

Carnegie's Fossils

**A 1-hour tour for Grades 2-6
Teachers' Guide**

**Carnegie Museum of Natural History
Division of Education**

www.CarnegieMNH.org/doe

Concepts

Fossils are the record of past plant and animal life. We can look at fossils and compare their body parts to the parts of plants and animals that live today.

Form follows function. Animals and plants adapt to their environments. Similar body plans of living and fossil animals or plants suggest that they lived in similar environments.

Not all fossil animals are dinosaurs. A dinosaur has particular skeletal features that define the group.

Other animals lived at the same time as the dinosaurs. Mammals, pterosaurs, turtles, other reptiles, fish, amphibians, and invertebrates all lived during the Mesozoic. Some of these lived through the mass extinction that killed most dinosaurs, but some animals perished with the dinosaurs.

Dinosaurs did not all live at the same time. Some types went extinct before others ever existed.

All life evolves. Fossils show us a record of these changes in the past.

Fossils only preserve some information about animals or plants that lived in the past. Many things we will never know, because we cannot see extinct creatures or plants today. For instance, we cannot know what color they were. We can only make educated guesses about extinct animal behaviors and the sounds they made. We rarely find fossilized evidence about soft body parts.

State Standards

Science and Technology

3.3.4 Know that some organisms have similar external characteristics—these relate to similar lifestyles and environments.

Compare extinct life forms to living life forms.

3.3.7 Describe the role that fossils play in studying the past.

Identify adaptations that enable organisms to live in a particular environment.

Understand that differences in individuals can give a survival advantage.

Describe how environmental change can affect survival.

3.5.4 Describe fossils and the type of environment they lived in.

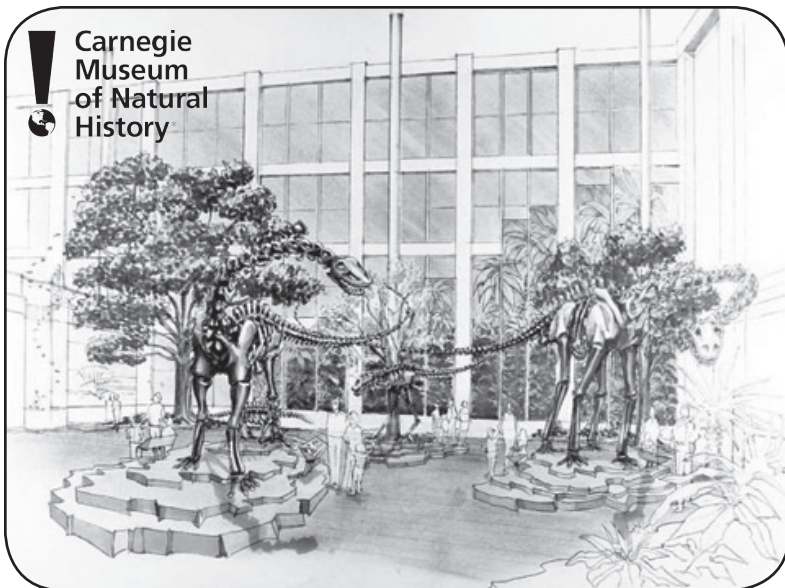
3.5.7 Identify living plants and animals that are similar to fossil forms.

Environment and Ecology

4.7.4 Identify plants and animals that are extinct and explain why.

4.7.7 Explain how an adaptation is an inherited structure or behavior that develops over time. (An adaptation helps an organism survive and reproduce.)

Explain how one species may survive an environmental change while another may not.



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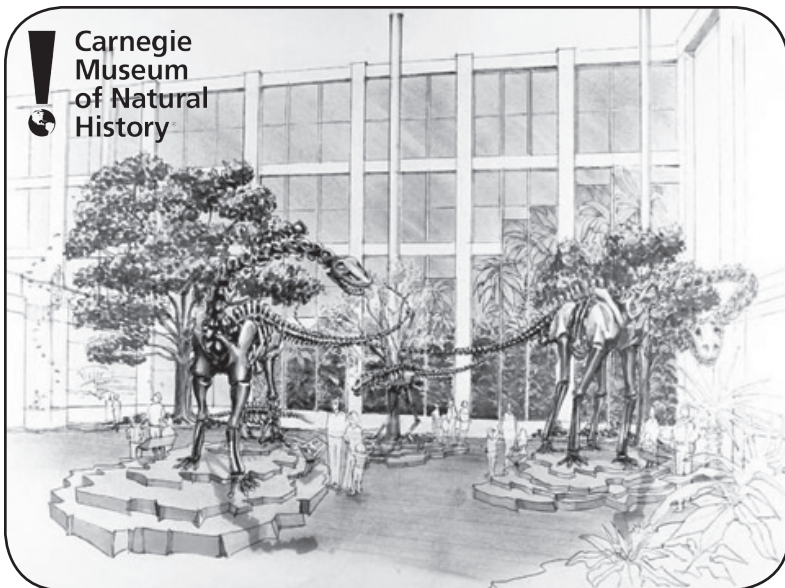
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Suggested Pre-Visit Activities

1. Your students might think of living animals that have similar body plans but that are unrelated (e.g. whales and fish or bears and koalas). Can the students think of any animals in the same environment that do not have this body plan? Do the animals with different body plans make their "living" the same way as the other animals? Do they eat the same type of food? Do they move around in the same manner? Does this tell us anything about what we can infer from dinosaur bones?
2. Your class might compare the human skeleton with those of various animals, preferably with different body plans (wings, flippers, four-legged and two-legged creatures, etc). Label the bone names, paying particular attention to the limbs. Why don't some of them have five arms or two heads? Show that all of these animal skeletons come from the same basic plan, with different adaptations for each type of creature.

Vocabulary

- *Artifact*: an object made or modified by a human being.
- *Avian*: bird.
- *Carnivore*: an animal that eats meat. A carnivore may be a predator and/or a scavenger.
- *Cenozoic Era*: the time period since 65 million years ago, including today. It is commonly called the Age of Mammals.
- *Dinosaur*: a reptile with particular skeletal features that define the group. Birds are now considered to be a group within the dinosaurs. Because of the birds, we cannot say that dinosaurs are extinct. We can say that non-avian dinosaurs are extinct. All non-avian dinosaurs lived on land, 225–65 million years ago.
- *Evolution*: change through time. All life is constantly changing. Over long spans of time, these changes cause animals to appear very different from the way they looked in the past. Fossils show us a record of these changes over time.
- *Extinct*: no longer existing on Earth.
- *Fossil*: any trace of life, not produced by a human, from more than 10,000 years ago. Fossils may be bones, teeth, eggs, shells, footprints, burrows, leaf impressions, scat, etc.
- *Herbivore*: an animal that eats plants.
- *Invertebrate*: an animal without a backbone.
- *Mammal*: a type of animal that produces mother's milk and has fur.
- *Mass Extinction*: an extinction event that is spread throughout the world.
- *Mesozoic Era*: the time period between 248 and 65 million years ago. This era is split into the Triassic, Jurassic, and Cretaceous Periods. The Mesozoic is commonly called the Age of Reptiles.
- *Paleontologist*: a scientist that studies fossils.
- *Paleozoic Era*: the time period between 543 and 248 million years ago.



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- *Reptile*: a type of animal that lays eggs on land, but does not produce milk or have fur.
- *Vertebrate*: an animal with a backbone (vertebral column). People are vertebrates; clams, insects, worms, and octopi, for example, are not.

Suggested Post-Visit Activities

1. Your students might draw the sequence of fossilization of an animal's bones and depict how paleontologists find them (death, burial, erosion, and discovery).
2. Each student may think of a novel adaptation for a dinosaur or other extinct creature. Why would this feature help this creature survive? In what environment would it have lived? What other animals might this new animal be related to? What traits does it share with its relative? What other animals and plants would share its environment? Which animals competed with it for food or preyed upon it? Is this new feature the student created something that would fossilize easily (e.g. is it a hard bony part or soft tissue)? Would paleontologists be able to see it and recognize how it is used? They can then create this new creature and its habitat in clay, with a full explanation of the unique features and how they helped it adapt to its environment.
3. Your students can find a poem about fossils or a fossil creature. One source for finding poems on different subjects is www.litfinder.com, which is available in the Online Resources section of the EIN Library network and can be searched with an Access library card number.

The student might read the poem aloud to the class and then critique the poem—does it say what they want to hear about the fossil? Each student might individually write a poem that does say what they want to hear, or the class may choose one of the poems to rewrite so that they compose a fossil poem as a unit.

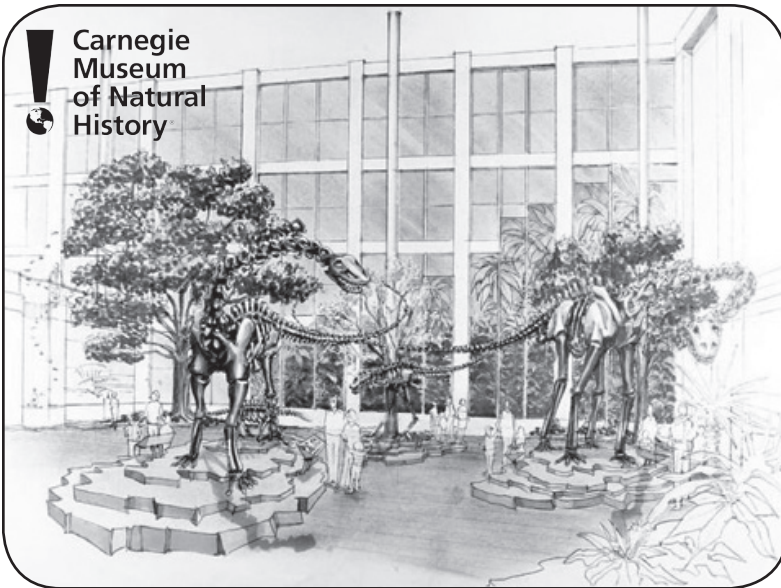
Suggested Reading

- Arnold, Caroline. *Pterosaurs: Rulers of the Sky in the Dinosaur Age*. New York: Clarion Books, 2004. Illustrated by Laurie Caple.
- Arnold, Caroline. *When Mammoths Walked the Earth*. New York: Clarion Books, 2002. Illustrated by Laurie Caple.
- Barrett, Paul. *National Geographic Dinosaurs*. Washington, DC: National Geographic Society, 2001. Illustrated by Raul Martin.
- Bishop, Nic. *Digging for Bird Dinosaurs: An Expedition to Madagascar*. Boston: Houghton Mifflin, 2000.
- Dixon, Dougal. *Dinosaurs: The Good, the Bad, and the Ugly*. New York, Dorling Kindersley, 2001.
- Esslinger, Jessica. *Discover Dinosaurs Activity Book*. Pittsburgh: Carnegie Museum of Natural History, 1988.
- Holtz, Thomas R., Jr. and Michael Brett-Surman. *Jurassic Park Institute Dinosaur Field Guide*. New York: Random House, 2001.
- Holtz, Thomas R., Jr. *T. rex: Hunter or Scavenger*. New York: Random House, 2003. Illustrated by Michael Skrepnik.
- Kittinger, Jo S. *Stories in Stone: The World of Animal Fossils*. New York: F. Watts, 1998.

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- Malam, John. *You Wouldn't Want to be a Mammoth Hunter!: Dangerous Beasts You'd Rather Not Encounter*. New York: Franklin Watts, 2004. Illustrated by David Antrim.
- Ottaviani, Jim. *Bone Sharps, Cowboys, and Thunder Lizards: A tale of Edwin Drinker Cope, Othniel Charles Marsh, and the Gilded Age of Paleontology*. Ann Arbor, MI: GT Labs, 2005. (Well-researched and historically accurate graphic novel.)
- Richardson, Hazel. *Smithsonian Handbook of Dinosaurs and Prehistoric Life*. New York: Dorling Kindersley, 2003.
- Scotchmoor, Judith et al. *Dinosaurs: The Science Behind the Stories*. Alexandria, VA: American Geological Institute, 2002.
- Svarney, Thomas E. *Handy Dinosaur Answer Book*. Detroit: Visible Ink Press, 2000.
- Turner, Alan. *National Geographic Prehistoric Mammals*. Washington, DC: National Geographic, 2004.
- VanCleave, Janice. *Janice VanCleave's Dinosaurs for Every Kid: Easy Activities that Make Learning Science Fun*. New York: Wiley & Sons, 1994. (Available as an e-book through Access Pennsylvania.)

Online Resources

American Museum of Natural History / Resources for Learning—Dinosaurs and Birds
amnh.org/education/resources/rfl.php?set=b&topic_id=5&subtopic_id=80

Childrens' Museum of Indianapolis / Dinosphere: Grades 3-5 Unit of Study
www.childrensmuseum.org/dinosphere/unitsofstudy/3-5/lesson1.html

Discovery Education Lesson Plan for grades 3-4

school.discovery.com/lessonplans/programs/tlc-dinosaurs

For grades 6-8

school.discovery.com/lessonplans/programs/dinosaurdetectives

school.discovery.com/lessonplans/programs/dinosargentina

school.discovery.com/lessonplans/programs/dinosaursruled/

school.discovery.com/lessonplans/programs/livingfossils/

Smithsonian MNH Virtual Dino Dig game

www.nmnh.si.edu/paleo/dinosaurs/interactives/dig/main.html

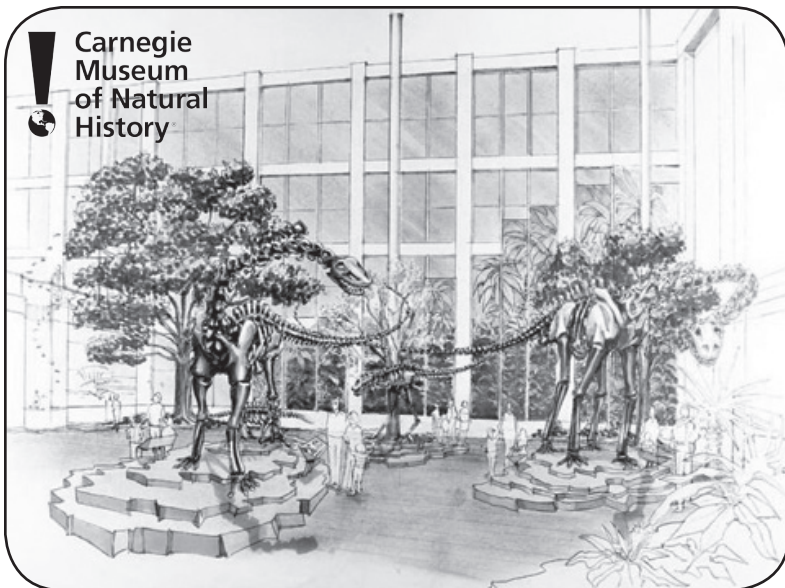
University of California Museum of Paleontology / Berkeley / Dinosaur Pages

www.ucmp.berkeley.edu/diapsids/dinosaur.html

Museum Resources

Educational Loan Collection

Teachers at registered schools may borrow material for two weeks for a fee of \$50. The entire faculty at a school may borrow indefinitely for the school year when the school pays a fee, based on the size of the school, from



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\$150–200. For more information or to reserve a loan, call (412) 622-3292.

These thematic kits are available to supplement this tour:

Dinosaurs

Fossils

Online Exhibits

Carnegie Museum of Natural History's Web site is a great source of educational content. Visit our online exhibits page for a complete list of all educational online content:

www.CarnegieMNH.org/exhibits

These online exhibits compliment this tour:

Paleolab

www.CarnegieMNH.org/ditw/paleolab.htm

Carnegie's Dinosaurs

www.CarnegieMNH.org/carnegiesdinosaurs

This is Your Life, Diplodocus carnegii

www.CarnegieMNH.org/carnegiesdinosaurs/dippy