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Thank you for downloading the Study Guide to go along with the performance presented by Arts On Stage. The last page of this Study Guide is a **Letter to Families** for you to send home with the child that includes information on what they saw to encourage parents to ask their child about the field trip.

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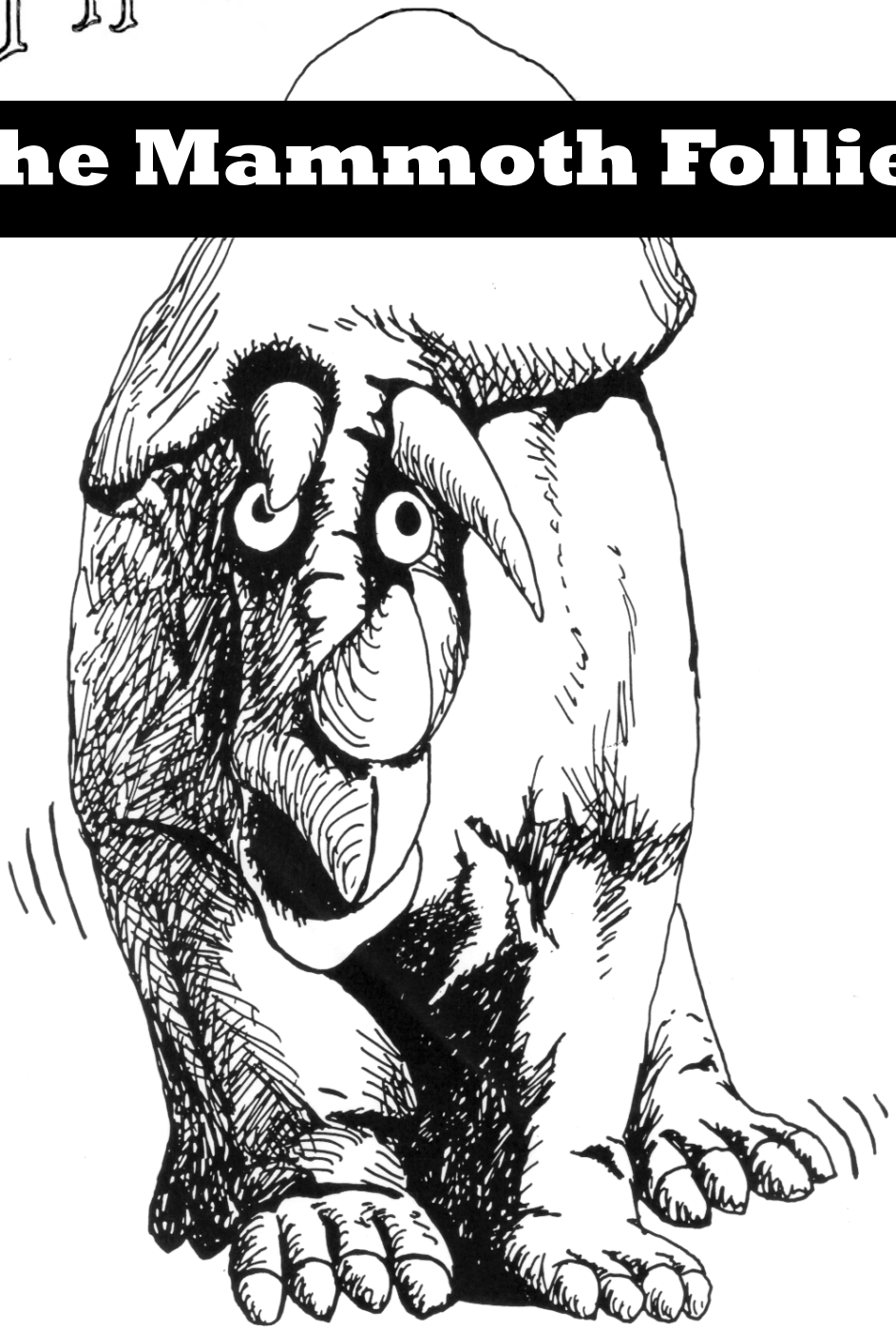
Presenting Live Professional Theatre Field Trips for Students & Families

Hudson Vagabond Puppets

The Mammoth Follies



Study Guide

The Mammoth Follies

In **The Mammoth Follies** the Hudson Vagabond Puppets use puppets of all kinds: enormous dinosaur puppets, hand puppets, body puppets, and rod puppets to dramatize historic and scientific facts about the great age of the dinosaur. In the style of a vaudeville review, the show brings drama, dance, humor, and song together to educate and entertain children and adults alike. We hope you enjoy the show!

All the puppets are designed by Peter and Lois Bohovesky and made completely by hand in our shop in Rockland County, NY. Adding to the complexity (and fun) of the performance are all the different types and styles of puppetry in the show. Lets take a look:

Trilobites, "Vegettes", and the Baby Dinosaurs: Theses are hand puppets, known in the business as "Hand in Glove" puppets. The performer places his or her hand in the mouth of the character as if it were a glove. From here all the facial movements, as well as the functioning of the mouth, are controlled by the puppeteer. The other hand is free to manipulate the hands, feet, or the little baby dinosaur tails.

The Trees, Minnie Pearl and Clem Clam, and Willy Mammoth: Body puppets. The puppeteer uses his or her own body to create the character from inside the puppet. Willie Mammoth and the Clams both borrow "human" legs from their puppeteers (a little poetic license, puppet style).

Terry Pterodactyl: Terry is a very specialized rod puppet. She uses five rods, one for her head and body and two for each wing. This also means that three puppeteers work very hard in well rehearsed choreographic unison to create the illusion of flight. Terry's main rod not only controls her head, but her mouth as well through a string attached to the lower jaw.

Smiley Smiladon: A traditional Bunraku puppet. Bunraku is a traditional Japanese puppet art form in which all the puppets are life-sized and are operated from behind by a hooded puppeteer dressed in black. Though you can see the puppeteer, the very best Bunraku performers never detract from the puppet's movements.

Tony and Trixie Triceratops: These backpack puppets are operated from the inside by two puppeteers coordinating their legwork in the song and dance of the triceratops. The puppets are over 10 feet long and are supported on the inside by a skeleton of nylon rods. The performer in the front has his or her head in the protective shield, the "frill" of the dinosaur.

Bessie Apatosaurus: She is the largest puppet in the repertory of the Hudson Vagabond Puppets. The top of the shoulders is eight feet tall, so both puppeteers wear a special aluminum backpack that extends the height of the performer. They dance a splendid waltz by slipping their feet inside the puppet's feet. Since most of her 22-foot length is in the neck area, a third performer (dressed in black) carries the head and works the mouth.

Tyrannosaurus Rex: This 11-foot tall monster is actually performed by a single puppeteer! The head and torso are supported by an aluminum backpack modified to carry the towering creature. The puppeteer actually operates the head with two hands on a pair of handlebars as if he was riding a motorcycle. The feet and legs are manipulated by the performer's own feet slipped into a secret pair of size 12 sneakers just behind Rex's toenails.

For Young Learners…

(From Pre-K through 1st Grade)

WHAT WAS A DINOSAUR?

A long, long time ago, some animals called **dinosaurs** lived on the earth. Some were taller than the trees. Some had lots of sharp teeth. Some had big horns on their heads. Some were as small as cats.

A dinosaur was a kind of animal called a **reptile.** A reptile has scaly skin. It is cold-blooded, which means that it needs to stay warm all the time. A reptile's babies come from eggs. Some reptiles that live today are snakes, turtles and lizards. Do dinosaurs live today?

Some dinosaurs could run fast on two legs, like you. Some of them could run on four legs, like a horse. They could run away from other animals. They could run to catch food to eat, too.

No one knows what color the dinosaurs were. What color do you think they were?

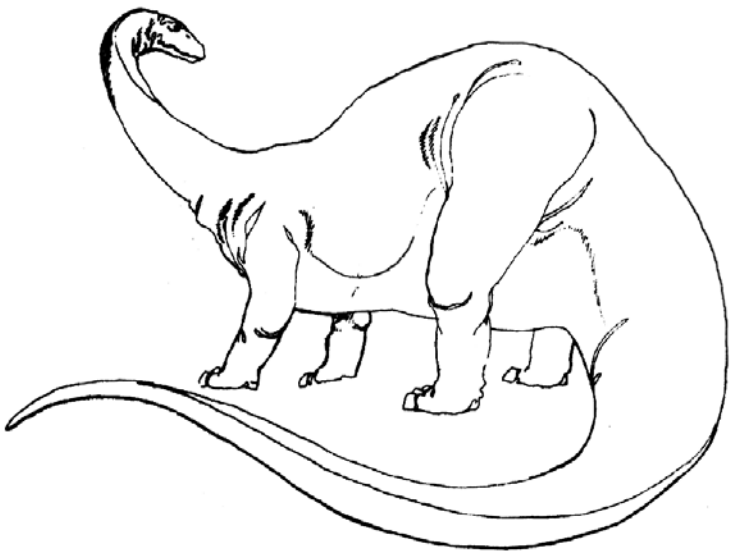
What did the dinosaurs eat? One kind ate only plants. These dinosaurs ate leaves from the trees. Another kind ate meat. These dinosaurs ate other animals for dinner.

SOME DINOSAUR FACTS

Tyrannosaurus (tie-RAN-oh-sore-us) was the scariest looking dinosaur. He was a meat eater and had many sharp teeth. You would only come up to his knees!

Stegosaurus (steg-oh-SORE-us) had large plates all over his back. He weighed about 4,000 pounds. But his head was small and his brain was only the size of an egg

Brontosaurus (bron-toe-SORE-us) was tall enough to eat the top branches off the tree. He was longer than ten cars.



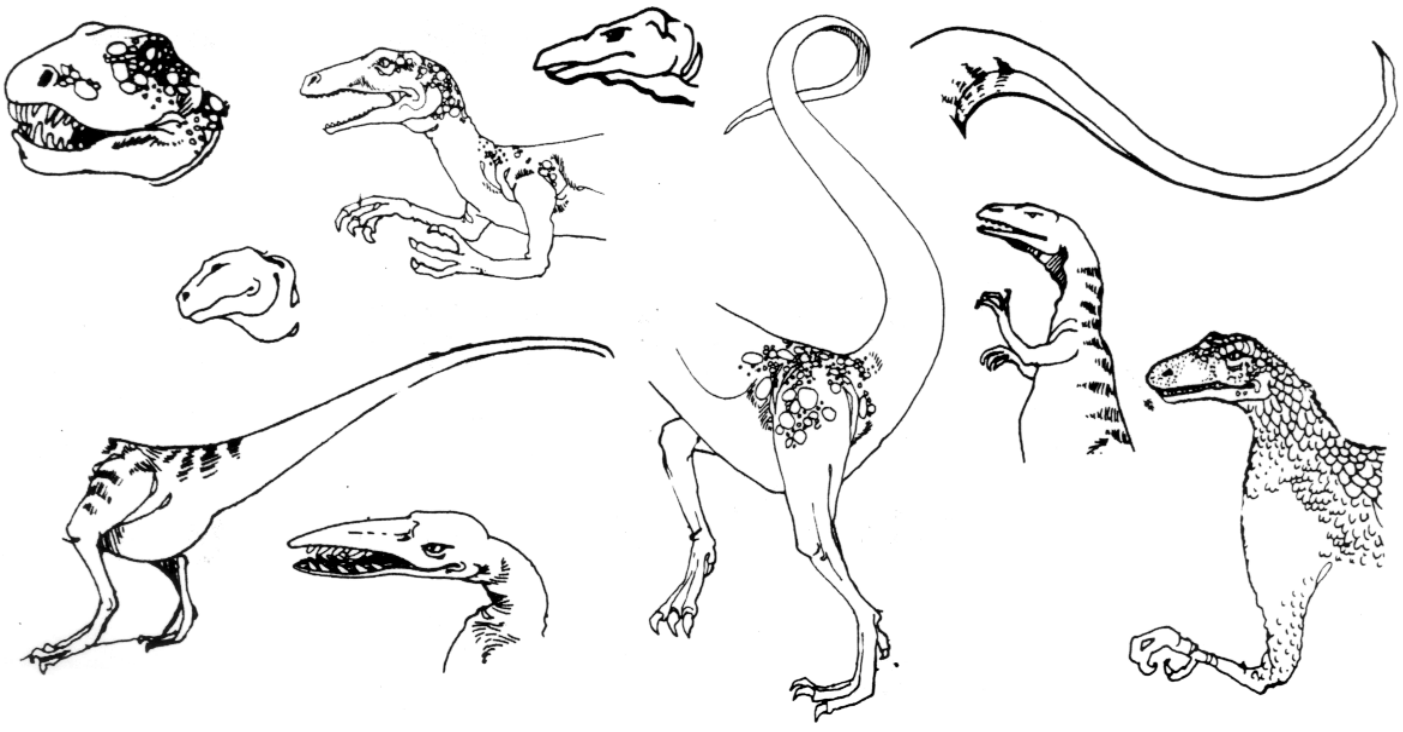
Triceratops (try-SER-uh-tops) had three horns on his head. He could use his horns to fight another dinosaur.

SOME THINGS TO DO

1. If you were a dinosaur, what kind would you like to be? Why? Draw a picture of yourself as a dinosaur. What is your name?
What do you eat? What do you do all day long?

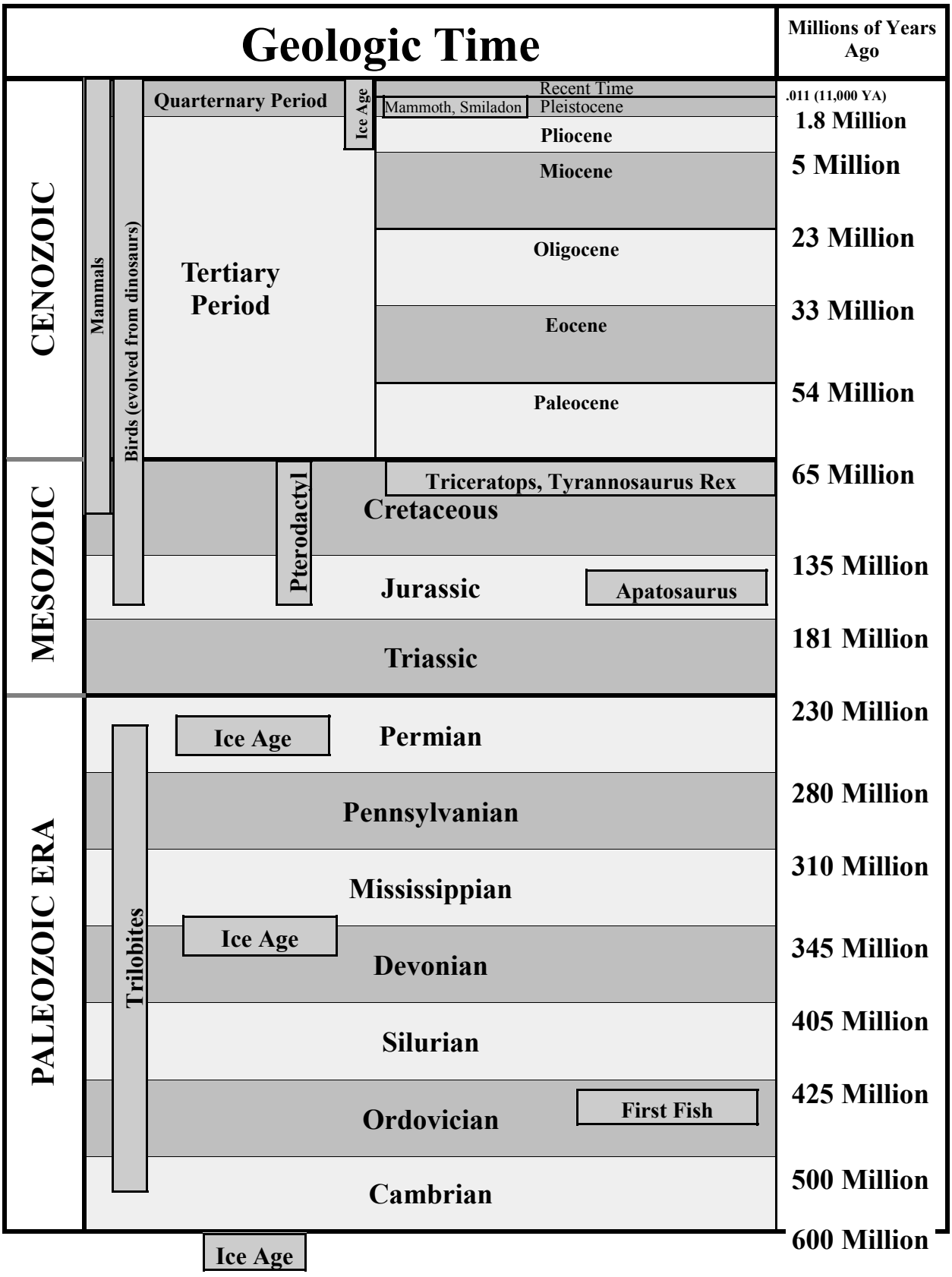
2. Pick one of these scenes and draw a picture of it:
A. A Tyrannosaurus chasing another dinosaur for food.
B. Two dinosaurs fighting each other
C. A dinosaur eating trees for dinner

3. Make up a new kind of dinosaur! Cut out a head, body, legs, and tail. Tape or glue them together to make a different dinosaur



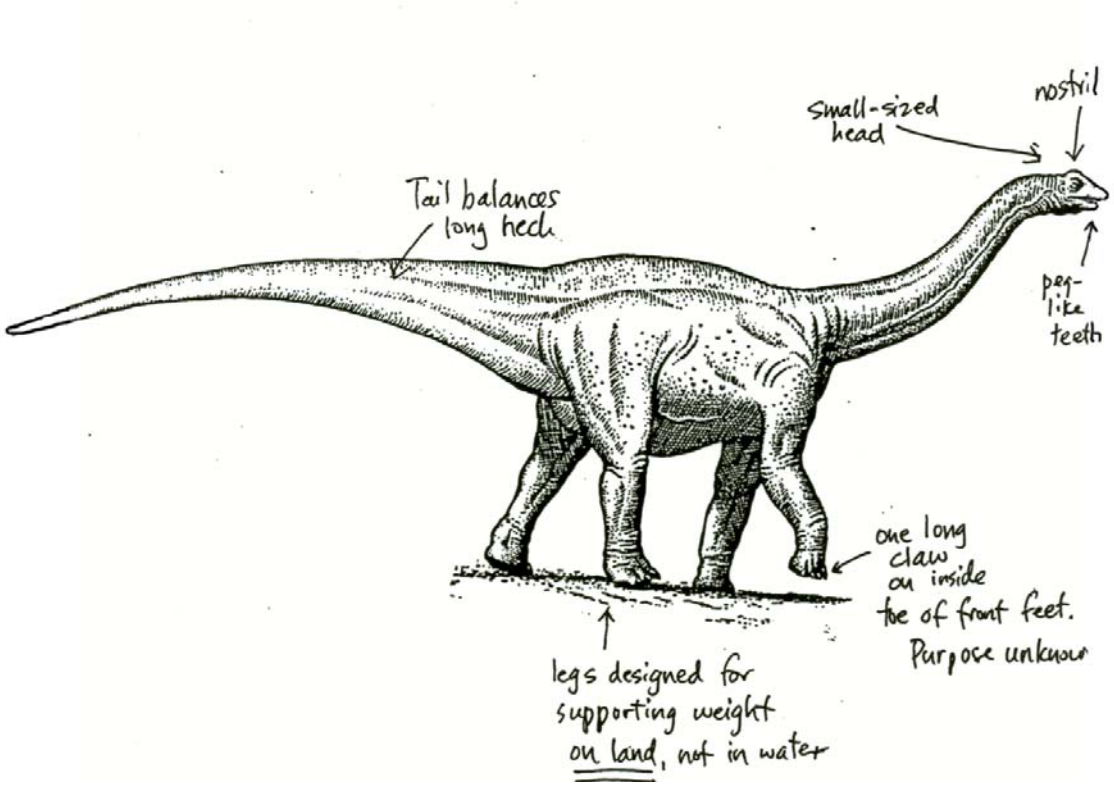
About the Dinosaurs…

(From 2nd through 5th Grade)



There's 3.9 BILLION years of earth history down here in the "Pre-Cambrian" period!

APATOSAURUS



ANATOMY
Apatosaurus/Brontosaurus was one of the largest land animals that ever existed. Apatosaurus lived during the late Jurassic Period, about 157-146 million years ago. The dinosaur Brontosaurus is now called Apatosaurus, one of a group of huge dinosaurs called Sauropods. This enormous plant-eater measured about 70-90 feet long and about 15 feet tall at the hips. It weighed roughly 33-38 tons. Its head was less than 2 feet long; it had a long skull and a very tiny brain. This plant-eater had a long neck (with 15 vertebrae), a long whip-like tail (about 50 ft long), a hollow backbone, peg-like teeth in the front of the jaws, and four massive, column-like legs. Its hind legs were larger than the front legs.

The biggest meat-eater at that time in North America (Allosaurus) was only 15 feet tall. Apatosaurus could have held its head at most 17 feet off the ground, which afforded Apatosaurus protection from predators, who couldn't attack its head or neck, and probably had more sense than to attack its gigantic, clawed feet or whip-like tail.

Strangely, Apatosaurus' nostrils were located on the top of its head. No one is sure what purpose this served. It used to be thought that this was a snorkel-like device for a water-dwelling animal, but this theory has been repudiated. Since Apatosaurus fossils have been found far from any water-dwelling fossils, it is now believed that Apatosaurus spent most of its time on land, far from large bodies of water or swamps.

WHY WAS APATOSAURUS' NECK SO LONG?
Apatosaurus held its neck more-or-less horizontally (parallel to the ground). The long neck may have been used to "mow" wide swaths of vegetation or to poke over and into stands of trees to get foliage that was otherwise unavailable since Apatosaurus could not venture into forests because of its size. The long neck may have

enabled this sauropod to eat soft horsetails, club mosses, and ferns. These soft-leaved plants live in wet areas, where sauropods couldn't venture, but perhaps the sauropod could stand on firm ground and browse in wetlands.

BEHAVIOR, LIFE SPAN

Although many sauropods may have traveled in herds, bonebeds of Apatosaurus fossils have not been found. Apatosaurus may have been a solitary animal.

Sauropods' life spans may have been on the order of 100 years.

EGGS

Apatosaurus, like other sauropods, hatched from enormous eggs up to a 1 foot wide. Sauropod eggs have been found in a linear pattern and not in nests; presumably the eggs were laid as the animal was walking. It is thought that sauropods did not take care of their eggs.

DIET

This huge, extremely heavy reptile was an herbivore. It must have eaten a tremendous amount of plant material each day to sustain itself. Apatosaurus must have spent almost all of its time grazing. It had blunt pencil-like teeth, arrayed like a garden rake. These were useful for stripping and gathering foliage. According to paleontologist Robert Bakker, Apatosaurus may have had thick, moose-like lips that would help in gathering plant material.

(pronounced GAS-troh-liths) Gastroliths are stones that some animals swallow and use to help grind up tough plant matter in their digestive system. Gastroliths are also called gizzard rocks. Apatosaurus swallowed stones to use as gastroliths.

Apatosaurus swallowed leaves and other vegetation whole, without chewing them, and had gastroliths (stomach stones) in its stomach to help digest this tough plant material.

Go to www.EnchantedLearning.com for a full version of this article.

HOW DID WE MAKE THE PUPPET?

The part of Bessie Apatosaurus is performed by three puppeteers, one in front holding the head and working the mouth, and two puppeteers completely inside the puppet. Each of the performers on the inside is wearing a backpack to lift the weight up above their heads. Their feet are inside Bessie's huge dinosaur feet.

Bessie's body is made of nylon rods wired together to make a frame. The frame is covered with muslin, foam, and then polyfill, or batting. The outside layer is colored spandex which is painted. Bessie's whip-like tail is made of a series of hinges surrounded by nylon hoops and covered with spandex.

APATOSAURUS LINKS

The American Museum of Natural History's page on Apatosaurus: *www.amnh.org/Exhibition/Expedition/Fossils/Specimens/apatosaurus.html*

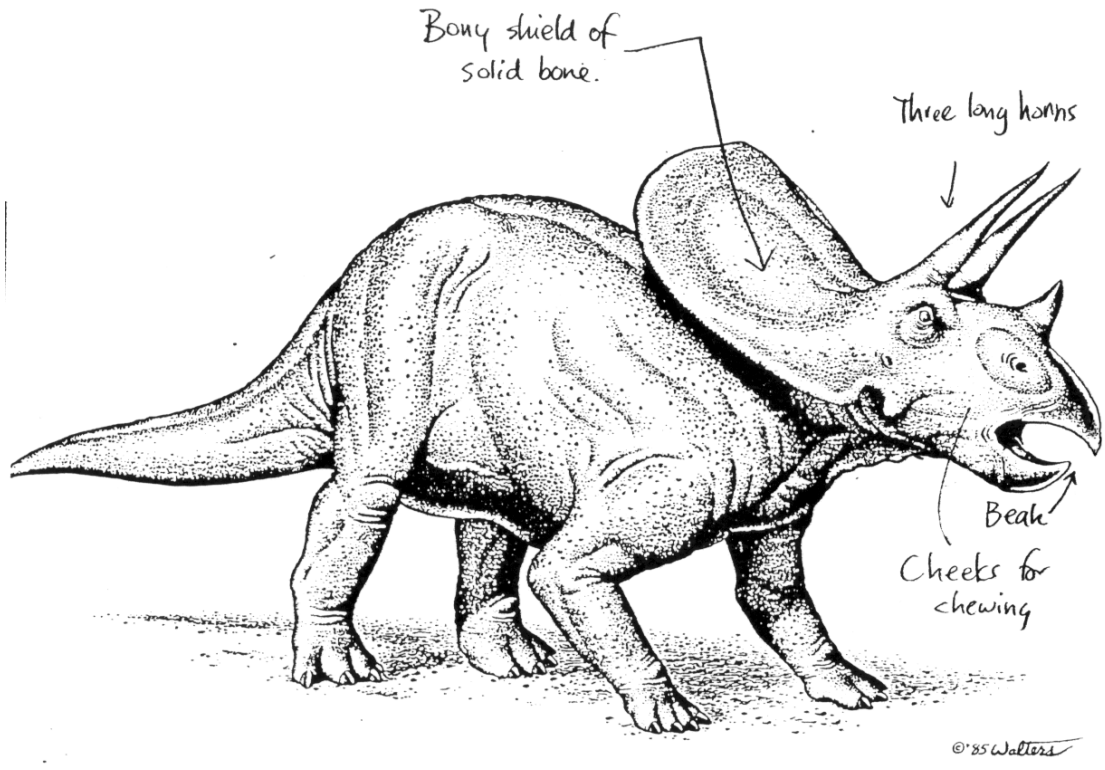
The Carnegie Museum's (Pittsburgh, PA, USA) Apatosaurus mount: *www.lhl.lib.mo.us/pubserv/hos/dino/gil1936a.htm*

Sauropods at the Univ. of California Museum of Paleontology at Berkeley: *www.ucmp.berkeley.edu/diapsids/saurischia/sauropoda.html*

Triceratops Horridus

Triceratops was a rhinoceros-like dinosaur. It walked on four sturdy legs and had three horns on its face along with a large bony plate projecting from the back of its skull (a frill). One short horn above its parrot-like beak and two longer horns (over 3 feet or 1 m long) above its eyes probably provided protection from predators. The horns were possibly used in mating rivalry and rituals. It had a large skull, up to 10 feet (3 m) long, one of the largest skulls of any land animal ever discovered. Its head was nearly one-third as long as its body. Triceratops hatched from eggs.

Triceratops was about 30 feet long (9 m), 10 feet tall (3 m), and weighed up to 6-12 tons. It had a short, pointed tail, a bulky body, column-like legs with hoof-like claws, and a bony neck frill rimmed with bony bumps. It had a parrot-like beak, many back teeth, and powerful jaws.



WHEN TRICERATOPS LIVED

Triceratops lived in the late Cretaceous period, about 72 to 65 million years ago, toward the end of the Mesozoic, the Age of Reptiles. It was among the last of the dinosaur species to evolve before the Cretaceous-Tertiary extinction 65 million years ago. Among the contemporaries of Triceratops were Tyrannosaurus rex (which probably preyed upon Triceratops), Ankylosaurus (an armored herbivore), Corythosaurus (a crested dinosaur), and Dryptosaurus (a meat-eating dinosaur).

BEHAVIOR
Triceratops probably traveled in herds, like the other Ceratopsians. This hypothesis is supported by the finding of bone beds, large deposits of bones of the same species in an area.

When threatened by predators, Triceratops probably charged into its enemy like the modern-day rhinoceros does. This was probably a very effective defense.

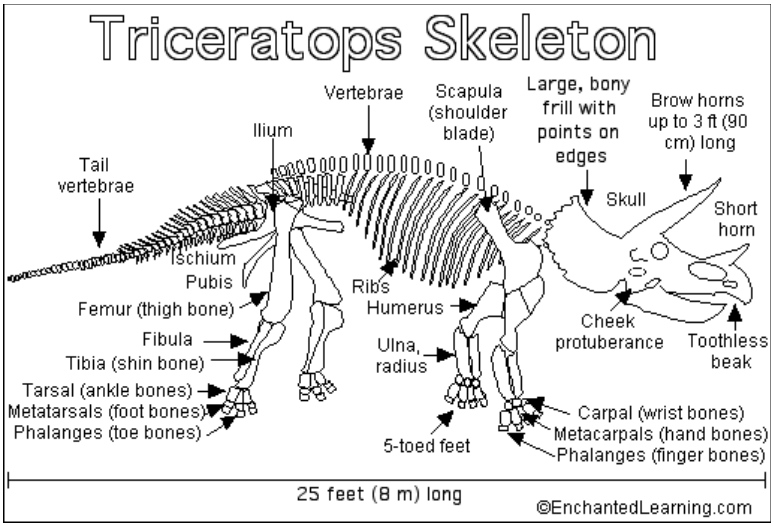
REPRODUCTION
No one knows how Triceratops reproduced or raised their young, except that they probably hatched from eggs.

Go to www.EnchantedLearning.com for a full version of this article.

HOW DID WE MAKE THE PUPPET?

Tony and Trixie Triceratops are performed by two puppeteers in each puppet, one in front legs and the other in the back legs. Tony and Trixie's bodies are made of nylon rods wired together to make a frame. The frame is covered with muslin, foam, and then polyfill, or batting. The outside layer is colored spandex which is painted. The performer in the front is wearing a backpack that extends up into the frill at the back of the triceratops' head. The frill contains some net material so the puppeteer can see. The front part of the head hangs off the frill part. The puppeteer moves it by manipulating two poles: one pole points the head in a particular direction and the other moves the lower jaw when the character is singing or speaking.

TRICERATOPS LINKS
Triceratops Questions and Answers
Origami Triceratops skeleton by YOSHINO Issei: *www.datt.co.jp/origami/Gallery/Japan/triceratops.html*
Triceratops and other Ceratopsians at at the Royal Tyrrell Museum, Canada: *www.tyrrellmuseum.com/tour/tricera.html*
Triceratops links at the Museum of Victoria, Melbourne, AU: *http://pioneer.mov.vic.gov.au/dinoExhibit/triceratops.html*
Overhead view and side view of a Triceratops skull from the Smithsonian Museum, Washington, D.C., USA: *www.viewseum.com/dinosaurs/dinosaur5.html*



PTERODACTYLS

"Winged fingers"

ANATOMY

The Pterodactyls (or Pterodactyloids) were a group of flying reptiles that ranged in size from having a wingspan of a few inches (primitive Pterodactyls) to over 40 feet (later Pterodactyls). They were lightly built with hollow bones, long, curved necks, long skulls, and small bodies. They had large brains and good eyesight. Some had short tails, some had no tails. Some had light-weight, bony head-crests, some did not. The crest may have acted as a rudder when flying or may have been a sexual characteristic. Some pterodactyloids had fur on their bodies.

Pterodactyloid wings were covered by a leathery membrane. This thin but tough membrane stretched between its body, the top of its legs and its elongated fourth fingers, forming the structure of the wing. Claws protruded from the other fingers.

Pterodactyloids could flap their wings and fly with power, but the largest ones (like Quetzalcoatlus) probably relied on updrafts (rising warm air) and breezes to help in flying.

WHEN PTERODACTYLS LIVED

Pterodactyloids lived from the Jurassic period through the late Cretaceous period. Pterodactyls died out during the Cretaceous, about 65 million years ago, during the K-T extinction. Birds evolved during the Jurassic period and were probably competition for the pterodactyloids.

DIET

Pterodactyloids were carnivores; some had bristle-like teeth, some had no teeth. They ate fish (which they caught at the surface of the oceans), mollusks, crabs, perhaps plankton (for some species), insects, and scavenged dead animals on land.

Go to www.EnchantedLearning.com for a full version of this article.

HOW DID WE MAKE THE PUPPET?

Terry Pterydactly is a rod puppet. Her body and head are mounted on a rod which is held on a flagpole holder by the main puppeteer. Two other puppeteers hold the wings, one on each side. The person in the center operates the mouth by a line attached to her lower jaw. All the performers have to work in perfect coordination to make the flight of the Pterodactyl look real.

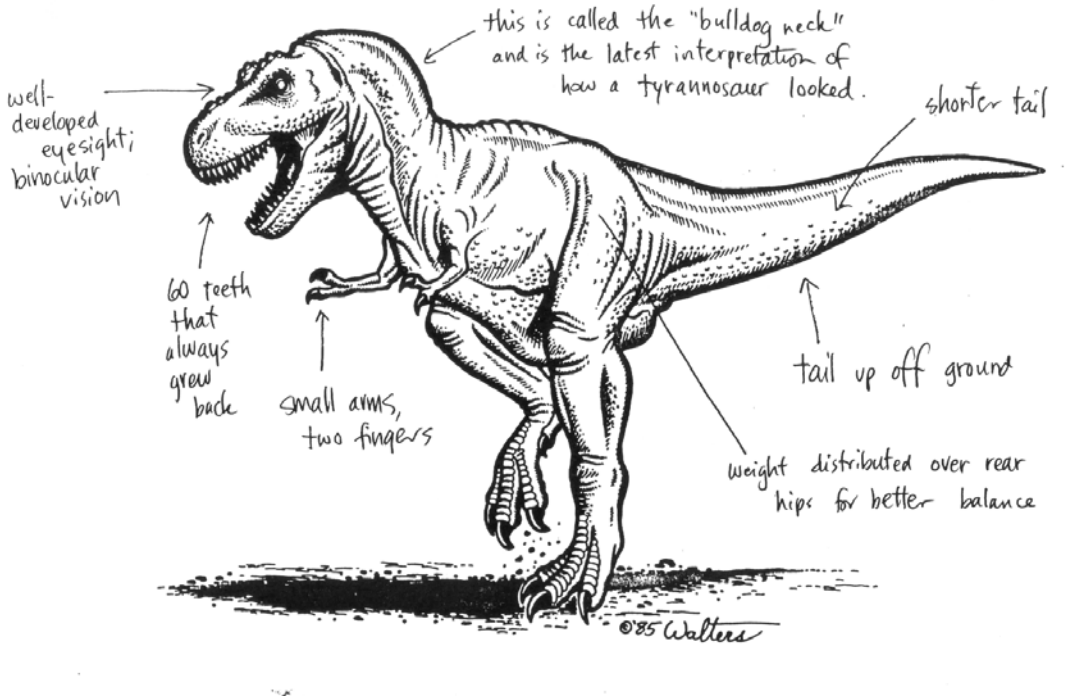
PTERODACTYLOID LINKS

Pterosaurs from the UCMP, Berkeley: *www.ucmp.berkeley.edu/diapsids/pterosauria.html*
Quetzalcoatlus, the giant pterosaur, at the Royal Tyrrell Museum: *www.tyrrellmuseum.com/tour/quetzalcoatlus.html*

Tyrannosaurus rex

T. rex was a huge meat-eating dinosaur that lived during the late Cretaceous period, about 85 million to 65 million years ago. T. rex lived in a humid, semi-tropical environment, in open forests with nearby rivers and in coastal forested swamps. The seasons were mild.

Tyrannosaurus rex used to be the biggest known carnivorous dinosaur. Giganotosaurus and Carcharodontosaurus are slightly bigger.



ANATOMY

Tyrannosaurus rex was a fierce predator that walked on two powerful legs. This meat-eater had a huge head with large, pointed, replaceable teeth and well-developed jaw muscles. It had tiny arms, each with two fingers. Each bird-like foot had three large toes, all equipped with claws. T. rex had a slim, stiff, pointed tail that provided balance and allowed quick turns while running. T. rex's neck was short and muscular. Its body was solidly built but its bones were hollow.

SIZE

Tyrannosaurus rex was up to 40 feet long, about 15 to 20 feet tall. The arms were only about 3 feet long. Tyrannosaurus rex was roughly 5 to 7 tons in weight.

The enormous skull was about 5 feet long. The eye sockets in the skull are 4 inches across; the eyeballs would have been about 3 inches in diameter.

T. rex left footprint is 1.55 feet long (although its feet were much longer, about 3.3 feet long; T. rex, like other dinosaurs walked on its toes). It had a stride length of up to 12 to 15 feet. Tyrannosaurus Rex may have run at up to 15 mph.

TEETH AND JAWS
T. rex's jaws were up to 4 feet long and had 50 to 60 thick, conical, bone-crunching teeth that ranged in size from very small to over 9 inches long. The adult had a variety of sizes of teeth in its jaws at one time, as teeth were broken and new (smaller) ones grew in to replace them. One T. rex was found with some teeth up to 13 inch long. T. rex could eat up to 500 pounds of meat and bones in one bite!

Tyrannosaurus rex had a wrap-around overbite; when T. rex closed its mouth, the upper parts of the lower jaw's teeth fit inside the upper teeth.

SKIN
Fossilized specimens of T. rex's rough, scaly skin have been found. It was bumpy, like an alligator's skin, and has been described as a "lightly pebbled skin."

HABITAT AND DISTRIBUTION
Tyrannosaurus rex probably lived in forests, where its prey (plant-eating dinosaurs) could find plenty of food. T. rex fossils have been found in western North America and Mongolia.

Go to www.EnchantedLearning.com for a full version of this article.

HOW DID WE MAKE THE PUPPET?
This 11-foot tall monster is actually performed by a single puppeteer! The head and torso are supported by an aluminum backpack modified to carry the towering creature. The puppeteer actually operates the head with two hands on a pair of handlebars as if he was riding a bicycle! The feet and legs are manipulated by the performer's own feet slipped into a secret pair of size 12 sneakers just behind Rex's toenails.

TYRANNOSAURUS LINKS
University of California, Berkeley: *www.ucmp.berkeley.edu/trex/trexpo.html*
About T. Rex, building a T. Rex skeletal model, kid's drawing contest.

Nova: The Curse of T. Rex: *www.pbs.org/wgbh/nova/teachers/programs/2408_trex.html*
A video and teachers resource guide on the discovery of a nearly complete T. Rex skeleton in South Dakota in 1990.

What Happened to the Dinosaurs?

The K-T Extinction

Evidence from locations across the globe supports the idea that a large asteroid struck Earth near the present-day Gulf of Mexico 65 million years ago at the end of the Cretaceous Period. Scientists theorize that huge amounts of water and dust entered the atmosphere and blocked sunlight for years, cutting the energy supply of plants on land and in the ocean. Without sunlight, the base of the food chain was devastated. Over half of the plant and animal groups that were living during the Cretaceous Period were extinct when the next era, the Tertiary Period, began.

The Evidence

Evidence for the catastrophic end of the Cretaceous period is found in a layer of sediment which was deposited at the same time that the extinction occurred. This layer contains unusually high concentrations of **Iridium**, found only in the earth's mantle, and in meteors and comets.

Meteorite Impact

Some paleontologists believe that the widespread distribution of this Iridium layer could have only been caused by meteorite impact. Further, these researchers cite the abundance of small droplets of basalt in the boundary layer as evidence of basalt from the earth's crust that were melted and flung into the air upon impact. The presence of shocked quartz - tiny grains of quartz that show evidence of the high pressure of impact - found in the boundary layer provides additional evidence of an extra-terrestrial impact at the Cretaceous-Tertiary boundary layer.

Species Affected

During the End-Cretaceous (K-T) extinction eighty-five percent of all species disappeared, making it the second largest mass extinction event in geological history. Although dinosaurs were among the unfortunate victims to perish in the K-T extinction, several other land and sea creatures were also severely affected or eliminated in the crisis. Among those that perished were the pterosaurs, many species of plants (except amongst the ferns and seed-producing plants), marine reptiles, and bivalves. Remarkably, most mammals, birds, turtles, crocodiles, lizards, snakes, and amphibians were primarily unaffected by the End-Cretaceous mass extinction.

BIRDS: Are Dinosaurs Still With Us?

In the last few years, scientists studying dinosaurs and birds have come to a remarkable conclusion. Not all dinosaurs vanished in the great extinction event that marked the end of the Cretaceous period. Rather, a number of small, arboreal dinosaurs of the theropod class survived and radiated into new forms. Their descendants are still dinosaurs, and are still with us today. We call them birds.

From the beginning of dinosaur studies in the 19th century, the affinities between birds and dinosaurs have been well known. For most of that time, birds have been considered descended from or related to dinosaurs. Since about 1995, however, new discoveries have made the conclusion overwhelming, at least to most scientists, that the relationship is more direct than had been realized. Birds aren't just descended from dinosaurs - they ARE dinosaurs!

K-T EXTINCTION LINKS

Animation of meteor hitting the earth: *www.classzone.com/books/earth_science/terc/content/visualizations/es3006/es3006page01.cfm?chapter_no=visualization*

Hooper Virtual Paleontological Museum *http://park.org/Canada/Museum/lobby.html*
Click on Mass Extinctions

Birds as Dinosaurs: *http://www.globaldialog.com/AdventureCentral/aviary/birdinos.html*

Resource Page for Teachers and Students

WEBSITES:

Dinosaur Facts: *www.enchantedlearning.com*
A great resource for kids and teachers with age-specific activities including coloring, essay ideas, crafts, puzzles, and jokes. Go to ZoomDinosaurs for a comprehensive on-line textbook about dinosaurs.

Smithsonian National Museum of Natural History (Washington): *www.nmnh.si.edu/paleo/dino/*
A virtual tour of the museums dinosaur exhibit.

American Museum of Natural History (Manhattan): www.amnh.org/education/resources/
A learning resource for Teachers and Students about Anthropology, Astronomy, Biology, Earth Science, and Paleontology.

The Natural History Museum (London): *www.nhm.ac.uk/interactive/dinosaurs.html*
Get the proof on how birds actually developed from dinosaurs.

Geologic Time Periods: *www.ucmp.berkeley.edu*
University of California, Berkeley Museum of Paleontology
Contains reference pages for each time period with facts of interest and ancient life.
Fantastic resource guide for K-12 students and teachers.
Kids check out ***Dinolink*** at www.ucmp.berkeley.edu/education/dinolink.html

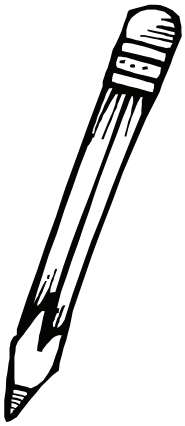
Ice Ages
Illinois State Museum: *www.museum.state.il.us/exhibits/ice_ages/*
On line exhibit of the various ice ages, including the one we are still in (technically) today.

Dear Family,

Today, I saw a live, professional theatre performance presented by Arts On Stage called, Mammoth Follies The play dramatizes historic and scientific facts (as well as some myths) about the great age of the dinosaur. Enormous puppets were on stage, including the host Willie Mammoth, Smiley the Saber-Tooth Tiger, Bessie the lovable 27-foot long Apatosaurus, Tony and Trixie Triceratops, Terry the Pterodactyl, and the 11-foot tall T. Rex. It was a trip through pre-history!

Attending a live performance is very different from watching a television show or a movie. Please ask me about my favorite characters and parts of the play. I would like to tell you all the things I learned and remember best.

Love,



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Child's Name

We welcome you and/or your child's comments. Artwork is always appreciated too! Contact information below.

info@ArtsOnStage.org www.ArtsOnStage.org 410-252-8717

Mail: Arts On Stage, Attn: Jamie Papas, 12 Broadridge Lane, Lutherville, MD 21093