MSN Field Trip
Dino Magic (1-4)

Script and Activities, updated 03/2024

Set up Lab tables:
Activity 1.

- Set up Dinosaur Placemats (5) at each table, Models of Dinosaurs, dragon and nest.
- Dinosaur fossils (container in bag with smaller pieces, 2 large bones in felt)

Activity 2.

- Cow bones, one per table
- Hand lenses (one per child)

Activity 3.

- "Shape It" sand and bag of small models

Front table:

- Cow bones, Pterodactyl, puppets

Slide 1:

- What is this a picture of? Take all answers. Find out what they know about dinosaurs (time period, kind of dinosaur, etc.) Ask them if they know what type of scientists study fossils/dinosaurs. Paleontologist. (**Paleo** means old; **onto** means life; and **logist** means a person who studies)
- Ask them what is wrong with this picture? Caveman and dinosaurs did not live together. Also, grass was not around with most dinosaurs.
- "Present is Key to the Past." What does this mean? This means that knowing about today's animals help us to determine the past. Many of the students know more than they think when they see a fossil. They are familiar with today's animals.

Slide 2: Everyone loves digging Dinosaurs!

- The first picture not only shows how the earth is layered, but the tools used by paleontologist are shown. Not only do paleontologists like to dig for dinosaurs but just the idea of digging for these prehistoric monsters is exciting to young and old. Everyone loves digging dinosaurs that gets buried through different geological processes.

- Young children even like to dig for dinosaurs. Just the joy of finding a piece of ancient animals is thrilling for both young and old.

- The third photos shows paleontologists working. Look at the tools and careful examination of gravels. This is what a real paleontologist looks like when they are working! The paleontologist is uncovering a large fossil? Of what? Skull? Point out the tools being used (hammers, scoops, glue, small shovels, plaster, picks).

Slide 3:

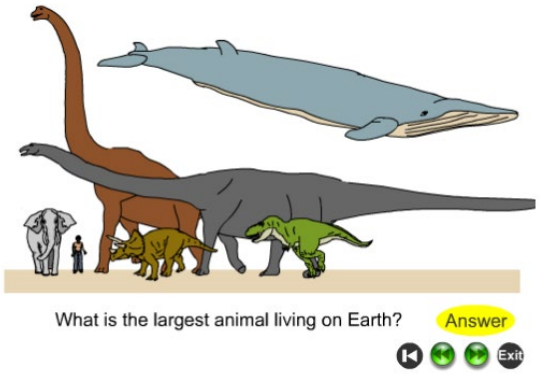
- What's wrong with this picture? Allow students to discover misconceptions, most importantly: dinosaurs and humans did not live at the same time!
- Dinosaurs also did not teach like humans.
- "Cavemen and mammoths did not live in the same era, so the dinosaur teacher would not be showing those pictures even if they could teach!

Slide 4:

- What's wrong with this picture? Who is this character? (Fred Flintstone) Here we are trying to emphasize color. We do not know the real color of dinosaurs, skin is not preserved, but since we know about present day animals, we can make correlations that they probably had similar colors because of environment.
- The "Present is Key to the Past." Present day animals can help us determine extinct animals? Are there purple elephants running around?

Slide 5:

- **What is the largest animal *living* on earth?** Read the question twice. Most students will say the brown dinosaur is the biggest. You can go over each animal and play a game with them about which one they think is the biggest. The Blue Whale is the biggest (in overall weight and length), because it is still living.
- Have students imagine if a whale was walking on lands. The marine environment helps to support the weight.
- Dinosaurs are **extinct.** Long neck group of dinosaurs were the largest of the dinosaurs. Notice that Tyrannosaurus rex is only a little larger than today's elephant.
- Compared to humans, many dinosaurs were larger. However, there were other smaller dinosaurs that roamed the Earth.



Activity 1 Looking at Dinosaur Models

- Go over the placemat with students before they go to back. Explain that it is a data chart. Dinosaurs lived in the "Mesozoic." The entire placemat is this timeframe (225 million years to 65 million years ago). You can stress how long that is by slowing saying how many zeros there is. For example, 65 zero, zero, zero, zero, zero, zero.
- The name of the geologic time period is on the top or horizontally (side to side). Go over each having the students repeat the words. Triassic, Jurassic, and Cretaceous, which together make up the Mesozoic. Most students are familiar with Jurassic because of the movie and theme park.
- Students will look for corresponding animals on the placemat. Explain that the placemats/data charts are designed so that the name of the geologic time period is across the top horizontally (side to side).
- Then show that under each time period those are some of dinosaurs found in the time periods are listed vertically (up and down).
- Dinosaurs lived during different times and also different places on Earth.

Go in the back to the lab tables and go over the rules.

- There are not enough models for one student to match all. They will have to take turns and share. They need to work as a team.
- Tell them you will give them a clue on which model to choose. One person at each table will pick up the model which is the answer. After each clue and discovery, have the students hold up each dinosaur so you can check it. Match on placemat if possible. Have the students put each dinosaur in the box underneath the table when they are done with it.
- Give students clues to the identities of the dinosaurs. Go over characteristics of each dinosaur (the level of detail depends on the age/level of the students). Discuss present day versus

fossils animals as you go through the clues (present is the key to the past, for example, how do we know this dinosaur ate meat?). Point out the time periods on the placemat. *There are no models from the Triassic.*

- There is a lot of information below. Depending on the age group will depend on how much you can go into.
- After you finish the models go back to slide show.

- First Question.

  Ask students to find the model that is not a real animal. One student should pick up the "dragon." Ask them which country loves dragons. China. Why? China has more dinosaur fossils than any other area. Imagine parents going out to the fields and coming home and bringing back big bones. The grandparents would be taking care of the children, and surely one would ask what the big bones were. Since the grandparents did not know they would bring up stories of wings, fire breathing, and would take bad children away. The dragon story remains. Have children put the model nicely under the table in blue bin.

- Ask students which model(s) is(are) not a dinosaur? It is the mosasaur. Paleontologist only consider large, **land walking** reptiles to be dinosaurs, if they flew or swam they were considered to be flying reptiles or marine reptiles.

- **Brachiosaurus** – Two models, one a solid green, one two different shades of green. The solid green model is not accurate; the butt is too big! If the butt were really this big the animal would tip over. It was re-designed after more information was known (put away solid green model). Long neck, crest on the head/green color. Up to 50 feet tall, ~80 feet long. Weighed 50-80 tons. Skulls had large nasal openings at the top, there were 52 teeth. Spines had 14 neck vertebrae, with the longest being 3 feet long. The neck was 20 feet long and had a complicated joint system to help strengthen it. They had 4 strong legs to hold up the large bodies, the front legs were longer to support neck. The feet were small for its size. The fist digit on the front, and first 3 digits of hind foot with had a claw. *Present on placemat, Jurassic.*

- **Apatosaurus**. Long neck, more horizontal orientation, two shades of green. Go over the name change and why. A scientist discovered a long neck dinosaur and named it Apatosaurus. Later another scientist found a similar dinosaur and named it brontosaurus. It wasn't found out until later that the second dinosaur was found to actually be the same kind as the first one. In science we use the name of the first discovery. So Brontosaur's name had to be changed to Apatosaurus. Can point out similarities between the Brachiosaurus and the Apatosaurus (long necks, long tails, strong legs). *Not present on placemat.*

- **Stegosaurus** - Ask students to look for the dinosaur that was on the very first slide. Extremely small skull about 16 inches, but was 24 feet long, weighed about two tons. Double row of large, bony plates with the largest about two feet wide and two feet tall. End of tail had foot-long spikes covered in tough horn. Back legs where twice as long as the front legs. Feet were broad with three toes. The front feet had five strong clawed toes. *Present on placemat,*

Jurassic.

- **Triceratops –** Look for the one with the long, sharp horns; bony frill around neck. Triceratops was 30 feet long 10 feet tall, and weighed 9 tons. Skull measured up to 7 feet long. The skull had two horns on the brow which were about 3 feet long, and short horn on nose that were about 7 inches. Neck frill was solid sheet of bone. Front of mouth was a sharp beak with grinding teeth in back. What do you think it ate? Leaves, the beak could pluck and cut leaves, and the teeth would grind them up. Long hipbones were attached to a large number of vertebrate, making the body stronger. It walked on four legs, they were all thick and strong. The feet there were short with wide toes; five in front and 4 in back. *Present on placemat*, *Jurassic*.

- **Parasaurolophus –** Herbivore, elongate crest on head, greenish. Body length about 10 m, height of 1.5 m, 2.5 tons. Crest could have been used as a visual display, sound amplification (communication), or thermoregulation. Was able to walk on either two or four legs. It may have run on two and foraged for food on four. *Present on placemat, Cretaceous.*

- **Pachycephalosaurus –** This dinosaur looks like it has a helmet. The bodies were about 15 feet long and 6-9 feet tall. The probably weighed about 1,000 pounds. The skulls have a bony dome and many small horn-like projections. The skull could have been used for head butting, similar to what rams do today. The mouth was small and pointed, it looked fearsome but was a plant-eater (low-lying vegetation). The torso was bulky (for fermentation). The tail was thick and heavy. Be sure to point out that the blue and purple colors of the figures are not the colors the dinosaur would have had! *Not present on placemat*.

- **Maiasaura** – This dinosaur has a broad mouth and is walking on all fours. It's nickname is "duck billed" dinosaur and belongs to a group called the Hadrasaurs. The bodies were about 30 feet long. The young likely walked on two legs while the adults walked on all fours. Maiasaurus means "good mother reptile". This is because nesting colonies have been discovered that contain both eggs and young animals. Because there were both eggs and young animals it showed that Maiasaura fed and cared for its young while they were in the nest. *Not present on placemat*.

There should be three models left. Ask which one has been found in California.

- **Nodosaur/Ankylosaurus (figure labeled sauropelta, which is in the same group)** – This one is low to the ground and has a lot of armor. Ankylosaurus was about 17 feet long and weighed 1.5 tones. The skull was triangular and low with small horns. It had a pointed beak (like triceratops). The neck and shoulders had long side-and backwards facing spines. The tail also had spines along the side. These were for protection. The skin was also covered in armor. This armor is in the form of ossicles, or boney nodules. There were four short legs, the back legs were longer than the front legs. -You can discuss that scientists found nodosaur (looks like an ankylosaur) bones in area near Patterson California. But we know that they were washed in through a river system. The bones are not preserved *in situ*, in place. And there were plesiosaur bones found as well.

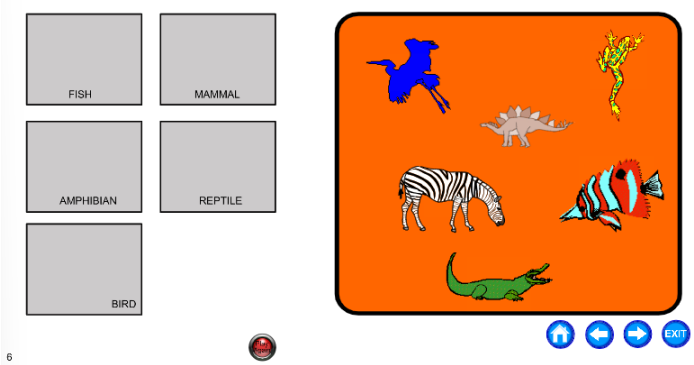
There should now be two left. They have both been featured in movies. Ask which dinosaur did not live in the Jurassic. If you look at the placemat, Tyrannosaurus rex lived in the Cretaceous! Remind students that not all movies give you the real information.

- **Tyrannosaurus rex –** This is one of the most famous dinosaurs, but it was not found in the Jurassic like the movies say! T-Rex was about 40 feet long and 12 feet tall. It could rear up on its hind legs and reach a height of 18 feet. It weighed 6-7 tons, more than an elephant. Massive skull was nearly four feet long. Skull had 60 sharp teeth embedded in 3 foot jaws. It walked on two legs and held its long tail straight out behind it which helped to balance. The back legs were strong enough to support the body because the front legs were tiny. Each foot had four toes, one small and three large ones. The claws were large. The arms and two clawed hands were small for its body and did not even reach its mouth. *Present on placemat, Cretaceous.*

- **Velociraptor** - Looks like a tiger/carnivore/sharp teeth/large claws**.** Body 6 feet long, 3 feet high. Had very large hands with strongly curved claws, also had long claws on the feet. The claw on the second toe could grow to be ~3 inches long. *Present on placemat, Jurassic.*

Slide 6:

- Animals on earth are sorted by whether they have a backbone or vertebrate (which refers to the bony component. The spine is an interconnected complex of bones, nerves, muscles, tendons, and ligaments. Paleontologists only have bones to interpret in many cases.
- Tell the students that you will need to put each animal in the "zoo". Go over what Aves and Pisces means, and ask the students if they know what an amphibian, reptile and mammal is. Ask for animal examples from each table. After sliding the animals over to the right cage, ask why the dinosaur has no place to go? Again it is extinct, too big, zoos were not invented back then, etc.
- You can ask what all the animals have in common (a spine). They will need help with this. Get Charlie the skeleton and point out the spine. You can also use Charlie to show the similarities between the cow bones and the human bones. This is also a good opportunity to bring up the present is the key to the past. Ex. How do we know this was a shoulder bone? It looks similar to that of other animals. If we see a fossil that looks like this, we can say that it is also a shoulder bone.



- Go through each group and ask questions to point out the differences. How does each group have babies?

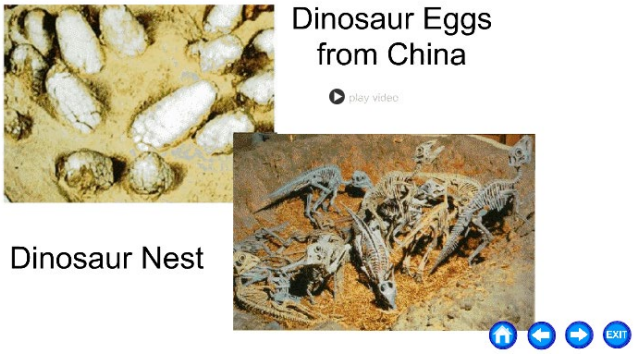
  -Fish and amphibians lay eggs in water

  -Reptiles and birds lay eggs on land (some reptiles have live birth, but it is best not to go into that for the younger students)

-Mammals (most) do not lay eggs, they have live birth

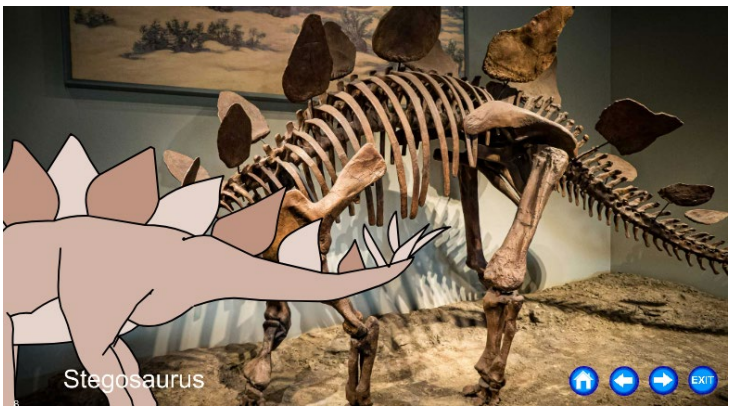
- You can also point out that there were dinosaurs that were mammal-like, bird-like and reptile-like. No dinosaurs were fish-like, dinosaurs lived on land.

Slide 7:



- Play the video of the first time they found eggs in China in the 1950s.
- Remind the students of the Maiasaurus they saw as a model. This is how they knew they were duck billed. They were able to see the bones in x-rays.
- Dinosaur nest and eggs. We know that some dinosaurs are reptiles because they laid eggs. Ask the students to name other reptiles: turtle, snake, alligator crocodiles and lizards.
- How did these get preserved. A volcanic eruption covered the nests and when uncovered the eggs were in groups.

Slide 8:



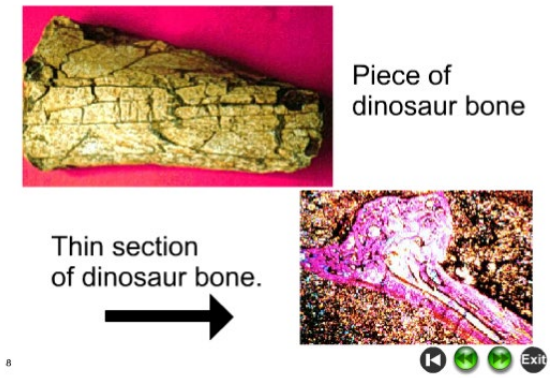
- During this slide you can talk about how we use bones to get hints as to what the dinosaur looked like. Artists can look at the bones and how they fit together and create models/pictures/figures.
- This is also done by comparing the dinosaur bones to modern bones (reiterate the present is key to the past).
- When we find bones, usually they are not all in one piece; a paleontologist then tries to put it together, like a detective.

Slide 9:

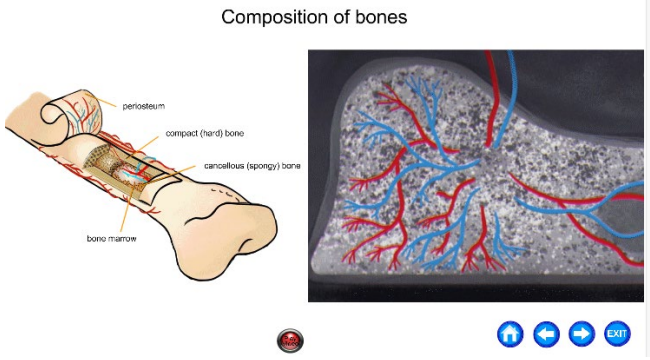
- This animation shows a Stegosaurus that dies and then some of the bones are lost and scattered
- Fossils are rarely found intact. Many land animals are not covered (unless buried by volcanic eruption or landslide). So, their bones are scattered as predators and scavengers move the bones. It takes a long time to put the pieces together.
- Most times the skeletons found in museums are replicas.
- The video shows how you excavate for dinosaur bones.

Slide 10:

- Go over what a fossil is. Original material replaced with minerals and chemicals in the environment. This turns the original material into stone. That is why some fossils are very heavy. This is a picture of a bone.
- We know it is a bone because under the microscope you can see clues that tell you it is a bone.
- Bones have diagnostic “holes.”



Slide 11: Composition of Bones



- A bone is living. It needs to develop a way to use nutrients to make the bones grow and then to maintain their health. All living vertebrate organisms have pores so blood can move freely throughout the bones to provide nutrients.
- The enlargement is an x-ray showing the pores, the red and blue are arteries and veins. This animation shows a cross section of a bone. Dinosaurs would have similar texture.
- There are two types of texture of the bone. The compact bone tissue is along the surface, more for protection and support.
- The spongy bone is where the blood vessels go through.

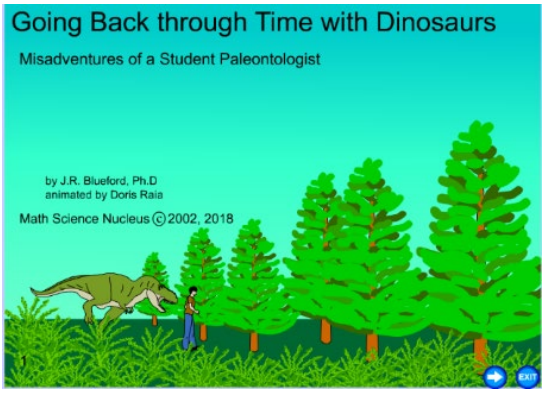
Activity 2 Discovering dinosaur bones

- While still seated at the front hold up the cow bones again. There is a clue on these bones that tell you the bones in the back are bones.
- Scientists use a tool to observe things. Show them a 3 loupe hand lens. Show them how to use the hand lens without breaking it. If you just use one loupe it is 5x magnification. If you put another one on it, it is 10X, and a third is 15x. Tell them when they go to the back they should use the hands lens by looking at their finger nail. See if there is dirt under the nails!
- Notice that you bring the object to your eye, and not move the hand lens (like the show in cartoons). Have them practice before they look at the dinosaur and real bone.
- Return to the back of the room. Tell the students that they will be looking at real dinosaur fossils. Ask them to use the hand lens and see if they can find something from the cow bones that they can see on the dinosaur bones. Try to force them to look and compare.
- Go table by table and ask children their opinion of what they observe.
- Note these bones were collected by U.S. Geological Survey scientists in the Arctic. The yellow paint with numbers are identification numbers.

- Have the students look at the larger and smaller bones.
- Walk around and ask the students to make observations about what the outside and inside of the bones look like (need to see that the bones have holes). These holes are where blood vessels ran through the bone (it is a living tissue!). Blood is actually made inside the bones by marrow. Most children and adults do not know this.

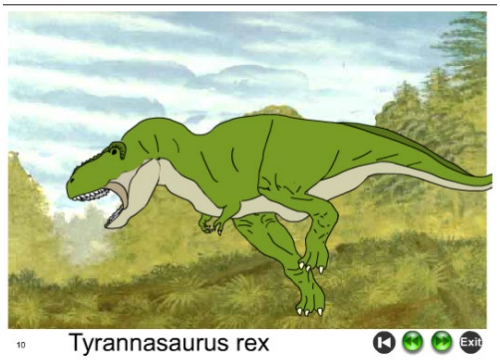
Break

- Read “Going Back in time with Dinosaurs.” This story reinforces main principles of the field trip.



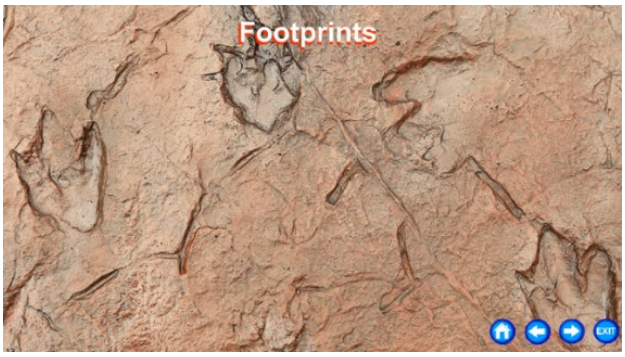
Slide 12:

- How do we know what dinosaurs sounded like? We don’t know for sure. But we do know what present day reptiles sound like so we compare the features of present day reptiles with those of dinosaurs and make educated guesses as to what the dinosaurs could have sounded like.



- Dr. Jack Horner, a noted dinosaur specialist, was asked to create the sounds of T. rex for Jurassic Park. He looked at the muscles pattern from bones and came up with this familiar sound.

Slide 13: Footprints



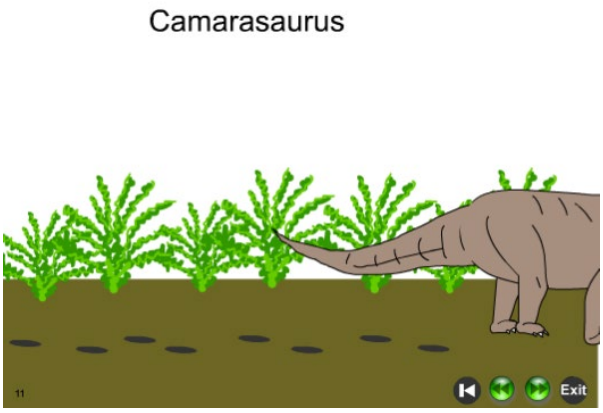
- Footprints are what we refer to as “Trace Fossils.” A fossil that shows the activity of an animal, but it is very difficult to give it a species name. Where bones are real fossils of the animal.
- You can tell how fast the animals is going; get a sense of the weight; whether it is 2 or 4 legged; whether it lives in a herd, or if there were little ones.
- Usually found in rock that was once mud or muddy sand.
- In this photo you can determine if they are tracks or trails. Describe the forms. Is there more than one animal. Not easy!

- These footprints are from Trentino, Italy from Jurassic dolomite deposits and looks like it was made by a biped, either Hadrosaur or theropod.

- These dinosaur footprints are from the Shandong Province in China and look like they were made by sauropods These are Late Cretaceous in age so it's likely they were made by something like Zhuchengtitan.

Slide 14:

- Camarasaurus. Let this run a couple of times. Discuss the leaving of footprints and poop. This demonstrates the significance of other types of fossils, trace fossils.
- Footprints are also important. If you find large prints with small prints, you can assume that a mommy and baby were walking together. You can tell if they are running or walking; on two feet or 4 feet; and even how heavy they were.
- Not every dinosaur becomes a fossil, but we can still learn about them and their behaviors based on other things they leave behind (tracks, excrement). Students may think it is gross, but it is very important!



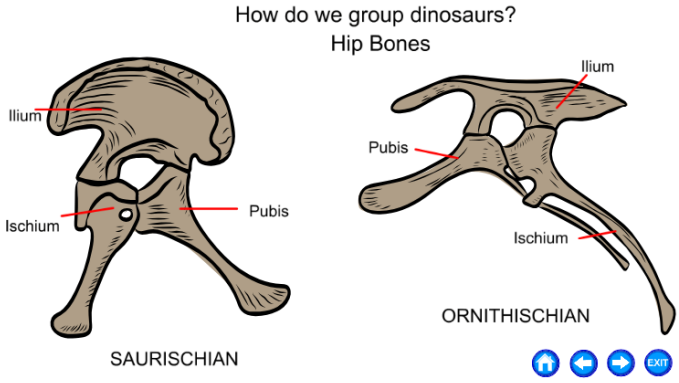
Slide 15:

- Dr. Karen Chin looking at fossil **coprolites** (fossil poop). She is a world authority from the Denver Natural History Museum. She looks at the coprolites under the microscope and can see if the dinosaur is a herbivore or carnivore
- Ask students what kind of information they think she can get from the coprolites? She can tell the kind of dinosaur, what they ate, and the environment.

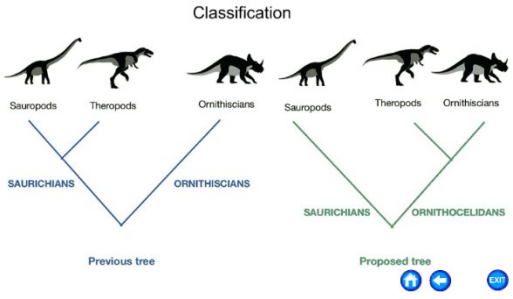
Activity 3 Trace fossils

- Have students turn around and demonstrate the “shape it” sand. It is important tell them to keep the sand in the containers, do not dump it out!
- They will use the small models to make their own trace fossils. They can make footprints and skin prints. Have them make observations about the footprints of the big vs. small dinos, and the bipedal vs. quadrupedal dinos.

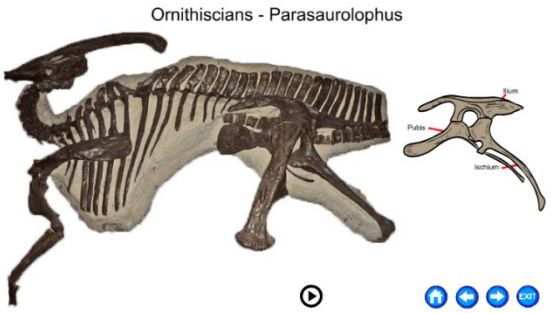
Slide 16: Classification of Dinosaurs



- For example, the hip bones of the two different groups of dinosaurs looked different. By looking at just a part of the dinosaur we can get a lot of information; the T-rex walked on two legs, and the triceratops walked on four. Look at slide and notice that in one classification they place the theropods with the saurichians but in other they put with a revised name ornithocelidans
- Some paleontologists question the hips being the only grouping, and some scientist want to open the classification up to include other features.
- However, do we know enough yet about how to group. Not really, there are many fossil sites being uncovered that change how we see dinosaur groups groupings based on not only hips.
- Scientist can revise their grouping based on more information or reinterpretation of old data
- Sometimes you only find part of a dinosaur and you can make an educated guess on what it might be related to.
- A classical mistake is the naming of brontosaurus by O. C. Marsh (Peabody Museum, Yale) and his rivalry with E.D. Cope (also of Yale), in the latter part of 1800’s. They were part of the “Bone Wars,” a media circus to find as many fossils in the west and name them. There seems to be a naming of different bones as one brontosaurus, which it seems it was not. Remember there were not many photos taken, or even a full understanding of the geology of the area. So, brontosaurus is not considered as a valid name. But it could change.

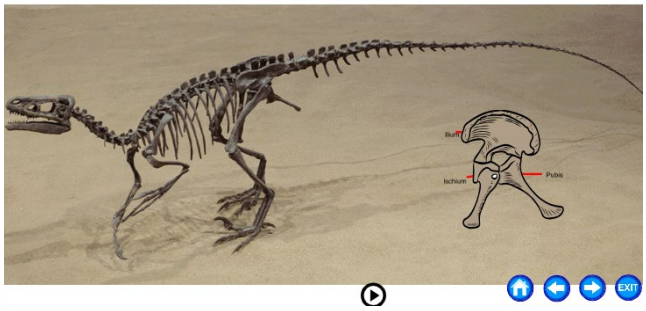


Slide 17: Ornithiscians - Parasaurolophus



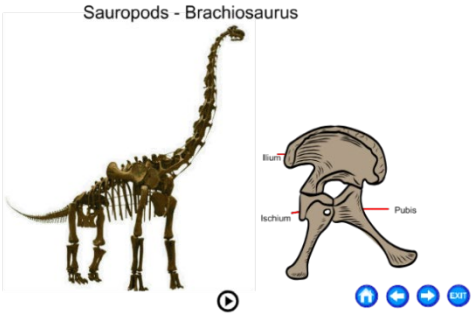
- long, distinctive, backward-curving crest
- herbivorous ornithopod dinosaur that lived during during the Late Cretaceous Period
- walked both as a biped and as a quadruped
- duck billed dinosaur
- Followed by pictures of two artistic vision of what a Parasaurolophus looked like.

Slide 18: Theropods - Ornitholestes



- A small theropod dinosaur that was built for speed and agility rather than strength and brute force.
- The lower leg bones are thought to have been slightly shorter than the femur, something that is contrary to other fast running dinosaurs.
- This might indicate that while Ornitholestes was a lightweight reasonably fast theropod, it was not suited to chasing other small bipedal dinosaurs.
- Up to half of the total body length was made up of the tail which would have served as a balancing aid.
- Followed by pictures of two artistic vision of what a Ornitholestes looked like.

Slide 19: Sauropods - Brachiosaurus



- *Brachiosaurus* was an unusual dinosaur that lived 155.7 million to 150.8 million years ago during the mid- to late Jurassic Period.
- Specimens have been found primarily in the fossil-rich Morrison Formation in North America, but the dinosaur did not resemble any of the others that roamed the region.
- Its long neck made it look like a giraffe, and its forelegs were longer than its hind legs.
- Look at the 2 artistic concepts, ask your students which one they think is realistic.

Slide 20: Finding Fossils and Preparation

The following slides can be used to show how fossils are prepared to come to a museum. After the slides, go to the museum upstairs to look for real fossils.

- Here is a photo of a paleontologist. Look at the tools and careful examination of gravels. This is what a real paleontologist looks like when they are working! The paleontologist is uncovering a large fossil? Of what? Hips! Point out the tools being used (hammers, scoops, glue, small shovels, plaster, picks).

- Paleontologist uncovering…ribs! Can point out the tools again. It is also helpful to point out how the fossils look when they are in the ground.

- Teacher helping with a unearthing dinosaur bones and putting it is a “cast” so it can be easily transported without breaking. Adds support when moving fossil.

Slide 21. Picture of museums

People love to go to museums and see a large skeleton of dinosaurs. There are many throughout the world. Some museums use the dinosaurs found locally, most use replicas from other areas.

- University of California Museum of Paleontology: Unlike many museums, UCMP is a research museum only open to scientists or for educational purposes. Located at UC Berkeley Campus, in the Integrative Biology Building.

- Museum of the Rockies is in Bozeman, Montana. The museum operates as an independent 501(c)(3) non-profit organization but associated with Montana State University. Largest collection of North American dinosaurs.

- Royal Tyrell Museum, Albert Canada: The Royal Tyrrell Museum of Palaeontology is Canada's only museum dedicated exclusively to the study of ancient life.

- Field Museum of Natural History, Chicago: One of the largest educational and scientific museums in the world. The professional staff maintains collections of over 24 million specimens and objects that provide the basis for the museum's scientific research programs.

Activity 4 Museum Tour

Allow time to go through all Halls. Focus on **Wes Gordon Fossil Hall**, point out the different tools used by the paleontologists.

Students usually get a dinosaur egg as a memory of coming to the museum. They should not open it up until they get home. Students will be a mommy or daddy to a baby dinosaur.