

# DINOSAUR DISCOVERY

## THIRD - FIFTH

### TEKS

*Third:* 3.2A, 3.2C, 3.2D, 3.2F, 3.3A, 3.3D, 3.9A, 3.9B, 3.9C, 3.10A

*Fourth Grade:* 4.2C, 4.2D, 4.2F, 4.3A, 4.3C, 4.3D, 4.9A, 4.9B, 4.10A

*Fifth Grade:* 5.2C, 5.2D, 5.2F, 5.2G, 5.3A, 5.3D, 5.9A, 5.9B, 5.10A

### Vocabulary

adaptations, consumer, dinosaur, extinct, food chain, food web, herbivore, omnivore, paleontologist, predator, prey, producer, theory

### Pre-Show Activity

#### Pre-Show Lesson: Dinosaurs, Are You For Real?

Post this question on the board: "How do we know dinosaurs are real?"

#### Materials:

Per class: a couple of dinosaur reference books, the book *The Dinosaurs of Waterhouse Hawkins: An Illuminating History of Mr. Waterhouse Hawkins, Artist and Lecturer* by Barbara Kerley

Per group: various prehistoric animal pictures (Appendix A-1)

Per student: two dinosaur skull pictures (Appendix A-2 and A-3)

#### Procedure:

1. Ask students what they know about dinosaurs. Make a list on a chart. Go over the facts about dinosaurs.
  - To be considered a dinosaur, an organism's legs must have been underneath it.
  - No dinosaurs ever lived in water.
  - Dinosaurs lived millions of years ago.

Have students act out being a dinosaur following the rules above. Ask them to repeat the facts about dinosaurs to a partner. Have them turn to another partner and repeat.

*Teacher Information:*

- Dinosaurs ruled the Earth for over 160 million years, from the Triassic period around 230 million years ago through the Jurassic period and until the end of the Cretaceous period around 65 million years ago.
  - The time period from 250 million years ago until around 65 million years ago is known as the Mesozoic Era. It is often referred to as the Age of the Dinosaurs because most dinosaurs developed and became extinct during this time.
  - It is believed that dinosaurs lived on Earth until around 65 million years ago when a mass extinction occurred.
  - Scientists believe that the event leading to the extinction may have been a massive asteroid impact or huge volcanic activity. Events such as these could have blocked out sunlight and significantly changed the Earth's ecology.
  - A person who studies dinosaurs is known as a paleontologist.
  - Rather than being carnivores (meat eaters), the largest dinosaurs such as the Brachiosaurus and Apatosaurus were actually herbivores (plant eaters).
  - To help fight meat eaters such as the Allosaurus or Spinosaurus, many plant eaters had natural weapons at their disposal. Examples of this include the spikes on the tail of the Stegosaurus and the three horns attached to the front of the Triceratops's head shield.
2. Students will sort pictures of prehistoric animals as either a dinosaur or not a dinosaur. These are provided in Appendix A-1. You may also want to include pictures of modern day animals. Debrief as a class. Remember, scientists believe that birds are considered descendents of dinosaurs; present day reptiles are relatives of dinosaurs but not considered descendents because their legs are on the sides, not under them like dinosaurs.
  3. Students sit together up front. Hold up some dinosaur resource books. Ask students how we know so much about dinosaurs today, if they were alive millions of years ago. How do we know what they looked like, ate, etc.? Students should understand that we learned about dinosaurs from studying their fossils. Ask: "What do you think it must have been like for the first people who discovered a dinosaur fossil? Do you think they knew right away what it was? How did they figure it out?" Much evidence had to be collected and put together and analyzed.

4. Read *The Dinosaurs of Waterhouse Hawkins: An Illuminating History of Mr. Waterhouse Hawkins, Artist and Lecturer* by Barbara Kerley. This book explains how the theory of dinosaurs evolved.
5. Tell students that today they are going to be dinosaur fossil hunters, or paleontologists. Each student is going to get a dinosaur skull. Tell students to imagine that they know nothing about this skull or the belief in dinosaurs. No one has ever seen a dinosaur fossil before. They are going to do what scientists who study dinosaurs do and make inferences based on their observations of the skull. They are going to collect and analyze data. They need to ask themselves, "What can I tell about how this dinosaur lived by looking at its skull?" Students will create a T-chart. On one side they will list skull observations and on the other side, they will list inferences by telling how they think the body part they observed helped the dinosaur adapt and survive.

Skull Observations	Inference about the Organism

Give each student a picture of a triceratops skull (Appendix A-2). Students may work with a partner or in groups, but each student should create their own T-chart like the one above in their science notebook. Once you have given them an appropriate amount of time, regroup and go over the following:

- Flat teeth: It ate plants (herbivore). You may want to model how flat teeth work by using two flat stones and a piece of lettuce or a green leaf. Have students feel their teeth with their tongue. Which ones are flat? Which ones do you use for mashing your food?
- Eyes on the side: It was prey to other animals. Eyes on the side, needs to hide.
- Horns: It was used as protection from predators.
- Turtle-like beak: It was used to clip through tough plants.
- Bony frill: Protected its neck.
- Large nasal cavity: It could smell its predators.

Ask: "The triceratops has all these body parts or adaptations to protect it from predators. Who do you think its main predator was?" Answer: *Tyrannosaurus rex*

Hand students a picture of a *Tyrannosaurus rex* skull (Appendix A-3). Ask, "What can we tell about *Tyrannosaurus rex* by looking at its skull? What adaptations did it have?"

- Sharp teeth: Used to tear meat.
  - Eyes forward: This gave them depth perception, which means means that they could see the world in 3-D.
6. Students should have the two dinosaur skull pictures. They are to create a prehistoric food chain which includes both dinosaurs. Older students should create a food web. They can use the information below, or you may allow them to use the Internet or resource books to complete their food chain/web.

Older students should label each picture as producer or consumer. They should further label each consumer picture as herbivore, omnivore or carnivore.

*What did dinosaurs eat?*

Some dinosaurs ate lizards, turtles, eggs, or early mammals. Some hunted other dinosaurs or scavenged dead animals. Most, however, ate plants (but not grass, which hadn't evolved yet). Rocks that contain dinosaur bones also contain fossil pollen and spores that indicate hundreds to thousands of types of plants existed during the Mesozoic Era. Many of these plants had edible leaves, including evergreen conifers (pine trees, redwoods, and their relatives), ferns, mosses, horsetail rushes, cycads, ginkos, and in the latter part of the dinosaur age flowering (fruiting) plants. Although the exact time of origin for flowering plants is still uncertain, the last of the dinosaurs certainly had fruit available to eat.

Source: <http://pubs.usgs.gov/gip/dinosaurs/food.html>

## Post-Show Enrichment Activities

### Activity One: Three Facts and a Fib

*Materials:* note cards, star stickers

*Procedures:*

1. Students will write three facts that they learned from the show and one fib on a notecard.
2. They will put a star by the fib.
3. Collect these and read some of them out loud.
4. Students will try to identify the fib in each list you read them.

### Activity Two: Dinosaur Extinction

*Materials:* dinosaur extinction article, internet

*Procedures:*

1. Discuss with students what a theory is and how it becomes accepted in the general public.
2. Students will analyze the data from two popular theories related to the extinction of the dinosaurs and form their own opinion (Appendix A-4). They must state their opinion and give evidence to support it. Students can use the information below, library resources or Internet sites to find evidence to support their belief.
3. You can have the students blog about their opinions by setting up a classroom blog. There are free websites available to do this.
4. Take a class opinion survey and graph your results. You may also want to show a video on this topic. There are many free ones available on the Internet.

### Activity Three: Be a Paleontologist

*Materials:* *How the Dinosaur Got to the Museum* by Jessie Hartland, dinosaur bones, plastic shoe box, observation chart

*Procedures:*

1. Read *How the Dinosaur Got to the Museum* by Jessie Hartland.

2. Bury a set of dinosaur bones in a plastic shoe box of sand for each group. You can print the skeleton in Appendix A-5 on tag board or get some inexpensive plastic dinosaur skeleton sets on the Internet.
3. Tell students that they are going to become paleontologists for the day. In groups, students will dig up the dinosaur bones and piece them together.
4. For older students, you may want to have them make a grid of the shoe box area and tell them to map where they found the bones to mimic what paleontologists do.
5. Once they have finished, students should identify the dinosaur. They may need to use the Internet to identify it.
6. Students will complete the chart in Appendix A-6 listing observations and inferences about the dinosaur based on its skeleton.

There are also a few virtual sites where students can dig for fossils and/or build a skeleton.

#### Activity Four: Famous Paleontologists

*Materials:* picture book, internet or printed background information on paleontologists

*Procedures:*

1. Read a picture book about a famous paleontologist. A couple suggestions are:

*Stone Girl Bone Girl* by Laurence Anholt and Sheila Moxley or

*The Dinosaurs of Waterhouse Hawkins: An Illuminating History of Mr. Waterhouse Hawkins* by Barbara Kerley and Brian Selznick

2. Discuss the contributions of these paleontologists to our understanding of our world, and what theories their work supported.
3. Students will research a paleontologist. They will design a poster giving pertinent information about their paleontologist to hang in the Paleontologist Hall of Fame in the classroom. This should include the following information.
  - Where were they born?
  - When and where did they go to school to be a paleontologist?
  - Why did they become a paleontologist?
  - What are they most famous for discovering?
  - What theories do they support?
  - Where did they make their discoveries?

- How did they do their research? What types of technology did they use?
  - What makes their accomplishing more valuable than other paleontologists?
4. Students will use the Internet or pre-printed background information to research a famous paleontologist. You may want them to work in partners or alone. Here is a list of possible paleontologists:

Edwin H. Colbert

Edward Drinker Cope

Jack Horner

Robert Bakker

Sue Hendrickson

Mary Anning

Barnum Brown

Othniel C. Marsh

Dong Zhiming

Luis Alvarez

Patricia Vickers-Rich

#### Activity Five: Dinosaur Museum

*Materials:* modeling clay, modeling dough, feathers, buttons, pipe cleaners, sparkles, cardboard pieces, construction paper, tissue paper, etc.

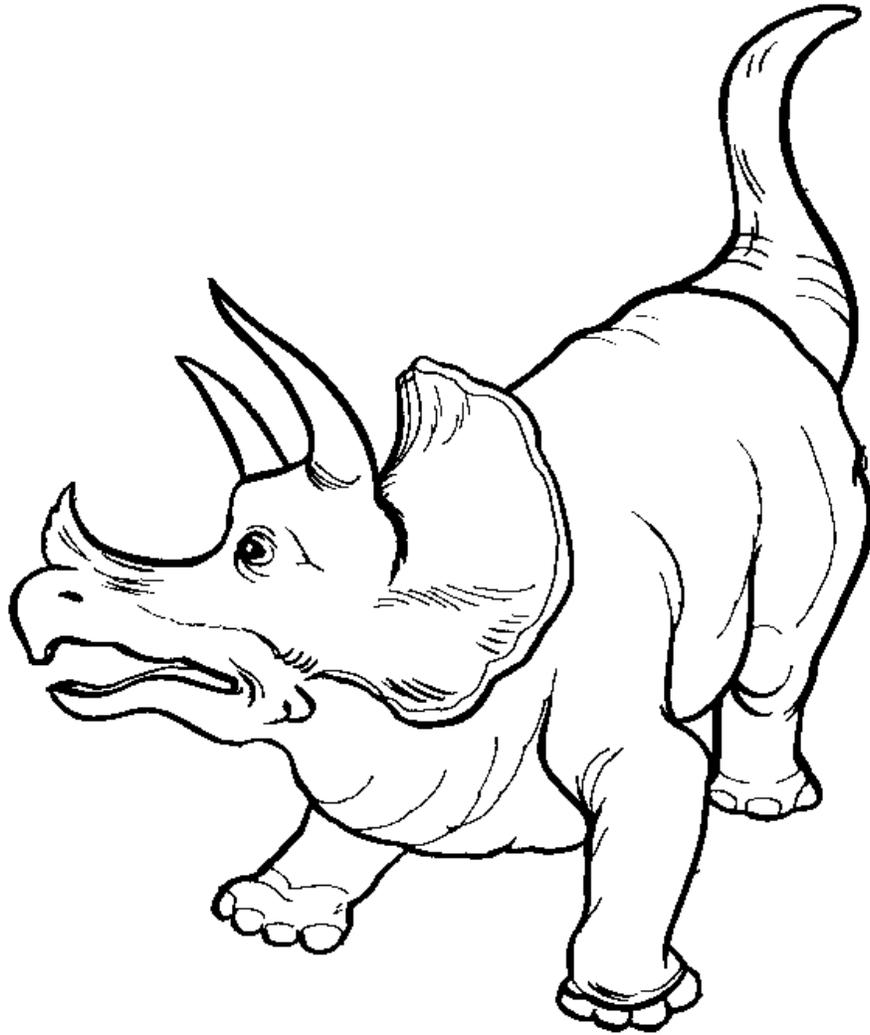
*Procedures:*

1. Students will invent their own dinosaurs using the material with which they are presented.
2. Students will make a T-chart listing at least six adaptations that their dinosaur has and explain how each adaptation helps it to survive in its ecosystem. They need to list at least five body parts or characteristics and one behavior.
3. Display the dinosaurs with their charts in a class Dinosaur Museum.

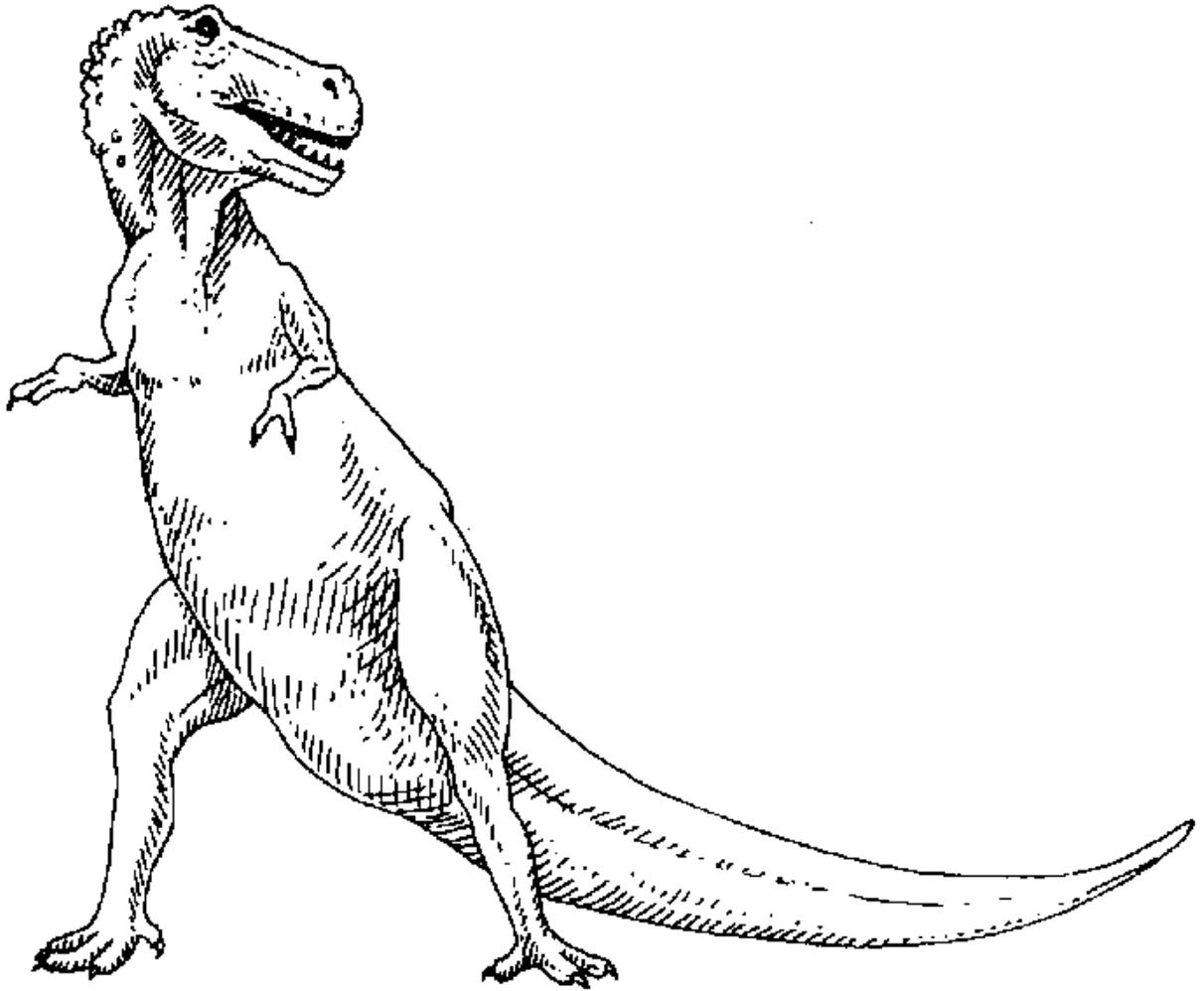
See Appendix A-7.

## Appendix

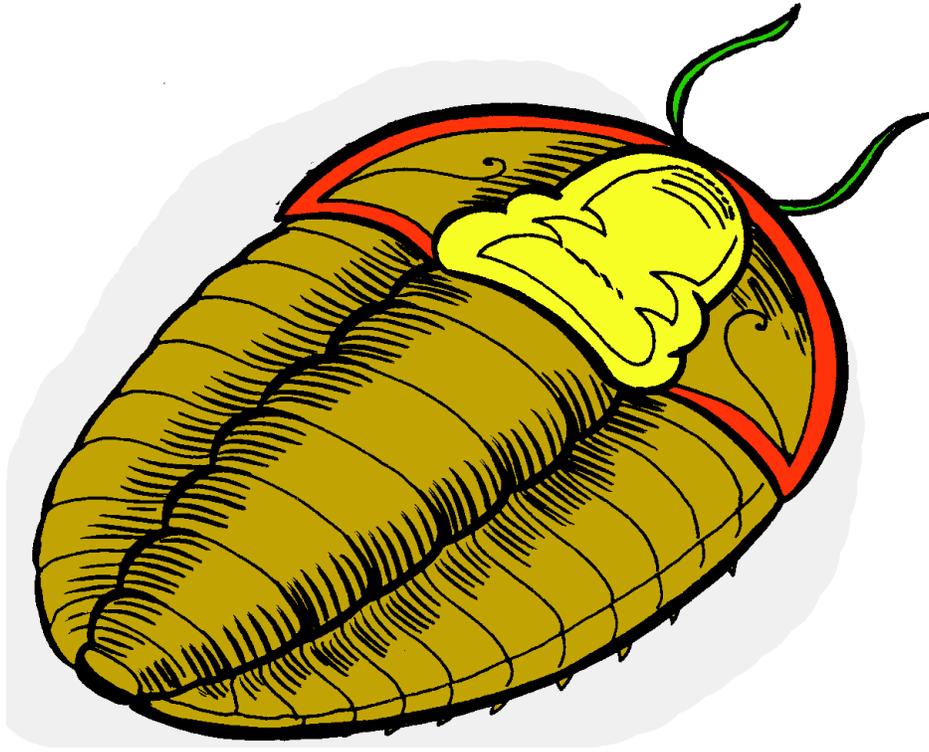
A-1



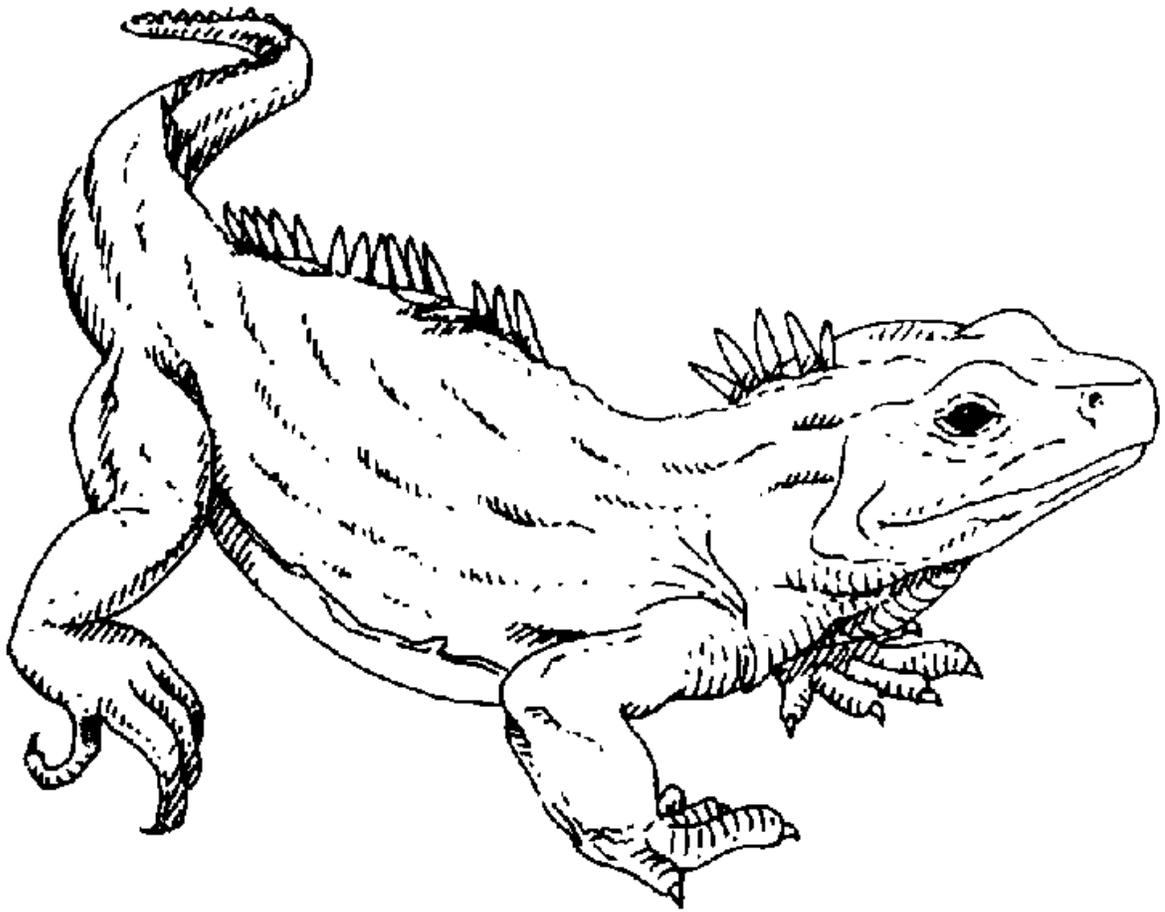
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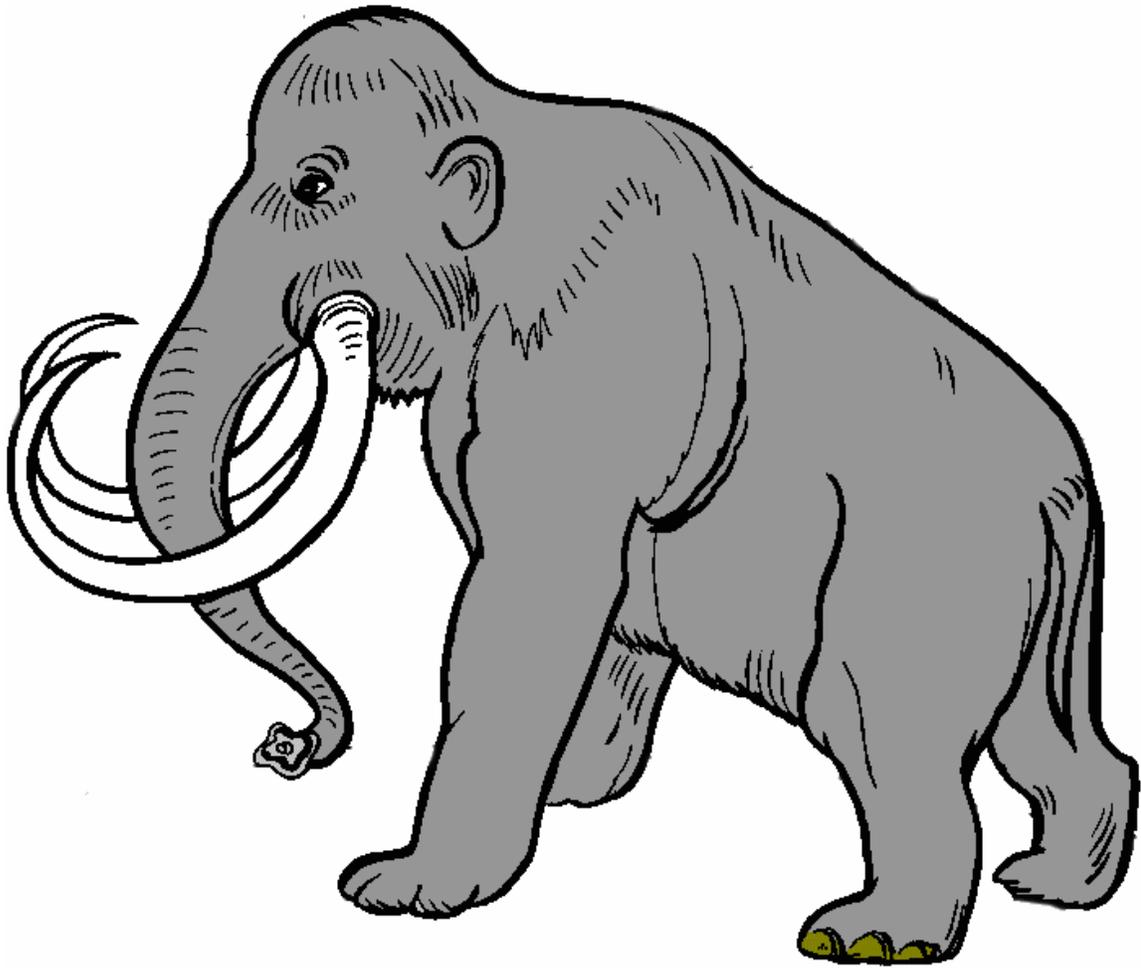
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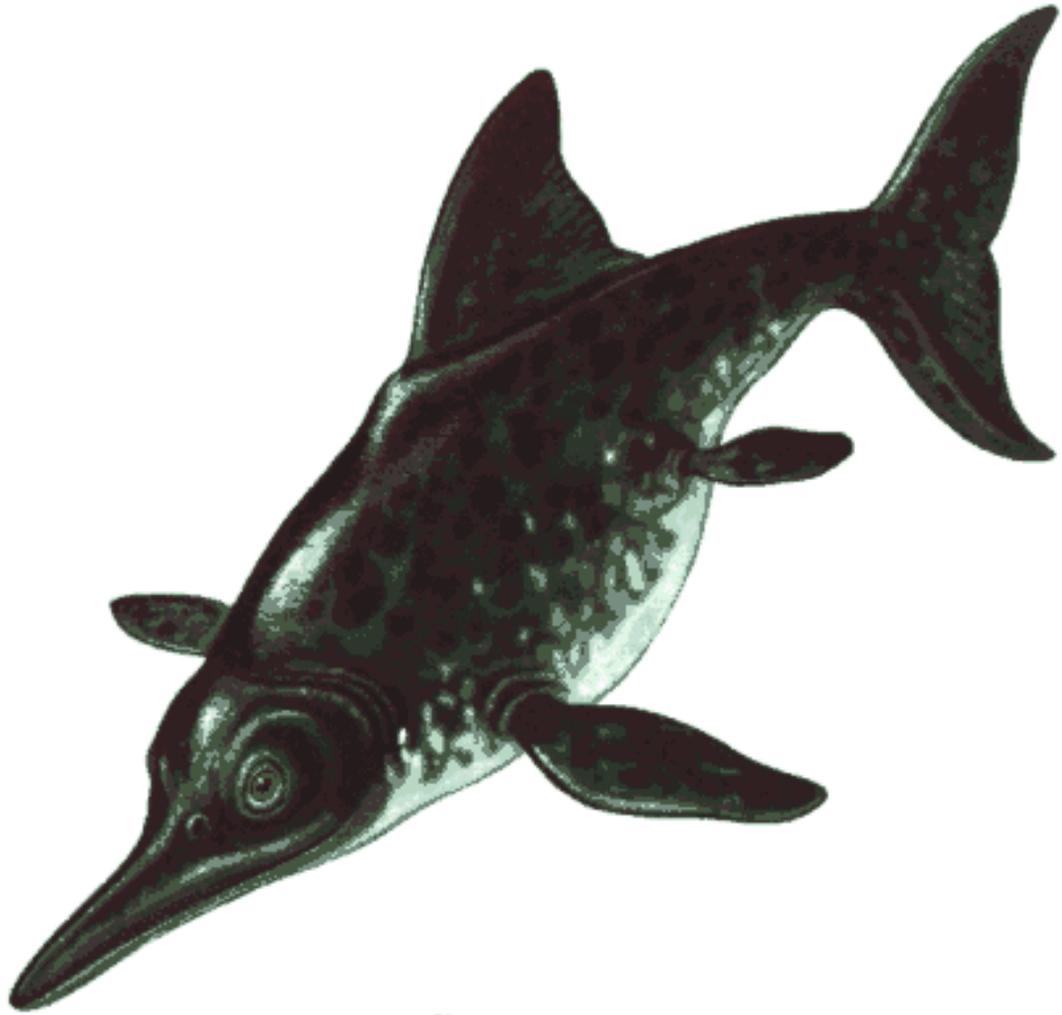
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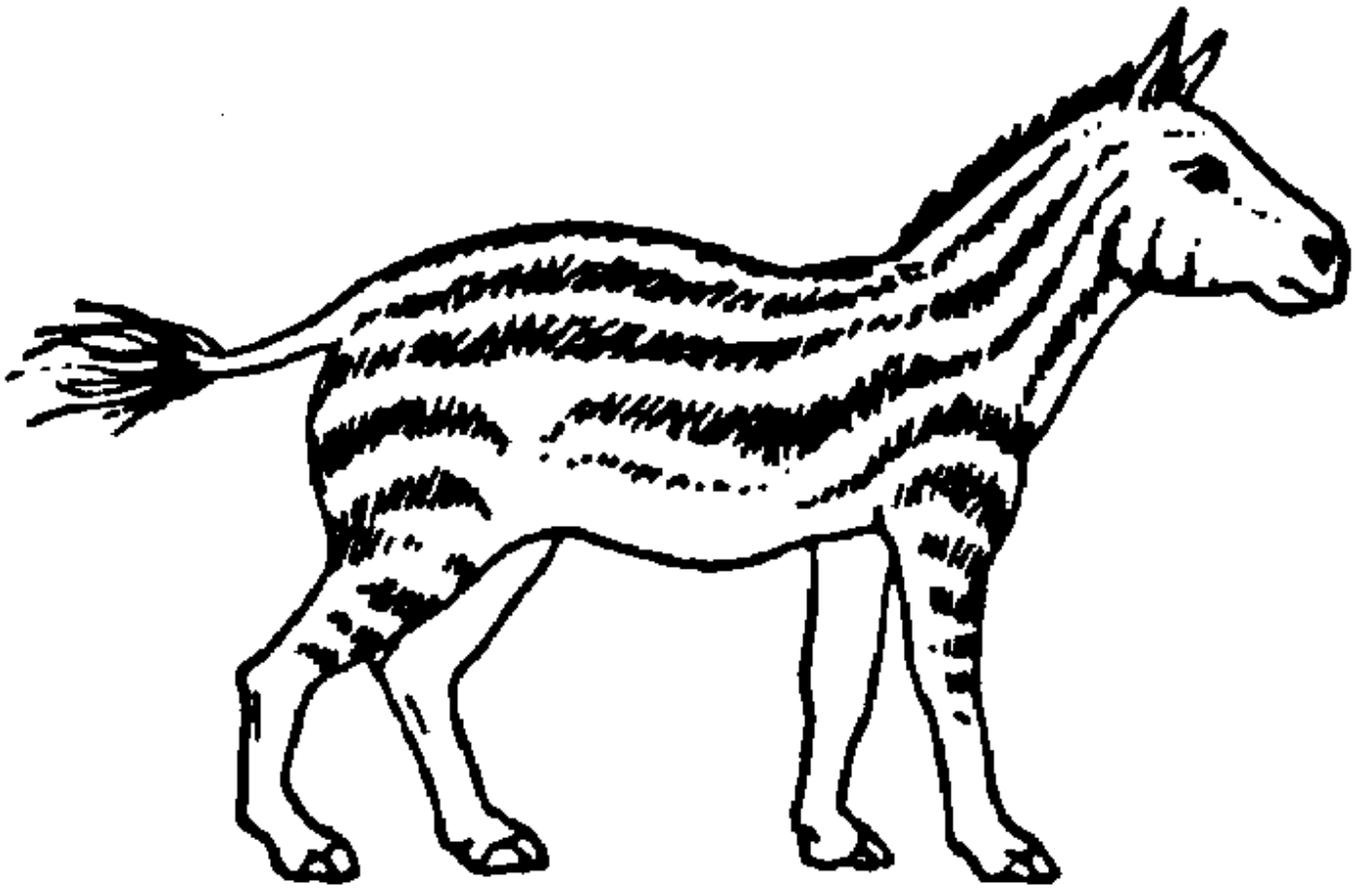
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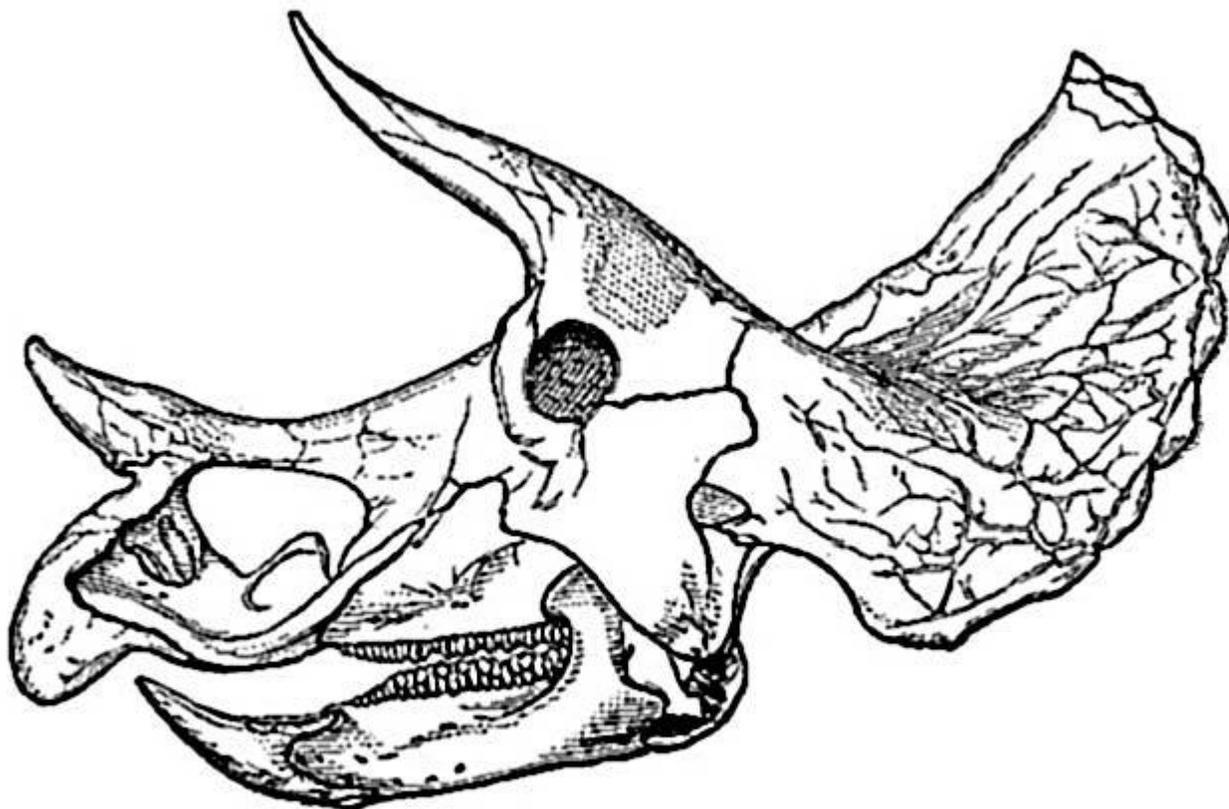


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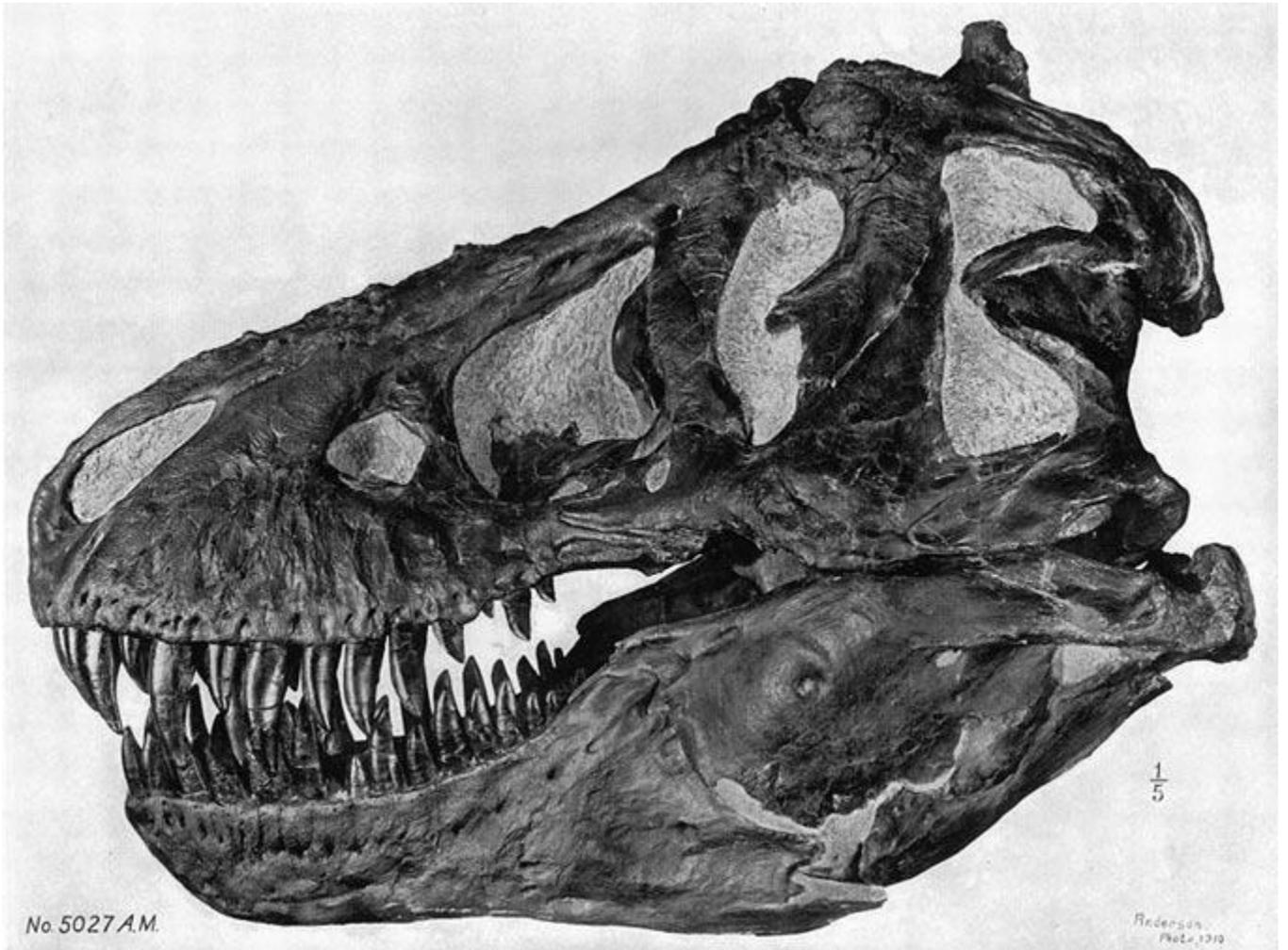
Source: Arthur's Clipart

A-2



Graphics Source: Science Kids

A-3



Graphics Source: [jurassicdinosaurs.co.uk](http://jurassicdinosaurs.co.uk)

## The Asteroid Theory

One of the most well-known and intriguing theories suggested for dinosaur extinction is the asteroid theory. In the 1980's the father-son team of Luis and Walter Alvarez discovered a layer of iridium in the K-T boundary. Iridium is rare on earth, but abundant in meteorites. The Alvaréz's suggested that a huge asteroid or comet, perhaps miles in diameter, hit the Earth at that time. The result of such an impact would be an enormous explosion that would throw dust clouds into the sky, darkening the planet. Massive forest fires, triggered by the hit, would add smoke to the sky. This would cool the planet causing climatic changes.

A crater, now worn down and partly under the ocean, was found along the Mexican Yucatan Peninsula and its creation coincides nicely with the K-T boundary. NASA scientists estimate that the asteroid that made Chicxulub Crater, as it is now known, would have been about 6 to 12 miles in diameter. The crater is about 130 miles across.

Scientists at the Southwest Research Institute in Boulder, Colorado, have even been able to trace the path of that asteroid back into space. According to their calculations 160 million years ago a collision between a 100-mile-wide asteroid, named *Baptistina*, and a smaller unnamed asteroid out beyond the orbit of Mars, shattered the larger object and sent pieces of it into the inner solar system. Ninety-five million years after that, these pieces encountered earth, ending the dinosaurs' reign.

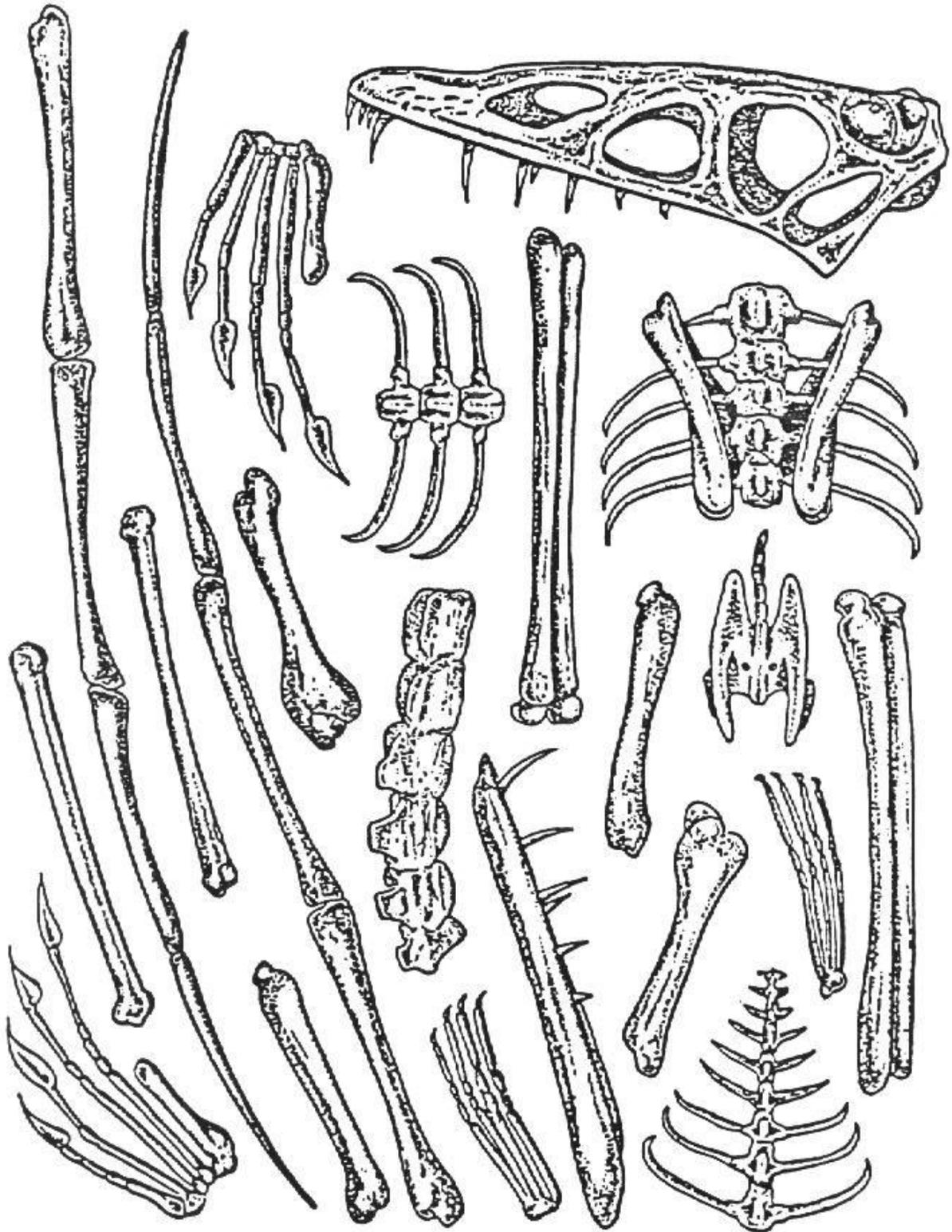
Not all scientists are satisfied with the asteroid theory, however. They point out the fossil record shows the dinosaurs were already in decline before the K-T boundary and the asteroid might just have been the final blow that finished off a population already weakened by some other factor.

In Montana, at a dig supervised by celebrated paleontologist Jack Horner, Nan Crystal Arens from Hobart and Smith Colleges carefully examined the fossil leaves and pollen from a slice of the Hell Creek formation at many different levels. The Hell Creek formation is set just above the K-T boundary and represents the millions of years just before the extinction of the dinosaurs. Dr. Arens found that the number of different species of plants, especially flowering plants, declined significantly as one got closer to the boundary. Perhaps 90% of all the flowering plants had already died before the asteroid struck. Since these represented a large portion of the herbivore dinosaur's food supply, and herbivore dinosaurs were in turn food for the carnivores, this might have caused a sharp decline in dinosaur populations even before the disaster.

## **The Deccan Traps Volcanoes**

Some scientists suspect that volcanic activity may have caused the dinosaurs' demise. In the several million years preceding the extinction event, volcanoes in what is now India were extremely active. While the span of the eruptions originally seemed too long to explain such a rapid extinction event, recent tests have shown the largest of the eruptions associated with the massive Deccan Traps lava beds in India; coincide with the K-T Boundary. During this period as much as two-thirds of the lava beds were created, covering nearly a million square kilometers (about half the size of modern India). According to volcanologist Vincent Courtillot, these eruptions might have released 10 times more climate-altering gases and materials into the air than the meteor impact in the Yucatan. These would have included dust and sulfuric particles that would have blocked sunlight cooling the planet. Carbon dioxide, a greenhouse gas, was also released by the volcanoes and would have heated up the earth once the dust cleared from the skies leading to an enormous temperature swing.

Source of Information: The UN Museum



A-6

Name \_\_\_\_\_

Date \_\_\_\_\_

### Be a Paleontologist

**Part I:** You will be digging up your very own dinosaur fossil. Using the tools provided, search in the sand pit until you find all of the pieces. Then, put them together and identify what you have found.

**Type of Dinosaur:** \_\_\_\_\_

**Part II:** In the space below, make observations and inferences about your dinosaur. See how many you can come up with.

Observation	Inference
<i>Example: Sharp teeth</i>	<i>Example: Eats meat</i>

A-7

Name \_\_\_\_\_

Date \_\_\_\_\_

### Dinosaur Museum

**Directions:** Use the provided materials to create your own dinosaur. Remember, it must be adapted to its environment. Dinosaurs only lived in the Mesozoic Era, in the Triassic, Jurassic or Cretaceous Periods. Once your dinosaur has been created, fill out the information below.

#### Part I: Basic Information

Fill in the blanks below:

My dinosaur is called \_\_\_\_\_ and lived during the \_\_\_\_\_ period. It was a herbivore/carnivore and its main source of food was \_\_\_\_\_. Its biggest predator was the \_\_\_\_\_.

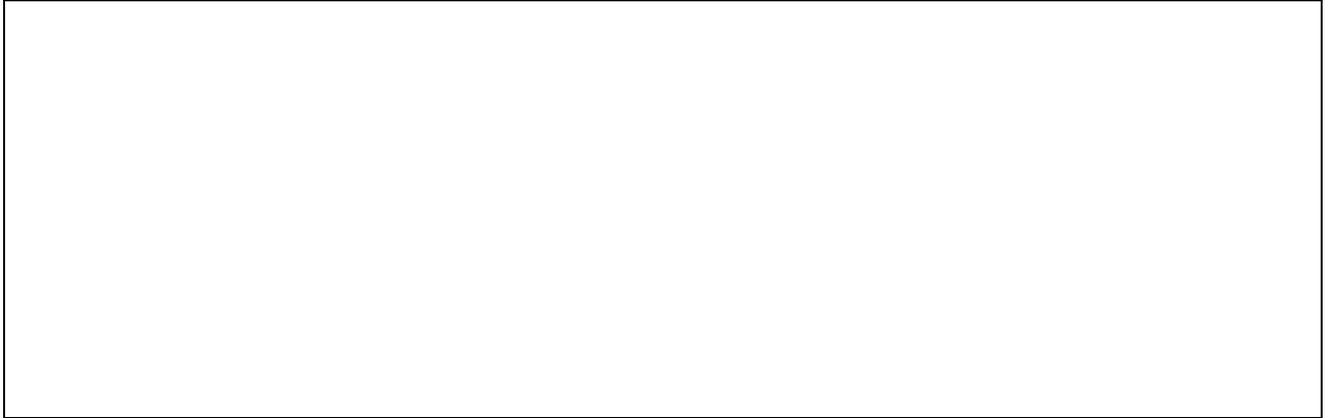
#### Part II: Adaptations

In the space below, list at least six adaptations and explain how each adaptation helps it to survive in its ecosystem. List at least five body parts/characteristics and one behavior.

Adaptation	Purpose
<i>Example: Flat teeth</i>	<i>Example: Grinds plants</i>
1.	
2.	
3.	
4.	
5.	
6.	

### **Part III: Display**

In the space below, create a text panel that you will cut out and display with your dinosaur. The text panel should include all of the most important information about your dinosaur, including its name, when it lived, what it ate, and how it survived.

A large, empty rectangular box with a thin black border, intended for students to create a text panel about their dinosaur. The box is positioned below the instructions and occupies a significant portion of the page's width.