Chinasaurs Teacher's Guide

恐龙 Huan ying, Welcome!

The exhibit provides a unique opportunity for guests to explore the paleontological treasures being unearthed in China and Mongolia. Get ready as feathered dinosaurs, life-size recreations, real fossils, animatronics, and a variety of demonstrations transport you back in time to an age when dinosaurs still roamed the Earth.

IN THIS GUIDE

Chinasaurs, a 6,500 sq ft. special exhibit, features 18 fully mounted dinosaurs, so me of the largest dinosaurs and best preserved fossils on the planet.
Activities from this guide for your classroom and in the exhibition will help students understand the importance of new fossil finds in China and its neighboring country, Mongolia.

This guide is based on one created by the Science Museum of Minnesota. Used by permission.

TABLE OF CONTENTS

HOW TO USE THIS GUIDE

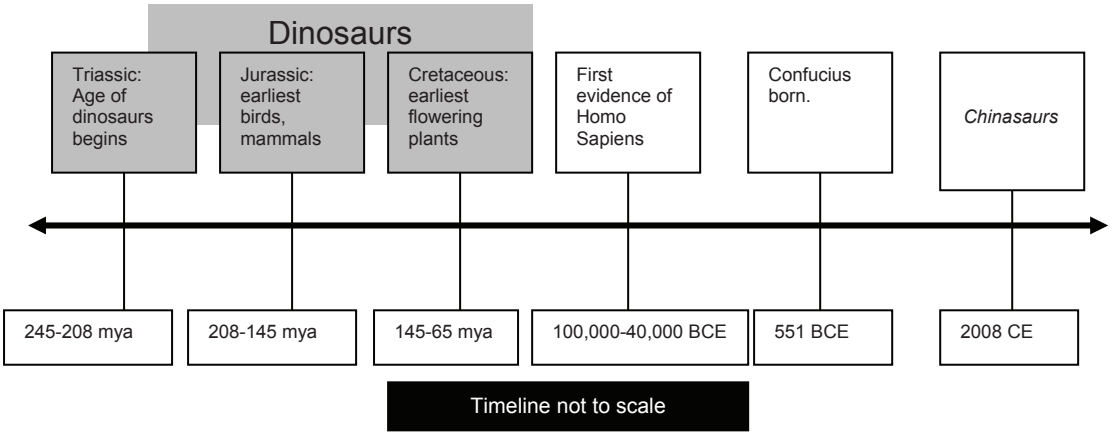
- Give chaperones copies of student pages.
- Add your own activities. Connect with your own special unit. Some questions may leave students with more questions. Use these as the basis for after-trip discussions or group research.
- Provide extensions of museum experiences back at school. The *Connecting with the Classroom* section (pg. 8) gives suggestions for integrating the museum visit with classroom lessons.
- Components are not sequential. You can start anywhere in the exhibition.

Visiting *Chinasaurs*

- ***Chinasaurs*** is located in Galleries 1 & 2 in the Science Building, from May 26-September 5, 2011
- Exhibit hours: Monday-Saturday: 10am-6pm; Sunday: noon-6pm
- Call 241-428-5555 x8 for reservations

ABOUT THIS TOPIC

Dinosaurs were an extremely successful group of reptiles that inhabited the Earth during the period of time known as the Mesozoic Era. The Mesozoic Era is divided into three periods: the Triassic, Jurassic, and Cretaceous. The reign of the dinosaurs did not start until close to the end of the Triassic Period, so there are few dinosaurs known from that time period. ***Chinasaurs*** contains some fossils from the Triassic Period, but all of the dinosaurs in this exhibit are from the Jurassic Period (208 -145 million years ago) or the Cretaceous Period (145 million – 65 million years ago).



How do we learn about dinosaurs and other ancient life?

Scientists called **paleontologists** study ancient life by examining fossils and the rock layers in which they are found. A **fossil** is any remain or trace of ancient life. It can be a bone or plant part that has been filled in with minerals, an insect trapped in amber, a

dinosaur egg, or even a footprint. In this exhibit you will encounter lots of dinosaur bone fossils, eggs, and footprints. You will also encounter several fossil animals that are NOT dinosaurs. Fossils are most commonly preserved in sedimentary rocks (rocks that are formed from the eroded grains of older rocks or minerals). Some of the most common sedimentary rocks are sandstone, shale, and limestone.

What is a dinosaur?

Dinosaurs are a group of reptiles that lived during the Mesozoic Era. Dinosaurs have certain features in their skeletons, such as the number of holes in their skull and the way their teeth fit into their jaws, that make them different from other reptiles such as lizards or turtles.

Dinosaurs also differed from other reptiles by the way they stood. Other reptiles have sprawling or semi-erect postures where the elbows and knees pointed out to the sides. Dinosaurs had an erect posture—their legs were directly underneath their bodies. In that way, the weight of the body was more efficiently supported by the legs. Mammals also have an erect posture.

Dinosaurs lived only on land. The flying reptiles, called pterosaurs, were not dinosaurs. Large prehistoric swimming reptiles such as plesiosaurs and mosasaurs were not dinosaurs either.

How does a dinosaur become a fossil?

Only a tiny fraction of all the animals that have ever lived are preserved as fossils. There are many things that happen to a dead animal that make fossilization unlikely. The body decomposes; scavengers pull the body apart and devour it. Wind and rain can destroy the body. But in rare, special circumstances, a dead animal is buried rapidly before any of these things can start to destroy the body. An animal that dies in or near water is more likely to be buried quickly by sediments in the water. Over thousands, even millions, of years, minerals contained in groundwater can be deposited within the animals' bones. The minerals make the bone heavier and it feels like rock. This is what people mean when they call something "petrified." Paleontologists call this process **permineralization and replacement**.

ABOUT THIS EXHIBITION

Chinasaurs, a 6,500 sq ft. special exhibit, features 18 fully mounted dinosaurs, as well as dinosaur eggs, feathered dinosaurs, wonderfully detailed birds, marine and flying reptiles, and other fossils from China and its neighbor, Mongolia.
Younger students will enjoy hunting for fossils in the dinosaur dig pit in Gallery 3.

Travel halfway around the world and nearly 200 million years back in time to experience some of the largest dinosaurs and best preserved fossils on the planet:

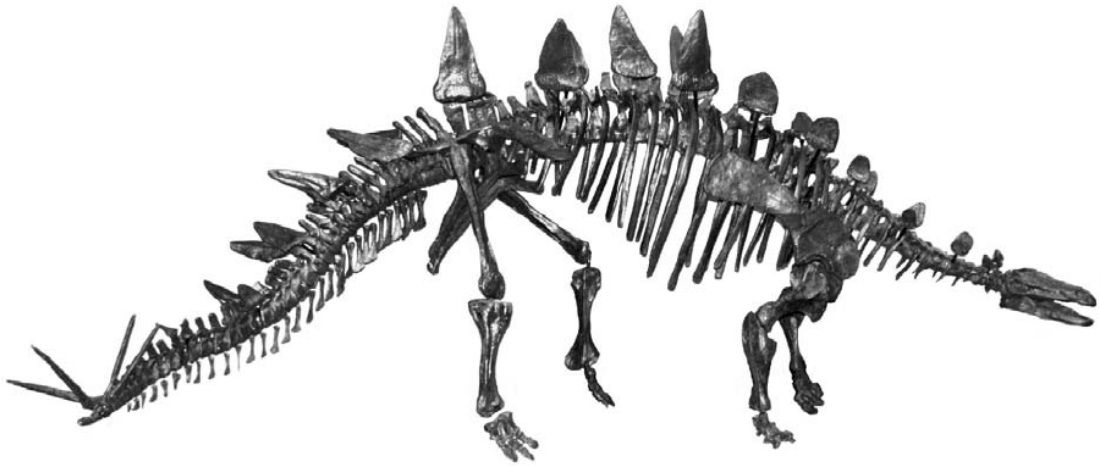
Dilophosaurus (di-LOH-fo-sawr-us): This dinosaur had long, powerful legs and short arms and two thin highly arched crests on its head. It may have been a scavenger, as its jaws were not well developed. This dinosaur was given a colorful frill and the ability to spit poison in the film *Jurassic Park*, although there is nothing in the fossil remains that would suggest either of these traits.

Monolophosaurus (MON-oh-LOAF-oh-SAWR-us): A medium-sized meat eater with a distinctive low crest running from between the eyes to the nostrils. This crest was hollow and connected to the nasal passage, suggesting that it may have been used to resonate sounds.

Velociraptor (va-LOSS-ah-RAP-tor): *Velociraptor* was a wolf-sized predator that probably ate small reptiles and mammals, although one was found that died fighting a *Protoceratops*. *Velociraptor* belongs to a group of dinosaur known as Dromaeosaurids (nicknamed raptors), which are famous for their sickle-shaped toe claws.

Protoceratops (PRO-toh-SER-ah-tops): *Protoceratops* was related, although not directly ancestral, to later horned dinosaurs like *Triceratops*. It had a strong, horny beak for eating tough plants and walked on all fours. It is one of the most common and well-known dinosaurs. Over one hundred individuals have been recovered.

Tuojiangosaurus (too-YANG-oh- SAWR -us): This dinosaur has pairs of triangular plates from its neck to halfway down the tail and two pairs of spikes at the end of the tail. It is one of several stegosaurs found in China. In fact, China has more species of stegosaurs over a longer time span than anywhere else in the world.



Tsintaosaurus (sin-tau-SAWR-us): There is evidence of a unicorn-like spike on its head that might have been a modified crest, but some paleontologists believe the spike or crest didn't exist at all. Many think *Tsintaosaurus* is a chimera - the head of *Tanius*, which was a crestless duckbill, mixed with the body of a lambeosaurine dinosaur. There are not enough specimens to give clear answers.

Lufengosaurus (lew-FEN-go- SAWR -us): One of the oldest Chinese dinosaurs found, this plant eater had massive hands, broad feet, a short neck and wide-spaced teeth. It was the first dinosaur to appear on a postage stamp in China, in 1958.

Bellusaurus (BELL-you- SAWR -us): *Bellusaurus* means beautiful lizard. A very small sauropod, there is a possibility that all *Bellusaurus* finds may be juveniles, hence their small size.

Mamenchisaurus (mah-MEN-chee- SAWR -us): Similar to and possibly related to the well-known *Diplodocus*, but possessed a much longer neck. No known dinosaur had as many neck vertebrae (19) as *Mamenchisaurus*. In fact it is the longest neck of *any* known animal. The animal was probably able to crop vegetation over a wide area without having to move its body.

Caudipteryx (cow-DIP-tuh-riks): It is the largest feathered fossil among the Chinese finds, about the size of a turkey. Characterized by a fan of feathers at the end of its tail, long feathers on its arms, and its entire body covered with seemingly down-like feathers. Symmetrical feathers and long legs indicate that it could not fly and was a ground-dwelling runner, possibly either a feathered dinosaur or a flightless bird.

Microraptor (MIKE-row-rap-tor): The smallest known dinosaur. Had feathers on forelimbs, hindlimbs and tail. May have been able to fly and glide (holding all four appendages out like a bi-plane).

Sinosauropteryx (SIEN-o-sawr-OP-ter-iks): Discovered in 1995, this small three-fingered dinosaur caused considerable excitement due to a line of structures along its back that were interpreted as feathers. These tubular structures could be the most primitive version of feathers known, but evidence is still not conclusive.

What is so special about Chinese dinosaurs?

Similarities between North American and Asian dinosaurs
At times during the Mesozoic, China was connected with North America through a land bridge. Several Chinese dinosaurs have similar relatives in North America. By comparing Chinese dinosaurs to ones in North America, paleontologists may be able to learn where major groups of dinosaurs first evolved and how they migrated across the globe.

Bird-Dinosaur relationships
Paleontologists have recently discovered several new dinosaurs with feathers or feather-like structures. These new specimens are further evidence for the evolutionary relationship between dinosaurs and birds and demonstrate that feathers evolved initially among non-flying dinosaurs for some other purpose. New specimens continue to be found that will no doubt raise more questions about bird evolution. The Liaoning fossil beds in China are home to more specimens relevant to bird origins than anywhere else in the world.

Dinosaur eggs

Some of the most famous fossils in the world come from the Gobi desert in Mongolia, a neighbor to China. American Museum of Natural History expeditions to the Gobi desert in the 1920s yielded fascinating new dinosaurs and the first dinosaur eggs ever discovered. China is a virtual treasure trove for dinosaur eggs. In fact, dinosaur eggs have been discovered in at least 41 different places in China.

Connecting with the Classroom

Before Your Visit

K-4

- Brainstorm as a class: What do we know about dinosaurs? What is a fossil? Add to this list of ideas or change things after your visit to ***Chinasaurs.***
- Scan the museum activities for new words.
- Since many of the exhibits in ***Chinasaurs*** are of fossil skeletons, it helps students become aware of their own skeletons. Using chicken bones or drawings of bones from other animals can help children locate their own similar bones and visualize that living animals have muscle and skin over their skeletons.
- Review favorite dinosaurs and their names: *Triceratops*, *Diplodocus, Stegosaurus.* Students will see dinosaurs in ***Chinasaurs*** that are similar to these favorites but have distinct differences.

Grades 5 and up

Odds are…

What are the odds of becoming a fossil? Rotten! Have students brainstorm all the things that can happen to an animal after it dies. Ask students if they have ever observed road kill. Was it in good condition? What things would make a dead squirrel in the road unlikely to become a good fossil?

(Hints: It is unlikely to be buried, it is exposed to the elements, it has been mangled by the car, birds eat it, flies lay their eggs in it and it becomes food for maggots, etc.)

If all those things work against fossilization, what are some of the things that favor fossilization?

- **Rapid burial:** This could be with sediments in flowing water, an ash fall from a volcano, or even being buried by a collapsing sand dune, which is what probably happened to many of the Gobi desert fossils in ***Chinasaurs.***

- **Having hard parts:** Soft fleshy remains decompose very quickly. But hard parts of animals, like bones, teeth, and shell last a lot longer and are more likely to be preserved as a fossil.

- **Dying in a place with very little oxygen:** Microorganisms that aid decomposition need oxygen. Therefore, a lack of oxygen delays or inhibits decay. Oxygen deprived conditions can be found in waters with poor circulation, such as stagnant lake bottoms or bogs.

Paleontologists recognize that only a very tiny percentage of all species that have ever existed on the planet have made it in to the fossil record. There are many we will never know about.

Fossilization Student Math Challenge
Odds of any one species becoming a fossil are probably less than one in a million.

Assume that each student represents a **species** (e.g. *T. rex* or a passenger pigeon) made up of thousands, maybe millions, of individuals. If we estimate that a species' chance of making it into the fossil record is 1 in 1,250,000, how many *classes* your size would you need to increase the odds that just *one* species (student) would ever be fossilized?

1 student = 1 species (Ask students to decide how many individuals they have in their species. There could be quite a range. Think how many dogs or African elephants there are in the world.) If there are 1,250,000 species, how many might be fossilized? *(One or fewer)* How many classes make up 1,250,000? How likely is it that one of <u>your</u> students (one species) would become a fossil?

Estimating length and height based on partial skeletons
Very often paleontologists only find a few bones of an animal. How do they figure out how big the whole animal was based on a femur (thighbone) or just a few vertebrae? Estimates are usually based on measurements from similar animals whose skeletons are better known. Only a few bones of *Nurosaurus* have been recovered. These particular bones are clearly much bigger than corresponding bones on many other known dinosaurs. Based on that, many would say *Nurosaurus* was 100 feet long. How reliable is that estimate?

Measurement Challenge
You have just discovered an enormous femur (thighbone) that appears to be that of a sauropod dinosaur. But this femur is far bigger than any known sauropod femur. You have measured it as 200 cm. You have a femur in your lab from another dinosaur, very similar to the one you have just discovered. That femur belonged to *Apatosaurus* and is 140 cm tall. Fortunately, paleontologists have found enough specimens and bones of *Apatosaurus* to know that it was about 4.5 meters tall at the hip. The *Apatosaurus* is the most similar of all known femurs to your enormous specimen.

If you were to make an educated guess on how long your dinosaur might have been, what would it be?

- Use measuring tapes to look at 200 cm and 140 cm.
- Measure your own femur. How long is it? How tall are you?
- Compare class measurements. Are there relationships between height and femur length?
- Are there relationships between sauropod length and femur length?
- How would you defend your estimate?

(Estimates should vary, since the initial comparisons are between the femur length and the height of the animal at the hip. There are other variables to be considered also, such as length of neck, size of head, length of tail, etc.).

Averages

For every species known from the fossil record (keep in mind that most never are known) there may be only one or two specimens ever recovered. There were probably hundreds of thousands or more that *weren't* preserved as fossils. In paleontology, we may have to make a generalization about a species that once had millions of individuals based on the remains of a few.

Randomly assign students to small groups of three or four. Have each group record their measurements and calculate the average height of their group. (If adults can be included, so much the better!) Assume each group is all that we know of the human species. Do the individual heights seem like a fair representation of what we KNOW to be true? What about the average?

- List all the averages and compare them.
- What is the tallest height and what is the shortest height in the room?
- How would you choose to describe the height of a *xx*th grader?
- Does it make much sense to argue over which was bigger- the 42-foot dinosaur or the 44-foot dinosaur-when only a few incomplete skeletons have been found for either?

An incomplete fossil record can really mess with our idea of what an average size is for a dinosaur we know so little about.

Back in the Classroom:

K-4

Review student experiences in the exhibition.

Discuss answers to exhibit activities. What dinosaurs did students find that looked like North American dinosaurs?

Discuss:

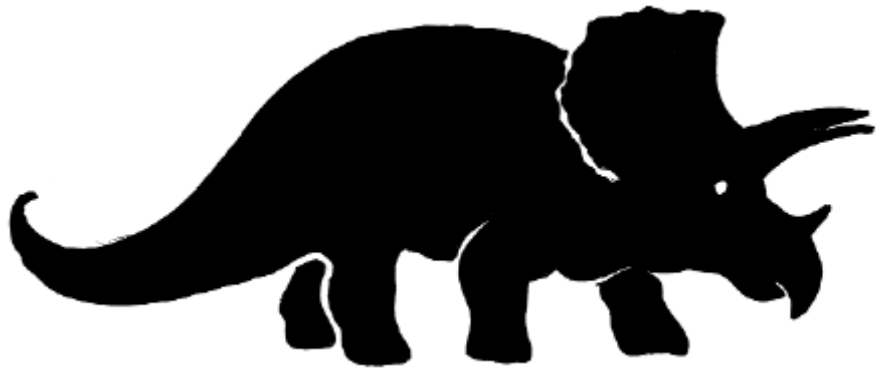
- What animals living today have feathers? *Birds.*
  Why do birds have feathers? Some new discoveries in China show dinosaurs with feathers. What might that mean?
- How do scientists know about dinosaur skin or muscles since we have mostly fossil bones?
- Review your first discussion about fossils and dinosaurs. What new things can students add to the list? What questions do students still have after the visit?

Grades 5-12

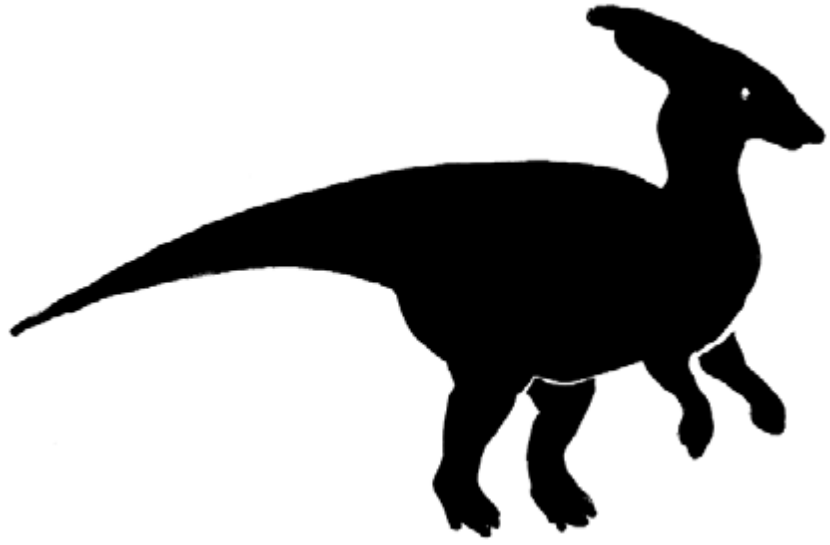
Review student pages completed at the museum. Discuss and research new questions.

Teacher key/Museum pages

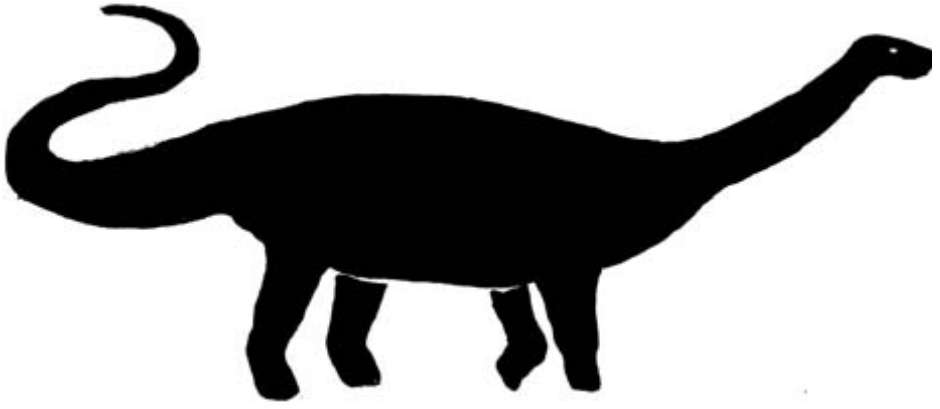
Below are silhouettes of well known North American dinosaurs. Find Chinese dinosaurs that are similar.



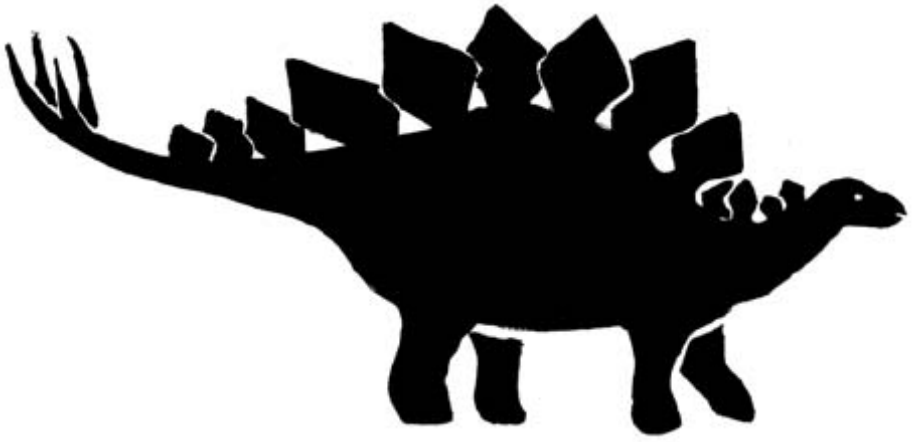
Drawing of: *Triceratops* answers: *Protoceratops, Psittacosaurus*



Drawing of: *Parasaurolophus* answers: *Tsintaosaurus*



Drawing of *Diplodocus* answers: *Mamenchisaurus, Bellusaurus*



Drawing of *Stegosaurus* answers: *Tuojiangosaurus*
Why are dinosaurs in China so similar to North American specimens?
(Many correct answers here.)

Find the large panels that show maps of the world in prehistoric time.
What does the word "Pangea" mean? *Whole Earth. A supercontinent made up of all the land masses.*
Look at the map showing the world during the Cretaceous Period. Describe two things you notice that are different from the world of today.
Continents are different shapes.
Land bridge between Asia and North America
Discuss why this can help explain the fossil record:
Dinosaurs and other animals were able to migrate back and forth. This may account for similarities we see in fossils today.
Dinosaurs are found in rocks of Mesozoic age, so areas that were under water during this period are not likely to have dinosaur fossils.

Reconstructing Ancient Life ***Mamenchisaurus*** and ***Gasosaurus***
Find: *bone bed mural of Jurassic times*

As a paleontologist, you have been asked to find out more about two dinosaurs living in Jurassic times. Look at the excavation of *Mamenchisaurus* and *Gasosaurus* fossil remains. Inspect the mural showing what these creatures may have looked like when they were alive.

Circle the bones that you are fairly certain belong to *Mamenchisaurus* and write "M."
Circle the bones you think belong to *Gasosaurus* and label them with a "G."
Don't worry if not all of the bones are circled—there will be some that you just can't be sure about.
Most of the bones in this bone bed belong to Mamenchisaurus. This is the same dinosaur as the two enormous long-necked specimens in the exhibit. Compare bones in the bone bed to those on the mounted skeletons if you need help. The other dinosaur bones in the bed belong to Gasosaurus, who is illustrated in the Jurassic Mural.

Identify bones you see by drawing a line from the name to the bone:
Ribs
Skull
Vertebra
Toe bone
Tail bone
Leg bone
Others_____

Describe the dinosaurs and what happened to create the excavated bone bed.

Mamenchisaurus
Herbivore or carnivore
Interesting facts about this dinosaur
One question I have about this dinosaur

Gasosaurus
Herbivore or *carnivore*
Interesting facts about this dinosaur
One question I have about this dinosaur

How did the bones end up all together in the “bone bed”?
Does it look like the bones of the Mamenchisaurus are in the same places they would have been when the animal was alive? Do you think some of them might have moved after it died? *Answers can vary. The Mamenchisaurus is pretty complete and not badly disarticulated- as big skeletons go. But by no means are all the bones where they would have been in life. They have shifted around and some were not preserved.Most likely both dinosaurs died near water and the current carried their bodies to a place where they piled up and were buried. However, any explanation is good. The question asks students to look at evidence and make hypotheses based on the evidence.*

Resources

Zoom Dinosaurs—information, definitions, activities, links to other dinosaur sites – very thorough; useful for K-12
http://www.enchantedlearning.com/subjects/dinosaurs/index.html

University of California Museum of Paleontology
http://www.ucmp.berkeley.edu/exhibits/index.php

Russell Jacobson, "Dino Russ," an Illinois geologist, has constructed a very complete dinosaur website. History of dinosaur research in Asia, links to more information about individual dinosaurs, as well as fossil locations.
http://www.dinoruss.com/

The National History Museum in London
http://www.nhm.ac.uk/nature-online/life/dinosaurs-other-extinct-creatures/

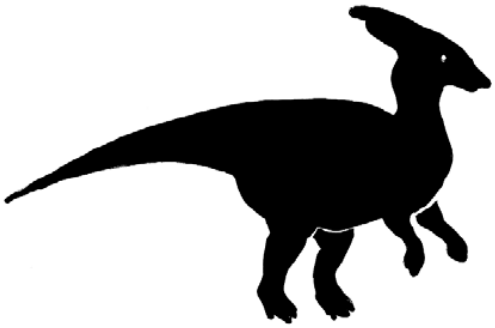
The Evolution of Flight in Birds contains excellent background information, online and classroom activities regarding the structures and functions necessary for flight present in living, flying birds and ancient, non-flying reptiles.
http://www.ucmp.berkeley.edu/education/explorations/reslab/flight/main.htm

Student Pages for Dinosaurs: China's Ancient Giants

Here are pictures of dinosaurs.
Find ones that look like the pictures.
Circle the ones you find in the exhibit.
Write the name of the Chinese one next to the American example.

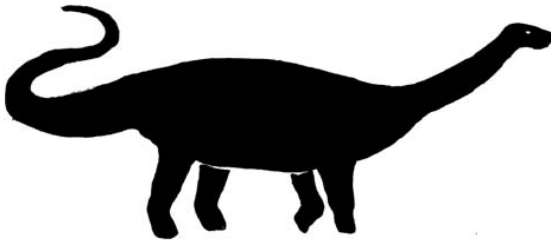
Looks like *Triceratops.*

Chinese dinosaur:



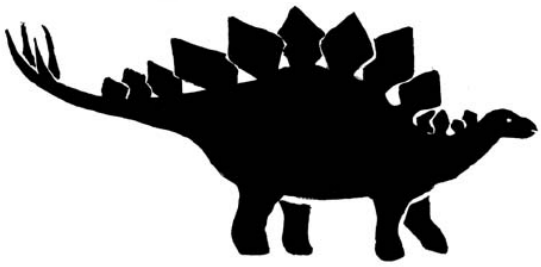
Looks like *Parasaurolophus.*

Chinese dinosaur:



Looks like *Diplodocus.*

Chinese dinosaur:



Looks like *Stegosaurus.*

Chinese dinosaur:

Why are dinosaurs in China so similar to North American specimens?

Find the large panels that show maps of the world in prehistoric time.
What does the word “Pangea” mean?

Look at the map showing the world during the Jurassic Period. Describe two things you notice that are different from the world of today.
1.

2.

Reconstructing Ancient Life: *Mamenchisaurus* and *Gasosaurus*
Find: *bone bed mural of Jurassic times*

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Identify bones you see by drawing a line from the name to the bone:

Ribs Skull Vertebra Toe bone Tail bone Leg bone

Circle the bones that you think belong to *Mamenchisaurus* and write “M.”
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Don’t worry if not all of the bones are circled- there will be some that you just can’t be sure about.

Describe the dinosaurs and what happened to create the excavated bone bed.

Mamenchisaurus
Circle one: Herbivore or carnivore
Interesting facts about this dinosaur

One question I have about this dinosaur

Gasosaurus
Circle one: Herbivore or carnivore
Interesting facts about this dinosaur

One question I have about this dinosaur

How did the bones end up all together in the “bone bed”?

CHINASAURS

China's Ancient Giants

Active Learning Log

Teacher Pages

The Process of Paleontology

The study of ancient life (paleontology) involves a combination of making observations, forming and revising testable questions (hypotheses), evaluating evidence and synthesizing conclusions. Fossils provide invaluable information gathered through direct measurement and inferences derived from many supporting sources.

Expert investigations

Assign specific specimens or types to each student/group to investigate thoroughly during their visit and report their findings to the class.

Have each student/group develop a hypothesis and gather information from the specimen skeletons in the exhibit.

- What information about dinosaurs can be inferred from skeletons?
  Vital statistics, such as estimated height, length, weight? Skin color? Behavior?

- What evidence would be needed to support or contradict your hypotheses?

Evidence based on direct measurement of the bones and similar results from many specimens can provide reliable support for inferences. Generally, bones do not provide enough specific information to support inferences about skin color or behavior while the animal was alive. Occasionally, however, there are exceptional finds – bits of pigmentation preserved in rock, feather impressions, or an undisturbed site where the position of the bones indicates something about the last moments of the animal's life. Sometimes bones from other animals are needed to support specific conclusions.

Gathering Data

Measurements
Provide a measuring tape or string marked with units – one per chaperone group.
(Note: Measuring tapes are not available at the museum. Please provide your own.)

Without touching the specimens have the students use the measuring tape to estimate the length of various parts of the dinosaur (femurs, total body, etc.) (Please keep in mind that some of the specimens may be easier to measure than others, depending on how they are posed.) For very long distances, have the students "pace out" the distance with the tape. Include all the students in the group.

Dinosaurs, Birds and Pterosaurs (other flying reptiles)

The Evolution of Flight in Birds contains excellent background information, online, and classroom activities regarding the structures and functions necessary for flight present in living, flying birds and ancient, non-flying reptiles.
http://www.ucmp.berkeley.edu/education/explorations/reslab/flight/main.htm

Target audience: teachers and students, grades 9-12; other teachers may find this information useful also.

Specimens of interest: early birds, feathered dinosaurs, therapods

What similarities/differences do you see?
Did the specimen(s) have feathers? What purpose do you think they served? (Insulation, flight, display) What evidence supports your answer?

Structural Features of Dinosaurs:

Teeth
Vertebrae
Feet

Compare the structure of several fossil specimens.
Include sketches and labels.

Teeth
What words would you use to describe the teeth? *(Long, pointy, sharp, ridges, grinding surface, etc.)*
How do you think the form affected their function? / How do you think they were used?
What type of food did they eat? What evidence supports your answer?
Generally, long, pointy, sharp teeth are signs of carnivores and short, blocky, teeth with ridges and grinding surfaces are signs of herbivores. However, some herbivores had long teeth with spaces between them in order to strip leaves from plants. (And those sauropods ate a lot of leaves!)

Vertebrae

What features do you notice about the neck vertebrae of the *Mamenchisaurus*?
How do you think the structure of the neck affected its function? Was it able to lift its head high into the air? What other organ adaptations do you think it had?

Neural projections are present on the neck vertebrae. They point backward and interlink, supporting the weight of the long neck, similar to a cantilever bridge. The Mamenchisaurus probably could not lift its neck, but held it straight out in front of its body. Although it is not possible to tell from skeletal evidence, Mamenchisaurus could have had a large heart and accessory muscles for pumping blood throughout the body.

Specimens of interest: *Mamenchisaurus*

Feet

Some dinosaurs had 3 toes; others had 4-5 toes. From observing the skeleton, what do you think the dinosaur's footprint looked like? How long, wide, and/or deep would you expect it to be? How do you think the number and arrangement of toes affected the way the dinosaur moved? Do you think the number of toes related to the weight of the dinosaur? The speed the dinosaur could travel? What observable evidence at the exhibit supports your hypothesis? What other evidence do you think would help answer your questions?

CHINASAURS

恐龙

China's Ancient Giants

Active Learning Log

Mesozoic Era – Triassic Period and Jurassic Period

__245 - 205__ Ma *_205 - 140_ Ma**

Earth Science Hall, 2nd Floor *(*Ma – mega annum)*

Note: Dates differ depending on the reference chart used. Accept approximate answers.

Paleontology Notes

Select a dinosaur to research.

Make a sketch and record the following information:

Name:

Location:

Time Period:

Habitat:

Circle one: Herbivore/Carnivore

Adaptations for Habitat:

(What physical characteristics do you think helped it to get food, protect itself, etc.?)

Questions I have about this dinosaur:

Mesozoic Era – Cretaceous Period
__140 - 65__ Ma
Featured Exhibit Hall, Main Floor

Velociraptor

How does the height of the *Velociraptor* compare to you?
(Estimate its height – measured at the hip.
Sketch the comparison.)
Did this surprise you? Why or why not?
After seeing the size of a *Velociraptor* skeleton, what do you think it would be like to meet one face to face?

Dinosaur Eggs

Observe the dinosaur eggs.
What can you tell about a dinosaur from looking at its eggs (the size, shape and/or texture)?
What information do you think is necessary to identify the species of the dinosaur?

Even extremely large dinosaurs started out as small eggs (roughly the size of softballs or melons). Herbivores tended to have round eggs; carnivores, elongated eggs. Pores give the shell texture and provide openings for gas exchange. Skeletons are necessary in order to identify the species of dinosaur.

Feathers

Examine the feathers on different fossil specimens.
(Look for fossils such as Sinosauropteryx, Confuciusornis, Caudipteryx, Sapeornis and others.)

Sketch of feather:

Specimen:

Circle one: dinosaur early bird

Sketch your favorite example.
What purpose do you think these feathers served? (Insulation, flight, display)

What evidence supports your answer?

A full description of feathers and function is not detailed in the text. However, students should be able to use prior knowledge to describe the feathers and infer their function.

Short, fluffy, fine feathers – insulation
Long, stiff, defined feathers on appendages – flight
Long feathers on tail – display

恐龙

CHINASAURS

China's Ancient Giants

Active Learning Log

Mesozoic Era – Triassic Period and Jurassic Period

_____-_____ Ma _____-_____ Ma*

*Earth Science Hall, 2nd Floor (*Ma – mega annum)*

Paleontology Notes

Select a dinosaur to research.

Make a sketch and record the following information:

Name:
Location:
Time Period:
Habitat:

Circle one: Herbivore/Carnivore

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(What physical characteristics do you think helped it to get food, protect itself, etc.?)

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Mesozoic Era – Cretaceous Period
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What evidence supports your answer?

Hypothesis (testable question):			
Fossil Information: Name Type Carnivore/ Herbivore			
Observati**o**ns, Sket**c**h**e**s, Questi**o**ns, **C**onclusions and **o**ther useful information:			