

Ages 7 & up
EI-5177

Dueling Dino Dig Guide Book

TRICERATOPS



EI-5176



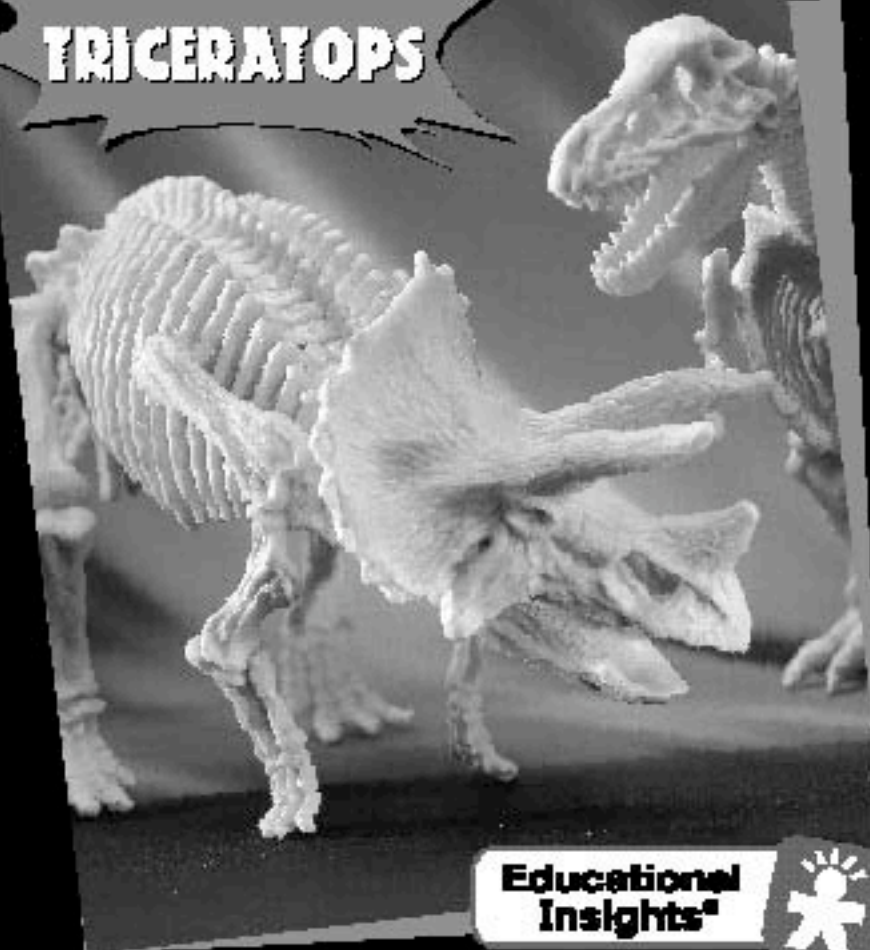
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**FOR MORE DIGGING FUN,
ADD THESE DUELING DINO DIGSM
KITS TO YOUR COLLECTION!**

ISBN 1-56767-217-5



**Educational
InsightsSM**



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WARNING: CHOKING HAZARD—Small parts.
Not for children under three (3) years.

What Is in Dueling Dino Dig?

Dueling Dino Dig Guide Book—Triceratops kit: This book contains an exciting story featuring Triceratops, set in the Mesozoic era. You will also find background information and history, plus instructions on how to excavate your fossils, assemble them, and pose your model with other Dueling Dinosaurs.

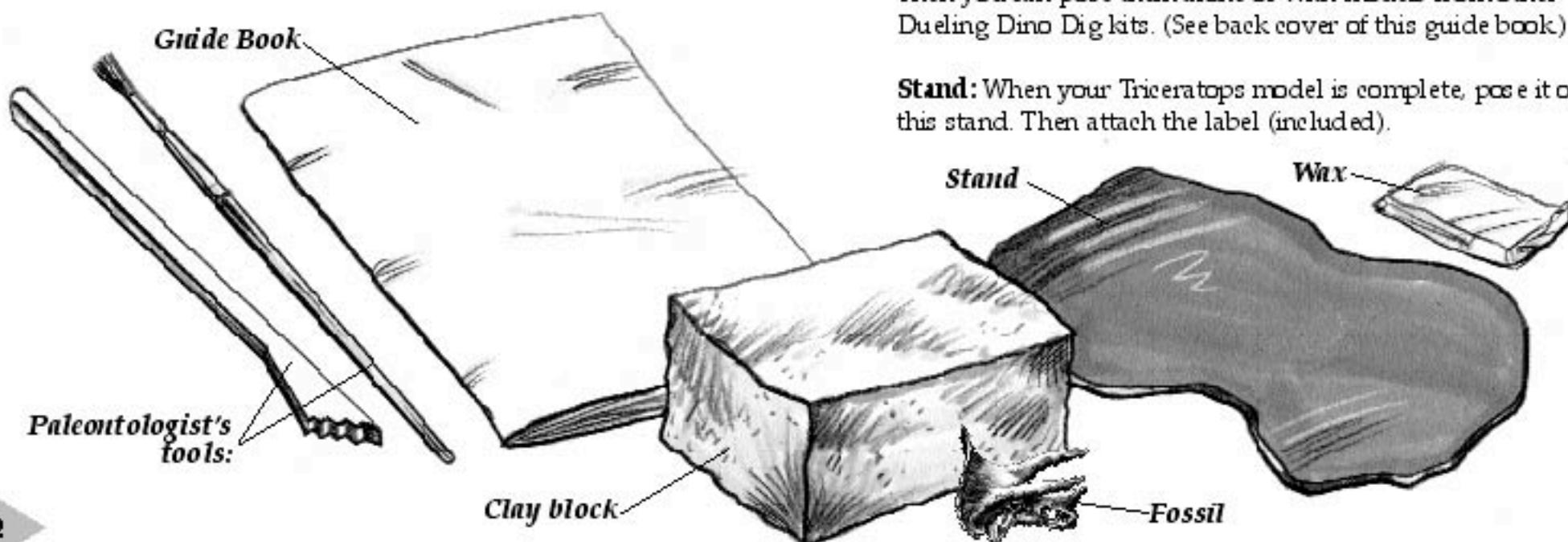
Clay block: This block of clay represents a piece of earth—millions of years old. Buried inside the clay, you will find fossil replicas of Triceratops bones.

Paleontologist's tools: Just like a paleontologist, you will get to dig "fossils" from the "earth." The digging tool will help you break apart the clay, separate the fossils from the clay, and clean bits of clay from the fossils. The brush will let you clean the dust away from the fossils as you excavate.

Fossils: The fossils that you excavate will be smaller than real ones, but when you put them together you'll have a true-to-scale skeleton of Triceratops.

Wax: This wax will hold your fossil parts together. It will not harden and you can change poses or positions whenever you wish! The flexibility of this wax allows your dinosaur to have a little bit of movement, especially in the jaw and legs. Then you can pose them alone or with models from other Dueling Dino Dig kits. (See back cover of this guide book.)

Stand: When your Triceratops model is complete, pose it on this stand. Then attach the label (included).



Welcome to Triceratops's World

Are you ready to find and study fossils, just like a paleontologist?

Are you ready to dig some fossils of your own?

Are you ready to build a model of a dinosaur and pose it in action?

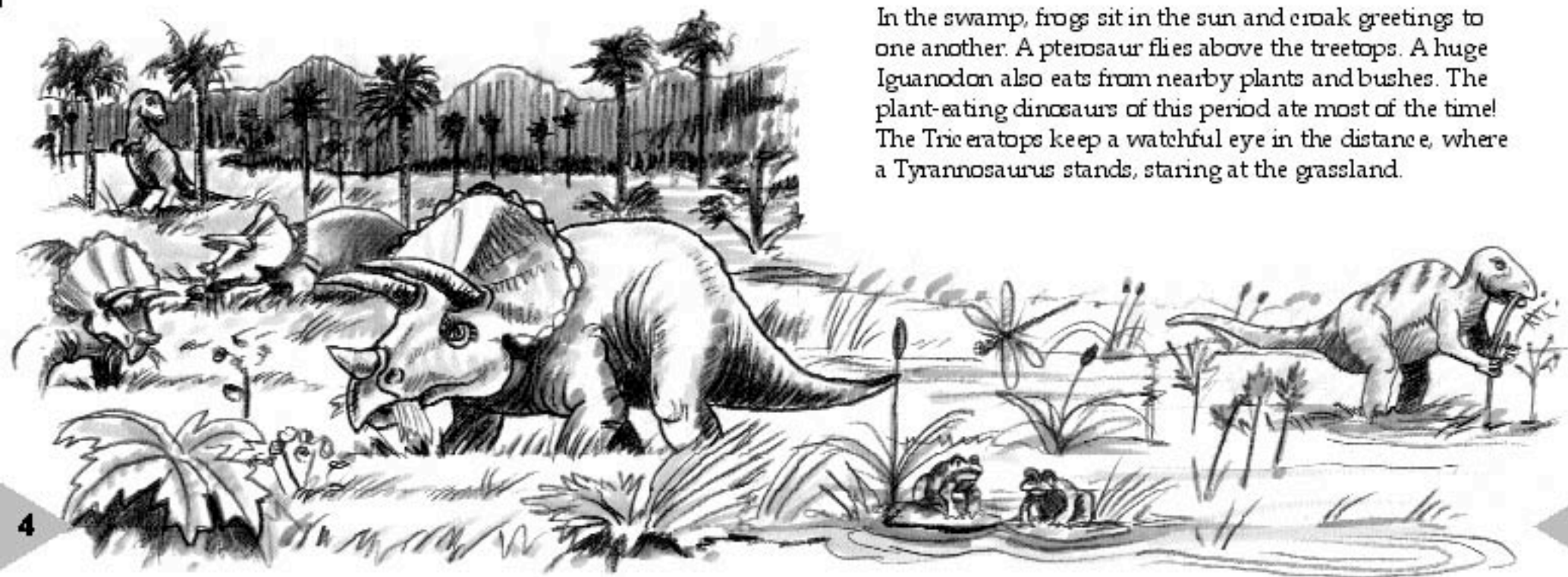
Then you are ready for Dueling Dino Dig!

Let's go back in time more than 65 million years to the world of dinosaurs—the time of Triceratops....

Triceratops Meets Her Fate

It is 65 million years ago, the time called the Mesozoic era* —the age of dinosaurs. Triceratops, a huge dinosaur, lifts her massive head to feel the warm breeze blow over the swamp. She tilts her head to one side and uses her beaked mouth to snip the leafy green plants that grow near the swamp's edge. Her long brow horns snag some higher branches and pull them down. With the sharp sides of her beak, she chops off mouthfuls of twigs and leaves, then slices them up between rows of shearing cheek-teeth inside her mouth. Other Triceratops in her herd eat from nearby branches. Chomp, crunch—the sounds mix with the buzzing of the dragonflies.

In the swamp, frogs sit in the sun and croak greetings to one another. A pterosaur flies above the treetops. A huge Iguanodon also eats from nearby plants and bushes. The plant-eating dinosaurs of this period ate most of the time! The Triceratops keep a watchful eye in the distance, where a Tyrannosaurus stands, staring at the grassland.



* To find out more about the Mesozoic era and the age of dinosaurs, see page 26.

Suddenly, a loud sound is heard across the grassland. The Triceratops turns to see a Parasaurolophus sounding a warning. Frogs leap into the water. All normal sounds of life come to a halt. Triceratops lifts her heavy head. She wants to see what Parasaurolophus sees.

The Hunters

A pack of hunting Deinonychus breaks through some tall trees. They are running toward Triceratops! She and other members of her herd bellow warnings at the Deinonychus. The Triceratops form a circle, pushing their young into the center for protection. All of the Triceratops face the oncoming Deinonychus. They lower their huge heads and aim their deadly horns in striking position. Triceratops may be gentle plant-eaters, but they will fight to protect themselves and their young!

The Deinonychus, hungry and snarling, approach the herd of Triceratops. They look for an opening in the circle. Their long, strong arms are outstretched — eager to grasp prey with their sharp-clawed hands! The largest Deinonychus jumps forward, balancing on one foot and kicking with the other. His jaws gape wide, showing big dagger-like teeth.

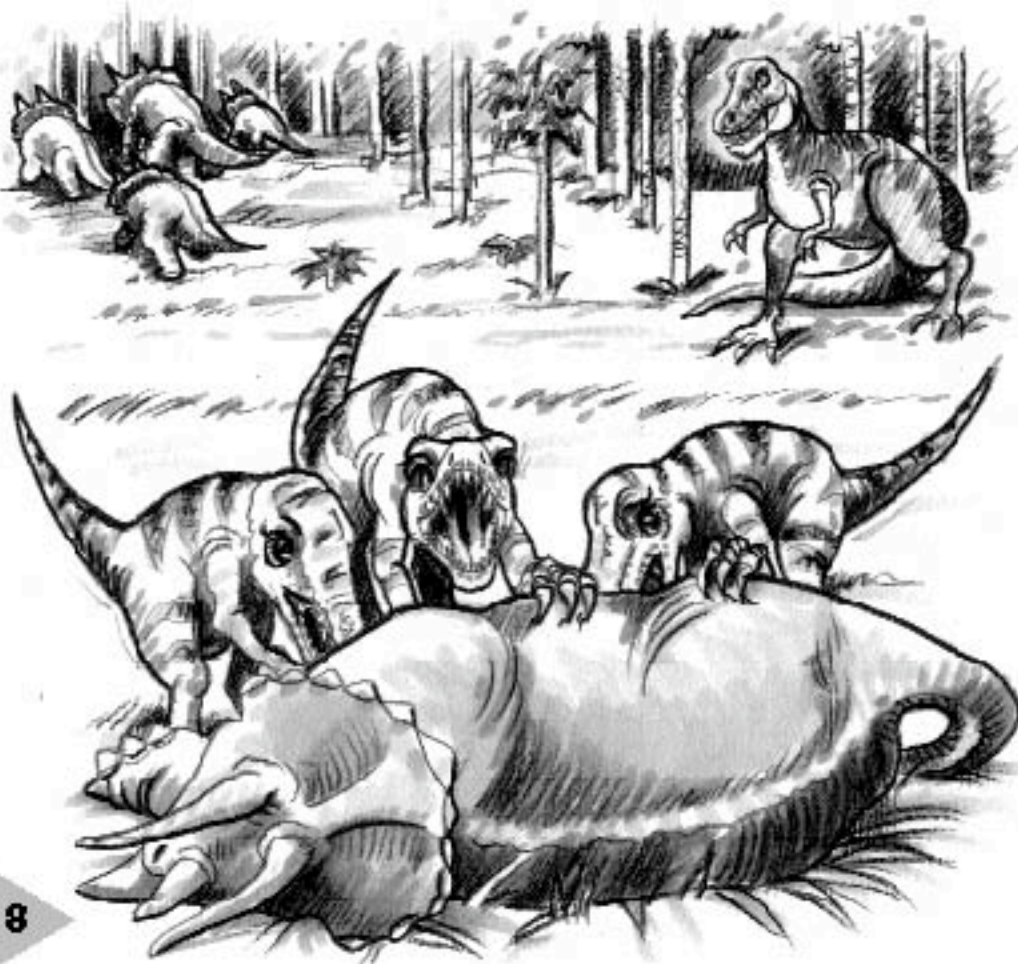
The Fight

Triceratops lowers her head, bellowing with fear and anger! She nips at her attacker, twisting her head from side to side. With her nose horn she gores Deinonychus, just as he slashes her shoulder. Crying out with pain, blood gushing from her wound, Triceratops uses her two brow horns to jab the attacking carnivore. The Deinonychus is down, but others leap onto Triceratops's back, slashing her with 12-inch (30 cm) sickle claws.



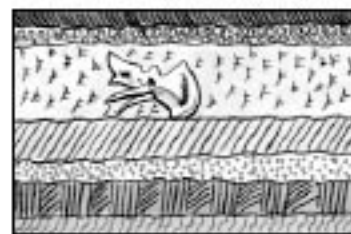
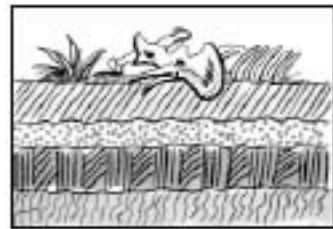
The battle is over. Triceratops lies dead. The surviving members of her herd run away. With huge thuds, they move their heavy bodies to safety, leaving the herd of Deinonychus noisily feeding on the lifeless Triceratops.

Tyrannosaurus, ever watchful, waits until the Deinonychus have finished their feast to come closer. He hopes to find some food, but instead finds only Triceratops's bare bones.



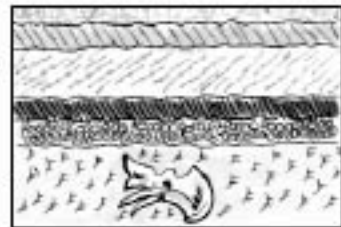
As Time Passes...

Triceratops's skeleton lies on the ground. Over time, her bare bones become scattered and weather-worn. The nearby river changes its course, and in a sudden flash flood, the bones are buried under sand, mud, and silt.

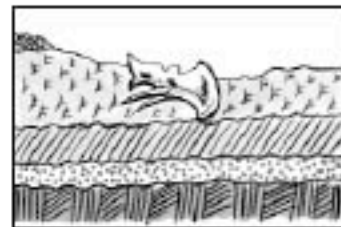


Fifteen million years after Triceratops's death, her bones are slowly transformed into stony fossils by the same chemicals that turned the river silt into rock.

During the Ice Age, 20,000 years ago, woolly mammoths roamed the land where the fossils lay buried. Mountains rose over the Triceratops fossils, pushing the bones deeper into the earth.



Centuries passed. The layered rocks, formed more than 65 million years ago, have been eroded by seasons of rain, snow, sun, and wind.



Finally, one day, the fossils that had been buried so deeply and for so long are brought to the earth's surface once again.

Triceratops Findings

Montana Plains, 1880s

Two fossil brow horns from the “three-horned face,” known as Triceratops, were found in the plains of Montana late in the 1880s. Through this discovery and other findings, paleontologists learned that Triceratops was about the size of an elephant (5.3 tons). A huge bony neck frill, formed by two long skull bones, protected the dinosaur’s neck and shoulders. The two long horns stuck out above the brow, and a shorter horn jutted from its nose.

Scientists think that the horns developed as the breed became larger and had trouble hiding from its enemies. These horns became mighty weapons. The bony horn cores measured up to 3 feet (90 cm). Triceratops could have charged any animal that threatened it, and gouged it with its horns. Scars and punctures in Triceratops fossils make scientists believe they also fought each other, probably for dominance.

Triceratops was a plant-eater. It would use its parrot-like sharp beak to snip off tough and fibrous plants. Then, with its strong powerful jaws and sharp teeth that meshed like scissor blades, it chewed up the plants, twigs, and branches. New teeth grew in to replace old teeth as they fell out. Paleontologists believe that because of their size (29 feet, or 9 meters), these large ceratopsians (horned faces), had to keep constantly moving in order to find enough food.

Although many skull and skeletal fossils have been found, an entire Triceratops skeleton has not yet been discovered.



A Dinosaur Dig

Dinosaur digs require very hard work. It can take months, even years, and a lot of work to find a fossil and remove it from the earth. It's worth it, though, for the excitement of discovery and new scientific knowledge!

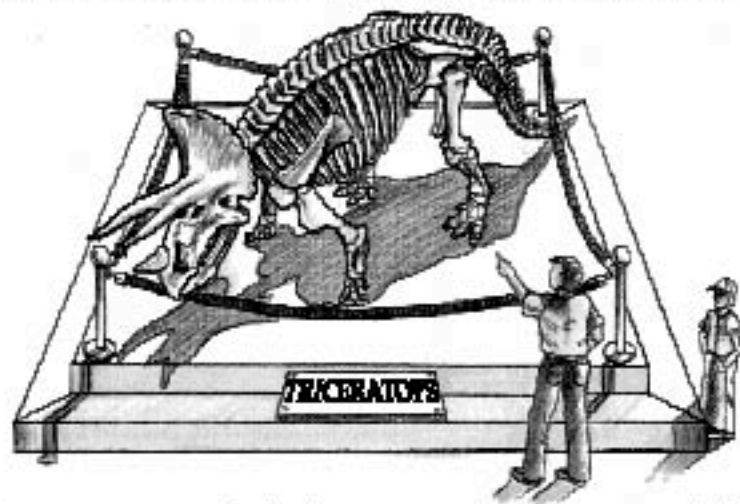
Let's take a look at what happens at many fossil digs:

- 1 Fossil hunters search rock layers of the Mesozoic era for fossils.
- 2 They use many tools, such as picks and hammers, bulldozers, and other heavy machinery to get to the fossils.



- 3 Once a fossil is found, the area is cleared and marked. Some of the rock and dirt is carefully removed from the fossil.
- 4 Photographs and drawings are made of the fossil while it is still in the ground. The fossil is numbered and labeled on a map of the site.

- 5 The fossil is uncovered with a brush. It is protected with wrappings of plaster-soaked cloth or sprayed with a resin to make it stronger.
- 6 When the plaster hardens, it is safe to remove the fossil from the ground. Sometimes a whole rock is excavated to protect a fragile fossil.
- 7 After it is removed from the ground, each fossil is carefully placed in a padded crate. The crates are loaded onto trucks and shipped to the museum laboratory.
- 8 At the laboratory, the fossils are carefully removed from their protective plaster or from the solid rock in which they were moved.
- 9 Researchers use magnifying glasses, microscopes, dental drills, dental picks, and even needles to free the fossil.
- 10 It may take years, but the fossils are finally reconstructed as a whole or part of a skeleton for display in a museum.



Now are you ready to begin your own dinosaur dig?

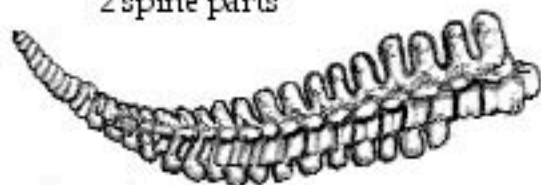
You'll DIG These Fossils!

Buried inside the Dueling Dino Dig clay block, you will find 10 different *Triceratops* "fossils." Of course, these bones aren't the true size of *Triceratops*. This dinosaur weighed about 5.3 tons and was about 29 feet (9 meters) long. You will discover bones that will let you assemble a true-to-scale model of *Triceratops*.

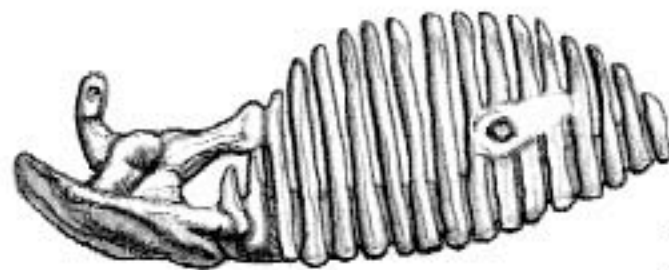
This is what you will find:



2 spine parts



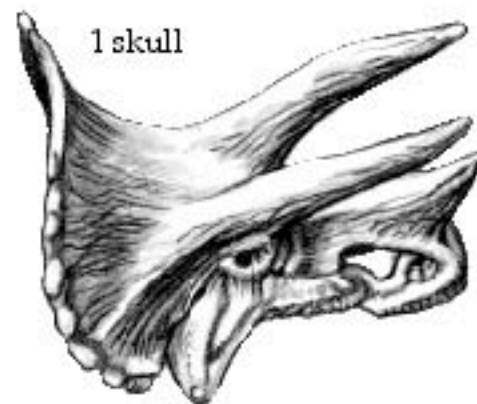
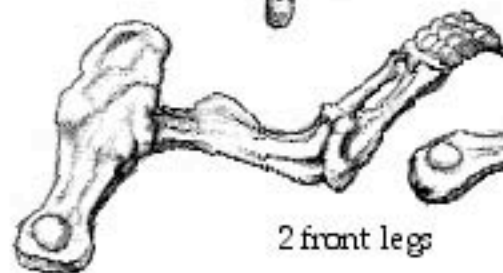
2 hind legs



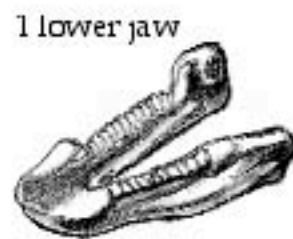
2 rib cages
with hip bones
attached



2 front legs



1 skull



1 lower jaw

Get Ready to Dig

Before You Begin

Set up a place to work. The area you choose must remain undisturbed while you complete your excavation. Spread out plenty of newspaper. Digging creates a lot of dust. Work on a floor or table counter that can easily be cleaned off when you're finished.

YOU'LL NEED:

- clay block
- digging tool
- brush



NOTE: You won't need the wax until you begin to assemble your model. Be careful to keep the wax separate from the clay. The clay dust will harm the wax.

Follow These Steps

Before beginning, read all the directions carefully.

1 Carefully examine the surface of the clay block. Look for bumps or dents that might show where one of your fossils is buried.

2 Gently start to scrape away the edge of the clay with your excavation tool. Scraping the clay is the most effective way to uncover fossils without breaking them. As in a real excavation, the clay may be very hard. Your excavation will go faster, and the digging tool will last longer if you sprinkle the clay with water.

SAFETY NOTE: Be careful to keep the sharp end of the tool pointed away from your eyes, body, and other hand. Work slowly and carefully. Remember, the fossil could be buried anywhere inside the clay.

3 When you see a fossil showing through the clay, be careful not to scratch it with your tool. Carefully dig out the clay from around the fossil. When you've uncovered its top and sides, start to dig out the clay underneath it. Never try to pull a fossil from the clay before you've dug completely around it. The fossils might break if not removed gently.

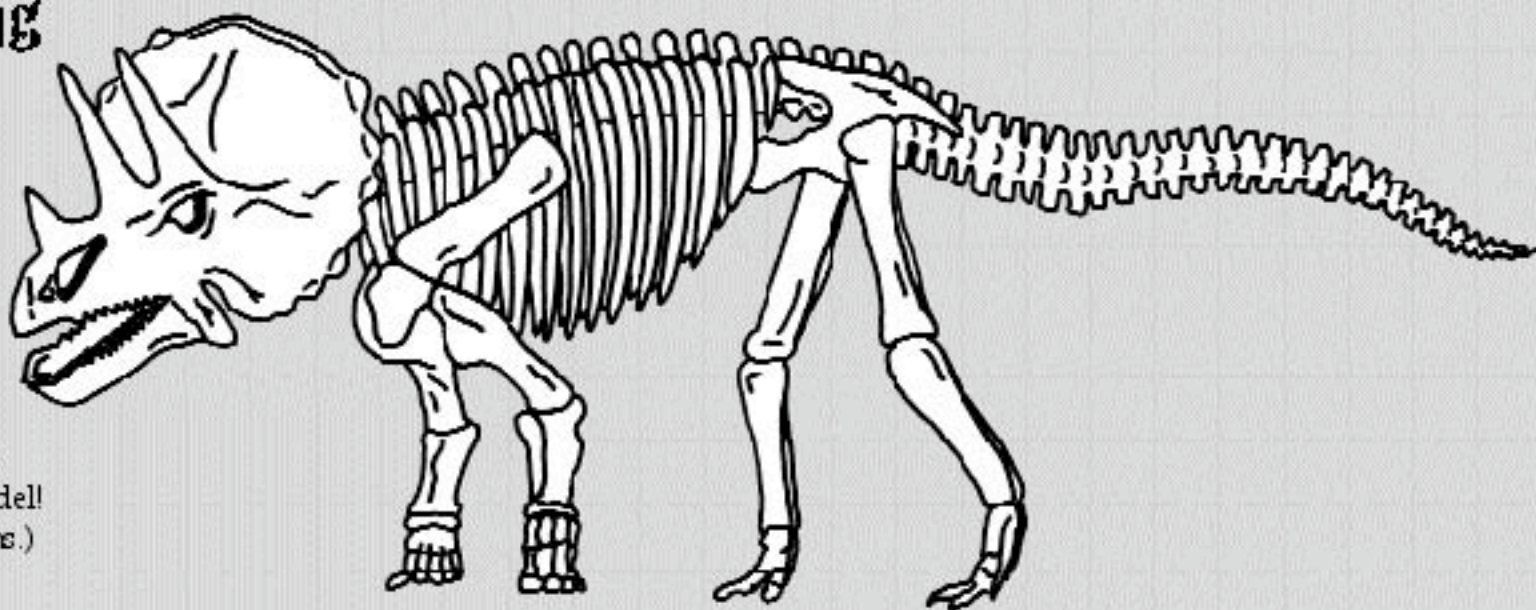
4 Use the excavation tool to remove any big clumps of clay from the fossil. Then use the brush to dust off the remaining clay. Use a damp cloth or carefully rinse the fossil in a bowl of water to clean off leftover dirt. Do not wash clay down the drain—it might cause a clog!

5 Follow these steps until you have unearthed all 10 of the fossils. Remember, good paleontology work is slow and methodical.

6 Record each fossil find by coloring that part of the Triceratops skeleton on pages 18 and 19. When you are ready to assemble Triceratops, turn to page 22 for directions.

Dino Drawing

Each time you find a Triceratops fossil, color it on this skeleton. You may want to use a different color for each fossil. (Color the rib cage in the back of the picture first, because it is difficult to see.) When the skeleton is complete, you are ready to make your Triceratops model! (See page 22 for instructions.)



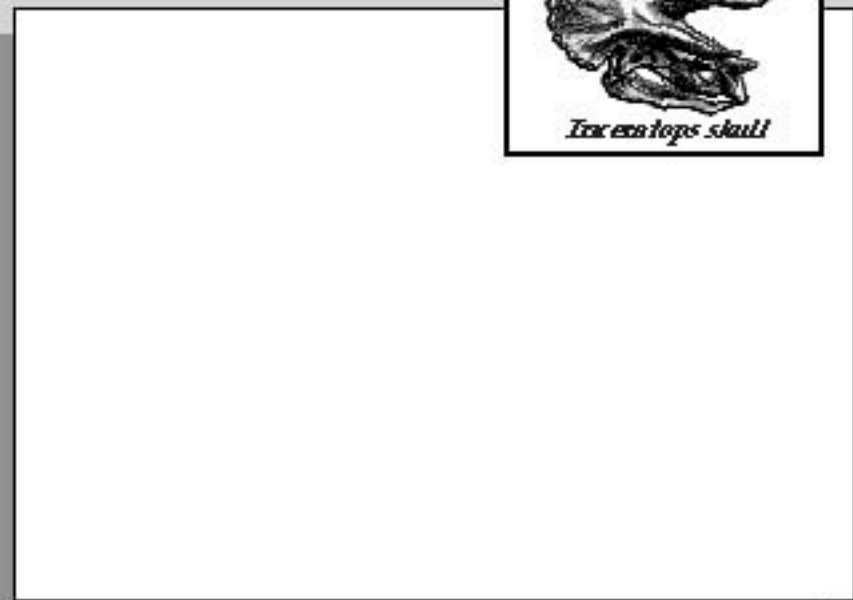
Draw Your Own

Paleontologists make a detailed drawing of the fossils they find. Then they label each part.

Look at the picture of the Triceratops skull. Can you see how the skull forms the neck frill? Do you see the two brow cores? The nose core?

Make your own drawing of the Triceratops skull you excavated. Label these parts:


- brow horn
- nose horn
- orbit (eye socket)
- neck frill





Triceratops Fact Sheet

Use what you read about Triceratops in this guide book to complete the fact sheet.



Triceratops

Length:

Weight:

Its Name Means:

When It Lived:

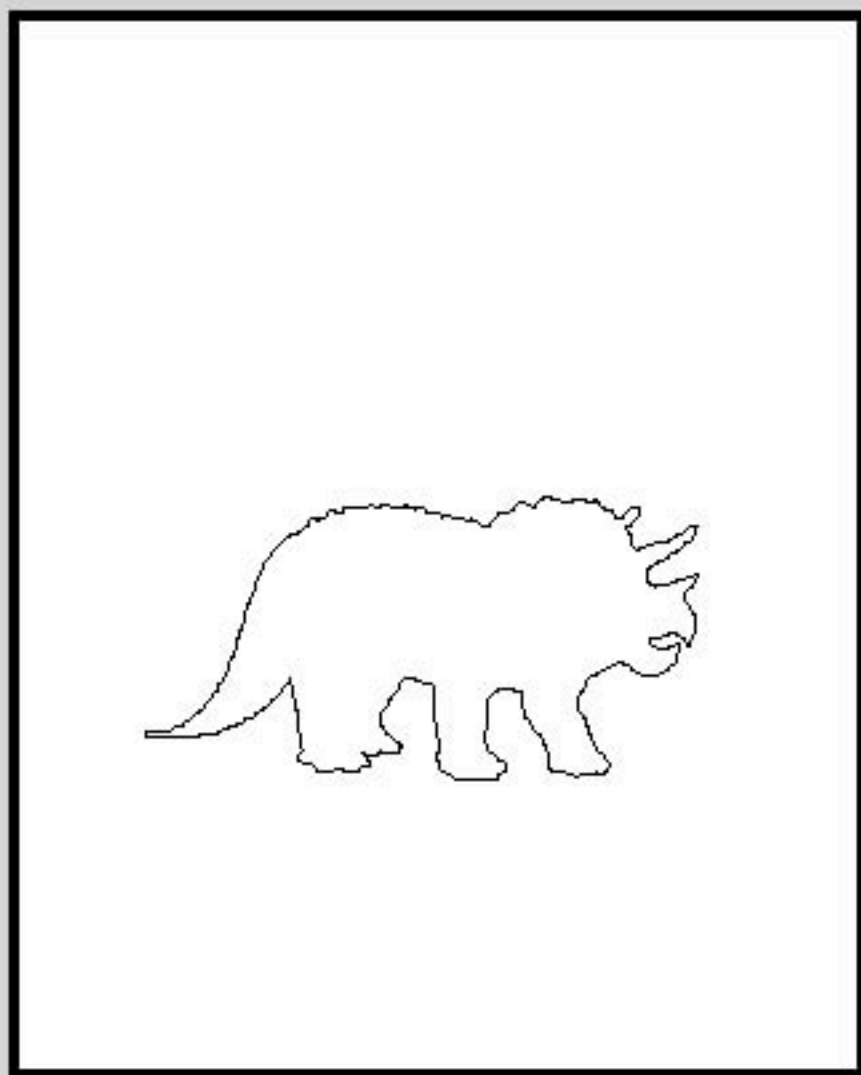
Diet:

Special Notes:



Picture Gallery

Use this page to draw Triceratops's environment. Be sure to include the details you have learned about plants, trees, and other animals that lived with Triceratops. (You can read more about the age of dinosaurs on pages 26-29.)

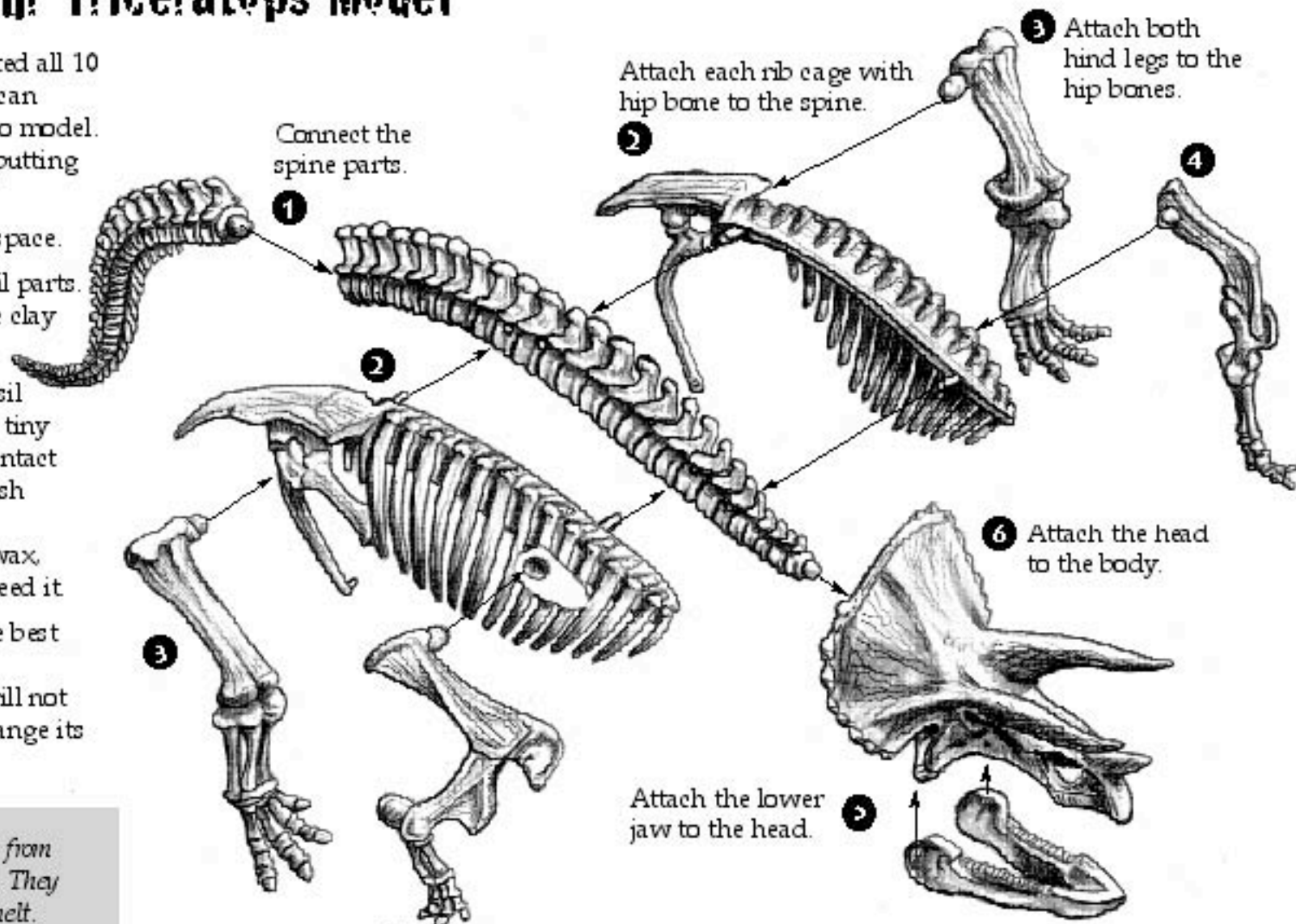


Making Your Triceratops Model

When you have excavated all 10 Triceratops fossils, you can build your Dueling Dino model. Some reminders about putting your model together:

- Prepare a clean work space.
- Clean and dry all fossil parts. Remember to keep the clay and wax separate.
- The wax holds the fossil parts together. Press a tiny piece of wax onto a contact point or nub. Then push the nub into the hole. Experiment with the wax, adding more as you need it.
- Experiment to find the best pose for your model. Remember, the wax will not harden, so you can change its pose or position.

Keep your model away from direct sunlight or heat. They can cause the wax to melt.



Connect the spine parts.

Attach each rib cage with hip bone to the spine.

Attach both hind legs to the hip bones.

Attach the head to the body.

Attach the lower jaw to the head.

Attach the front legs to the rib cage.

Pose your Triceratops on its stand. Use wax to keep it in place. Attach the label to the stand.

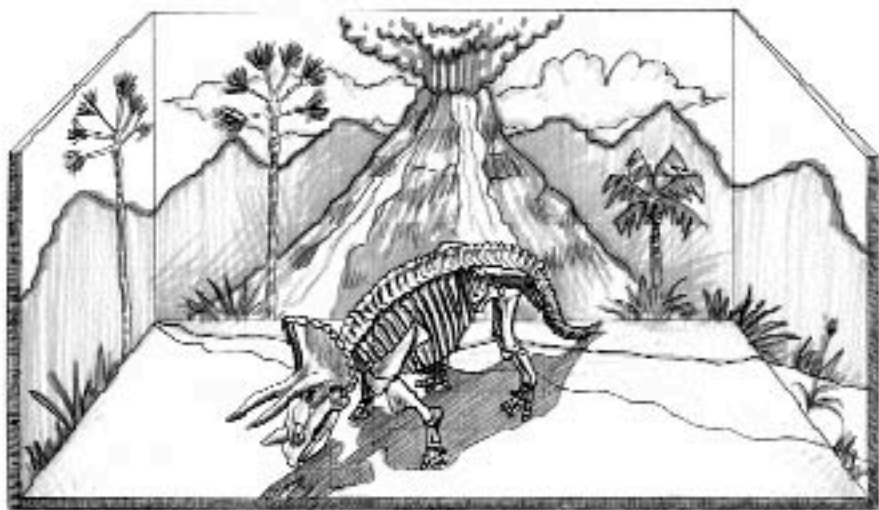
Displaying Triceratops

When your Triceratops model is complete, you will want to put it on display. Here are some ideas and hints:

Do you have a shelf for models or special things? It would be the perfect place for your Triceratops model.

You may want to create a Cretaceous diorama to place behind your model, complete with volcanoes erupting and pterosaurs swooping down from the sky! A diorama is a miniature scene. You have probably seen dioramas in museums.

To create a diorama, you can use a shoe box or a long piece of cardboard that you can bend into a three-sided display.

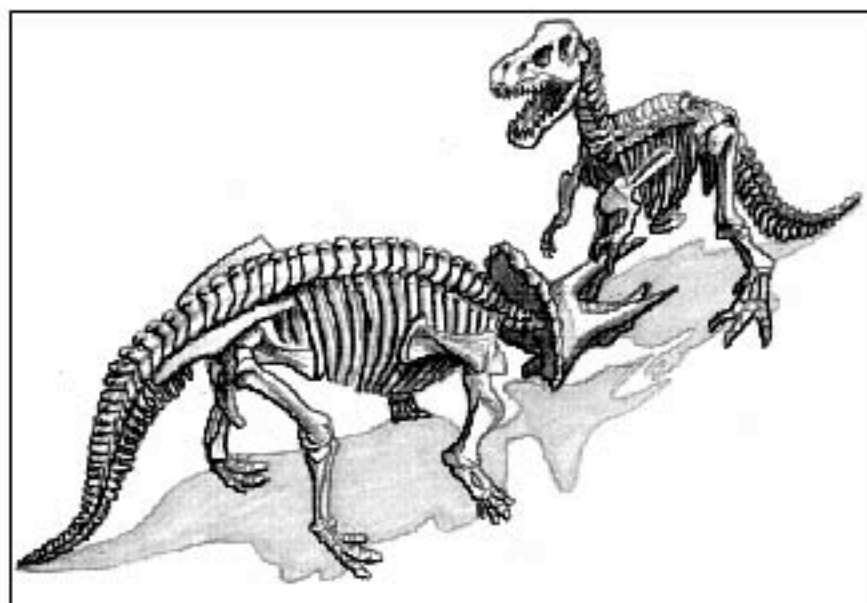


If you have a shoe box, cut out one of the long sides. The other long side will be the background with the volcanoes and mountains. The bottom of the shoe box will be the ground. Illustrate the three sides and place your model inside. Here are some things you might want to draw in the background:

Mountains, volcanoes, pine trees, flowering plants, streams, other dinosaurs, birds, and insects.

You can combine Triceratops with dinosaurs from other Dueling Dino Digs to create a whole scene from the Mesozoic era. There are four Dueling Dino Dig kits: Tyrannosaurus, Triceratops, Stegosaurus, and Velociraptor.

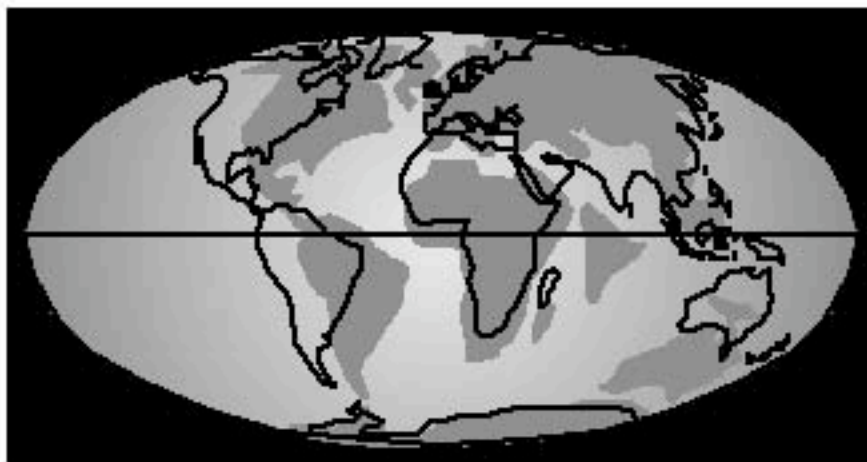
Below is a duel between Tyrannosaurus and Triceratops.



The Age of Dinosaurs

Dinosaurs lived on the earth millions of years ago, during the Mesozoic era. The Mesozoic era lasted from about 248 million years ago to about 65 million years ago. Not all of the dinosaurs lived on the earth at the same time during the Mesozoic era. The time is divided into three periods. They are the Triassic, from about 248 million years ago to 208 million years ago; the Jurassic, from around 208 million years ago to 145 million years ago; and the Cretaceous, which lasted from about 145 million years ago until the dinosaurs all mysteriously disappeared, about 65 million years ago.

Triassic



During the Triassic period, the earth looked different than it looks today. All of the land was connected as one continent. This land mass is called Pangaea, a word that means "all earth."

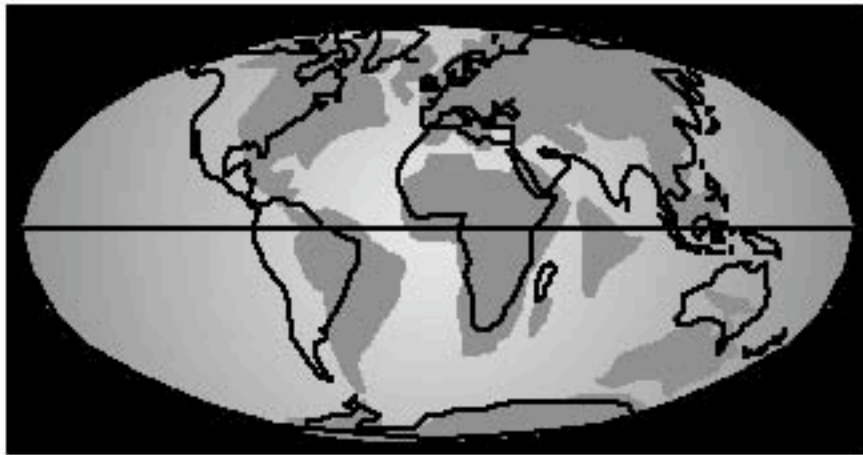
Scientists believe a group of bony fishes were ancestors of early reptiles. They lived on the earth about 370 million years ago. By about 245 million years ago, there were several kinds of reptiles roaming on the single land mass. The rhynchosaurs were ancestors of mammals. These plant-eaters had strong hind feet and curved beaks. Archosaurs, meat-eaters that looked similar to crocodiles, later evolved to pterosaurs (flying reptiles) and dinosaurs.

Jurassic



By about 208-213 million years ago, the single land mass had changed. Now the earth had two large land masses. Laurasia was in the north, and Gondwanaland was in the south. Plant life changed, and so did animal life. The lush vegetation became the food source for many dinosaurs. Giant meat-eaters, such as Allosaurus, evolved during the Jurassic period. This is the time when dinosaurs of many sizes, shapes, and ways of surviving shared the earth's air, land, and food sources.

Cretaceous—The Triceratops's World



The black outline shows the world today compared to the shaded Cretaceous period.

During the Cretaceous period, the land masses continued to shift and break apart. Mountain ranges thrust up and shallow seas formed. Flowering plants began to appear along with many of the trees we know today—oaks, walnuts, maples, and magnolias.

Many of the hadrosaurs, such as *Maiasaura*, whose fossils have been found in western North America, lived and died during the Cretaceous period. Some snakes, birds, moths, and a few other animals that we recognize today first appeared during this time. But many other species, including all of the dinosaurs, mysteriously vanished from the earth during this time—about 65 million years ago.

Where Did They Go?

Despite all of our developments in science and technology, no one really knows the reason for the extinction of the dinosaurs. There are many theories. Some are:

A comet or asteroid caused huge masses of dust to block out the sun. Lack of sun caused plants to die. Then the plant-eating dinosaurs died, and finally, the meat-eaters died.

Massive volcanic eruptions shot dust containing poisons into the air. The poisons caused fewer and fewer eggs to hatch, until finally no more eggs were laid or new dinosaurs hatched.

Changes in the climate caused genes to change so that animals gave birth to only one gender. This would cause a species to die out.

A huge plague or disease wiped out a species or its food source.

The newly developing flowers poisoned the dinosaurs.

No one knows what *really* made the dinosaurs disappear. What do YOU think?