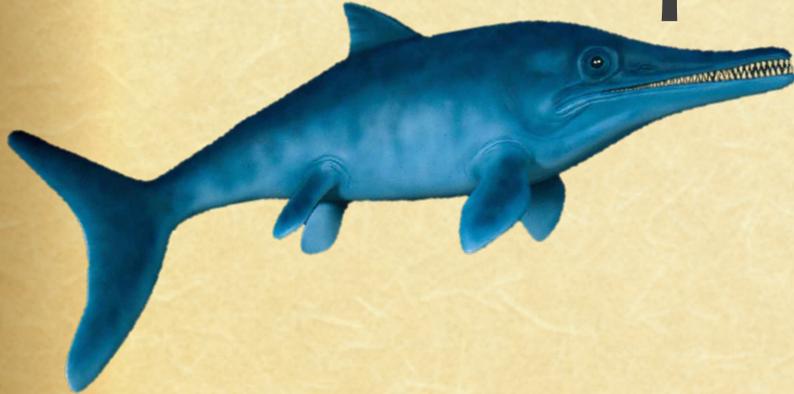
- ◆ Theropods included the enormous tyrannosaurs as well as the relatively small but ferocious raptors.
- ◆ They were not all giants, including the turkey sized *Compsognathus*, which was one of the smallest dinosaur known, and a diverse group of medium-sized cousins.



**T**his picture shows *Compsognathus* next to the foot of an *Iguanodon*. *Iguanodon* was not the biggest dinosaur – but it was fourteen times bigger than *Compsognathus*.

# Extinct Animals:

## Marine Reptiles & Pterosaurs

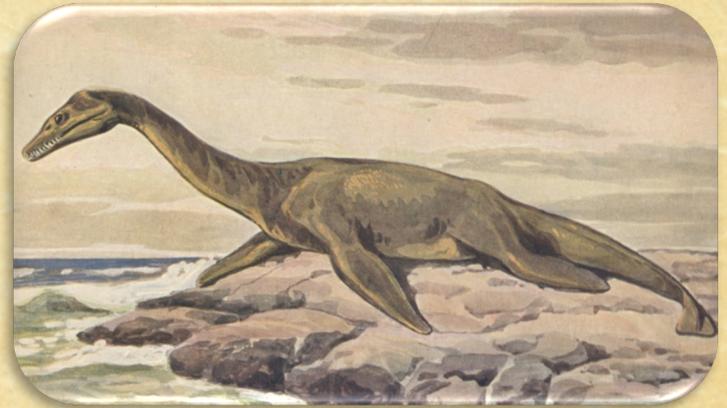


- ◆ Long-necked marine reptiles called plesiosaurs also appear in the Mesozoic layers.
- ◆ At 50 ft. long, they were as long as a 5-story building.
- ◆ Ichthyosaurs were even longer, up to 70 ft. long.
- ◆ Flying reptiles called pterosaurs flew in the skies above them
- ◆ Some were no longer than a sparrow, while others were the size of an airplane with a wingspan of up to 40 ft.

# Extinct Animals:

## Marine Reptiles & Pterosaurs

- ♦ Marine reptiles have frequently, and erroneously, been called dinosaurs.
- ♦ Though they have been found in the same part of the geologic column, they differ from dinosaurs in several important details.
- ♦ No marine reptile had a skeleton with a hip bone shaped like either of the main groups of dinosaurs, and their limbs were modified flippers or paddled, somewhat like fins of marine mammals today.



# Extinct Animals:

## Marine Reptiles & Pterosaurs



- ♦ Pterosaurs are not considered dinosaurs either.
- ♦ They had hollow lightweight bones, long necks, short bodies, and forelimbs that took the form of wings.
- ♦ Their wings were featherless and made of a skin membrane like the wings of a bat.
- ♦ Whether they flew by flapping their wings or gliding through the air is uncertain.

# Extinct Animals:

## Marine Reptiles & Pterosaurs

- ◆ On the ground, pterosaurs may have walked or crawled, or they have been bipedal, walking on only their hind limbs.

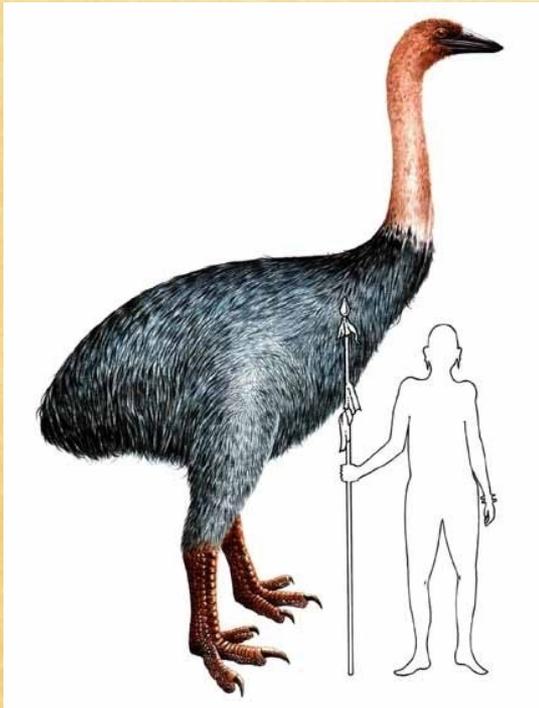


# Extinct Animals: Megafauna

- ◆ Another group of extinct animals, called the Megafauna, included large animals that lived during the Cenozoic Era.
- ◆ This group of animals included mammals, birds, and reptiles.



# Extinct Animals: Megafauna



- ◆ Birds called moa were nearly twice as tall as an average human.
- ◆ Although they could not fly, fossilized footprints suggest that moa could walk up to 3mi/h.
- ◆ Another flightless giant bird belonged to the *Aepyornis* species.
- ◆ These birds were more than 10 ft. tall and could have weighed nearly 1100 lbs.

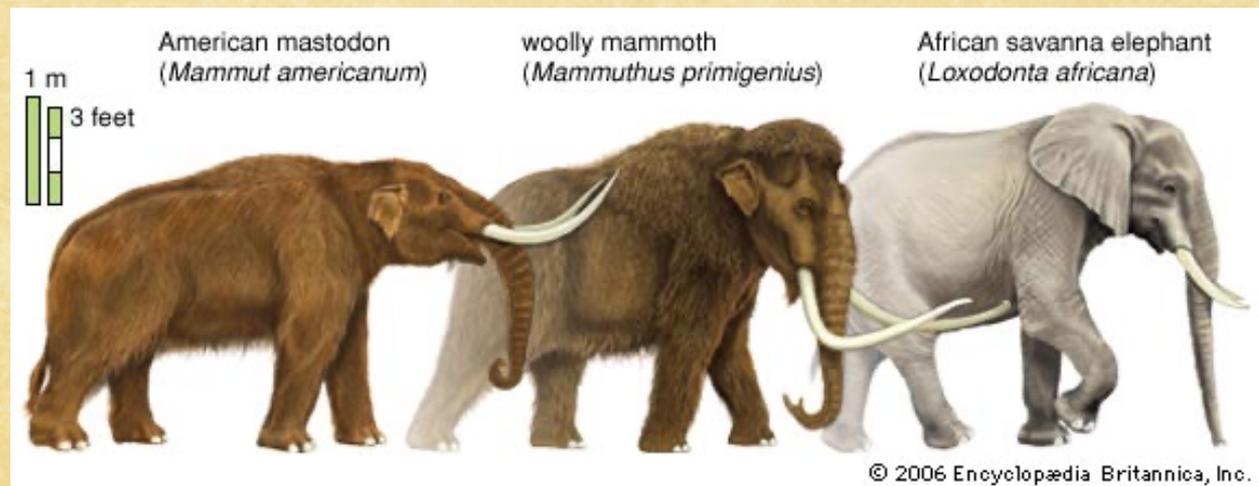
# Extinct Animals: Megafauna

- ◆ The giant ground sloth was about the size of a black bear but had claws that could be 20 in. long.
- ◆ These sloths did not have front teeth but were still able to eat various types of plants, including willows and cacti.



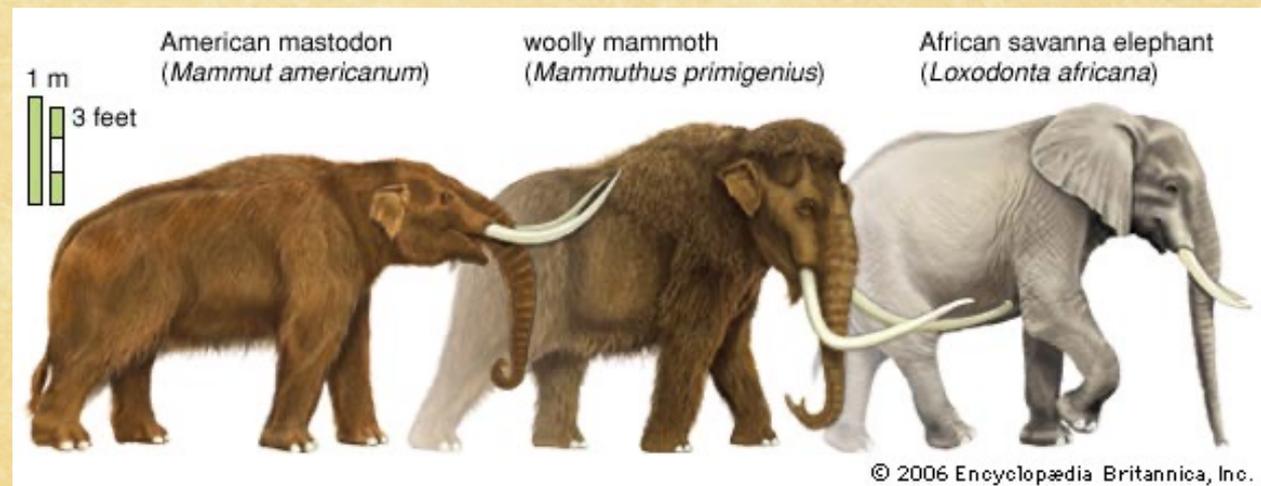
# Extinct Animals: Megafauna

- ◆ Mastodons and woolly mammoths are two other Megafauna.
- ◆ Mastodons had large tusks and teeth.
- ◆ They stood about 10 ft. tall and weighed about 1200 lbs.

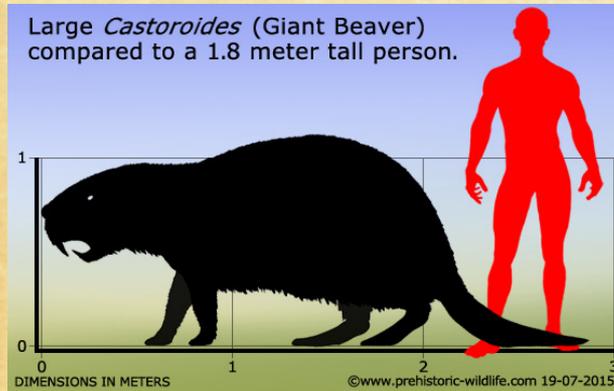


# Extinct Animals: Megafauna

- ♦ Woolly mammoths were much larger and probably weighed around 17,600 lbs.
- ♦ At the shoulder, they measured 16 ft. tall and had long, curved tusks, which were often 13-16 ft. long.



# Extinct Animals: Megafauna



- ◆ Several extinct rodents belonged to the Megafauna.
- ◆ Two species of giant beavers that lived in North America measured nearly 8 ft. long
- ◆ Another mega-rodent was the North American giant capybara that lived in Florida, South Carolina, Texas, and Arizona.
- ◆ Capybaras were the worlds' largest rodents.
- ◆ They weighted about 200 lbs. (which is nearly twice the size of the capybaras that live today)

# Extinct Animals: Megafauna

- ◆ The largest animal in the Megafauna was a hornless rhinoceros called Paraceratherium.
- ◆ It was probably the largest mammal to have ever lived on land.
- ◆ Based on fossil finds, an adult could have been 18 ft. tall at the shoulders and 39 ft. long.

