The Children's Museum
of Indianapolis

PALEO ARTISTS:
BRINGING DINOSAURS TO LIFE!

A Grade 3 – 5 Unit of Study

Cover: © 1998 Michael Skrepnick, Tyrannosaurus rex and Triceratops *(detail), acrylic on Masonite, 35 1/2" w x 20 3/4" h, The Children's Museum of Indianapolis*

THE CHILDREN'S MUSEUM OF INDIANAPOLIS

The Children's Museum of Indianapolis is a nonprofit institution dedicated to providing extraordinary learning experiences for children and families. It is one of the largest children's museums in the world and serves people across Indiana as well as visitors from other states and nations. The museum provides special programs and guided experiences for students as well as teaching materials and professional development opportunities for teachers. Field trips to the museum can be arranged by calling (317) 334-4000 or (800) 820-6214. Visit Just for Teachers at The Children's Museum Web site at ChildrensMuseum.org.

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How does artist Sylvia Czerkas use sculpture to show a dinosaur coming to life?

ENDURING IDEA

Artists use scientific evidence, artistic skills and creativity to reconstruct the world of the dinosaurs.

Dinosaurs no longer walk the earth, but they still have the power to fascinate us. We want to learn more about them, and we have many questions: What did they look like? How did they interact with each other? How did they thrive and then become extinct? Artists share our fascination and ask the same questions. Like us, they seek answers from paleontologists, scientists who develop theories about plants and animals of the past through the study of fossils. Paleo artists use their skills and creativity to translate this scientific information about dinosaurs and other ancient life into works of art.

WHAT'S AHEAD

This unit of study introduces students to the world of paleontology and paleo art through three lessons:

LESSON 1

PALEO ART — MOMENTS IN TIME

Students analyze one paleo artwork and examine the way the artist has used elements and principles of art to capture a moment in time. They compare this artist's depiction of a *T. rex* with an image created in the 1940s and consider how ideas about dinosaurs have changed over time.

© 2004 Michael Skrepnick, T. rex Attack! acrylic on Masonite, 35" w x 22"h, The Children's Museum of Indianapolis

© 1995 Brian Cooley, *Baby Louie*, polyester resin, The Children's Museum of Indianapolis

LESSON 2

PALEO ART COLLECTORS AND ARTISTS — OPENING WINDOWS ON THE WORLD OF DINOSAURS

Students compare the ways artists use scientific information, make choices about subject matter and media, and use their skills to reconstruct the dinosaurs and their world.

LESSON 3

CULMINATING EXPERIENCE — DINOSAUR DISCOVERY

In this culminating lesson, students apply what they have learned about paleo art to create their own works of art based on recent dinosaur discoveries.

© 2005 Steve Saulsbury, pencil, 17" w x 11" h, The Children's Museum of Indianapolis

INTRODUCTION

WHAT WILL STUDENTS LEARN?

INDIANA'S ACADEMIC STANDARDS

The experiences in this unit will help students achieve standards in:

- **VISUAL ARTS**
- **SCIENCE**
- **LANGUAGE ARTS**

This unit of study explores the ways that scientists and artists collaborate to create images of dinosaurs and their world. It enables students to examine works of art, carry out research and apply the results of their inquiry as they create their own artworks. The unit is designed for classroom teachers and provides a unique opportunity to work with visual arts teachers. Planning instruction with an arts educator will result in richer learning experiences for students and help to address academic standards in visual arts as well as language arts and science.

Additional science standards can be met by incorporating activities and background information from *Dinosphere: A 3–5 Unit of Study.*

WHAT WILL STUDENTS BE ABLE TO DO?

UNIT GOALS

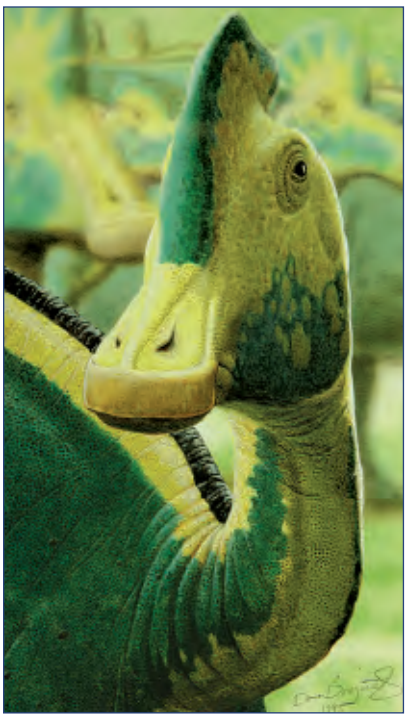
Students will:

- Use art inquiry skills to examine specific works of art and interpret their meaning.
- Examine the connection between science and paleo art.
- Describe how paleontology and the fossil record influence paleo art, and explain why accuracy is important.
- Compare and contrast different works of art by examining the ways artists make choices and use different materials and techniques to convey ideas.
- Explain how viewing a collection can change the way we think about paleo artworks.
- Trace the process that one paleo artist follows to create large dinosaur sculptures.
- Examine the impact of public artworks on the surrounding community.
- Research recent dinosaur discoveries and speculate about how these discoveries may change current thinking about dinosaurs.
- Synthesize what they have learned about paleo art as they use artistic skills to create their own works of art.

MUSEUM LINKS

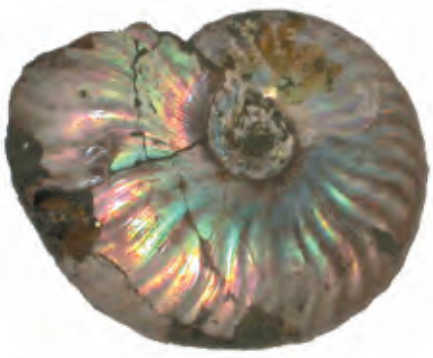
Dinosphere at **The Children's Museum** offers extraordinary opportunities for exploration of paleo art and paleontology. **The Mann Properties Gallery featuring the Lanzendorf Collection of Dinosaur Imagery** contains one of the most extensive collections of paleo artworks in the country. Here students can examine works in depth and use actual fossils to inspire their own creations. The state-of-the-art **Paleo Lab** allows both children and adults to interact with paleontologists and paleo technicians as they examine new dinosaur finds. See the **Resources** section of this unit for a guide to paleo art and paleontology exhibits that your students should be sure to see when they visit the museum. You can also visit the museum's Web site for dinosaur information, student activities and **Dinosphere** units of study containing inquiry-based learning experiences and teaching resources for K-2, 3-5 and 6-8 classrooms. The museum provides print copies of the units and a wealth of additional materials through its teacher professional development programs. For information, see the **Teacher** section of the museum's Web site at **ChildrensMuseum.org**.

GETTING STARTED



CLASSROOM ENVIRONMENT

Make your classroom a **Dinosaur Discovery Environment** focusing on the **Cretaceous Period**. Clear space to display the artworks students will create later in the unit. Fill the room with dinosaur models, skeletons and plant life models, books, posters and other items dealing with the Cretaceous Period. Create a rich visual environment to spark students' imaginations and immerse them in a wide variety of media.



RESOURCE CONNECTION

Create a **Dinosaur Resource Center** in the classroom. The center will assist students with their investigative work. The area should have tables and chairs and include student reading materials suggested in the **Resources** section of this unit. Be sure to include books about paleontologists who dig for and study fossils as well as stories about people who have found fossils accidentally. Work with your media specialist to locate resources and invite children to bring dinosaur books from home to share with the class. Include materials from magazines, newspapers and Web sites that offer accurate information about new dinosaur discoveries. It is helpful to have a computer that allows teams to access the Internet in order to search for more information. Encourage students to visit the **Dinosphere** Web site at **Dinosphere.org** for interactive dinosaur experiences and current research.

PALEO ART RESOURCES

See the **Resources** section for a list of Web sites featuring paleo artists and their work. Select some Web addresses to provide to students so they can investigate these sites. *Be careful to review artists' sites and make certain that they are suitable for your students.* The **Resources** section also lists books that illustrate how artists have used the fossil record, their skills and creativity to reconstruct dinosaurs and their world. *The Lanzendorf Collection* of *Dinosaur Imagery* provides excellent background and beautiful images of the works of paleo art now housed at **The Children's Museum**.

LESSON 1:
PALEO ART — MOMENTS IN TIME

Paleo artists use scientific information to create dinosaurs and place them in moments of time. Artists' skills and imagination are at work not only in reconstructing dinosaurs and their environment based on the fossil record, but also in envisioning how they moved, behaved and interacted. This lesson introduces students to paleo art and helps them examine the ways scientific discoveries are constantly changing our thinking about the world of the dinosaurs.

OBJECTIVES

Students will:

- Use art inquiry skills to analyze a work of paleo art.
- Explain that paleo art is based on scientific findings.
- Explain why it is important to study recorded dinosaur fossils in order to create accurate paleo art.
- Compare recent paleo artworks with those of the past to learn how ideas about dinosaurs have changed based on new evidence.
- Examine a specific work of art to determine how the artist uses scientific information to depict dinosaurs, their environments and their behavior.
- Compare direct and indirect methods that paleontologists and paleo artists use to learn more about how dinosaurs lived and interacted with each other.
- Consider the reasons that paleo art might be important to scientists, filmmakers, book authors and others.

FOCUS QUESTIONS

Use these questions to help students focus on key ideas in **Lesson 1**.

- How do artists provide clues to help us interpret their work?
- What is paleo art?
- Why have our ideas about dinosaurs changed over time?
- What kinds of evidence do paleo artists use to determine how dinosaurs might have looked and how they interacted with their environment and other animals?
- How do paleo artists use both scientific evidence and their creative skills when they reconstruct the world of the dinosaurs?
- Why are accuracy and scientific evidence important in paleo art?
- What are the purposes of paleo art? Why is it important to us? Why would it be important to scientists, filmmakers and book authors?

YOU WILL NEED ...

Materials

- Reproduction: *Tyrannosaurus rex and Triceratops*, Michael Skrepnick, acrylic on Masonite (1998)
- Reproduction: Detail from *The Age of Reptiles,* Rudolph Zallinger, mural, the Peabody Museum (1947)
- Book: *The Dinosaurs of Waterhouse Hawkins* by Barbara Kerley
- 8 1/2" x 11" lined notepaper for the **Dinosaur Record Book**, enough for each student to create a journal of several pages
- Fossils or fossil casts of various types, including both plants and animals
- Science picture books showing various types of animals
- Stapler, sketching pencils

TIME

Three class periods.

DIGGING DINO WORDS

- **adaptation**
- **color**
- **evidence**
- **form**
- **fossil**
- **fossil record**
- **inference**
- **line**
- **movement**
- **mural**
- **paleo art**
- **paleo artist**
- **paleontologist**
- **paleontology**
- **realism**
- **shape**
- **texture**
- ***Triceratops***
- ***Tyrannosaurus rex***

LESSON 1

EXPERIENCE 1:
ONE MOMENT IN TIME

Students use inquiry skills to examine a work of art and determine how the artist has created a moment in the life of a dinosaur. Students learn that paleo art is based on scientific evidence.

How did Michael Skrepnick manipulate the elements of this painting to create a dramatic scene?

INDIANA'S ACADEMIC STANDARDS

Visual Arts
Standard 3: Responding to Art — Criticism (3.3.1, 3.3.2, 3.3.3, 4.3.1, 4.3.2, 4.3.3, 5.3.1, 5.3.2, 5.3.3)
Standard 13: Integrated Studies (3.13.2, 4.13.2)

Language Arts
Standard 5: Writing Applications (3.4.2, 4.4.1, 5.4.1)

PROCEDURES

- Introduce students to the reproduction of the painting *Tyrannosaurus rex and Triceratops* (page 57) by Michael Skrepnick.

  Guide students in an inquiry process using this work as a focus.

- Ask students: What is this painting about?

- Give students time to suggest answers and then ask: How do you know? What clues in the painting make you think this?

- Help students discuss the "moment in time" captured by this work of art. Ask: What is this moment like? What are the dinosaurs doing? What do you think the dinosaurs might have been doing just before this moment? What do you think they might do immediately after this? What evidence can you find for your ideas in the painting?

- Discuss the artistic techniques Skrepnick has used to create this moment in time. How has he used lines, shapes, textures and colors? How does he place the dinosaur figures in space and use body positions, facial expressions and environmental details to make this a dramatic scene?

- Ask students: Now that you've had time to examine this work carefully, have your ideas about its meaning changed? If so, how?

- Ask students how they think Michael Skrepnick learned how these dinosaurs might have looked and behaved.

- Explain that works of art based on scientific evidence about dinosaurs and other forms of ancient life are called **paleo art**. The artists who create these works are **paleo artists**.

PROFILE OF MICHAEL SKREPNICK

Michael Skrepnick has been an artist for many years, but started focusing on dinosaurs only within the past decade. He has won many awards for his reconstructions and has worked on books, magazines, television programs and murals. Skrepnick's fascination with dinosaurs was sparked by early childhood interests. He now lives in one of the world's centers of fossil discovery: Alberta, Canada. Like many paleo artists, he works to educate viewers about the importance of accuracy in paleo art. Skrepnick understands the placement of bones in a dinosaur skeleton. He knows the size and shape of the muscles and how the animal probably walked, ran and stood. He studies birds, lizards and other animals to choose skin colors for his dinosaurs. His works are created using acrylic paints, sometimes with the addition of graphite and ink.

- Tell students that they each will need to keep a journal recording what they are observing and learning about dinosaurs and paleo art. The journal will help them create their own works of art. Help them put together several pages of lined notepaper with a stapler for their journal. Have each student write the title, **Dinosaur Record Book**, and his or her name on the first page.

- For their first entry in the **Dinosaur Record Book**, have students write down the title of the artwork, *Tyrannosaurus rex and Triceratops*, and then answer two questions: "What is happening in this scene?" and "What evidence in the painting supports this idea?"

EXPERIENCE 2:
MOMENTS IN TIME

This experience introduces students to Waterhouse Hawkins, the first paleo artist. After considering how ideas about dinosaurs have changed in the last 150 years, students then compare the way that *Tyrannosaurus rex* is depicted in Rudolph Zallinger's paleo artwork of the 1940s and in Michael Skrepnick's 1998 work. Students learn that ideas about dinosaurs are continuing to change as more scientific evidence is discovered and analyzed.

Rudolph Zallinger, *The Age of Reptiles* (detail), mural, 110' w x 15' h, © 1947 The Peabody Museum of Natural History, Yale University

Rudolph Zallinger's 1947 mural inspired new generations of scientists and paleo artists. Would this work look different if Zallinger were painting it today?

INDIANA'S ACADEMIC STANDARDS

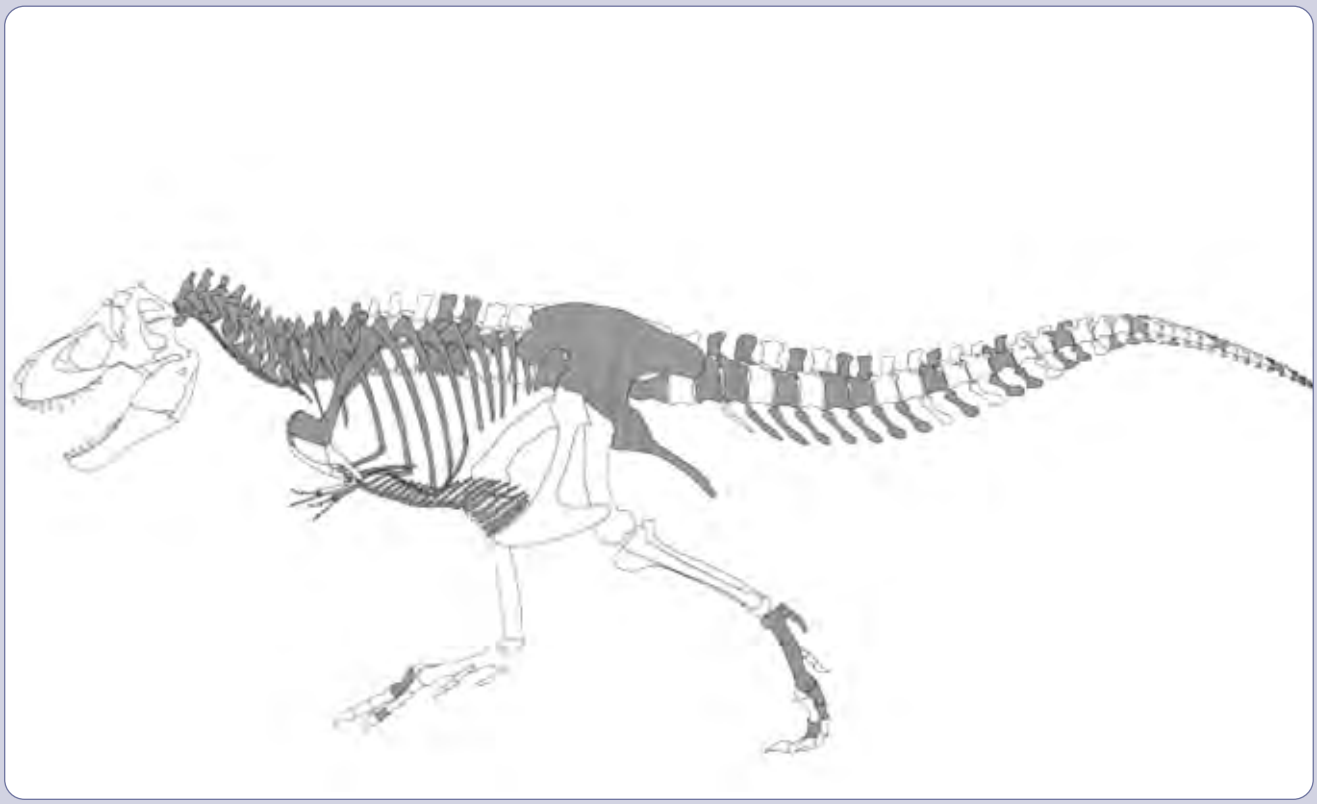
Visual Arts
Standard 1: Responding to Art — History: 3.1.1, 4.1.1, 5.1.1

Language Arts
Standard 4: Writing Process: 3.4.3, 4.4.3, 5.4.3

Rudolph Zallinger, *The Age of Reptiles* (detail), mural, 110' w x 15' h, © 1947 The Peabody Museum of Natural History, Yale University

PROCEDURES

- Introduce students to the book *The Dinosaurs of Waterhouse Hawkins*.
  - After a preview of the cover, title and illustrations, ask students to make three predictions about Waterhouse Hawkins.
  - Read the book aloud to students. (When you are finished discussing the book, place it in the **Dinosaur Resource Center** so that all students have an opportunity to read it.)
  - Ask students if their predictions were accurate or if they had to modify them.
  - Explain that Hawkins was the first paleo artist. Have students examine the illustrations closely and ask: Where did Waterhouse Hawkins get his ideas about dinosaurs? What kind of scientific evidence did he use? Do his depictions of dinosaurs look different from the images we see today? How?
  - Point out to students that 150 years ago scientists had only just begun to study dinosaurs and only a few fossils had been identified. Today the fossil record is much larger and continues to grow as scientists make more discoveries. Ask: Have our ideas about dinosaurs changed? Why? (See page 13 for a chart of important dates in dinosaur discovery.)
- Introduce the reproduction of a segment of the **mural** created at the Peabody Museum at Yale University by Rudolph Zallinger between 1943 and 1947.
- Explain that a mural is usually painted directly on a wall or another large surface. This mural was 110 feet long and took over three years to complete. Reproductions were published in magazines in the 1950s and were seen by people all over the country.
  - Explain to students that this mural was based on the best scientific information available at the time and that it inspired future generations of scientists and paleo artists, such as Michael Skrepnick and others.
  - Have students examine the image of the *Tyrannosaurus rex* in the Zallinger mural. Have students compare the image with the *T. rex* in Skrepnick's 1998 painting.
  - Ask students: How are these two dinosaurs similar? How are they different?
  - Point out specific differences in the two images, such as the position of the tail and the size and placement of the forelegs.
  - Ask students: Which differences do you think are the result of artist's choices about how to depict the *Tyrannosaurus rex*? Which differences do you think are the result of new fossil evidence?
- Remind students how ideas about dinosaurs have changed since the time of Waterhouse Hawkins. Ask students: Can we be wrong about what we think we know about dinosaurs today? Why or why not?
- Have students write one or more paragraphs in their **Dinosaur Record Book** explaining their answers to following questions: Do you think that new discoveries about dinosaurs are being made today? Explain. Will our ideas about dinosaurs continue to change in the future? Why or why not?



In this illustration of a Tyrannosaurus rex *specimen called Bucky, the shaded areas represent actual fossils. The remainder of the skeleton is made of casts taken from other* T. rex *fossils. Bucky is considered to be the sixth most complete* T. rex *ever discovered. A complete dinosaur skeleton is a rare find.*

PALEO ART AND THE FOSSIL RECORD

A **paleo artist** draws, paints or sculpts animals, plants and environments that existed in earlier geological periods. The artistic style has developed over the past 150 years as more and more scientific evidence about dinosaurs and other ancient life has been discovered and analyzed. Dinosaurs lived between 248 million and 65 million years ago, an earlier geological era called the Mesozoic. This era includes the Triassic, Jurassic and Cretaceous periods. Paleo art is based on the work of scientists called **paleontologists** who use **fossils** to study life in the past. **Fossils** are the preserved remains or imprints of plants and animals. Both artists and paleontologists depend upon the growing **fossil record**, the accumulated body of information developed by scientists through the long-term study of fossils. This record is constantly changing as more data is collected. New fossil discoveries are always being made and new views about the appearance and behavior of dinosaurs develop as a result. This new information changes what we know about dinosaurs and also changes artists' renderings of dinosaurs. This explains why fossils are important in creating an image of life in the geological past. Paleo art is a wonderful example of how well science and art can work together to educate, inspire, entertain and inform.

IMPORTANT DATES IN DINOSAUR DISCOVERY

600 B.C.	Central Asian traders bring stories of griffins, based on the fossil record of *Protoceratops,* to the ancient Greeks.
300 A.D.	Chinese scholars record the presence of "dragon bones."
1677	Robert Plot illustrates a thighbone, possibly of *Megalosaurus.*
1824	William Buckland names *Megalosaurus,* the first dinosaur to be scientifically described.
1825	Gideon Mantell and his wife find a dinosaur tooth and name the genus *Iguanodon.*
1842	Richard Owen coins the term **dinosauria**.
1851	Models of *Iguanodon, Megalosaurus* and *Hylaeosaurus,* made by Waterhouse Hawkins, are displayed in the Great Exhibition at the Crystal Palace in London.
1856	The first dinosaur remains from the United States are described.
1867	Thomas Henry Huxley is the first scientist to suggest that birds are the direct descendants of dinosaurs.
1858 – 1897	The "Bone Wars," a fierce scientific rivalry between Othniel C. Marsh and Edward D. Cope, sparks the discovery of hundreds of new dinosaur specimens in the American West.
1878	Miners discover dozens of *Iguanodon* skeletons at Bernissart, Belgium.
1920s	A series of expeditions, led by Roy Chapman Andrews of the American Museum of Natural History, to Mongolia's Gobi desert results in the first discovery of dinosaur eggs and of many new types of dinosaurs.
1930s	The Chinese scientist C.C. Young begins a series of expeditions to excavate dinosaurs in China.
1969	John Ostrom, of Yale University, publishes a description of *Deinonychus,* beginning a revolution in the way scientists and the public perceive dinosaurs.
1970 – present	Increasing evidence suggests that some dinosaurs are indeed the ancestors of birds. Continued study of specimens shows that dinosaurs were active, complex animals.

Sources: *National Geographic Dinosaurs* by Paul Barrett (National Geographic Books, 2001). *Tyrannosaurus Sue* by Steve Fiffer (W.H. Freeman and Company, 2000).

EXPERIENCE 3:

PARTNERS: PALEO ARTISTS AND PALEONTOLOGISTS

In this experience, students learn that artists and paleontologists work together using the fossil record and observations of living animals to find clues about the way dinosaurs looked and lived. They speculate about what aspects of paleo art are based on scientific evidence and what aspects may be the result of the artist's skill and creative abilities.

A dinosaur comes to life as paleo artist Gary Staab "fleshes out" the skull of a T. rex.

PROCEDURES

- Have students take another look at *Tyrannosaurus rex and Triceratops* (page 57) and ask them: Are the dinosaurs in this work doing things that we would expect living animals to do?
- Point out to students that paleo art is not fantasy. Paleo artists work very carefully to show dinosaurs as real animals interacting in their natural environment. Paleo artists practice a style of art called **realism**, which strives to create accurate, natural representations of people, animals and things.
- Ask students how Skrepnick uses line, shape, color and texture to make the image look as real as possible.
- Ask students how they think the artist knows how *Triceratops* and *Tyrannosaurus rex* looked, moved and behaved.
- Explain that paleontologists and paleo artists examine fossils of plants, dinosaurs and other animals that lived during the same period to learn how dinosaurs lived and interacted with each other. This is called **direct evidence** because scientists are able to examine the fossils themselves.
- Explain that another method scientists and artists use is to observe living animals and plants. Since it isn't possible to observe dinosaurs, they have to make **inferences**, ideas about the way dinosaurs behaved and lived in their environment, based on observations of living animals. This is called **indirect evidence**.

Paleo artist Michael Skrepnick carries out detailed studies of dinosaur fossils before he begins to paint. Fossils provide direct evidence of how dinosaurs looked. In this drawing, Skrepnick has identified the major bones in the skulls of Tyrannosaurus rex *and* Triceratops.

INDIANA'S ACADEMIC STANDARDS

Science — Standard 2: Scientific Thinking (3.2.6, 3.2.7, 4.2.7, 5.2.4) Standard 4: The Living Environment (3.4.5, 4.4.6, 5.4.7, 5.4.8)

Visual Arts — Standard 7, 9 and 10: Creating Art — Production (3.7.1, 3.9.2, 3.10.1, 3.10.2, 4.7.1, 4.9.2, 4.10.1, 4.10.2, 5.7.1, 5.9.2, 5.10.1, 5.10.2)

THEY LIVED WITH THE DINOSAURS!

Although dinosaurs may seem strange, we would recognize many of the plants and animals that shared their environment. Turtles and river crocodiles have survived with few changes in their anatomy. This is also true of some types of fish and crustaceans, such as crabs and lobsters. Insects such as beetles, cockroaches and dragonflies also have lived since the dinosaur era. Ferns, pines and ginkgo trees were part of the dinosaurs' landscape and can be seen growing today. Flowering plants and trees, including magnolias and dogwoods, first appeared during the Cretaceous, the last dinosaur period. What characteristics may have helped these species survive for millions of years?

WHAT COLOR IS YOUR DINOSAUR?

Doug Henderson, *Maiasaura Nesting Ground*, pastels, 27 1/2" w x 16 1/2" h, © 2004 The Children's Museum of Indianapolis

No fossil evidence regarding colors in dinosaurs has been found to date. Until recently, dinosaurs were depicted in drab shades of grey, brown or green. As a result of observing animals living today, artists and paleontologists have begun to realize that dinosaurs may have had a variety of colors and markings. Color could have been an adaptation to the environment that would have served the same functions for dinosaurs as it does for modern animals. It could have helped them hide from predators, attract a mate and recognize members of their own group. Today, paleo artists use a wide variety of colors and patterns for the dinosaurs in their works of art. Their choices are based on scientific observation of living animals.

© 2004 The Children's Museum of Indianapolis

This rare imprint of Edmontosaurus *skin was a significant discovery on The Children's Museum's 2003 Dino Institute Teacher Dig in South Dakota. The fossil indicates that the dinosaur may have had scaly skin, but it provides no clue about its color.*

- After discussion, explain to students that new fossil discoveries are made constantly and that our view of dinosaurs changes and becomes more complete as we learn more. (For example, the recent discovery of dinosaur fossils showing feathery imprints may support the theory that some dinosaur species were related to birds.)
- Have students use the **Dinosaur Record Book** to write one or more paragraphs answering these questions: Why is accuracy based on scientific evidence important in paleo art? Why is the artist's skill also important? Why is paleo art important to scientists, film makers and book authors? Is it important to you? Why or why not?
- Have students examine the dinosaur images in the artworks again and identify those features that are probably based on evidence from fossils. (For example, look for features that would leave fossilized remains or an imprint, such as horns, claws or frills.)
- Ask students which features are probably based on artist's choices (such as color). What scientific evidence would an artist use in making such choices?

PALEO ART AND EVIDENCE

Paleo artists often visit museums to see how paleontologists have reconstructed dinosaur skeletons. By studying the placement of bones in this Triceratops *specimen at The Children's Museum an artist can determine how the animal might have moved.*

Most artists who create scientific works about dinosaurs prefer to use the term "paleo art" rather than "dinosaur art" to identify works of art that are based on research, not fantasy. Paleo artists study fossils for direct evidence about a dinosaur's size, shape, form and behavior. Throughout a project, an artist may consult with paleontologists and other experts, read the scientific literature and even visit a dig site. Fossils serve as the structural guide for artists, helping them create lifelike images based on skeletal material, plant material, tracks or other remains. The fossil record is informative, but it does have limitations. Complete fossil remains of dinosaur specimens are rarely found. Because paleo artists sometimes have few clues to go by, they have to rely on the accumulated evidence about specific dinosaur species. They also observe the movements and behavior of living animals for indirect evidence about how dinosaurs might have interacted with each other and their environment. Paleo artists strive to make their works as realistic as possible by blending current scientific evidence based on fossils and observation of modern animals and plants with artistic skills and imagination.

HOW A DINOSAUR BECOMES A FOSSIL

STEP 1: LIFE
The dinosaur is alive and growing.

STEP 2: DEATH
The dinosaur dies.

STEP 3: SEDIMENT
Sediments quickly cover the dinosaur.

STEP 4: TIME
Over a long time more sediments settle on the dinosaur.

STEP 5: FOSSILIZATION
Water, sand and minerals fossilize the dinosaur.

STEP 6: EXPOSURE
The fossil remains are revealed and found after wind and water remove layers of sediment.

ASSIGNMENT 1:
DECONSTRUCT A DINO!

Students can examine and sketch the skeleton of Stan, the T. rex, *in* ***Dinosphere*** *at The Children's Museum.*

Provide this scenario to students:

You are a member of a team of artists and paleontologists. Your mission is to determine if a work of paleo art is as accurate as possible based on current fossil evidence.

- Focus on the *T. rex* in Michael Skrepnick's *Tyrannosaurus rex and Triceratops.* Examine the body carefully.
- "Deconstruct" the *T. rex* by using drawing pencils to sketch the skeleton that supports the dinosaur's body. Keep in mind that by "deconstructing" the dinosaur, you are reversing the process followed by the artist when he used a fossilized skeleton to recreate a "fleshed out" dinosaur.
- Evaluate your work: Compare your sketch to the skeleton of *Stan*, the *T. rex* on **The Children's Museum** Web site at **ChildrensMuseum.org**. Use **The Dinosaur Record Book** to write answers to this question: Based on the fossil evidence, what would you change in your sketch?
- Compare the *T. rex* in Skrepnick's painting with the fossil evidence. What features of the dinosaur might be the result of the artist's choices about how to show his subject? What scientific evidence might have been the basis for these choices?

SCORING CRITERIA

This assignment will be evaluated based on a student's ability to:

- Carefully examine the details of a work of art
- Control selected media
- Exercise care and attention to detail in the execution of work
- Evaluate his or her work and that of others

SCORING RUBRIC

This rubric provides a framework for assessing a student's ability to make careful observations, use drawing as a medium to record observations and apply criteria to evaluate personal work and that of other artists.

Partial: The student makes general observations and produces a drawing based on those observations but does not show attention to detail or care and control in executing the drawing. The drawing may be rudimentary and lack connection with the subject. The student can make only general statements comparing his or her work to a fossilized skeleton of the same dinosaur species.

Essential: The student examines the subject carefully and produces a detailed drawing based on observations. The drawing shows good control of the media and makes specific references to the subject. The student can give valid examples comparing his or her work to a fossilized skeleton of the same dinosaur species and can explain the rationale for judging the accuracy of another artist's work.

Exceptional: The student examines the subject with great care and produces a drawing that shows unusual attention to detail. The drawing is closely referenced to the subject and demonstrates care, reflection and control of media to a high degree. The student can compare his or her work to a fossilized skeleton of the same dinosaur species, citing numerous specific examples and indicating changes that are needed based on the fossil evidence. In a similar way, the student can use fossil evidence to evaluate the accuracy of another artist's work.

ASSIGNMENT 2: ADAPTATION

Provide this scenario to students:

You are planning a work of art, such as Michael Skrepnick's painting or Rudolph Zallinger's mural. Return to these works and identify specific dinosaur features such as skin, tails, horns, claws or frills. Your assignment is to determine the function of one of these features. Since it is not possible to observe dinosaurs directly, you will have to make an **inference** based on the behavior of animals that live today.

- Prepare an oral report using information from science books, articles and online resources and compare the dinosaur feature you have selected with a similar feature in a living animal. Your report should:
- Identify the dinosaur feature you are studying and a species of dinosaur that displays this feature
- Identify a living animal that has a similar feature
- Explain how this feature is an **adaptation** that helps the animal survive in its environment
- Explain why evidence about dinosaurs gathered by observing living animals is different from direct evidence gathered from fossils
- Make suggestions, based on your research, about the way the dinosaur should be depicted in the artwork you are planning
- Provide sketches to support and help explain the ideas in your report

SCORING RUBRIC

This rubric provides a framework for evaluating the student's ability to use research and communicate ideas in planning a paleo artwork.

Partial: The student can identify one or more dinosaur features and can compare them to those in an animal living today. The student demonstrates understanding that adaptations help animals to survive in their environment. The student shows minimal understanding of direct and indirect means of gathering evidence and does not make the connection between scientific evidence and how it informs paleo artworks. The student listens to others and can explain basic ideas but may not be able to use sketches to illustrate his or her main points.

Essential: The student shows understanding of how adaptations help animals survive in their environment, can give examples about how a specific feature functions in a living animal and can make inferences about how a similar feature may have functioned in a species of dinosaur. The student understands the difference in evidence gathered directly and evidence gathered indirectly. The student listens to others, speaks clearly and presents main points in an organized way. The student can use sketches to help communicate ideas and can make meaningful suggestions for depicting the dinosaur under study based on scientific clues.

Exceptional: The student has a broad understanding of adaptation in animals, can provide numerous examples of how a specific feature helps an animal survive and can make inferences about the possible function of a similar feature in a species of dinosaur. Because the student understands the nature of inferential evidence, he or she is also able to suggest alternative ideas regarding the function of a dinosaur feature. Drawings are used effectively to illustrate specific points in the report. The student is able to make a number of suggestions for depicting the way the dinosaur under study should look, move, behave and interact with other dinosaurs based on scientific clues. The student listens carefully to others and speaks clearly. Orally presented information is well-organized and explained in ways that are easy for listeners to understand.

SCORING CRITERIA

This assignment will be evaluated based on a student's ability to:

- Make valid inferences about the function of a specific dinosaur feature based on similar features in living animals
- Explain on how this feature may have helped the dinosaur adapt to its environment
- Explain the difference between direct and indirect evidence
- Use sketches to help communicate plans for a work of paleo art

What kinds of adaptations might have helped these ornithomimid specimens, painted by Donna Braginetz, survive in their environment?

TEACHER TIPS

Allow students to respond to the works of art featured in this lesson on the basis of personal interpretation and an examination of the properties of the artworks themselves. Help students understand that there may be several plausible interpretations of a work. Some teachers may wish to introduce background information during the first viewing of the works. Other teachers may prefer to seek student responses first and later introduce background information to provide a context for reinterpreting some of the works. See **Notes on Artists and Artworks** in the **Resources** section for information. If students have not already learned how fossils are formed, introduce them to the concept. (See: *Dinosphere: A 3–5 Unit of Study, "How a Dinosaur Fossil Forms," pages 8–10.)*

MUSEUM LINKS — SEE THE REAL THING!

While it is helpful for students to view reproductions, there is no substitute for seeing original works of art. Viewing originals allows students to examine the ways that artists have used elements and principles of design and how they have handled the art media. For example, when students view an original painting, they will be able to see how the paint was applied and experience a truer representation of the colors the artist intended. Visit the **Gallery** to see John Lanzendorf's collection of original paleo art. Here students can experience original works by Michael Skrepnick and other paleo artists. In **Dinosphere,** they can also examine one of the most extensive collections of dinosaur fossils in the United States and begin to understand how artists and paleontologists work together to recreate the world of the dinosaurs. Use *Dinosphere: A 3-5 Unit of Study* and **The Children's Museum** Web site at **ChildrensMuseum.org** to learn more about the science of dinosaurs.

BONUS

- Have students use the **Dinosaur Record Book** to make observational sketches and label different types of plant and animal fossils. (Visual Arts Standard 7: 3.7.1, 4.7.1, 5.7.1)
- Use Lesson 2, Experience 1 from the *Dinosphere* 3-5 unit of study (pages 20 – 23) to examine the meaning of dinosaur names. Ask students: What features can you find in the artwork that relate to this name? How do you think the artist knew that the dinosaur had this feature? Why was this feature important for the dinosaur? (Science Standard 4: 3.4.1, 5.4.7)
- Ask students to give examples of how plants and animals today grow, die and decay, and how new organisms are produced. Ask students: Do you think that some remains of plants and animals living today may become fossils in the future? Why or why not?

LESSON 2:
PALEO ART COLLECTORS AND ARTISTS: OPENING WINDOWS ON THE WORLD OF DINOSAURS

© 2004 Michael Skrepnick, *Watering Hole*, acrylic on Masonite, 35" w x 22" h, The Children's Museum of Indianapolis

Paleo art requires that artists work within important parameters. They must accurately represent the evidence that paleontologists and other scientists have discovered about the structure and behavior of dinosaurs. On the other hand, paleo artists make creative choices when they choose a subject, the materials they will use and the ideas they will convey. In this lesson, students learn how a collection of paleo art can introduce viewers to the world of dinosaurs and compare and contrast works by two different paleo artists. They will read an interview with paleo artist Brian Cooley and examine the process he followed and the decisions he made in creating the *Alamosaurus* sculpture at **The Children's Museum**.

"Artists are the eyes of paleontologists and paintings are the window through which nonspecialists can see the dinosaurian world."

— Dale A. Russell,
Dinosaurs Past and Present,
Volume I, page 117

OBJECTIVES

Students will:

- Consider the ways that a collection can provide insights into the work of a single artist or group of artists
- Identify the choices that paleo artists have to make in creating a work of art
- Compare the ways artists use painting and sculpture to portray dinosaurs
- Compare and contrast works of art by two different paleo artists
- Examine Cooley's *Alamosaurus* sculpture as public art and consider its impact on the museum and its surroundings
- Read an interview with Brian Cooley and identify the choices he makes and the steps he follows in creating a large outdoor sculpture

DIGGING DINO WORDS

- ***Alamosaurus***
- **armature**
- **collection**
- ***Corythosaurus***
- **drawing**
- **media**
- **mural**
- **painting**
- **photorealism**
- **proportion**
- ***Protoceratops***
- **public art**
- **realism**
- **scale**
- **sculpture**

FOCUS QUESTIONS

Use these questions to help students focus on key ideas in **Lesson 2**.

- What is a collection? How is viewing a collection of paleo art different from viewing a single work of art?
- How is a **sculpture** different from a **painting**? How are they similar?
- What are some of the differences you can see in the two works by Donna Braginetz and Sylvia Czerkas? How are they similar?
- What choices did the artists make when they created these works?
- What is public art? Is the *Alamosaurus* sculpture by Brian Cooley public art?
- How does this sculpture change the way people think about the museum building?
- What difference does the sculpture make for the neighborhood and surrounding community?
- How have the three works of art you've examined in this lesson changed the way you think about dinosaurs?

YOU WILL NEED ...

Materials

- Student Handout 1— **John Lanzendorf: Paleo Art Collector** page 34
- *Juvenile Corythosaurus*, Donna Braginetz, acrylic on bristol board (1995)
- *Protoceratops*, Sylvia Czerkas, resin (1975)
- *Alamosaurus,* Brian Cooley, fiberglass and paint, The Children's Museum of Indianapolis (2004)
- Photographs of The Children's Museum of Indianapolis before and after the installation of Cooley's *Alamosaurus* sculpture
- Student Handout 2 — **How to Build Really Big Dinosaurs in 12 "Easy" Steps**, page 35. See The Children's Museum Web site for photographs of Cooley's process in creating large sculptures at ChildrensMuseum.org
- Student Handout 3 — **An Interview with Brian Cooley**, page 36

TIME

Two or three class periods.

EXPERIENCE 1:

JOHN LANZENDORF: PALEO ART COLLECTOR

In this experience students read a short biography of paleo art collector John Lanzendorf and discuss how his early interests became an important part of his adult life. They examine the meaning of the word **collection** and consider how viewing a collection can affect the way we think about works of art.

Paleo art collector John Lanzendorf with a few of the artworks in his collection.

John Lanzendorf has been fascinated with dinosaurs since he was 5 years old and began to collect toy models.

PROCEDURES

- Explain that the painting students examined in Lesson 1, *Tyrannosaurus rex and Triceratops* by Michael Skrepnick, is part of a **collection** of paleo art put together over a number of years by a collector named John Lanzendorf.
- Ask students what the word **collection** means to them. Do any students collect special items?
- Have students use the **Dinosphere** link on **The Children's Museum** Web site to view a number of works from the collection.
- Examine the artworks on the Web site and ask students to point out some of the differences in the works, such as different types of dinosaurs, different environments, uses of different materials, colors, etc. Ask students what the works have in common.
- Ask students: How is viewing a collection of paleo artwork different from viewing a single work of art? What can you learn about dinosaurs from seeing a collection of paleo art? What can you learn about an artist or a group of artists when you view a collection of works?
- Provide the biography of John Lanzendorf and have students read in pairs.
- Ask students how Lanzendorf's interests as a boy influenced him later in life. How did he pursue his dreams?
- Ask why they think John Lanzendorf and others are interested in dinosaurs and paleo art. What purpose do they think paleo artworks serve?
- Ask students to view the artworks again and think about them as part of a collection as well as individual works. Ask: Why do you think Lanzendorf might have collected each one?
- Have each student choose one work and pretend that he or she is a friend who saw the work before John Lanzendorf collected it. Each student should use the **Dinosaur Record Book** to write a persuasive letter to John Lanzendorf stating the reasons that he should or should not add this specific work to his collection.

INDIANA ACADEMIC STANDARDS

Visual Arts
Standard 1: Responding to Art — History (3.1.2, 4.1.2, 5.1.2)
Standard 6: Responding to Art — Aesthetics (3.6.2, 4.6.2, 5.6.2)

Language Arts
Standard 5: Writing Applications (3.5.3, 4.5.6, 5.5.4)

EXPERIENCE 2:
MAKING CREATIVE CHOICES

In this experience, students compare and contrast two works of art, one a painting and the other a sculpture, and consider the creative choices made by the artists.

PHOTOREALISM

Juvenile Corythosaurus, by Donna Braginetz, is an example of **photorealism**. It seems so much like a photograph that it might be compared to a *National Geographic* magazine cover photo. Works of art in this style pay great attention to detail and use photographic techniques, such as contrasting images in sharp focus with those in soft focus. How is this painting similar to and different from a photograph?

INDIANA'S ACADEMIC STANDARDS

Visual Arts
Standard 3: Responding to Art — Criticism (3.3.3, 4.3.3, 5.3.3)
Standard 6: Responding to Art — Aesthetics (3.6.2, 4.6.2, 5.6.2)

PROCEDURES

- Introduce reproductions of two works of art, *Protoceratops* by Sylvia Czerkas and *Juvenile Corythosaurus* by Donna Braginetz. Explain that they are part of the Lanzendorf collection.
- Ask students: What do you think these two works are about? What clues make you think this? What are the dinosaurs doing at this moment? What do you think they were doing a moment ago? What do you think they will do a few moments from now? How do you know?
- Ask students to compare and contrast the subjects of the two works, the baby *Protoceratops* and the young *Corythosaurus.* Ask students: How are these two dinosaurs similar? How are they different? Can you tell anything about their behavior? What are some other ways the artists could have shown these two dinosaurs?
- Point out to students that one of the works is a **painting** and the other is a **sculpture**. Discuss the different types of materials and processes used in drawing, painting and sculpting.
- Have students speculate about why the artists chose these different approaches. Ask: Why do you think Sylvia Czerkas chose sculpture to portray a hatching *Protoceratops*? Why do you think Donna Braginetz chose to create a painting of the *Corythosaurus*? What clues can you find in the artworks about why the artists might have made these choices?

© 1975 Sylvia Czerkas, Protoceratops, resin, 4 3/4" h from base, The Children's Museum of Indianapolis

WHAT IS A SCULPTURE?

Help students understand that drawings and paintings are two-dimensional or flat. A sculpture has three dimensions: height, width and depth. Provide models or sculptures to help students understand that a sculpture is a three-dimensional work of art. Visit **The Children's Museum** Web site for 360 degree views of sculptures or visit the museum to see *Protoceratops* and other paleo art sculptures.

- Ask students: What can sculpture show that a painting or drawing cannot? What can a painting or drawing show that a sculpture cannot? If you were going to create a paleo artwork would you choose to make a drawing, painting or sculpture?
- Ask: Do the two works appear realistic? Why or why not? How have the artists used color, texture, line and shape or form to make the images seem real? Which one appears to be the most realistic? (Point out that if students could see Czerkas' actual sculpture, it might appear to be real because it is three-dimensional.) Ask: How has Braginetz made her painting look almost like a photograph of a living animal? What effect does this have on the viewer?
- Have students consider what they can tell about the surroundings of the two dinosaurs. Ask: Can you tell anything about the way these dinosaurs might have lived and behaved? What are some things that you might not see? What might you have to imagine?
- Ask students to research and answer this question in their **Dinosaur Record Book:** What kind of scientific evidence do you think guided the artists in creating these two works? For example: What evidence might there be that *Protoceratops* hatched from eggs or that *Corythosaurus* lived in herds?

Doug Henderson, *Maiasaura Nesting Ground*, pastel, 27 1/2" w x 16 1/2" h, © 2004 The Children's Museum of Indianapolis

What creative choices did paleo artist Doug Henderson make when he painted Maiasaura Nesting Ground*?*

ARTISTS' CHOICES

One of an artist's most important choices is to select a subject and decide what to express about that subject in a work of art. To help students examine the choices the artist has made, ask them to think of other ways that the artist might have shown the dinosaur. The dinosaur may be shown protecting its young, but the artist could have decided to show the same dinosaur sleeping, drinking water or playing. Each of these choices would have conveyed different ideas about the nature of the dinosaur. Besides showing what a dinosaur is doing, an artist also must decide what materials to use, how to use these materials (technique), how to use line, shape, form, color and texture (the elements of design) and how to organize the parts of the artwork using balance, repetition, movement, proportion and other art principles. All of the choices an artist makes add up to the message or key ideas communicated by the work of art.

EXPERIENCE 3:
BRIAN COOLEY: PALEO ARTIST

This experience introduces Brian Cooley, the artist who created the *Alamosaurus* sculpture that appears to be bursting out of **Dinosphere** at **The Children's Museum**. After reading an interview with Brian, students identify some of the choices he made and the processes he followed to create the sculpture. Students then examine this work as an example of public art and consider how it changes the architecture of the building and what it means to the surrounding community.

Brian Cooley, Alamosaurus Family, fiberglass, life-size, © 2004 The Children's Museum of Indianapolis

Brian Cooley's sculpture of an Alamosaurus *family appears to be breaking out of* ***Dinosphere.***

INDIANA ACADEMIC STANDARDS

Language Arts
Standard 2: Reading Comprehension (3.2.2, 3.2.3, 4.2.1, 4.2.2, 5.2.1)
Visual Arts
Standard 1: Responding to Art — History (3.1.2, 4.1.2, 5.1.2)
Science
Standard 6: Common Themes — Models and Scale (3.6.3, 4.6.3)

PROCEDURES

- Introduce students to the Brian Cooley *Alamosaurus* sculpture on **The Children's Museum** Web site.
- Point out to students that the sculpture is life-size. A fourth grade student might stand only "knee-high" to the adult *Alamosaurus*. Ask students how the artist knew what size to make the adult and young dinosaurs.
- After examining images of the sculpture, ask students what questions they would like to ask the artist and record these questions on chart paper or the chalkboard.
- After discussing the questions, tell students that **The Children's Museum** interviewed Brian Cooley by e-mail and asked some similar questions.
- Give each student a copy of the Student Handout *An Interview with Brian Cooley* on page 36.
- Have students read the interview aloud in pairs, with one student playing the role of the interviewer and asking the questions. The other student should read Brian Cooley's responses.
- When pairs have finished reading, discuss the questions focusing on Cooley's comments about **proportion** and **scale**.

ASK AN ARTIST

Brian Cooley, *Alamosaurus Family* (detail), fiberglass, life-size, © 2004 The Children's Museum of Indianapolis

In general, the following questions provide important insights about the way an artist works:

- How do you come up with ideas for your works of art? (Artists work with ideas.)
- Once you have an idea, what do you do? (Artists develop their ideas in different ways.)
- What are some of the important choices you have to make as you are planning the work? (Artists have to make decisions about the subject, ideas, materials, techniques and use of art elements and principles.)
- What specific steps do you take in developing the artwork? (Artists have specific processes for different types of artwork.)
- How do you decide when to stop working on your artwork? (Artists judge their own works of art.)
- How has your artwork changed over time? (Artists reflect on their completed works of art and make changes in subsequent work.)

PROPORTION AND SCALE

When Brian Cooley discusses proportion, he is referring to the size of the dinosaurs and their size in relationship to each other and the environment. It is also important to know the size of the different parts of a dinosaur so that the head is the right size for the body, and the legs and tail are the right lengths. This is an important principle in creating a work of art. To make certain that proportions are correct, sculptors often create a scale model. In such a model an inch or another small measurement might represent a foot or several feet. Students should have encountered the idea of scale measurement in maps, where an inch may represent several miles. Introduce the idea of scale measurement of three-dimensional objects by using models of cars or other familiar large objects. Ask students: How do artists know what size the dinosaurs were and what their body parts were like? How do they know what trees, plants and other parts of the environment looked like?

Photograph by Gary Campbell

Brian Cooley and his wife, Mary Ann Wilson, work together on sculpture projects and children's books. They spend as much time as possible with their daughters and do creative activities as a family.

- Introduce students to the handout on Brian Cooley's process for making the *Alamosaurus* sculpture, **How to Build Really Big Dinosaurs in 12 "Easy" Steps**, page 35 (also available with photos on **The Children's Museum** Web site).
- Show students a photo of the museum before the sculpture was installed. Ask students: What are your impressions of the museum? Would you like to visit? What do you think you might find inside?
- Show students a photo of the museum since Brian's sculpture has been installed. Ask students: How has the sculpture changed the way you think about the museum? Do you want to visit the museum more now than you did before? What would you expect to see inside? Is the building itself more interesting to you now?
- Explain to students that works of art placed where people in the community can easily experience them are considered **public art**. Often public artworks are located outdoors or inside buildings that are used by large numbers of people. These works may be sculptures, **murals** or other art forms. Buildings themselves may be considered a kind of public art.
- Ask students: Do you think the *Alamosaurus* sculpture is public art? Why?
  - What impact do you think this sculpture has on the surrounding community?
  - Would you like to live nearby? Why or why not?

ASSIGNMENT
PLAN A DINOSAUR

Provide this scenario to students:

Your principal has invited students to submit plans for a piece of public art for your school. You have decided that a life-size dinosaur sculpture would be the perfect project. Select a dinosaur species and develop a plan for integrating a dinosaur sculpture into your school setting.

- Research your dinosaur, paying special attention to body type, size and behavior.
- Make a sketch and then create a three-dimensional scale model of your dinosaur in clay using correct proportions.
- Choose a location inside or outside the school building for the sculpture. Make a brief oral presentation to explain your plan. Be sure to:
  - Defend your choice of subject and location for the sculpture
  - Use your sketch and model to help communicate your ideas
  - Explain what purpose the sculpture will serve for your school and why this will be a public art project

SCORING CRITERIA

This assignment will be evaluated based on a student's ability to:

- Use the results of research to develop a plan for a life-size dinosaur sculpture
- Create a sketch and a scale model sculpture using appropriate proportion
- Use the sketch and model to help communicate ideas in an oral presentation
- Explain the purpose of the proposed sculpture as a piece of public art

Brian Cooley, *Alamosaurus Family* (detail), fiberglass, life-size.

SCORING RUBRIC

This rubric provides a framework for evaluating the student's ability to use research, a preliminary sketch and a scale model to communicate ideas for a proposed life-size sculpture.

Partial: The student selects a dinosaur but demonstrates little evidence of research into the characteristics of this species. Sketch and model are simplistic and show poor attention to proportion and scale. The sketch and model are not used effectively to communicate ideas and the student's oral presentation does not demonstrate an understanding of the functions and the potential impact of a large sculpture in the school setting.

Essential: The student selects and researches a dinosaur species. The results of this research are evident in the student's sketch and scale model, which take proportion and dinosaur behavior into account. The student is able to use the sketch and model to explain his or her choice of subject and location for the sculpture. The student can also describe the purpose of the sculpture and its importance for the school.

Exceptional: The student carefully researches the physical characteristics and behavior of the selected dinosaur species and makes modifications in plans if necessary. The sketch and scale model show special attention to proportion and are used effectively to communicate ideas for the sculpture. The student can defend his or her choice of subject and location and can explain the purpose of the proposed sculpture as a piece of public art. The student demonstrates understanding of the impact of such a work on the school and surrounding community and includes appropriate responses in the proposed plan. (For example, if the student anticipates that a large sculpture outside the school will make the building a community landmark, plans might be made to accommodate people who want to view the work.)

BONUS

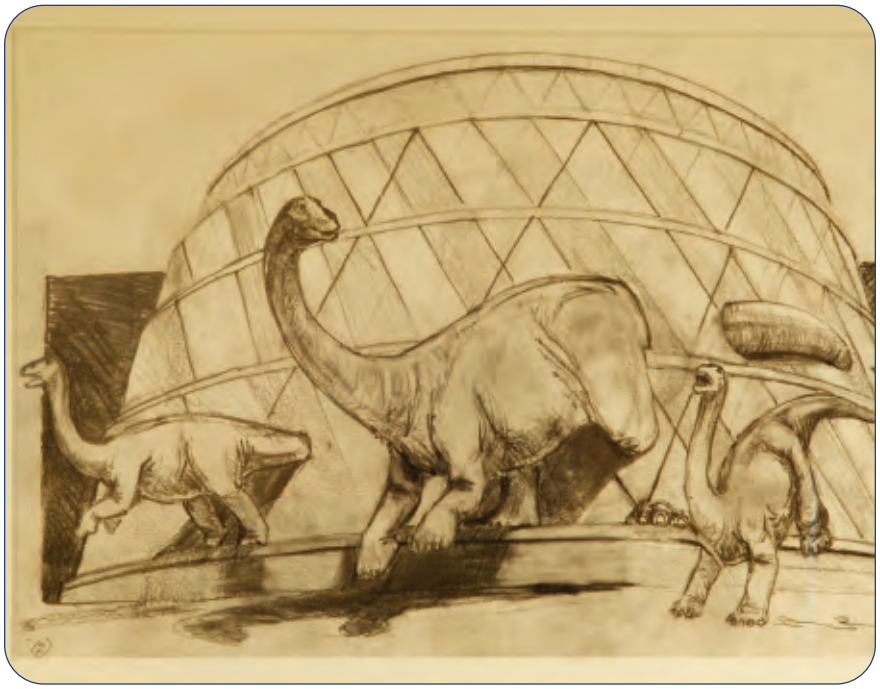
Extending Experiences

- Have students use the Web to research other paleo artists and their works.
- Use the interpretation of artworks featured in this lesson to increase students' vocabulary. Have them start a "collection" of contrasting descriptive words inspired by the works, such as mysterious/ordinary, dangerous/safe, fierce/timid, rough/smooth, dark/light, warm/cool.
- After a visit to the paleo art gallery at **The Children's Museum**, have students write an article for the school newspaper or parent newsletter describing the collection and telling why it is important. (Visual Arts Standard 1: 3.1.2, 4.1.2, 5.1.2; Language Arts Standard 5: 3.5.2, 4.5.3, 5.5.4)
- Some students may want to bring their own collections and show them to the class. Students may also want to start a collection in the classroom so that everyone can participate. As students begin to produce their own artworks, encourage them to begin a representative collection of works. This collection could become an art exhibit that can be shared with other classes, parents and community members.
- Have students create their own dinosaur sculptures. See the **Resources** section for the book *Make-A-Saurus* by Brian Cooley and Mary Ann Wilson. Brian describes the process of making a dinosaur sculpture and gives step-by-step instructions that can be used for classroom dinosaur sculpture projects.

Doug Henderson, *Maiasaura Nesting Ground*, pastels, 27 1/2" w x 16 1/2" h, © 2004 The Children's Museum of Indianapolis

TEACHER TIPS

Seeing Brian Cooley's *Alamosaurus* sculpture at **The Children's Museum** is the only way students can fully appreciate the size and impact of this work. A visit to the **Gallery of Dinosaur Imagery** will allow them to examine Sylvia Czerkas' 4-inch-high *Protoceratops* and understand that sculptures can be also be very small. See the museum Web site for an overview of the process of making the *Alamosaurus* sculpture (**How to Build Really Big Dinosaurs in 12 "Easy" Steps**) and Douglas Henderson's creative process for creating a pastel drawing of a *Maiasaura* family group.



Brian Cooley, original sketch for *Alamosaurus Family*, pencil, © 2002 The Children's Museum of Indianapolis

After he completes his research on a dinosaur species, one of Brian Cooley's first steps in creating a sculpture is to draw a sketch.

JOHN LANZENDORF
PALEO ART COLLECTOR

John Lanzendorf and his cat pose with a T. rex *sculpture from his collection of paleo art.*

Dinosaurs have always fascinated John Lanzendorf. When he was 5 years old, he found a little green toy dinosaur in a cereal box. He began to collect whole sets. He drew dinos, read comics and put together plastic dinosaur skeletons. "I was fascinated by their shapes and their stories," he says. "My whole bedroom was dinosaurs!"

In 1953, John saw a photo of a dinosaur mural by the artist Rudolph Zallinger in *Life* magazine. The mural, painted for the Peabody Museum, was called *The Age of Reptiles*. Zallinger had worked with scientists to get the latest information on dinosaurs, reptiles and ancient plants. It took him over three years, from 1943 to 1947, to finish the 110-foot-long mural.

At last, John could see how the world of the dinosaurs might have looked! This famous mural inspired a lot of kids like John. Some grew up to become paleontologists or other scientists. Others became artists or collectors. They grew up to study, draw, paint, sculpt and collect works of paleo art.

When John grew up, he became a successful hairstylist on Chicago's Michigan Avenue and also a serious paleo art collector. He bought his first dinosaur sculpture in 1986 and his first paleo painting in 1993. This was a time when new scientific discoveries were inspiring wonderful paleo artworks.

As John's collection grew, he learned as much as he could about dinosaurs. He read, studied and went to lectures by paleontologists. He met many artists, worked with paleontologists digging for fossils and talked with scientists in their labs. John was careful to collect the most scientifically accurate works of art. As a result his collection of paleo art became known as the finest in the nation.

Soon John's collection included more than 300 paintings, sculptures, prints and drawings. When paleo art completely filled his apartment he realized that he needed to find a new home for his collection. In 2002, John Lanzendorf's collection came to **The Children's Museum**, where people of all ages can see it and learn about the world of the dinosaurs.

John is on the museum's International Paleo Advisory Board and says he still likes dinosaurs. "I became obsessed with dinosaurs like a lot of kids do, but I've never grown out of them," he says. He hopes that his collection at **The Children's Museum** will inspire a new generation of kids to become scientists, artists and collectors.

HOW TO BUILD REALLY BIG DINOSAURS IN 12 "EASY" STEPS

These are the steps in the process Brian Cooley uses to create his big dinosaur sculptures:

1. Sketch dinosaurs.

2. Make a model of the dinosaurs. Now is the time to make careful measurements that will help you "scale up" the dinosaurs to full size.

3. Build a metal frame, called an **armature**. The armature supports the sculpting materials, clay and foam, as you work.

4. Wrap the armature in wire mesh.

5. Spray foam on top of the wire mesh. Wait for it to dry, and then start carving the dinosaur's shape.

6. Spread clay on top of the foam. You can sculpt details in clay, like skin texture or the shape of a dinosaur's eye.

7. To make a mold, spray liquid rubber on top of the clay. The rubber mold picks up even the tiniest details carved in the clay.

8. Spray fiberglass on top of the rubber mold. When the fiberglass hardens it will hold the rubber mold in place. Take out the armature. The fiberglass will hold everything together.

9. Spray more fiberglass inside the rubber mold. All the details on the mold are picked up by the fiberglass once it hardens.

10. Take off the fiberglass on the outside, and then peel away the rubber mold. There's your dinosaur!

11. Give your dino a bath to clean it. Then apply paint.

12. Load the dinos on big trucks and take them to the museum.

AN INTERVIEW WITH BRIAN COOLEY

This interview between sculptor Brian Cooley and staff members of **The Children's Museum** was conducted by e-mail on April 16, 2004.

QUESTION:	If you have never drawn or sculpted a particular dinosaur, how do you start? Do you look at the fossils? Do you measure the bones?
BRIAN COOLEY:	I always start by finding out how much information there is on a particular dinosaur: size, bone measurements, and which paleontologists are most familiar with that dinosaur.
QUESTION:	Is there a connection between the fossils and your artwork?
BRIAN COOLEY:	I like to think there is a very close connection between my work and the fossils I'm basing it on. Sometimes I visit the museum that has the most fossils of the dinosaur and draw the bones. If I can't go there, I try to get someone to send me as much information as possible. Sometimes I have to guess. For example, no one has ever found a skull of *Alamosaurus*, but the skull of a similar type of dinosaur was found in Madagascar. So, when I was designing the sculpture for **The Children's Museum**, I gave the *Alamosaurus* a head like the Madagascar dinosaur.
QUESTION:	When you first draw a dinosaur, what do you start with, a shape or a basic skeletal outline?
BRIAN COOLEY:	When I first draw a dinosaur, I do a bunch of little sketches of the rough shape and position. Once I get a pose I like, I do a light drawing of the skeleton in the right proportions. Then I draw in the fleshed-out dinosaur on top.
QUESTION:	Scale seems to be a crucial part of your work. How do you start with a small drawing and then scale up to a big sculpture?
BRIAN COOLEY:	Scaling up is done with a ruler, measuring tape and calculator. For the adult *Alamosaurus* I used a laser level and a laser distance finder.

LESSON 3:
CULMINATING EXPERIENCE — DINOSAUR DISCOVERY

In this culminating lesson students apply what they have learned about paleo art as they research and create their own works of art based on recent scientific discoveries.

Robert Bakker, pen and ink drawing,color by Pat Redman, 17" w x 11" h, © 2005 The Children's Museum of Indianapolis

Only the skull of Dracorex hogwartsia, *a new genus and species of Pachycephalosauridae, has been found. Dr. Robert Bakker's drawing suggests how this plant-eating dinosaur may have looked and interacted with others.*

LESSON 3

OBJECTIVES

Lesson 3 will enable students to:

- Use research skills to collect data about recent dinosaur discoveries.
- Use journals to record important written and visual observations for reference later in the project.
- Explain why it is important to make careful and accurate notes and sketches.
- Describe the role paleontologists play in collecting data about the past.
- Describe the role of paleo artists in interpreting this data.
- Explain how new discoveries may change the way people think about dinosaurs.
- Use new scientific information in an original work of paleo art.
- Present their artwork along with a written statement explaining their choices as artists.

DIGGING DINO WORDS

- **anatomy**
- **biped**
- **basic needs**
- **habitat**
- **interpretation**
- **media/medium**
- **mixed media**
- **Pachycephalosauridae family**
- **quadruped**

BEFORE YOU START

Make the classroom and the **Dinosaur Resource Center** ready for student inquiry projects. Be sure that at least one computer with Internet access is available for students to use. Have a number of magazine and newspaper articles on hand that deal with current dinosaur discoveries. Recent scientific finds might include the *Dracorex hogswartsia* skull specimen at **The Children's Museum**, the discovery of soft tissue in *Tyrannosaurus rex* fossils in northeastern Montana and the discovery of *Sinosauropteryx* fossils in China that show imprints of feathery scales.

YOU WILL NEED ...

Materials

- Current magazine, newspaper articles and Internet sources on recent dinosaur discoveries
- Scrap paper for making preliminary notes and sketches
- A variety of media for student artworks: Markers, crayons, colored pencils, paints, clay, paper

TIME

Approximately three class periods.

FOCUS QUESTIONS

Use these questions to help students focus on key ideas in **Lesson 3**.

- What does an artist need to know before creating a work of art about dinosaurs?
- What recent discoveries may change some of our ideas about dinosaurs?
- How will you use what you have learned to create your own work of art?
- What ideas would you want to convey to someone who views your artwork?
- How would you plan to communicate the information you have in an artwork? What materials and techniques would you use?
- How have your ideas about dinosaurs changed since the beginning of this project? How might they change in the future? Why?

This fossilized skull of Dracorex hogwartsia *is a recent discovery on exhibit at The Children's Museum of Indianapolis. The first of its kind to be found, this unique specimen is creating great excitement in the world of paleontology.*

INDIANA ACADEMIC STANDARDS

Science
Standard 1: The Nature of Science and Technology (3.1.3, 3.1.4, 3.1.5, 4.1.3, 5.1.2).
Standard 2: Scientific Thinking (4.2.5, 4.2.6, 4.2.7, 5.2.4)
Language Arts
Standard 2: Reading Comprehension (3.2.2, 3.2.3, 4.2.1, 4.2.5, 5.2.1, 5.2.3, 5.2.4)
Standard 4: Writing Process (3.4.4, 4.4.4, 4.4.7, 5.4.5)
Visual Arts
Standard 3: Responding to Art: Criticism (3.3.3, 4.3.3, 5.3.3)
Standard 8, 9 and 10: Creating Art — Production (3.8.1, 3.9.1, 3.9.2, 3.10.1, 4.8.1, 4.9.1, 4.9.2, 4.10.1, 4.10.2, 5.8.1, 5.9.1, 5.9.2, 5.10.1, 5.10.2)
Standard 13: Integrated Studies (3.13.2, 4.13.2, 5.13.2)

PROCEDURES

- Introduce students to the story of "Pachy" on the **Dinosphere** page of **The Children' Museum** Web site. The discovery of the "flat-headed" skull of a new species of the Pachycephalosauridae family is causing great excitement among paleontologists.
- After studying the 360 degree view of the skull, ask students to speculate about the **anatomy** (body structure) of *Dracorex hogwartsia*.
- Explain to students that paleo artists are also examining the newly discovered skull to determine what the dinosaur may have looked like.
- Remind students that all the images we see of dinosaurs are artists' **interpretations**. In paleo art these ideas are based on scientific evidence but the artist uses his or her artistic skills and creativity to interpret or explain the information.
- Tell students it is their turn to play the role of paleo artists by researching a new dinosaur discovery, recording the information they find and interpreting their findings in a work of art.
- Provide Student Handout 1: **Dinosaur Discovery Research Guide** to help students focus on specific research questions.
- Have students use magazines, newspapers and the Internet to research recent dinosaur fossil discoveries and record important data in their **Dinosaur Record Book**. Students should keep an accurate record of the sources they have used.
- When students are finished with their research, have them answer these questions in the **Dinosaur Record Book**: What is one important thing you have learned about a recent dinosaur discovery that you would like to show in your work of art? What would you want viewers to understand? What questions would you want viewers to think about? How will this work change the way that people think about dinosaurs?

ASSIGNMENT

DINOSAUR DISCOVERY

This pachycephalosaur cast with the Dracorex hogwartsia *skull shows how the skeleton of the recently discovered dinosaur may have looked. The Children's Museum had the honor of naming this species. Can your students describe the meaning of the name?*

Provide this scenario to students:

Now that you have inquired into a recent dinosaur discovery, plan and carry out a work of art that will help others understand the significance of this new information.

- Choose a **medium** that you believe will help convey your ideas. You might choose to draw, paint or sculpt your dinosaur or use **mixed media**.
- Decide how you will show your dinosaur so that the viewer will understand the significance of the discovery. You may decide to show a fully fleshed-out dinosaur or a detailed skeleton.
- Consider what to show about the dinosaur's behavior. Will the dinosaur be alone or with other animals? How will it interact with others?
- Decide how much of the dinosaur's environment you will show and how you will show it. Be prepared to explain why you made these choices.
- Consider how you will use art elements and principles to communicate your ideas. How will you use line, shape, form, color, texture and space? How will you organize the elements of your work in space and use principles such as proportion and movement to provide important information about your dinosaur?
- Execute your work carefully, keeping in mind your intended messages to the viewer.
- Prepare a written artist's statement describing your process and explaining the choices you made in order to convey the major ideas you want the viewer to discover. Draft, edit and revise your statement so that it can be displayed with your work.

SCORING CRITERIA

This assignment will be scored based on the student's ability to:

- Use results of inquiry into current scientific research in developing a work of paleo art
- Use subject matter, visual elements, composition, media and techniques to convey ideas about how a recent discovery may change views of dinosaurs
- Write an artist's statement explaining the process followed and the choices made in the production of a paleo artwork

SCORING RUBRIC

This rubric provides a framework for determining a student's ability to communicate ideas in a work of art and to reflect in written form on choices of subject, media, and use of art elements and principles.

Partial: The student locates current information on scientific research about dinosaurs but has difficulty translating this information into an artwork that effectively conveys ideas. The student has difficulty controlling the medium, techniques and processes needed to execute the artwork. The work may also suffer from lack of care and planning. In the written artist's statement, the student is unable to make the connection between appropriate selection of subject matter and artistic elements and the ideas he or she is attempting to communicate. The student may fail to edit and revise the statement so that it is suitable for display along with the artwork.

Essential: The student shows a good understanding of a recent scientific discovery about dinosaurs and is able to focus on specific ideas to be communicated in a work of art. Execution of the artwork shows care, planning and good control of the medium but may be inconsistent in using visual elements and organization effectively. In the written artist's statement, the student is able to give at least some specific examples of how he or she attempted to use artistic tools and techniques to communicate ideas. The written piece shows evidence of editing and revision but some minor errors may remain.

Exceptional: The student's understanding of a recent scientific discovery is translated into a paleo artwork that effectively conveys significant ideas to the viewer. The artwork is carried out with care, thoughtfulness, attention to detail and originality. Subject matter, visual elements, organization and techniques are used to convey key information and understandings to the viewer. The artist's statement is well-written and demonstrates the student's ability to reflect upon and assess his or her own work. The student can provide several strong examples connecting his or her choices of subject matter, media, tools and processes with the ideas being conveyed.

TEACHER TIPS

Expressing ideas from classroom research in a work of art may be difficult for some students. It may be helpful for students to read additional interviews with paleo artists to learn about the ideas they were trying to convey and the strategies they used in specific works of art to get these ideas across. See the **Resources** section for listings of artists' Web sites.

Some students may want to do further research. Share the information on *Discoveries from Paleontologists and Dinosaur Hunters* (page 42) with them. They may be interested to learn that not all dinosaur discoveries are made by paleontologists.

DISCOVERIES FROM PALEONTOLOGISTS AND DINOSAUR HUNTERS

These scientists and dino hunters have all made discoveries that changed the way we think about dinosaurs.

PHILIP CURRIE AND EVA KOPPELHUS

Philip Currie is a Canadian paleontologist. He has worked extensively in Canada and Asia and recently excavated feathered dinosaurs in China. He is a leading proponent of the connection between dinosaurs and birds. He discovered a number of new dinosaur species, including *Albertosaurus*. His wife, Eva Koppelhus, is a paleobotanist. They travel the world in search of fossils and have coauthored several books about dinosaurs.

ROBERT BAKKER

Robert Bakker is one of the best known paleontologists in the United States. In the late 1960s, he presented new evidence supporting the idea that dinosaurs were warm-blooded, active, fast-moving animals. This revolutionized views of dinosaurs for paleontologists, paleo artists and members of the public. Bakker is also one of the leading proponents of the theory that modern birds are related to some dinosaur species. He has authored several books and often appears on television science programs.

BUCKY DERFLINGER

Not all dinosaur discoveries are made by paleontologists. Bucky Derflinger found his first dinosaur bone at age 9 while growing up on his family's ranch in South Dakota. This sparked his long-term interest in dinosaurs. In 1998, when he was 20, the young cowboy discovered the fossilized skeleton of a juvenile *Tyrannosaurus rex* specimen now known as "Bucky." This important find is the sixth most complete *T. rex* fossil ever discovered and the first found with an identified furcula or "wishbone." This and other fossil evidence indicates a relationship between theropods like the *T. rex* and birds. Bucky continues his work as a rancher and dinosaur hunter while his namesake is on display in **Dinosphere** at **The Children's Museum**.

DINOSAUR DISCOVERY RESEARCH GUIDE

Use these research questions to help you find the information you will need to create your work of art:

1 What is unusual or new about this dinosaur discovery? How will it change the way people think about dinosaurs?

2 What is known about the anatomy of the dinosaur you are researching?

- Skeletal Structure — Were the bones thick or thin? What was its size compared to other familiar objects or animals? Was it a **biped** or **quadruped**? How do we know?
- Teeth — What kind of teeth did the dinosaur have, if any? What does this suggest?
- Does the dinosaur have any other special features? Did it have feathers, horns, plates, frills, scales or claws?

3 How did this dinosaur interact with its environment?

- How did your dinosaur meet its **basic needs** for food, protection and a place to live? Is your dinosaur a meat eater or a plant eater? Will you show it eating, drinking or sleeping?
- How did it live with other dinosaurs? Will you show it alone, grazing with a herd, or hunting another animal? Will you show it playing, fighting or running from a predator? Are there other ways you might show it?
- What was its **habitat** like? Will you show it in a forest, by a river or sea, or on a dry plain? What other types of habitat might you choose?

4 What kinds of evidence do we have that suggest answers to these questions?

5 Do you have other questions about this dinosaur?

RESOURCES FOR CHILDREN

BOOKS

Arnold, Caroline. *Dinosaurs All Around: An Artist's View of the Prehistoric World.* New York: Clarion Books, 1993. This book for Grades 4 – 6 uses photos and text to describe the way that sculptor Stephen Czerkas recreates dinosaurs, including some that are as big as life!

Barrett, Paul. *National Geographic Dinosaurs*. Washington, D.C.: National Geographic Society, 2001. Raul Martin, illustrator.

Cooley, Brian and Mary Ann Wilson. *Make-a-Saurus: My Life with Raptors and Other Dinosaurs*. Toronto: Annick Press Ltd., 2000.

Farlow, James Orville. *Bringing Dinosaur Bones to Life: How Do We Know What Dinosaurs Were Like?* New York: Franklin Watts, 2001. James E. Whitcraft, illustrator. This source explains how artists and scientists create art featuring dinosaurs using the fossil record as a guide.

*Gillette, J. Lynett. *Dinosaur Ghosts: The Mystery of Coelophysis*. New York: Dial Books for Young Readers, 1997. Douglas Henderson, illustrator. This book explores the death of a large group of *Coelophysis* dinosaurs by presenting readers with several theories of how they might have died en masse. This is a good resource for exploring the process of scientific inquiry.

*Horner, John R. *Maia: A Dinosaur Grows Up*. Bozeman, Mont.: Museum of the Rockies, 1998. Doug Henderson, illustrator. Suitable for Grades K–4, this book traces a baby duckbill dinosaur, living 80 million years ago, as she is born, leaves her mother's nest and grows up to have offspring of her own.

Kerley, Barbara. *The Dinosaurs of Waterhouse Hawkins.* New York: Scholastic, 2001. Brian Selznick, using original sketches by Hawkins as inspiration, beautifully illustrates this account of the life of Waterhouse Hawkins.

Kudlinski, Kathleen V. *Boy, Were We Wrong About Dinosaurs!* New York: Dutton, 2005. S.D. Schindler, illustrator. There is always more to learn about dinosaurs. Kudlinski helps children move from fantasy to scientific inquiry by making it clear that even the most recent ideas about dinosaurs may change as we discover more.

Lambert, David. *The Giant Dinosaur Book.* New York: Kingfisher, 2001. Jeremy Gower, illustrator. This dinosaur reference provides readers with general information about all species of known dinosaurs.

Lambert, David. *The Ultimate Dinosaur Book*. New York: DK Publishing, Inc., 1993. This reference book provides information about every dinosaur species, including visuals and descriptions. It also contains a section explaining how dinosaurs go from being buried to being discovered and then exhibited.

*Lessem, Don. *Seismosaurus: The Longest Dinosaur.* Minneapolis, Minn.: Carolrhoda Publications, 1996. Donna Braginetz, illustrator. Lessem focuses on the discovery and excavation of the fossils that led to the identification and classification of *Seismosaurus.* The text is easy to read for upper elementary and middle school students and includes photos, charts and full-color illustrations. Also included are facts about other dinosaurs, dino digs, and the history of fossils.

*Shealy, Dennis R. *Dinosaurs Alive! The Dinosaur-Bird Connection*. New York: Random House Inc., 2001. Michael Skrepnick, illustrator. This book explores the possible relationship between dinosaurs and birds and theorizes that birds are the only type of dinosaur still alive.

**Illustrations in these books are by artists whose work is part of The Lanzendorf Collection.*

WEB SITES

Dinosphere: This link on **The Children's Museum** Web site allows students to access dinosaur information, take part in webquests and see how a fossil is prepared in the Paleo Prep Lab.
Dinosphere.org

Enchanted Learning: This is a reference site where kids can explore dinosaurs. It provides fact sheets, printouts and other materials.
http://www.enchantedlearning.com/subjects/dinosaurs

Age of the Dinosaurs: This BBC interactive site provides photos and complete, up-to-date information on dinosaurs.
http://www.bbc.co.uk/sn/prehistoric_life/dinosaurs/

RESOURCES FOR TEACHERS

BOOKS

Katter, Eldon and Marilyn G. Stewart. *Art: A Community Connection.* Worcester, Mass.: Davis Publications, 2001. This outstanding resource will enhance the understanding of visual arts for both arts educators and classroom teachers.

Lanzendorf, John. *Dinosaur Imagery: The Science of Lost Worlds and Jurassic Art.* San Diego, Calif.: Academic Press, 2000. This book showcases the paleo art collected by John Lanzendorf and features biographical information about many of the artists in the collection. It also explains the role that John Lanzendorf has in the fields of paleontology and paleo art.

Norell, Mark A. et al. *Discovering Dinosaurs in the American Museum of National History*. New York: Knopf, 1995. This reference book for young adults and adults provides comprehensive information about dinosaurs from the American Museum of Natural History's collection and research.

Palmer, Douglas, ed. *The Simon & Schuster Encyclopedia of Dinosaurs & Prehistoric Creatures: A Visual Who's Who of Prehistoric Life*. New York: Simon & Schuster, 1999. Using outstanding images and limited text, this source provides extensive general information about specific dinosaur specimens.

Rey, Luis V. *Extreme Dinosaurs*. San Francisco: Chronicle Books, 2001. Luis V. Rey, illustrator. This book explores the relationship between science and creativity, showing how the fossil record provides paleo art with up-to-date, accurate scientific information.

WEB SITES

The following sites are suggested for teachers but also may be useful for student research. Preview all sites to make certain they are suitable for your students.

Dinosauria On-Line: This is a reference site for adults and older children, focusing on every aspect of dinosaurs including ancient birds, dinosaurs, evolution, fossilization, extinction, even legal issues surrounding many discoveries.
http://www.dinosauria.com

Dinosaur Illustrations: This site helps visitors locate dinosaur illustrations posted on the Internet.
http://www.search4dinosaurs.com

The Dinosaur Interplanetary Gazette: There is a lot to explore on this site. The Dinosaur Links page provides links and background information on various dinosaurs, paleontology, recent and past discoveries, museum exhibits, paleo art and more. Listings of paleo artists do not always have supporting information and images. Those that are available are worthwhile.
http://www.dinosaur.org

The Web sites listed below provide information about some of the paleo artists whose works are part of the Lanzendorf Collection. ***Be sure to screen all Web sites to make sure that they are appropriate before offering them to your students.***

Michael Skrepnick:
http://www.dinosaursinart.com

John Bindon:
http://www.bindonart.com/

Stephen and Sylvia Czerkas:
http://www.dinosaur-museum.org

Brian Cooley:
http://www.dinosaur.org/dinodel/dinodelcooley.htm

Luis V. Rey:
http://www.luisrey.ndtilda.co.uk

Michael Trcic:
http://www.trcicstudio.com/

James Gurney:
http://www.dinotopia.com

Tony McVey:
http://www.menagerieproductions.com

Robert Walters:
http://www.dinoart.com

John Gurche:
http://www.gurche.com/content_dinosaurs.htm

Douglas Henderson:
http://gallery.in-tch.com/~earthhistory/

GLOSSARY

Accurate — an emphasis on being careful, exact and precise; free from mistakes or errors

Adaptation — a body part (feathers, scales, teeth, horns) or behavior (living in groups, hibernation) that gives an animal species an advantage and helps it survive in its environment

Alamosaurus – a long-necked, whip-tailed plant eater, about 69 feet long and weighing approximately 33 tons, that lived during the late Cretaceous period. This dinosaur originated in South America, but fossils have been found in New Mexico, Texas and Utah.

Anatomy — the structure of an organism, such as an animal or plant

Armature — a framework for supporting the clay or other material used in modeling a sculpture

Art — creative work, its principles or outcomes; human activity that may include many different art forms, such as painting, sculpture, architecture, theatre, dance or music

Artist — a person who uses the skills and processes of an art form to create works of art

Basic needs — the minimum that an animal needs to survive, such as food, water and protection

Biped — an animal that uses only its hind legs for locomotion

Carnivore — an animal that feeds primarily on the flesh of other animals

Collection — a group of things purposely collected that share a common theme

Color — the visual sensation caused by the refection of light waves of different length; one of the elements that an artist selects and manipulates to achieve a certain effect

Corythosaurus — a duckbill dinosaur with a hollow bony crest on top of its head that lived in western North America in the late Cretaceous period

Cretaceous period — the third and final period of the Mesozoic era, lasting from 144 million years ago to 65 million years ago, in which the dinosaurs were one of the dominant life forms

Design elements — basic components of an artwork, such as line, shape, form, color, value, space and texture

Design principles — the different ways artists organize or use elements of an artwork. Examples include balance, contrast, emphasis, pattern, proportion, movement, rhythm, unity and variety

Environment — the conditions that make up one's surroundings

Evidence — data that proves support for a hypothesis

Form — an element of design. Any three dimensional object. A form has height, width and depth

Fossil — the preserved remains, imprint or trace of an ancient plant or animal

Fossil record — the accumulated body of information developed by scientists through the long-term study of fossils

Habitat — the region or environment where a plant or animal naturally grows or lives

Herbivore — an animal that eats only plants

Hypothesis — an unproved proposition about how something in nature works that can be tested by further investigation, experiments or observations

Inference — an opinion or idea about something based on indirect evidence (for example, ideas about how some dinosaurs may have behaved have been developed by observing present-day animals)

Inquiry — an investigation into something

Interpretation — a person's conception, explanation or translation of an idea, subject or work of art

Line — a thin, straight or curved mark made by pencil, pen, chalk or other medium; one of the design elements that an artist manipulates to achieve a certain effect

Media — the materials an artist uses, such as pencil, chalk, oil paints, clay, metal, glass, etc. (singular: **medium**)

Mesozoic era — an era of geological time ranging from 248 million years ago to 65 million years ago and divided into three shorter periods, the Triassic, the Jurassic and the Cretaceous

Mixed media — the use of different media, such as watercolors and pencil, in the same composition

Movement — the suggested motion in an artwork achieved by the way an artist arranges the components of the work or uses media in a specific technique

Mural — an image painted on a wall or other large surface

Observation — a fact about a specimen that can be directly observed

Painting — a form of art that uses oil, water or acrylic paints to develop an image on a two-dimensional, flat surface

Pachycephalosauridae family — a family of plant-eating dinosaurs. Some species in this family have domed heads made of solid bone and a series of bony knobs at the back of the skull and along the snout. The newly discovered, flat-headed dinosaur skull at **The Children's Museum** is a new genus and species of the Pachycephalosauridae family called *Dracorex hogwartsia*.

Paleo art — an artistic style that reconstructs life in earlier geologic periods based on scientific evidence

Paleo artist — an artist who works with paleontologists and uses scientific evidence to reconstruct life in earlier geologic periods

Paleontologist — a scientist who studies fossils and other evidence to understand life in earlier geologic periods

Paleontology — the study of life in earlier geologic periods, focusing on fossils for clues

Photorealism — a style of late 20th-century painting that explores the way people and objects are seen by the camera, rather than the human eye

Proportion — the comparative relationship between things, parts or elements with respect to size, amount, degree, etc.; the relationship between parts of a whole; balance, harmony

Protoceratops — a plant-eating dinosaur that lived in herds in lowland habitats of Mongolia during the late Cretaceous period. *Protoceratops* had a parrot-like beak and a large frill extending back from its face.

Public art — art created to be viewed in public spaces

Quadruped — an animal that uses all four legs for locomotion

Realism — an artistic style that emphasizes the representation of people and things are they really are

Scale — the proportion that a map, model, etc., has to the thing that it represents; the ratio between the dimensions of a representation and those of the actual object (for example, 1 inch equals 1 mile)

Sculpture — an art form that uses materials such as wood or metal to build three-dimensional arrangements

Shape — a two-dimensional natural (curved or irregular) or geometric (circle, triangle, square) figure created by a line that surrounds a space

Sinosauropteryx — a theropod living in the early Cretaceous period whose skin was covered with downy structures that may have evolved into feathers

Texture — the surface qualities of a work of art or the appearance of surface qualities that appeal to the sense of touch

Three-dimensional — art forms that have length, width and depth, such as architecture, sculpture, pottery, etc.

Theory — a set of principles or circumstances that explains an observed phenomenon and is supported by considerable evidence

Theropod — a suborder of dinosaurs that walked upright on their hind legs and ate meat

Triceratops — a three-horned, four-legged plant eater from the middle to late Cretaceous Period

Two-dimensional — Art forms that have length and width but not depth, such as drawing, collage, painting and print

Tyrannosaurus rex — A two-legged theropod from the late Cretaceous period

ACADEMIC STANDARDS

The Paleo Artists unit of study addresses the following state and national academic standards:

INDIANA STANDARDS

Indiana Language Arts Standards

Grade 3 Language Arts Standards

Comprehension and Analysis of Grade-Level-Appropriate Text

3.2.2 Ask questions and support answers by connecting prior knowledge with literal information from the text.

3.2.3 Show understanding by identifying answers in the text.

Organization and Focus

3.4.2 Discuss ideas for writing, use diagrams and charts to develop ideas, and make a list or notebook of ideas.

3.4.3 Create single paragraphs with topic sentences and simple supporting facts and details.

Research and Technology

3.4.4 Use various reference materials (such as a dictionary, thesaurus, atlas, encyclopedia and online resources).

Different Types of Writing and Their Characteristics

3.5.3 Write personal, persuasive, and formal letters, thank-you notes, and invitations that show awareness of the knowledge and interests of the audience; establish a purpose and context; and include the date, proper salutation, body, closing and signature.

Grade 4 Language Arts Standards

Structural Features of Informational and Technical Materials

4.2.1 Use the organization of informational text to strengthen comprehension.

4.2.5 Compare and contrast information on the same topic after reading several passages or articles.

Organization and Focus

4.4.1 Discuss ideas for writing. Find ideas for writing in conversations with others and in books, magazines, newspapers, school textbooks or on the Internet. Keep a list or notebook of ideas.

4.4.4 Use common organizational structures for providing information in writing, such as chronological order, cause and effect, or similarity and difference, and posing and answering a question.

Research and Technology

4.4.7 Use multiple reference materials and online information (the Internet) as aids to writing.

Different Types of Writing and Their Characteristics

4.5.6 Write for different purposes (information, persuasion) and to a specific audience or person.

Grade 5 Language Arts Standards

Structural Features of Informational and Technical Materials

5.2.1 Use the features of informational texts, such as formats, graphics, diagrams, illustrations, charts, maps and organization, to find information and support understanding.

Comprehension and Analysis of Grade-Level-Appropriate Text

5.2.3 Recognize main ideas presented in texts, identifying and assessing evidence that supports those ideas.

5.2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Organization and Focus

5.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

5.4.3 Write informational pieces with multiple paragraphs that present important ideas or events in sequence or in chronological order; provide details and transitions to link paragraphs; and offer a concluding paragraph that summarizes important ideas and details.

Research and Technology

5.4.5 Use note-taking skills.

Different Types of Writing and Their Characteristics

5.5.4 Write persuasive letters or compositions that state a clear position in support of a proposal; support a position with relevant evidence and effective emotional appeals; follow a simple organizational pattern, with the most appealing statements first and the least powerful ones last; and address reader concerns.

Indiana Visual Arts Standards

Grade 3 Visual Arts Standards

Responding to Art: History

3.1.1 Identify visual clues in works of art and artifacts that reflect characteristics of a given culture and speculate on where, when and by whom the work was made.

3.1.2 Speculate on the function or purpose of a work of art and make connections to the culture.

Responding to Art: Criticism

3.3.1Identify and describe sensory, formal, technical and expressive properties in the work.

3.3.2 Construct meaning in works of art based on personal response, properties found in the work and background information about the work.

3.3.3 Use appropriate art vocabulary.

Responding to Art: Aesthetics

3.6.2 Reflect on personal response to a work of art and identify personal preference.

Creating Art: Production

3.7.1 Demonstrate observational skills in the production of artwork.

3.8.1 Apply elements (line, shape, form, texture, color and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis) in their work that effectively communicates their ideas.

3.9.1 Identify differences between media and the visual characteristics of each medium.

3.9.2 Identify and control different media, techniques and processes to effectively communicate ideas, experiences, and stories.

3.10.1 Demonstrate evidence of reflection, refinement and care in completion of work.

3.10.2 Identify and apply assessment criteria for studio work (craftsmanship, control of media, communication of ideas) and reflect on the evidence of those qualities in their work.

Integrated Studies

3.13.2 Demonstrate the ability to create a work of art integrating concepts, subject matter or the sign systems (such as words or numbers) of another discipline.

Grade 4 Visual Arts Standards

Responding to Art: History

4.1.1 Identify the relationship between a work of art and the geography and characteristics of the culture; and identify where, when and by whom the work was made (focus: Indiana history).

4.1.2 Research and identify the function of a work of art or artifact and make connections to the culture (artifacts from Indiana).

Students describe, analyze and interpret works of art and artifacts.

Responding to Art: Criticism

4.3.1 Analyze sensory, formal, technical and expressive properties in a work of art.

4.3.2 Construct meaning based on properties found in the work, personal response and research on the work and its context.

4.3.3 Use appropriate art vocabulary.

Responding to Art: Aesthetics

4.6.2 Understand that personal preference is one of many criteria used in making informed judgments.

Creating Art: Production

4.7.1 Demonstrate refined observational skills in their work.

4.8.1 Apply elements (line, shape, form, texture, color and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis) in work that effectively communicates their ideas.

4.9.1 Identify differences between media and the visual characteristics of each medium.

4.9.2 Identify and control different media, techniques and processes to effectively communicate ideas, experiences and stories.

4.10.1 Demonstrate the ability to successfully generate an idea, select and refine an idea, and execute the idea.

4.10.2 Identify and apply criteria for assessment in their work, in peer critiques and in self-assessment.

Integrated Studies

4.13.2 Create a work of art using subject matter, concepts or sign systems (words, numbers) of another discipline.

Grade 5 Visual Arts Standards

Responding to Art: History

5.1.1 Identify the relationship between a work of art and the geography and characteristics of the culture, and identify where, when, why and by whom the work was made (focus: North America).

5.1.2 Identify and compare works of art and artifacts with similar functions.

Students describe, analyze and interpret works of art and artifacts.

Responding to Art: Criticism

5.3.1 Analyze the artist's use of sensory, formal, technical and expressive properties in a work of art.

5.3.2 Construct meaning in the work based on personal response, properties found in the work, and background information on the context of the work.

5.3.3 Use appropriate art vocabulary.

Responding to Art: Aesthetics

5.6.2 Understand that personal preference is one of many criteria used in making judgments about art.

Creating Art: Production

5.7.1 Demonstrate refined observational skills through accurate rendering of representational objects and subject matter from life.

5.8.1 Apply elements (line, shape, form, texture, color, value and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis and unity) in work that effectively communicates their ideas.

5.9.1 Discriminate between visual characteristics of a variety of media and selectively use these in their work.

5.9.2 Identify and control different media, techniques and processes to effectively communicate ideas, experiences, and stories.

5.10.1 Demonstrate evidence of reflection, thoughtfulness and care in selecting ideas and completing work.

5.10.2 Identify and apply criteria for assessment in their work, in peer critiques and in self-assessment.

Integrated Studies

5.13.2 Create products or performances (debates, critiques, papers) that communicate in-depth knowledge gained through integrated study of a theme, historical period or event.

Indiana Science Standards

Grade 3 Science Standards

The Nature of Science and Technology

3.1.3 Keep and report records of investigations and observations using tools, such as journals, charts, graphs and computers.

3.1.4 Discuss the results of investigations and consider the explanations of others.

3.1.5 Demonstrate the ability to work cooperatively while respecting the ideas of others and communicating one's own conclusions about findings.

Scientific Thinking

3.2.6 Make sketches and write descriptions to aid in explaining procedures or ideas.

The Living Environment

3.4.5 Give examples of some kinds of organisms that have completely disappeared and explain how these organisms were similar to some organisms living today.

Common Themes

3.6.3 Explain how a model of something is different from the real thing but can be used to learn something about the real thing.

Indiana Science Standards Continued

Grade 4 Science Standards

The Nature of Science and Technology

4.1.3 Explain that clear communication is an essential part of doing science since it enables scientists to inform others about their work, to expose their ideas to evaluation by other scientists and to allow scientists to stay informed about scientific discoveries around the world.

Scientific Thinking

4.2.5 Write descriptions of investigations, using observations and other evidence as support for explanations.

4.2.6 Support statements with facts found in print and electronic media, identify the sources used and expect others to do the same.

4.2.7 Identify better reasons for believing something than "Everybody knows that ..." or "I just know" and discount such reasons when given by others.

The Living Environment

4.4.6 Explain how in all environments, organisms are growing, dying and decaying, and new organisms are being produced by the old ones.

Common Themes

4.6.3 Recognize and describe how changes made to a model can help predict how the real thing can be altered.

Grade 5 Science Standards

The Nature of Science and Technology

5.1.2 Begin to evaluate the validity of claims based on the amount and quality of the evidence cited.

Scientific Thinking

5.2.4 Keep a notebook to record observations and be able to distinguish inferences from actual observations.

The Living Environment

5.4.7 Explain that living things, such as plants and animals, differ in their characteristics, and that sometimes these differences can give members of these groups (plants and animals) an advantage in surviving and reproducing.

5.4.8 Observe and describe how fossils can be compared to one another and to living organisms according to their similarities and differences.

NATIONAL STANDARDS

National Standards for Art Education

Visual Arts K–4

Content Standard 1: Understanding and applying media, techniques and processes

a) know the difference in materials, techniques and processes

c) use different media, techniques and processes to communicate ideas, experiences and stories

d) use art materials and tools in a safe, responsible manner

Content Standard 2: Using knowledge of structures and functions

a) know the differences among visual characteristics and purposes of art in order to convey ideas

b) describe how different expressive features and organizational principles cause different responses

Content Standard 3: Choosing and evaluating a rage of subject matter, symbols and ideas

a) explore and understand prospective content for works of art

b) select and use subject matter, symbols and ideas to communicate meaning

Content Standard 4: Understanding the visual arts in relation to history and culture

b) identify specific works of art as belonging to particular cultures, times and places

Content Standard 5: Reflecting upon and assessing the characteristics and merits of their work and the work of others

a) understand there are various purposes for creating works of visual art

c) understand there are different responses to specific artworks

Content Standard 6: Making connections between visual arts and other disciplines

b) identify connections between the visual arts and other disciplines in the curriculum

Visual Arts 5–8

Content Standard 1: Understanding and applying media, techniques and processes

a) apply media, techniques and processes with sufficient skill, confidence and sensitivity so that their intentions are carried out in their artworks

b) conceive and create works of visual art that demonstrate an understanding of how the communication of their ideas relates to the media, techniques and processes they use

Content Standard 2: Using knowledge of structures and functions

b) evaluate the effectiveness of artworks in terms of organizational structures and functions

Content Standard 3: Choosing and evaluating a range of subject matter, symbols and ideas

b) apply subjects, symbols and ideas in their artworks and use the skills gained to solve problems in daily life

Content Standard 5: Reflecting upon and assessing the characteristics and merits of their work and the work of others

b) describe meanings of artworks by analyzing how specific works are created and how they relate to historical and cultural context

c) reflect analytically on various interpretations as a means for understanding and evaluating works of visual art

Content Standard 6: Making connections between visual arts and other disciplines

b) compare characteristics of visual arts within a particular historical period or style with ideas, issues or themes in the humanities or sciences

National Science Education Standards

Content Standards K–4

Content Standard A — Science as Inquiry: As a result of activities in grades K–4, all students should develop
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry
Content Standard C — Life Science: As a result of activities in grades K–4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, organisms and environments
Content Standard E — Science and Technology: As a result of activities in grades K–4, all students should develop
Understanding about science and technology
Abilities to distinguish between natural objects and objects made by humans
Content Standards G — History and Nature of Science: As a result of activities in grades K-4, all students should develop understanding of science as a human endeavor

Content Standards: 5–8

Content Standard A — Science as Inquiry: As a result of activities in grades 5-8, all students should develop abilities necessary to do scientific inquiry, understanding about scientific inquiry
Content Standard C — Life Science: As a result of activities in grades 5-8, all students should develop understanding of structure and function in living systems, regulation and behavior, populations and ecosystems, diversity and adaptations of organisms
Content Standard E — Science and Technology: As a result of activities in grades 5-8, all students should develop understanding about science and technology
Content Standards G — History and Nature of Science: As a result of activities in grades 5-8, all students should develop understanding of science as a human endeavor, nature of science, history of science

Standards for the English Language Arts

Standard 1: Students read a wide range of print and non-print texts to build an understanding of texts, themselves and the cultures of the United States and the world; to acquire new information; to respond to the needs of and demands of society and the workplace; and for personal fulfillment.
Standard 3: Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts.
Standard 4: Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
Standard 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
Standard 7: Students conduct research on issues and interests by generating ideas and questions and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
Standard 8: Students use a variety of technological and informational resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge

The Mann Properties Gallery featuring the Lanzendorf Collection of Dinosaur Imagery at **The Children's Museum** gives students the opportunity to experience original paleo artworks, including works by the artists featured in this unit. Because of the large number of items in the collection, works are rotated on a regular basis.

MICHAEL W. SKREPNICK

"I've been interested in dinosaurs since I was a little kid," Michael Skrepnick points out in a 2001 interview for PaleoPortfolio, a paleo art Web site. Growing up in Canada, his first inspiration as an artist was Rudolph Zallinger's mural *Age of Reptiles*. Michael graduated from art school in the 1970s. When the Royal Tyrrell Museum of Paleontology opened near the fossil fields in the badlands of Alberta, he started doing volunteer fossil preparation there. This led him to do drawings of some of the fossil material and then dinosaur illustrations. Soon he had commissions from paleontologists for illustrations in popular publications and, by 1993, he had begun to work full-time as a paleo artist. Today, Michael is considered one of the world's leading interpreters of ancient life. His drawings and paintings appear in museums, scientific institutions, numerous publications and books, including covers for *The Encyclopedia of Dinosaurs* and John Lanzendorf's *Dinosaur Imagery*. He particularly enjoys working on recent discoveries with paleontologists to reconstruct "soon to be described" species. "When I recall my interest in dinosaurs and dino art as a kid," Michael says, "it now just seems to me that events in my life have taken me full circle."

In the same 2001 interview, Michael admits that *Tyrannosaurus rex and Triceratops* is one of his favorite works, a preference that is shared by the public and other paleo artists. "I think the dominant pose of the predator worked out nicely, the overall composition held it together and the encroaching intruder opens up the 'What's gonna happen next?' response in the viewer," Michael says. "One of the more challenging things about the painting was rendering the *Triceratops'* right brow horn, which was extremely foreshortened, and to try to get the feeling that it was advancing through the picture plane."

Tyrannosaurus rex and Triceratops
Medium: Acrylic on Masonite
Date: 1998
Dimensions: 35 1/2" W x 20 3/4" H

In *Dinosaur Imagery,* Michael comments on the scientific background that serves as the foundation of the painting: "*Tyrannosaurus rex* was a fierce predator and an unmistakably efficient opportunistic scavenger. The painting depicts this majestic carnivore over a recent carcass of *Triceratops* along a river embankment." Michael points out that the *T. rex* probably didn't kill its unfortunate meal and is simply a scavenger in this case. *Triceratops* weighed several tons, had three sharp lance-like horns and would be a hard animal to kill, but that doesn't mean there won't be a fight! Michael describes the painting's dramatic tension: "The *Tyrannosaurus* has just begun to feed and has been discovered by another of its kind patrolling the river's edge. Perhaps a skirmish over the prize will ensue, the outcome of which will be observed by a lone turtle, hidden amidst the shoreline detritus."

Other artworks at The Children's Museum

Michael works in several different media, including pen and ink, pencil, Prismacolor and paint. For the painting process, he usually works in acrylics on Masonite. He has completed three paintings that reconstruct the three major fossil scenarios in **Dinosphere** at **The Children's Museum**: *T. rex Attack*, *The Watering Hole* and *Scavenger or Predator?*. The original paintings and several other of his works can be viewed in the **Mann Properties Gallery**.

In an April 2004 interview with museum staff, Michael describes how he develops works like these and the effect that he hopes to have on the viewer: "Once I have worked out the anatomy of the dinosaurs (having fleshed out the skeletal mounts), having amassed reference material regarding the specific plants involved as well as generic landscape imagery that reflects similar lighting and time of day that will appear in my reconstruction, I begin the actual painting process. The sky is always laid in first, and after 'blocking in' the ground, I most often work from the distant background into the foreground. As the landscape is being developed, I will reach a point at which the outlines of the dinosaurs are dropped into the scene. Color and light are rendered onto the dinosaurs to reveal their three-dimensional form and must replicate the light source (the sun) in the same manner as they light appears to be falling on the background surroundings in order for the entire scene to appear 'correct.' If all the research and technical problems are handled in a careful and methodical manner, the resulting image should transcend the actual physical diorama components, allowing the viewer to be 'drawn in' to the image, experiencing a state of 'suspended disbelief' in which for a few moments they feel as though they have been transported back in time to the Cretaceous!"

SYLVIA J. CZERKAS

Born in 1943, Sylvia Czerkas is a sculptor, book author, editor and researcher. She and her husband, paleo artist Stephen Czerkas, usually work as a team. Together they founded The Dinosaur Museum in Blanding, Utah, where they tell the story of dinosaurs through fossils, graphics and sculptures, including reconstructions of dinosaur specimens from the Four Corners area of New Mexico, Arizona, Utah and Colorado. Sylvia and Stephen have developed several traveling exhibits and often spend their summers digging for fossils. Sylvia served as guest curator for *Dinosaurs Past and Present,* a major exhibit and scientific symposium organized by the Natural History Museum of Los Angeles in 1986. She was also co-editor of the two-volume book by the same name. In 2005, both Sylvia and Stephen received honorary doctorates from the California Academy of Arts.

As a result of their meticulous study of rare fossilized skin samples, the Czerkases have developed a reputation for their realistic reconstructions of both dinosaur anatomy and skin features. Most recently the Czerkas team has worked on a National Geographic project with paleontologist Paul Sereno to reconstruct a scale model of one of Paul's most dramatic discoveries, the most complete spinosaur skeleton ever found. They spent days with Paul documenting and discussing every inch of the fossil. They sculpted every single bone and muscle. When the body structure was complete, they sculpted the surface features of the dinosaur and created a skin in soft earth tones, making it as natural and realistic as possible. Commenting on National Geographic's Web site, Sylvia says: "This was probably the most fun project we've ever had!"

Protoceratops
Medium: Resin
Date: 1975
Dimensions: 4 3/4" H from base

This small sculpture is one of Sylvia's early works. Created in 1975, when scientists had only begun to study dinosaur eggs, this area of research would later become a focus for her as well as for a number of other artists and paleontologists. She has captured the moment when a hatching *Protoceratops* first forces its way out of the egg. Fragments of the egg shell lie near the base of the sculpture. The relatively smooth surface of the egg contrasts with the wrinkled texture of the dinosaur's sturdy little forelegs. The forelegs are bent, suggesting that in the next moment another strong push will split the egg to pieces and free the hatchling for good. Sylvia has tinted the resin sculpture in soft, delicate yellows and pinks. *Protoceratops* communicates both the fragility and determination of this emerging dinosaur life.

Other artworks at
The Children's Museum
The sculptures of Sylvia and Stephen Czerkas are exhibited in museums around the world. In addition to Sylvia's *Protoceratops*, several of Stephen's smaller sculptures are part of the Lanzendorf collection at **The Children's Museum**. His two versions of *Tyrannosaurus rex* demonstrate how new scientific discoveries have changed our ideas about how the body of the *T. rex* looked and functioned.

Whether they are sculpting hatching babies or the largest carnivores, the Czerkases first carry out a painstaking study of fossils, living animals and modern animal behavior. This is fundamental to the process of fleshing out a dinosaur, creating the skin, choosing color and markings and deciding on realistic action poses. When they reconstruct life-size dinosaurs, they first create small-scale models. Then they scale the figure up, construct an armature and sculpt the dinosaur's body in clay. A mold is made from the clay sculpture. When it is dry, the mold is filled with fiberglass. The fiberglass sections are clamped together, the body is assembled and the seams where the sections join are sealed. Finally, color and details are added to complete the sculpture. For more information on how these two paleo artists bring dinosaurs to life, see their book, *My Life With the Dinosaurs*, or read *Dinosaurs All Around: An Artist's View of the Prehistoric World* (Grades 4 – 6) by Caroline Arnold.

DONNA BRAGINETZ

Donna Braginetz is a freelance painter and illustrator known for her precise renderings of dinosaurs and other ancient life. She began her career while a student at Colorado State University. Today, she works at her studio in northern Colorado. Her drawings and paintings have appeared in many books, including *The Encyclopedia of Dinosaurs* (1997) and *The Complete Dinosaur* (1997) and in magazines such as *Natural History* and *Ranger Rick*. She has also illustrated a series of children's books about dinosaurs for Carolrhoda/Lerner Publications. Currently she is working on paleo landscape paintings for the Denver Museum of Nature and Science and for the National Science Museum in Tokyo.

Donna began to receive a great deal of attention in the paleo art world when she painted the first landscape in the *Ancient Denvers* series. This project is a

reconstruction of how the Denver area may have looked in different geologic periods. Positive public response led to the expansion of the project to include 13 additional works.

For the expanded *Ancient Denvers* project, Donna was part of a team including sculptor and painter Gary Staab, muralist Jan Vriesen, geologist Bob Raynolds, and Kirk Johnson, curator of paleontology at the Denver Museum of Nature and Science. The process of creating past landscapes involves the skills and expertise of both scientists and artists. Paleontologists excavate fossils and, sometimes with the help of a scientific illustrator, make sketches of individual fossils and what the organism may have looked like when alive. Geologists provide information on rock layers and topography. Plant and animal biologists contribute information based on their studies of existing plants and animals as well as those that existed during the time of the dinosaurs. The paleo artist uses this data to make an initial sketch to develop the composition of the painting and the look of the plants and animals. Scientists give critical feedback and the artist makes revisions before beginning to paint. This exchange of ideas between scientists and the artist continues until a painting emerges that is as scientifically accurate as possible.

Juvenile Corythosaurus
Medium: Acrylic on bristol board
Date: 1995
Dimensions: 8" W x 9" H

Donna demonstrates the intense attention to detail that is the hallmark of her work in this painting of a young duckbill dinosaur. The image almost appears to be a close-up seen through the lens of a camera, with the head and neck of the subject in sharp focus while other members of the herd form soft focus patterns of shape and color in the background. Donna shows every wrinkle and bump in the texture of the young dinosaur's skin and captures an expression that is both curious and wary. The young *Corythosaurus* seems to be staring back into the camera's eye, trying to decide whether to investigate or flee. The entire herd is on alert, their eyes dark and intent in the background. In the next moment they may bolt.

Behaviors of this type can be seen in herds of prey animals today. Scientific observation of living animals may also be the basis for the distinctive markings and colors of *Corythosaurus*, rendered in acrylics in this painting. While there is no direct evidence of dinosaur coloration, scientists and paleo artists speculate that it may have served the same purposes as it does for living animals. Diversity in color allows different species to recognize each other and often plays a role in mating behavior. It allows herding animals to distinguish between members of their group and predators who may be stalking the herd. It can also serve as camouflage that makes them more difficult for predators to see.

Other artworks at
The Children's Museum

In addition to *Juvenile Corythosaurus*, another of Donna's works, *Omnivorous Ornithomimids* (1994) is part of the Lanzendorf Collection. This painting shows two ornithomimid specimens that appear to be feeding on both plants and small animals. In this work, Donna continues to use the techniques of photorealism by placing the figures of the dinosaurs in the foreground in sharper focus than the misty green background. To appreciate the range of Donna's work, see her illustrations in children's books such as *Seismosaurus: The Longest Dinosaur* (1996) by Don Lessem, or visit the "Landscapes" section of the *Ancient Denvers* exhibition at: **http://www.dmns.org/main/minisites/ancientDenvers/landscapes.html**

Omnivorous Ornithomimids
Medium: Acrylic on bristol board
Date: 1994
Dimensions: 23" W x 18" H

BRIAN COOLEY

Brian Cooley grew up loving the wide-open spaces of his home in Alberta, Canada. As a boy, he hiked for miles to observe plants and wildlife. He also enjoyed reading science fiction and dinosaur stories. "I started collecting plastic dinosaurs at age 5," Brian says in a February 2004 e-mail interview with **The Children's Museum**. "I made environments for them and also drew and sculpted dinosaurs throughout childhood. I used to enter my dinosaur dioramas in the local fair every year. Who'da thought?"

Brian's parents encouraged him to draw, paint and sculpt. Unlike some children, he never stopped. After graduating from high school, he attended the Alberta College of Art in Calgary, where he majored in sculpture and met his wife, Mary Ann Wilson, a painter. Mary Ann was born in Whitehorse, Yukon, and moved to Alberta at the age of 13. Her

mother was a painter so, like Brian, Mary Ann was encouraged to draw and paint at an early age.

Brian's first job after graduating from art school was sculpting a volcano for the Calgary Zoo's Prehistoric Park. That led to working with Mary Ann to construct a dinosaur for a company in Vancouver. In the course of doing research for the project, the couple met Dr. Philip J. Currie, one of the world's most prominent paleontologists. Dr. Currie's enthusiastic accounts of new discoveries and theories renewed Brian's love of dinosaurs.

Since that time, Brian and Mary Ann have completed many major projects, often working with Dr. Currie. Brian's sculptures are in private collections and museums, including The Royal Tyrrell Museum of Paleontology, The Nature Museum of Canada, The Academy of Natural Sciences in Philadelphia and the Field Museum in Chicago. He is also well-known for bringing life to new fossil discoveries, such as his reconstructions of baby dinosaurs in eggs (1996) and feathered dinosaurs (1998 and 1999) for *National Geographic* magazine.

Brian and Mary Ann have two daughters and spend as much time with them as possible, remembering the encouragement they received from their own parents. They often do creative projects together as a family, one of which was the inspiration for the book, *Make-a-Saurus: My Life with Raptors and Other Dinosaurs.* In this easy-to-understand guide for children, Brian and Mary Ann explain how scientists determined that some dinosaurs had feathers, and Brian shows how he reconstructs life-size feathered models. Photographs help children see how they can use Brian's professional model-building process to create their own works of art.

Brian Cooley, *Alamosaurus family* (detail), fiberglass, lifesize, © 2004 The Children's Museum of Indianapolis

Alamosaurus family (Detail)
Medium: Fiberglass
Date: 2004
Scale: Life size

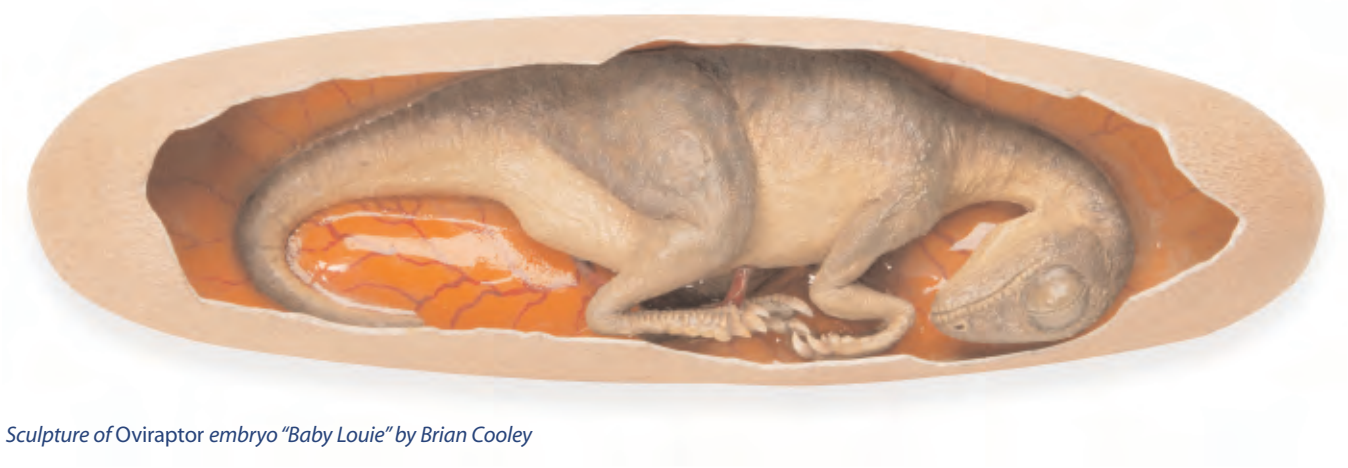
It is now hard to imagine **The Children's Museum** without Brian's sculptures of a 70-foot adult and two 25-foot juvenile sauropods. The *Alamosaurus* family appears to be bursting through the wall of **Dinosphere** as if to run wildly into the nearby intersection. Installed in 2004, this work of public art has become a community focal point and a new museum icon. Visitors often stop to take photographs or simply to look.

While the setting is playful and dramatic, the sculptures are not a work of fantasy. Brian begins a dinosaur sculpture by talking to scientists, measuring skeletons and reading whatever information is available about a dinosaur species. He takes photographs and does sketches of fossils. Often fossils are incomplete. Under these circumstances Brian works with paleontologists to determine what the missing parts may have looked like. Clues can often be found in the fossils of related dinosaurs. This is the case with *Alamosaurus*. No fossilized skull of this dinosaur has ever been found, so Brian used the skull of a related specimen as a model. He used titanosaur skin impressions as a sample for the skin texture and pattern of *Alamosaurus*.

When Brian has finished his research, he makes sketches of the dinosaur in different poses. When he is satisfied with the pose, he creates an armature to support the sculpture by cutting steel rods to the exact size of the bones they represent. Then he welds the rods together in the pose he has selected and begins sculpting, usually in clay.

Constructing a life-size dinosaur may require special materials and procedures. To create *Alamosaurus family*, Brian covered the armatures with sprayed urethane foam, carved the foam and then finished the sculpting process in clay. He textured the clay to recreate the skin. The finished sculptures were cut into sections and rubber molds were made. When the rubber hardened it was removed and the inside of the molds were sprayed with fiberglass. The fiberglass pieces were joined together and painted to complete the dinosaurs.

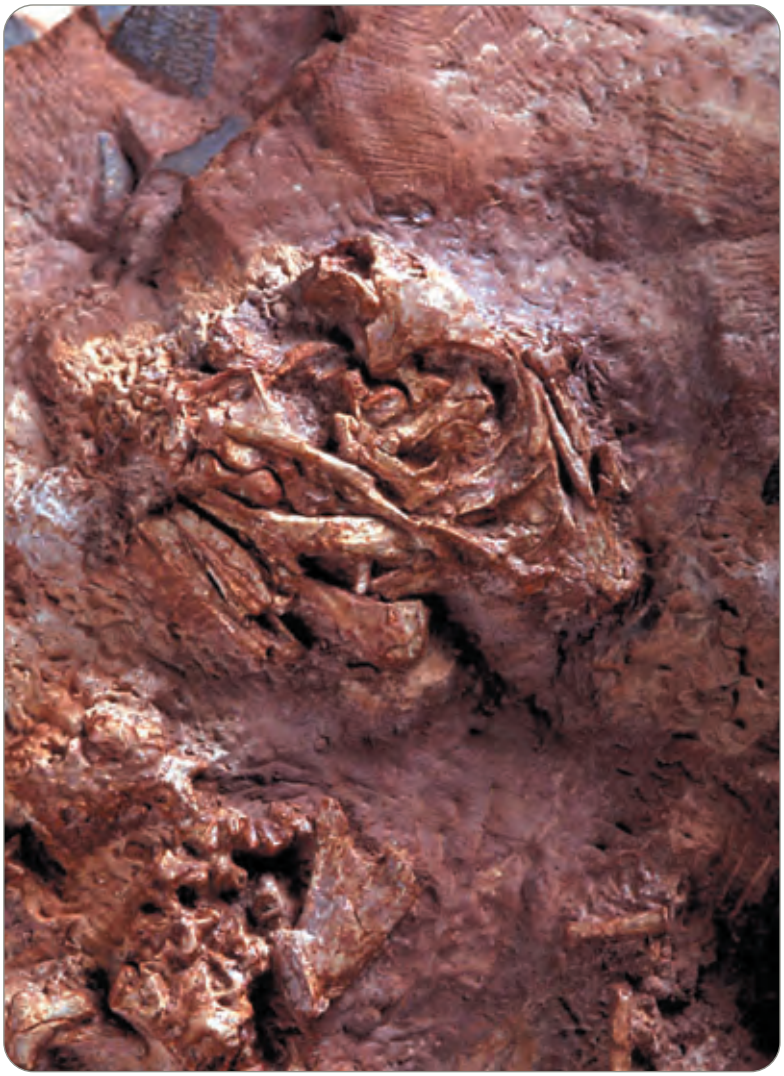
The entire process, from initial design to completion, took a year and a half. The sculptures were shipped from Brian's studio to Indianapolis on large flatbed trucks. The largest of the three dinosaurs had to be shipped in sections and assembled on site. Cleverly, Brian also sculpted fiberglass pieces, painted to match the walls of **Dinosphere**, that appear to be crumbling away from the side of the building as the dinosaurs break free. Viewers can't believe their eyes when they first see this Cretaceous escape under way at the corner of 30th and Illinois streets! Creating this kind of reaction must be rewarding. As Brian says in *Make-a-Saurus,* "It's still great fun for me to imagine what dinosaurs really looked like and how they lived — and to create that world with my own hands."



Sculpture of Oviraptor *embryo "Baby Louie" by Brian Cooley*

Other artworks at The Children's Museum

Brian's small sculptures *Triceratops* and *Albertosaurus & ornithomimids* are part of the Lanzendorf Collection. His sculpture of "Baby Louie," a rare, intact articulated fossil of a dinosaur embryo, is featured in the "Nests and Babies" area of **Dinosphere**. Brian reconstructs the embryonic *Oviraptor* as it may have appeared in the egg. A photograph of this fleshed-out model appeared on the cover of *National Geographic* magazine in May 1996.



The outline of the fossilized skull of the Oviraptor *embryo called "Baby Louie" can be seen in a matrix of rock. The embryo was discovered in China by paleontologist Charlie Magovern in 1994.*

Tyrannosaurus rex and Triceratops

Artist: Michael Skrepnick
Medium: Acrylic on Masonite
Date: 1998
Dimensions: 35 1/2" W x 20 3/4" H

Rudolph Zallinger, *The Age of Reptiles* (detail), mural, 110' w x 15' h, © 1947 The Peabody Museum of Natural History, Yale University

***The Age of Reptiles* (Detail)**

Artist: Rudolph Zallinger
Medium: mural
Date: 1947
Dimensions: 110' L x 15' H

Juvenile Corythosaurus

Artist: Donna Braginetz
Medium: Acrylic on bristol board
Date: 1995
Dimensions: 8" W x 9" H

Protoceratops

Artist: Sylvia Czerkas
Medium: Resin
Date: 1975
Dimensions: 4 3/4" H from base

Brian Cooley, *Alamosaurus Family*, fiberglass, life-size, © 2004 The Children's Museum of Indianapolis

Alamosaurus family

Artist: Brian Cooley
Medium: Fiberglass
Date: 2004
Scale: Life-size

"Before" photo of The Children's Museum ***Dinosphere*** *(Cinedome) view, prior to the installation of the Cooley sculpture*