Digging Up Dirt
How Paleontologists Bring Dinosaurs Back to Life

Each year, thousands of visitors stroll through dinosaur exhibits in museums across the country. They crane their necks to see the top of Brachiosaurus’ skeleton and marvel at the ferocious look of Tyrannosaurus rex. Adult visitors try to comprehend the passage of time when it’s counted in hundreds of millions of years instead of hours. Dinosaurs make adults think about evolutionary change and abrupt extinction; they wonder what the dinosaurs’ experience on earth can teach us.

Rather than being merely curious, children are passionate about dinosaurs. They gaze at the huge skeletons, imagining a landscape that could hold such creatures. They read and mouth the difficult-to-proounce dinosaur names. Children possess encyclopedic knowledge about dinosaurs. Any teacher who has studied dinosaurs with a class has been corrected by a ten-years-old expert. “Actually, Ms. Miller, since the 1970s, Iguanodon has been depicted with the tall alfot,” Children are fascinated by the unique place dinosaurs occupy in the panoply of monsters. Dinosaurs were huge, ferocious, preposterous-looking and, best of all, real. They require none of the suspended disbelief that Red Riding Hood’s wolf calls upon. Their gigantic forms strike awe without causing fear since they are not merely dead, they are extinct.

However, few people understand paleontology, the science that brought dinosaur remains to human understanding. The purpose of this issue of *Art to Zoo* is to introduce you and your students to this uniquely speculative science. First you will be introduced to a practicing paleontologist, John Homer, and his remarkable discoveries about how dinosaurs nurtured their young. The next sections tell how fossils form and how paleontologists find, stabilize, and transport fossils from the field to the laboratory. In the Practicing Paleontology section, students participate in activities designed to help them think about the fossil record the way paleontologists do. The Pull-Out Page invites students to collaborate in science teams and to create miniature model fossil finds. In addition to the fun they will have with boxes of sand, chicken bones, and plaster of Paris plant fossils, students will learn about geology, paleontology, anatomy, and scientific method.

**Background**

**Discovering the “Good Mother Lizard”**

John R. Homer is a famous paleontologist (a person who studies ancient life) whose analysis of the dinosaur remains he found in Montana have led many people to believe that at least some dinosaurs took care of their babies after they were hatched. Before Homer made his discoveries, most paleontologists believed that dinosaurs, like most reptiles, merely deposited their eggs and left the infant dinosaurs to fend for themselves. Learning about John Homer’s discoveries will teach you a lot about dinosaurs, but it will also teach you how paleontologists think and how they pose the questions that shape what they look for, and thus, what they find.

In 1978, John Homer, a paleontology technician working at Princeton University, was interested in finding the nesting sites of baby dinosaurs. He had read about the few places such remains had been found in the past, such as Mongolia, Canada, Montana, and New Mexico. His research had given him the idea that he might find more juvenile dinosaur remains in a fossil-rich rock formation in Montana, called the Two Medicine Formation. Choosing a place to look for dinosaur remains in the Two Medicine Formation would payoff. Though his scientific plans had been carefully made, John Horner’s first discovery of a baby hadrosaur’s jawbone occurred while he was rummaging through a coffee can full of dinosaur bones in the Two Medicine Formation.

Having his scientific plans had been carefully made, John Horner’s first discovery of a baby hadrosaur’s jawbone occurred while he was rummaging through a coffee can full of dinosaur bones in the Two Medicine Formation. Horner was so excited when he found the bone that he kept it in his lap while driving his truck back to his laboratory. He arrived at his lab holding the bone in his hand and immediately called Brugnetz and Ellingsen, his colleagues to tell them his discovery. They were equally excited when they saw the bone and immediately the two decided to send it to the lab. They sent it to the lab and when they analyzed it they realized that it was a baby hadrosaur’s jawbone. They were excited to find that it was a baby hadrosaur’s jawbone because it was the first time that they had found a baby hadrosaur’s jawbone.

**The Discovery of the Babies’ Nest**

Horner’s next discovery was the nest of baby hadrosaurs. He had found the nest in a small mound of mudstone near the base of a hill. The mound was about ten feet high and about twenty feet wide. The nest was about three feet deep and had been left by the babies’ mother who had died in the nest. Homer dug into the nest and found many baby hadrosaur bones mixed haphazardly into the mudstone. Digging deeper, however, they saw that the green mudstone sat within a large, shallow bowl of red mudstone about six feet wide and three feet deep. They theorized that the red mudstone bowl could have been a nest for the babies. It looked as if it had been made by the babies’ mother who had mound up the earth and scooped out the middle. They believed the green mudstone had filled the nest during the many millions of years since the babies had died. When Homer finished digging through the small mound of mudstone, he found the remains of 15 three-foot-long baby dinosaurs. (Another type of bone that had been found in this nest grow to be 25-30 feet long.) These were not 15 complete skeletons. They were disconnected bones belonging to 15 babies who had died in the nest and whose skeletons had been subjected to time and weather until they fell apart; then they were fossilized.

John Homer had many questions about these baby dinosaurs. Researchers had always posed the questions and learning about how he answered them will help you understand how a paleontologist thinks. If you had made this discovery, what would your questions have been?

First, Homer wondered if these were babies’ remains or the remains of another kind of very small dinosaur such as Microceratosaurus, which was 3.5 feet long when full grown and weighed a mere 12-15 pounds. In order to answer his questions, he had to “read” the evidence found at the site: the number, condition, and placement of the bones, and the soil type. The first thing he did was to look at the development of the bone. His close examination told him that these were indeed the bones of baby dinosaurs. The signs that he read were found in the vertebrae (bones of the spine) near the base of the spine. These vertebrae were not yet fused together as they are in mature dinosaurs. When he saw that the ends of the limb bones were not fully formed either, Homer knew these were the remains of very young dinosaurs.

But these were not merely newborn babies who had yet sudden death right after their birth. Homer found a sign of their age from a source that yields a great deal of information: he looked at the babies’ jaws and teeth. He found that their teeth were worn down from chewing. In order to show wear on their teeth, these babies must have been chewing for some time. Their worn teeth...
showed that they could not have died immediately after birth.

Another aspect of this find was interesting and perplexing. The nests were filled with bits of crushed eggshell. How would you have explained the crushed eggshells? Homer believed that the babies had stayed in their nests for the early part of their life and that they trampled their own eggshells after they were born.

Now, here are the next thoughts that went through Homer's mind. The babies' teeth were worn down from eating; fifteen of them had been found in the same nest, and all the eggshells in the nest were broken up. It sun looks like the babies had stayed in the nest for a long time. And if they actually did stay in the nest, someone had to bring them food for them to survive — someone, Homer believed, like their mother. The idea that the parent dinosaur would care for the baby dinosaur was unheard of until this time, and it caused Homer much excitement. Furthermore, this was a newly discovered species of dinosaur. Much later, after they'd found and studied a skull of an adult dinosaur, they could come to the conclusion that it was a new species.

The next two years brought even more exciting discoveries. More specimens revealed that the maiasaur nests were spaced 23 feet apart. Can you explain why they were always this far apart? He believed they were far enough apart so that the babies wouldn't kill each other. Further investigation revealed the kind of remains Homer had been looking for. He found eggs that had not hatched, 14-inch-long maiasaur babies, and finally a site that gave a picture of the maiasaur nest and its contents. The oval eggs were about 8 inches long and were not smooth like chicken eggs but were ridged. They were arranged as two concentric circles, one layer of eggs below the other layer.

John Homer went on to make many other fossil discoveries, including the eggs and nests of another brand-new species of dinosaur, which he named Eoraptor. After his colleague Bob Makela. He also found remains of a herd of 10,000 adult maiasours! His experience shows that no matter how big, how long, or how vicious a dinosaur remains may be, a paleontologist's interpretation of the bones' message can add new, startling information to our understanding of the past.

**Paleo-Puzzle IV**

You are excavating a new dinosaur skeleton. You have been working back from the tip of the tail toward the head, when your digging reveals a sharp change in the kind of rock you are digging in and, sadly, no more skeleton. Where is your dinosaur's head? What force made the rock change so abruptly?

**Paleo-Puzzle III**

Even an energetic paleontologist would be exhausted by the thought of digging up a sauropod. The tallest sauropod, Ultrasaurus, was 55 feet tall. The largest sauropod, Supersaurus, stretched 125 feet from nose to tail. In addition to their great size, sauropods present another challenge to paleontologists. Few complete sauropod skeletons have ever been found, most are missing their extremities, such as head, neck, and tail. Further, sauropod skulls are nearly impossible to find. Now, knowing what you do about sauropods, can you tell why their remains are so incomplete?

**Paleo-Puzzle II**

Fossil remains of young dinosaurs are extremely rare, while remains of adult dinosaurs are much easier to find. Why do you suppose this is true?

**Paleo-Puzzle I**

What unique characteristic of reptiles makes it impossible for paleontologists to say definitively the type of dinosaur grew to be at 30 feet long and none of them ever grew any longer?
Gastroliths. Some paleontologists believe that dinosaurs deliberately swallowed stones, for the same reasons that modern-day chickens peck up gravel. These stomach stones, or gastroliths, stayed in the dinosaur’s gizzard and rolled around to more completely grind up the dinosaur’s food.

Necks. As we learned in our reading about Homer’s Gastroliths. Some paleontologists believe that dinosaurs deliberately swallowed stones, for the same reasons that modern-day chickens peck up gravel. These stomach stones, or gastroliths, stayed in the dinosaur’s gizzard and rolled around to more completely grind up the dinosaur’s food.

Appendix. I’m going to see if I can find any of these Early Cretaceous rocks. Before you do the following activities, visit your local natural history museum or go to the library and look through books about dinosaurs to find one that makes you curious. You might be intrigued by the vicious Deinonychus, the four-toed Allosaurus, or the seven-toed Brontosaurus. For these activities, you should have your “favorite” dinosaur in mind. You should also know as many facts about your dinosaur as you possibly. Use this questionnaire to help you get ready for the activities.

Reading the Rocks

Paleontologists believe that there is as much information about a dinosaur locked up in the rocks around the skeleton as in the skeleton itself. They read all aspects of the site closely to understand the fossilized remains. For example, even if a paleontologist finds an intact skeleton, he must also study the rock holding the skeleton. The structure of sedimentary rocks gives important information about the environment in which the remains lived. The speed of the water shows up in the grain size of the sediment. Finely grained sediment is deposited by slow-moving water. This has less energy and carries less material. This type of sediment can form into rock after a long time. During their travels in ancient waters and before their burial, the bones are scraped and the joint ends are broken off. Often bones are fractured by the pressure of the surrounding rocks. As we learned in our reading about Homer’s Gastroliths. Some paleontologists believe that dinosaurs deliberately swallowed stones, for the same reasons that modern-day chickens peck up gravel. These stomach stones, or gastroliths, stayed in the dinosaur’s gizzard and rolled around to more completely grind up the dinosaur’s food.

Choosing Where to Dig

A dinosaur fossil hunter sometimes is lucky enough to see dinosaur remains on the surface of the earth rather than having to dig for them. Such forces as wind and water erosion and volcanic activity can expose rock that is millions of years old. Erosion wears away at the rock covering the fossils. Sometimes, powerful movements under the earth’s surface, such as the formation of mountains or the activity of volcanoes, will push very old rock to the surface. Such rock may contain dinosaur remains. Ancient fossil debris may be exposed in the rock and found right on the ground we walk upon.

Paleontologists use special maps, known as geologic maps, to suggest which regions might have dinosaur fossils buried within them. While topographic maps offer information about a region’s present landscape—such as features, such as rivers, roads, and mountains, geological maps tell a paleontologist which places are promising for digging for fossils. Geological maps help identify the name, location, and age of rock formations.

Thus, if a paleontologist knows what he is looking for, he may try to simply go after it. He might sit down with a geologic map of his state and look for an area containing rock formations of a certain period. A paleontologist might say, “I’m looking for dinosaur bones of the Lower Cretaceous period (144 - 97.5 million years ago) and I’m going to see if I can find any of them in Maryland.” The geologic map of Maryland above reveals that the Arundel Clay, cutting a diagonal path along the eastern side of the state, is a rock unit of Early Cretaceous age. As this map shows, a paleontologist would have several options about where to dig to find remains of such Early Cretaceous dinosaurs as the giant Triceratops and Dryosaurus. A fossil hunter would choose where to dig, then go to the site and prospect the area.

Preserving and Transporting Bones

If a paleontologist is lucky enough to find bone he must watch that he does not harm it while trying to get it out of the ground. First, she gently chips away at the rock around the bone using small picks and chisels.

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Dinosaur Background Information

Dinosaur’s name: When did this dinosaur live? How big was this dinosaur? What are the dinosaur’s unique features of appearance? Trace or photocopy a drawing of the dinosaur to use for reference. What is the earliest fossil evidence of this dinosaur? What is the latest fossil evidence of this dinosaur?

Activity 1. Find a geologic map of your state. Where would you choose to hunt for remains of your dinosaur? Why did you choose this region? If there is no area in your state that might yield fossils of the age you need, where is the closest place you could dig? Activity 2. Draw a picture of one picture of your dinosaur’s anatomy on a transparency. You might choose to draw only the skull, or perhaps even only one bone, like the femur, or thighbone. In a darkened room, place the drawing on the overhead projector. Then pull the overhead projector back away from the
Activity 1. Dinosaur footprints can be fossilized when a special set of circumstances occurs. If a dinosaur made footprints in stiff mud and the tracks were then covered with another layer of dirt, which would eventually harden, and if the tracks were then covered with water, the footprints might be preserved. If it is too hard to make a dinosaur bone from a picture, try modeling a real bone, such as a chicken leg. Remember, modern birds are dinosaurs' remote cousins!

Activity 2. Dinosaur footprints are best preserved when the foot is pressed into the mud. If the foot is pressed into dry soil, it will not be preserved. The same thing is true when making plaster casts of your own foot: the plaster must be made when the foot is wet. The footprints themselves are not fossilized, but they are preserved as casts of a footprint or mold of the foot sole itself. Paleontologists sometimes use the footprint as a mold, and fill it to make a replica of the dinosaur’s sole.

Try this experiment with your own footprint. Fill a shoebox with two inches of wet plaster of Paris mixed to the consistency of heavy paste. Firmly press your bare foot into the plaster, creating an exact impression of your foot. Let the plaster dry, then coat the entire surface (even the plaster that did not receive your footprint) with a thin layer of petroleum jelly. Pour another two inches of thick plaster of Paris into the mold of your foot. Let it dry. Try the foot into the shoebox, then pull the two layers of plaster apart.

You now have a positive version of your footprint, the cast, and a negative version, the mold. What information can you learn about your foot’s sole, skin, and bone structure from the cast that was difficult to detect in the mold?

Activity 3. Paleontologists rarely find a complete skeleton. If they want to mount a skeleton for display in a museum, they will probably have to use some original bones and many fabricated bones. These man-made bones may be cast in stiff urethaneresin from other similar skeletons, or replicas of drawings of bones. Using modeling clay, encase one of your dinosaur’s bones or teeth. Making this model will be easier if you can draw a drawing of one of your dinosaur’s bones from the different angles so you can see it from all sides. If it is too hard to model a dinosaur bone from a picture, try modeling a real bone, such as a chicken leg. Remember, modern birds are dinosaurs’ remote cousins!

Activity 4. Dinosaur footprints can be fossilized when a special set of circumstances occurs. If a dinosaur made footprints in stiff mud and the tracks were then covered with another layer of dirt, which would eventually harden, and if the tracks were then covered with water, the footprints might be preserved. If it is too hard to make a dinosaur bone from a picture, try modeling a real bone, such as a chicken leg. Remember, modern birds are dinosaurs’ remote cousins!

Every picture tells a story. What story can you invent to explain this drawing of dinosaur tracks? How many dinosaurs appear in this tale? Are all of the tracks made by the same dinosaur? How did this story start?

journal when they return to the lab, especially if more than one skeleton was found at the site. Above are two entries from the field book of famous paleontologist Walter Granger. These notes were made in 1923, while Granger was collecting fossils in Mongolia. This expedition was to yield remarkable results: the skeletons, nest, and eggs of Protoceratops. Dzark, Mongolia, offered the first proof that dinosaurs laid eggs. Walter Granger’s field journal contains several different kinds of valuable information: a map of the site, finds, and captions for the birds that are holding the Protoceratops fossils, and a drawing of a skeleton found near the nest.

Solution I: The skeleton was deposited on a fault line, or a fracture in the rock holding the dinosaur. A fault line is a place where the rock splits and the fragments slide past each other. The fault line may have caused huge segments of rock to move up or down, or to break or shift vertically. Other fractures that did not break the rock may have led to the formation of a fault line. For example, a fault line may have occurred when the Earth’s crust breaks and a fault occurs. A fault can destroy a dinosaur fossil embedded within sedimentary rock.

Solution II: These animals were so large that the extremities rotted away before the whole carcass could be buried by sediments. Complete burial of a new dodo could take several years.

Solution III: There are several solutions to this puzzle. Large, adult birds fossilize more readily than small, delicate, juvenile bones. Quite simply, the remains of juvenile dinosaurs may not have a chance to fossilize. Another reason for the scarcity of young dinosaurs remains that young dinosaurs may have lived differently and in different places than their parents. For example, they may have lived in environments that did not lead to preservation.

Solution IV: Mammals and birds stop growing at a certain point in their lives, with some dying before they die. Reptiles do not stop growing; they become bigger and bigger until they die, though they grow very slowly at the end of their lives.

Paleo-Puzzle Solutions

Bibliography

Books for Teachers


Books for Children


Fossil Finds ... In the Classroom?

Now that you have learned about John Horner's maiasaur discovery and how paleontologists search for and interpret fossils, it is your turn to try the science. This Pull-Out Page invites you and your classmates to build a model of a fossil find.

Science is a collaborative activity. Scientists practice in groups as they collect, record, and interpret data. It is easy to understand why paleontologists work in groups. They benefit from each other's understanding, certainly. Also, it is nice to have fellow paleontologists nearby when you unearth a six-foot-long limb bone!

Form Your Paleontology Team

Join the classmates who will be members of your science team and tell them about the "favorite" dinosaur you studied in the Practicing Paleontology activities. Encourage your team to ask you questions about your dinosaur. When your group has heard about all the teams' dinosaurs, choose one that interests the group most. This dinosaur will be the one your team displays in the fossil find.

Give your team a name, to represent its personality, interests, and focus dinosaur.

Now your science team should learn as much about the dinosaur as it possibly can. Find out when and how long the dinosaur lived and where its remains have been discovered. What did the dinosaur look like?
Crested or frilled? Horned or armor-plated? What shape print did its feet leave? If it was an herbivore, which plants did it eat? If it was a flesh-eater, which animals became its prey? Become hunters yourselves, hunters of materials to inform you about your dinosaur, beginning with library books.

Record the knowledge you gain about your team’s dinosaur in your field journal, the written account of the progress of your “expedition.” The background information will be the first entry in your field journal. As you construct your site, you will note your findings, draw maps of the site, and make hypotheses about the fossils in the field. Read more about the field journal ahead.

**Gather Your Materials**

Your science team is going to build a miniature landscape that holds fossilized “dinosaur remains”... right in your own classroom. This project will take some imagination. Your whole class will have to imagine that modern materials are really Mesozoic remains, that chicken bones are dinosaur bones, that sand scooped from the backyard sandbox was once the bank of a Late Triassic river. Imagination is a natural part of science; paleontologists rely on it to conceive of the world dinosaurs occupied so long ago. In addition to imagination, you will need:

- a large, strong cardboard box
- plastic for lining the box
- spray adhesive or spray acrylic glaze to keep the top layer of sand or soil in place
- soil of different colors and textures: sand, clay, topsoil or potting soil, and gravel
- plant leaves, seeds, stalks, or needles. Make plant fossils by pressing any part of a plant into plaster of Paris to make an impression. Then peel the plant matter away and let the impression dry. Or simply use the plant in
your model to represent a plant fossil.
Learn which plant grew at the time and in the region your dinosaur lived. During dinosaurs’ millions of years on earth, climate and plants changed greatly. The hot, dry Triassic Period supported evergreens and ferns. During the milder, wetter Jurassic Period, forests grew and became denser. The cooler, drier Cretaceous brought a range of new, flowering plants such as oaks and daffodils.

• **Bones.** No one in your science team has a pile of dinosaur bones in his or her basement. Because birds are the dinosaurs’ closest living relatives, chicken bones are good substitutes. Ask your parents to prepare a whole chicken for dinner, instead of cut pieces. Carefully clean the meat from the bones and learn about how the parts of the skeleton fit together. Then use this skeleton for imitation dinosaur bones. Or make bones from modeling clay.

• **Tracks.** Make dinosaur footprints by pressing heavy cardboard footprint cutouts into wet soil to create a trackway. Build a *Maiasaur*, *Protoceratops*, or hypsilophodont nest using chicken eggshells or plastic eggs.

A final option: reconstruct an authentic site. If you learn about a site while doing research, try to duplicate that site, or part of it, in your box.

**Build Your Fossil Find**
Before your group decides how you will display your fossils, create a story to explain how the fossils arrived at the site. Write the story in your field journal. A sample background story: “We believe this *Edmontosaurus* died trying to defend itself from *Tyrannosaurus rex*. *Edmontosaurus* had been eating leaves from a magnolia tree that grew by the side of a fast-moving river. (We can tell this ancient river was fast-moving because the grain size of the matrix holding the remains is so tiny and fine.) After *Edmontosaurus* died, the fast waters picked up its body, rolling it over and over before depositing it in its burial place. We found foot bones, some plant remains, and a broken *Edmontosaurus* forearm bone (radius).” Your story will help you decide what to put in your fossil find.

As professionals, do, your team will keep a field journal as a record of your excavation’s progress. The journal should include hand-drawn maps of your site. If your site is based upon a real place, in your state or otherwise, copy or trace an authentic map of that place. If your team invents a site, draw in and name all the important topographic (surface) features of your site as they appear before you break ground, then as you dig. As your work proceeds, draw a picture of each fossil your team finds, and its position at the site.

Use your field journal as a science diary. Write a daily account of what your science team finds, describing what you find first, second, etc., the kind of rock your fossils are embedded in, the condition of the fossils. Mention any fossils you see. Write about how well or poorly the work is going. To make your field journal as authentic as possible, use scientific words as often as you can. For example, a real paleontologist calls a thigh bone the “femur.”

A list of useful words appears in the
In many ways, this imaginary fossil find happens backwards. Real paleontologists free fossils from rock; your science team is covering “fossils” with dirt! Real paleontologists compose stories about what happened at their site after they dig up the bones; your science team created the story before assembling the site model. Real paleontologists jacket bones carefully and carry them away; you will leave bones exposed for your classmates to examine. But your purpose is the same as a real paleontologist’s: to learn about prehistoric life by studying fossils.

**Present Your Fossil Find to Your Classmates**

When you have completed your model and the accompanying field journal, present your find to your class. If your team wants to offer the class a chance to discover still-hidden remains, invite another science team to expose and analyze the fossils in your box. Or, your team could show the class fully exposed remains and ask for interpretations.

**Paleontology Lexicon**

Use these scientific words to discuss and write about your fossil find.

**Articulated**: joined or connected, pertaining to skeletons

- **Carnivore**: a flesh-eating animal
- **Clutch**: a nest of eggs
- **Coprolite**: fossilized dung
- **Cranium**: the part of the skull that covers the brain
- **Enamel**: the hard outer covering of a tooth
- **Femur**: thigh bone
- **Fenestra**: opening in a skull or other bone
- **Fibula**: the narrower shin bone

**Fossil**: any evidence of life from the geologic past

**Gastrolith**: stomach stone or pebble

- **Herbivore**: a plant-eating animal
- **Humerus**: the upper arm bone
- **Keratin**: a protein that makes feathers, claws, beaks, horns, hooves, and scales, as well as human hair and fingernails

**Matrix**: the rock surrounding a fossil

**Nestling**: a young dinosaur not yet ready to leave the nest

**Preparator**: a technician who removes fossils from rock matrix

**Radius**: a forearm bone

**Sedimentary rock**: rock formed by deposited particles; shale, sandstone, and limestone

**Scapula**: shoulder blade

**Tendon**: the tissue that attaches muscle to bone

**Tibia**: the larger shin bone

**Ulna**: a forearm bone

**Vertebra**: a bone of the backbone
¿Descubrimiento de Fósiles... en la Clase?

Ahora que has leído la historia del descubrimiento del maiasaurio de John Horner y aprendido acerca de cómo los paleontólogos investigan e interpretan fósiles, es tu turno de tratar de hacer lo mismo. Esta página de sacar, les invita a ti y a tus compañeros de clase a construir un modelo para la búsqueda de fósiles.

Ciencia es una actividad que se hace en colaboración. Los científicos trabajan en equipos cuando recolectan, codifican e interpretan información. Es fácil entender porque los paleontólogos trabajan en grupos. Ciertamente, se benefician del conocimiento de cada uno de sus compañeros. A su vez, es agradable tener a un compañero paleontólogo cerca cuando desentierras un hueso de una extremidad que mide seis pies de largo.

Organiza Tu Equipo de Paleontología

Reúne a los compañeros de clase que serán tus futuros miembros de equipo e informales acerca de tu dinosaurio “favorito” sobre el cual aprendiste en las Prácticas de Paleontología. Anima a tu equipo a hacer preguntas sobre tu dinosaurio. Cuando tu grupo haya oído acerca de los dinosaurios de todos los equipos, escoje el dinosaurio que le interese más a tu grupo. Este será el dinosaurio que tu equipo muestre en la búsqueda de fósiles.

Dale a tu equipo un nombre que represente la personalidad, interés y características más importante del dinosaurio que escogieron.

Ahora tu equipo científico deberá aprender lo más que pueda acerca del dinosaurio. Averigua hace cuanto tiempo existió este dinosaurio y cuantos años solía vivir, averigua también donde se descubrieron sus restos. ¿Cuál era la apariencia del dinosaurio?
¿Tenía cresta o un cuello adornado? ¿Tenía cuernos o tenía la piel como un acorazado? ¿Qué tipo de huellas imprimían sus patas? Si era herbívoros, ¿qué tipo de plantas comía? Si comía carne, ¿qué animales eran sus presas? Conviértanse en cazadores, cazadores de información acerca del dinosaurio que han escogido, empezando por los libros de la biblioteca.

Anoten lo que van aprendiendo acerca de su dinosaurio en un diario, diario en donde irán anotando el progreso de su “expedición”. La primera entrada que incluirán en su diario será la información básica sobre el dinosaurio. En la medida en que vayan construyendo su área de investigación, irán anotando sus descubrimientos, dibujarán mapas del área, y harán hipótesis sobre los fósiles que encuentren allí. Encontrarás más información sobre tu diario más adelante.

**Reúne Tus Materiales**

Tu equipo va a construir un paisaje de miniatura que contiene “restos de dinosaurio fosilizados”...allí mismo en tu propia clase. Este proyecto requiere algo de imaginación. Tu clase tendrá que imaginar que los materiales de construcción modernos son realmente restos Mesozoicos, que huesos de pollo son huesos de dinosaurio, que la arena recogida de la caja de arena del patio fue alguna vez parte de la orilla de un ulterior río Triásmico. La imaginación es parte natural de la ciencia; los paleontólogos se apoyan en ella para concebir el mundo que los dinosaurios habitaron hace mucho tiempo. Además de imaginación, necesitarán
- una caja de cartón grande y resistente
- plástico para forrar la caja
- roceador adhesivo o barniz acrílico para mantener la capa superior de arena o tierra firme
- tierra de diferentes colores y texturas: arena, arcilla, tierra natural o comercial, y cascajo o arena gruesa
- piedras de varios tamaños
- hojas, semillas, tallos, u hojas aciculadas.
Hagan fósiles de plantas imprimiendo cualquier parte de una planta en un molde de yeso para lograr una impresión. Luego saquen los restos de la planta y dejen que la impresión se seque. O simplemente usen las...
plantas que tienen en su modelo de tal forma que representen fósiles. Averiguen que tipo de plantas existían en la época y región en la que vivió tu dinosaurio. Durante los millones de años en que los dinosaurios existieron, el clima y las plantas cambiaron significativamente. El caluroso y seco Período Triásico permitió el crecimiento de siempre verdes y helechos. Durante el templado y húmedo Período Jurásico, bosques crecieron y la vegetación se hizo más densa. El frío y seco Cretáceo trajo un nuevo tipo de plantas tales como los robles y los narcisos.

- huesos. Nadie en tu equipo científico tiene una pila de huesos de dinosaurio en su zozano. Dado que los pájaros son los seres vivientes más próximos a los dinosaurios, los huesos de pollo son buenos substitutos. Pídele a tus padres que preparen un pollo entero para cenar en vez de partes de pollo. Separa cuidadosamente la carne de los huesos y observa cómo las diferentes partes del esqueleto se juntan. Luego utiliza ese esqueleto como una imitación de los huesos de dinosaurio. O utilizan huesos hechos de arcilla tal y como hicimos en la Práctica de Paleontología Actividad 3.

- rastros. Fabriquen huellas de dinosaurio apretando recortes de huellas hechas con cartulina gruesa en tierra húmeda. Construyan el nido de un Maiasaurio, Protoceratopo, o hypsilophodonto utilizando cáscaras de huevos

- huevos de plástico.

Una última opción: reconstruyan una área auténtica. Si descubren algún área mientras hacen su investigación, traten de representarla en su totalidad, o parte de ella en su caja.

**Construyan un Modelo del Área del Hallazgo de Fósiles**

Antes que el grupo decida como van a exhibir sus fósiles, inventen una historia que explique cómo los fósiles llegaron al lugar. Escriban la historia en su diario de investigación. Ejemplo de una historia: “Pensamos que este *Edmontosaurus* murió tratando de defenderse del *Tyrannosaurus*. Los *Edmontosaurus* habían estado alimentándose de hojas de un árbol de magnolias que creció a la orilla de un río con un flujo de agua muy rápido. (Podemos decir que este río ancestral tenía un flujo rápido porque el tamaño del grano de la matriz que sujeta los restos son pequeños y finos.) Después que el *Edmontosaurus* murió, las rápidas aguas arrastraron su cuerpo, haciéndolo rodar una y otra vez antes de depositarlo en el lugar donde quedó enterrado. Encontramos huesos de pie, restos de algunas plantas, y un hueso roto de un radio (radius) del *Edmontosaurus*. ” Tu historia te ayudará a decidir que poner en su modelo.

**Escriban en Su Diario de Investigación**

Tal y como hacen los profesionales, tu equipo mantendrá un diario de investigación como un record del progreso de sus excavaciones. El diario deberá incluir mapas hechos a mano del área del hallazgo. Si su área está basada en algún lugar real, en el estado en donde vives o en otro sitio, copia o calca un mapa auténtico del lugar. Si tu equipo se ha inventado el área, dibujen e indiquen la topografía (superficie) más importante tal y como aparecía antes que iniciasen la excavación, luego como se veía cuando excavaban. En la medida en que progrese su trabajo hagan dibujos de cada fósil que el equipo encuentre, y su posición en el área.
Usen su diario de investigación como un diario científico. Escriban los descubrimientos de su equipo diariamente, describiendo que encontraron primero, segundo, etc., el tipo de roca que cubría los fósiles, la condición de los fósiles. Mencionen cualquier fósil que vean. Describan lo bien o lo mal que esta yendo el trabajo. Para hacer su diario de investigación tan auténtico como sea posible, usen palabras científicas cada vez que puedan. Por ejemplo, un paleontólogo de verdad le llama “fémur” al hueso de la pantorrilla. Una lista de palabras útiles aparece en el Léxico de Paleontología (diccionario) al final de la página de sacar.

De muchas maneras, esta búsqueda imaginaria de fósiles sucede a la inversa. Los verdaderos paleontólogos remueven a los fósiles de las rocas; tu equipo científico está cubriendo a los “fósiles” con tierra! Los verdaderos paleontólogos escriben historia acerca de lo que pasó en el área después que ellos desenterraron los huesos; tu equipo científico creó la historia antes de construir el modelo. Los verdaderos paleontólogos cubren los huesos cuidadosamente y se los llevan; ustedes dejarán los huesos expuestos para que tu clase los pueda examinar. Pero su propósito es el mismo que el de los verdaderos paleontólogos: aprender sobre la vida prehistórica estudiando fósiles.

**Léxico Paleontológico**
Usen estos términos científico para discutir y escribir acerca de los fósiles descubiertos.

- **Articulados**: unidos o conectados, perteneciente a esqueletos
- **Carnívoro**: un animal que come carne
- **Coprolito**: excremento fósil
- **Cráneo**: la parte osea que cubre el cerebro
- **Enamel**: la parte dura que cubre los dientes
- **Fémur**: hueso de la pantorrilla
- **Fenestra**: orificio en el cráneo u otro hueso
- **Peroné**: hueso angosto de la espinilla
- **Fósil**: cualquier evidencia de vida del período geológico
- **Gastrolito**: piedra del estómago
- **Herbívoro**: un animal que come plantas
- **Húmero**: el hueso de la parte superior del brazo
- **Queratina**: proteína que se encarga de producir plumas, harras, picos, cuernos, cascos y escamas, y también pelo humano y uñas
- **Matriz**: la roca que rodea un fósil
- **Polluelo**: un joven dinosaurio que todavía no está listo para abandonar el nido
- **Preparador**: técnico que remueve fósiles de la roca matriz
- **Radio**: hueso del antebrazo
- **Roca sedimentaria**: roca formada por partículas depositadas; esquisto, piedra arenisca y piedra caliza
- **Escápula**: omoplato
- **Tendón**: el tejido que adhiere el músculo al hueso
- **Tibia**: hueso alargado de la espinilla
- **Cúbito**: hueso del antebrazo
- **Vertebra**: hueso del espárrago

**Presenta tus Fósiles a tus Compañeros de Clase**
Cuando hayan acabado su modelo y el diario científico, hagan una presentación de sus fósiles a la clase. Si tu equipo quiere ofrecerle a la clase la oportunidad de descubrir algunos restos adicionales, inviten a otro equipo científico a presentar y analizar los fósiles de la caja. O, tu equipo podría mostrarle a la clase todos los hallazgos y pedir interpretaciones a los compañeros de clase.