Dinosaurs Were Real!

Pictured here, covered with kids, is “Uncle Beasley” (figure 1), a life-size model of the dinosaur, Triceratops, located on the Smithsonian Mall. Every year, thousands of children visit the Smithsonian to climb on Uncle Beasley and to see dinosaur exhibits in the National Museum of Natural History—giving just some indication of the fascination that dinosaurs hold for children of all ages.

This article, written in collaboration with Jean Lafaye Siegel, of the Office of Education in the National Museum of Natural History, suggests some hints in which you can capitalize on your students’ natural interest in dinosaurs. By presenting dinosaurs as real animals, subject to the same laws of nature as other animals, you can introduce basic concepts that will help students to understand the history of all life.

What to Look For

In looking at a dinosaur—or at any other animal for that matter—students have primarily two questions to consider: (1) What and how did the animal eat? (2) How did the animal defend itself? The specialized, weak, or ground-down teeth of the plant eater and the long, sharp teeth and grinding claws of the meat eater provide revealing clues to the answers to these questions. The presence of armor, of bulky configurations, of swimming adaptations such as webbed feet, and of horns, as well as the over-the-shoulder ability to throw the body build of the animal, offer additional clues.

The drawing shown here in figure 2 of the skeleton of the dinosaur, Stegosaurus. If you have an opaque projector, show the drawing to your students. Have a degree of imagination, and let paleontologists try to reach conclusions, from just this visible evidence, about an unidentified “mystery find.” What did the creature eat, and how did it obtain its food? How did it defend itself against other animals that might have tried to eat it? Was it fast on its feet, . . . or quick with its claws? Or endowed with some other means of defense? Students may guess correctly that Stegosaurus’s small jaws (with small teeth) and low head position indicate a diet of soft, low-growing plants. Since the creature lacked claws, as well as the agility to escape from its predators by running, as is clearly apparent, Stegosaurus must have relied primarily on its armored plates and horned tail for defense.

After students have thoroughly examined Stegosaurus, they may want to ask similar questions of our second “mystery find”—Ceratosaurus, shown in figure 3. This carnivorous animal, with its long, sharp teeth and claws, and strong jaws for seizing and eating prey, probably depended on superior strength and speed for defense. The function of the small horn above its nose is unknown.

For a follow-up exercise to this inquiry, the children may want to make colored drawings of Ceratosaurus and Stegosaurus in the flesh, in a Mesozoic setting. They may then want to use some of the materials suggested at the end of this article to check their hypotheses about these two very different kinds of dinosaurs.

Of course, other types of dinosaurs make equally good “mystery finds”—and much better than a picture of a dinosaur is the real thing, seen in a museum. This article ends with a list of museums whose exhibits you and your students might visit.

The World of Dinosaurs

Dinosaurs emerged early in the Mesozoic Era, in a world very different from that of today. The land was lower in relation to the oceans than it is now, historic shallow seas flooding wide areas. Temperatures were even and mild, and the possession of wide bodies of water helped to prevent fluctuations in climate as we have today. Flowers, fish, ferns, cycads, and other primitive plants were dominant; flowering plants had yet to appear.

Before the dinosaurs, a variety of reptiles roamed the land, including a group known today as the archosaurs, which eventually gave rise to crocodiles, flying reptiles, birds, and also to dinosaurs. Two clues to this line of descent from the archosaurs can easily be observed today in fossil dinosaurs. The first clue is a pattern of short forelegs, inherited from the archosaurs, which may be seen in the drawings on this page of Stegosaurus and Ceratosaurus (figures 1 and 2), as well as in a marked similarity—which students may see in Ceratosaurus and in other, smaller dinosaurs—between dinosaur feet and the feet of birds.

The dinosaurs were enormously successful over a very long stretch of time and developed a variety of specialized features that helped them to deal effectively with their environment. Mosty they were plant eaters as opposed to meat eaters, a fact reflected both at the Smithsonian and at other museums, where few carnivorous dinosaurs are exhibited because relatively few have been found. The dominance of the dinosaurs over other land animals, including mammals, lasted nearly 130 million years, until the dinosaurs’ disappearance 65 million years ago.

Reconstructing the Era

Paleontologists have reconstructed a picture of the world of dinosaurs, from fossil remains laid down in sediments during the Mesozoic. An interesting problem these scientists faced has been the fragmentary nature of the fossil evidence. Few animals are ever preserved as fossils, and since those that are preserved usually live in or near the water, scientists cannot be certain that what they have found is representative of all animal population as a whole. Imagine the odds against a giant dinosaur’s being washed into a stream, lodging on a sand bar, and being covered over with silt—which is the very sort of thing that would have had to occur in order for a dinosaur to be preserved! Nonetheless, a sufficient number of prehistoric animals have been unearthed to enable us to build a logical picture of the succession of life. Indeed, fossils (and even pictures of fossils, as we have just demonstrated) are a great deal to tell us about the lives and times of dinosaurs.

In rare instances, a dinosaur’s habits are illuminated by a find of preserved soft tissues. For example, several mummified specimens of duck-billed dinosaurs have been found. From these we know that the skin of the duck-bill was scaly like that of modern reptiles. The presence of webbed feet indicates how much time was spent in the water, while a meal of pine needles found in one specimen’s stomach shows that the duck-bill must have done at least some feeding on shore. (We do not know for certain the function of the crests on some of the duck-bill heads.)

In considering all the evidence available to them about dinosaurs, paleontologists have drawn on a reservoir of background information, a familiarity with specialized features, and a knowledge of animal interrelationships. Students should be aware, however, that children’s books sometimes ignore the scientific evidence and on pure speculation assign ascribed habits to dinosaurs. It is important for students to learn the difference between such speculation and fact.

Were Dinosaurs Warm-Blooded?

This brings us to a subject of current hot speculation: were dinosaurs warm-blooded? A number of recent articles and books have claimed that they were. The truth is, however, that we simply do not know for sure. With the smaller, more active dinosaurs and with flying reptiles, some sort of internal temperature control would have been useful, maybe necessary. But for the larger land animals, such as the dinosaurs, internal temperature control might have been slow anyway, owing to the fact that the larger an animal, the smaller its relatively surface area. Consider the case of a person with the mild climatic conditions of the Mesozoic, the fact of naturally slow temperature fluctuations in large mammals seems to indicate that the development of internal control may not have been too urgent in giant dinosaurs. Indeed, the dinosaur’s increase in size may in itself have been sufficient to minimize fluctuations in climate, maintaining a narrow temperature range. A recent article in Science magazine claims Stegosaurus’s plates constitute an excellent heat exchange system. This, if true, would argue against warm-bloodedness, at least in Stegosaurus.

We bring this subject up, not because it is central to studying dinosaurs but because it is likely that someone in your class may have read or heard about the theories on warm-blooded dinosaurs, and you may want some background information with which to respond. We think the point to be made with students here is that this is just one of many questions about dinosaurs that remain to be answered by scientists in the future.

Change Is Constant

The one constant throughout the history of the earth is change. The land lifts, erodes, and folds; animals and plants adapt, give rise to new species, become extinct. Shifts in climatic patterns, invasions of an area by new predators, creation of a new habitat or food supply, competition for food and shelter—all these promote changes in life forms. Although change is constant, the rate of change is not. At those times when conditions are the most stressful, adaptation is accelerated. During the Mesozoic, conditions remained fairly stable, favoring the continuing rule of reptiles. For 130 million years, there were few major events to alter the environment. In response to the slow evolution of bigger, more
A Matter of Looking

BY BONNIE BASKIN

EDITOR'S NOTE: This article by Bonnie Baskin—Curator of Education at the University Art Museum, University of California at Berkeley—is the first in a series of articles from museums other than the Smithsonian to be printed in ARTZOO this school year. The purpose of these articles will be to share with you news of museum education programs, from across the country, whose concepts and methods may be applied to your curriculum in fresh and imaginative ways. Meanwhile, as the year progresses we hope you'll share with us any news of museum programs in your community that you feel might interest other teachers.

Your letters will provide the basis for ARTZOO articles in the future.

"I didn't know the world was cracked up like that."

This line concludes a letter from a fifth-grader named Gary and refers to Gary's tour, with his class, of the University Art Museum, where we have been trying to crack up the world a little differently for the past five years.

What we do in our tours is to pair three or four children with an adult guide who loves art, wants to share his or her enthusiasm, and has a fascination for learning what other people think about art works. The children in this equation are mainly elementary-school students, although groups range from preschoolers to adults. The guides are all college students—usually art or art history majors, and mostly from the University of California/Berkeley—who receive academic credit for their museum work.

The guides present games, looking activities, and Socratic discussion questions—both time-tested and spontaneously invented—that seem appropriate to whatever groups the art works and the messages. Some questions that work are like instilling the smells, tastes, sounds, and feel of art works just by looking. There is also considerable movement as groups "walk" in landscapes, "dance" a painting, "phone up" an art work, and deepens, or dazzles the eye the more that it is viewed?

Socratic discussion questions—both time-tested and your students' ideas—can help your students to understand art—to be open to experiencing it with all their senses, in visual, emotional, aesthetic, technical, and intellectual ways. For art is a matter of looking, of looking deeply and exhaustively at art and sharing visual discoveries, you can help your students to understand art—and to be open to experiencing it with all their senses, in visual, emotional, aesthetic, technical, and intellectual ways.

The guides build their tours around feedback from the children, using teaching approaches to diagnose interests and spark ideas. They do not, therefore, feel responsible for providing brilliant art entertainment. Rather they operate as catalysts, working to attain a level of participation that will "launch" a tour and make it a group effort. When launching occurs, conversation develops naturally; the children initiate both discussion and activities, with the guide moderating the group process and providing focus, continuity, and occasional changes of pace. Nor do the guides feel they must be oracles. They are, in a sense, "experts"—because they love art and know the museum well. Since they are in the museum, however, to facilitate the experiences of others and to learn for themselves through exchanges with visitors, they have an experimental attitude towards their tour approaches. It is perfectly fine with them if the kids hate the idea of inhaling colors, down to their toes. These same children would probably hate tasting colors even more, but they might enjoy taking precise, faithful mental photographs of art works, or just looking wordlessly at some paintings.

What the flexibility of this approach to museum teaching means to you is that even with little or no training in art—but with an enthusiasm for art and the abilities to listen sensitively and to ask good questions—you can successfully lead gallery tours for your students or offer slide presentations in the classroom, in absence of a nearby gallery or museum.

At the University Art Museum, University of California/Berkeley: Students find that art is a way of looking.
The Smithsonian Institution, founded in 1846, is a vast complex of museums and art galleries, scholars and experts, with facilities here in Washington, D.C., around the country, and overseas. It owes its beginning to James Smithson, a wealthy English scientist, who willed his fortune to the United States "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." Over succeeding generations, the Smithsonian has carried out the terms of this bequest through scholarly activity in the fields of history, science, and art; through museum and library operations; and through the dissemination of information. In recent years, increasing emphasis has been placed on public education, with classes, films, lectures, musical events, guided tours, and other activities offered to growing numbers of children and adults. These photographs show schoolchildren from the Washington metropolitan area engaged in activities created especially for them by the various education departments of the Smithsonian. Look to future issues of Art to Zoo for articles based on these activities.

At the National Zoological Park: Giraffes really are tall, aren't they?

At the National Museum of History and Technology: Students examine Revolutionary War artifacts.

At the Anacostia Neighborhood Museum: A lesson on black history.

At the Chesapeake Bay Center for Environmental Studies: Fifth-graders investigate the physical and biological characteristics of an estuary.

At the National Museum of Natural History: An Early Man tour.

At the National Collection of Fine Arts: An improvisational tour.

At the Hirshhorn Museum and Sculpture Garden: Fourth-graders are introduced to the pleasures of a richly varied collection of 19th and 20th century painting and sculpture.

At the National Portrait Gallery: A fifth-grader helps to complete a sculpture, during a Discover Portraits tour.

At the National Air and Space Museum: Young visitors study the spacecraft exhibition featuring the Apollo command module, "Columbia."
While Gerald Ford and Jimmy Carter are out collecting votes, Herbert Collins has been following the campaign trail in search of items of a different sort. Mr. Collins works at the Smithsonian Institution in Washington, D.C. An important part of his job is to collect objects—such as campaign buttons, posters, and signs—that will give people a feeling for the important events of our time. Mr. Collins is a political historian in the Smithsonian's National Museum of History and Technology.

His job is not always easy. "I spent a lot of time trying to convince people at the Republican and Democratic conventions to give their campaign hats and buttons to the Smithsonian, where they will be displayed and cared for, not stashed away and forgotten," he says. "But many people wanted to keep the objects for themselves."

So Mr. Collins had to plead and trade and even search the floors of the convention halls to get what he wanted. It took some doing to get a police department sign from the Democratic convention. The sign says, "No Standing—Democratic National Convention." It had been posted outside the hall in New York City where the convention was held. Finally, Mr. Collins found a sympathetic policeman who checked with headquarters for permission to give the sign to the Smithsonian.

Mr. Collins collects objects for the Smithsonian just as you might collect football cards or seashells or stamps for your own enjoyment. He says that in deciding what to add to the collections, he tries to think 100 years into the future, imagining what our great great grandchildren will want to know about the events of today. The things he collects are not always worth a lot of money right now, but he feels that someday they will be priceless.

"Future generations will learn about our times from photographs and paintings, from printed material, such as magazines and newspapers, and from objects," he explains. "Objects are important because they help to make history come alive. My job is to find and care for those objects that will mean the most in the future."

Often the things he collects are put on exhibit in the museum for everyone to see. The photograph here shows Mr. Collins standing in front of an exhibit containing campaign buttons.

Many of the objects are stored carefully away in a special area of the Smithsonian. Before they are stored they are labeled. Each label tells where the object came from, who made it, and how it was used. This is for the information of the many scholars and students who come to the Smithsonian to study the collections. Recently Mr. Collins took us through the storage area of the National Museum of History and Technology. In addition to modern objects, the area contains many things from the past. Among other treasures, we saw china used by President John Adams, a dress worn by First Lady Bess Truman, and a pair of shoes used by President Roosevelt.

Mr. Collins has worked at the Smithsonian for sixteen years. Besides collecting and caring for objects, he prepares exhibitions, writes books and articles, and answers a lot of mail. He likes his work. And one part of his job that he especially enjoys is getting letters from school children.

This is partly because he remembers his own childhood interest in history. While growing up in a small Virginia town, he loved to hear his grandparents tell stories of the Civil War as though they were happening to alter this picture? Suddenly, many factors.

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