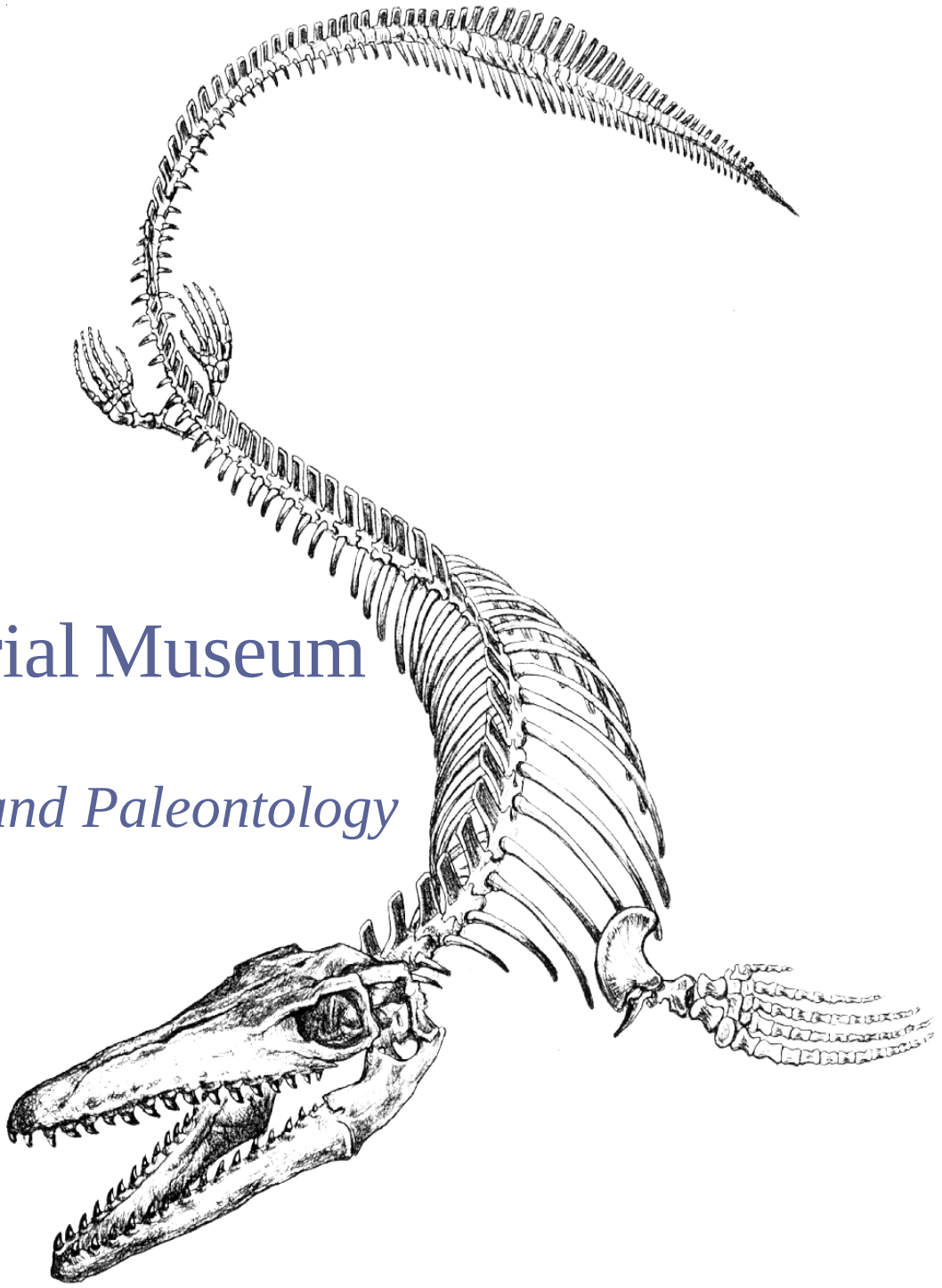

Texas Memorial Museum

Hall of Geology and Paleontology
Educator Guide
Grades 3-5

Texas Memorial Museum
TEXAS NATURAL SCIENCE CENTER
THE UNIVERSITY OF TEXAS AT AUSTIN

Hall of Geology and Paleontology Table of Contents

Hall of Geology and Paleontology Overview

Over its long history Texas has been pocked by meteorites and covered by oceans. Mountains have come and gone, and new ones have appeared. Forests have sprouted and disappeared, and the climate has changed dramatically. Texas has been home to some of the world's strangest and most spectacular creatures. Its dynamic geological history has left today's Texas with a great wealth of natural resources. So walk with us back through the Ice Ages, beyond the Age of Dinosaurs, into the most remote depths of Texas' natural history. By studying environments and life forms of Texas' past, we have learned much about our natural world today. As you walk through the Hall of Geology and Paleontology, consider this: what will the Texas environment be like in the future?

Texas Essential Knowledge and Skills Correlations

English Language Arts and Reading

3rd grade - 3.1, 3.3, 3.4, 3.6, 3.7, 3.8, 3.9, 3.14, 3.15, 3.18, 3.20
4th grade - 4.1, 4.3, 4.5, 4.7, 4.8, 4.9, 4.10, 4.15, 4.16, 4.18, 4.19, 4.21, 4.25
5th grade - 5.1, 5.3, 5.7, 5.8, 5.9, 5.10, 5.15, 5.16, 5.18, 5.19, 5.21, 5.25

Science

3rd grade - 3.8 (A-C), 3.9 (A, B), 3.10 (B)
4th grade - 4.5 (A), 4.8 (A-C), 4.10 (B)
5th grade - 5.9 (A-C), 5.10(A), 5.11 (B)

Social Studies

3rd grade - 3.16 (E)
4th grade - 4.6 (A), 4.22 (C)
5th grade - 5.6 (A), 5.25 (C)

Words to Know

- **adaptation** –Features or behaviors that can improve a plant or animal's chance for survival and of leaving more young.
- **amphibian** – An animal that typically lives in an aquatic habitat breathing by gills as young, and primarily in a terrestrial habitat using lungs and moist glandular skin to breathe as an adult.
- **aquatic** – Living in or near water.
- **carnivore** – An organism that eats other animals.
- **cast** – An exact replica of a fossil usually made out of plastic or fiberglass.
- **defense** – How a plant or animal protects itself.
- **environment** - The air, water, minerals, organisms, and all other parts of the habitat surrounding and affecting a plant or animal at any time.
- **erosion** – The wearing away of rock or soil.
- **evolution** – Changes in plants and animals over many generations.
- **extinction** – The dying out of a species of any living thing, forever.
- **field jacket** - The name given to a package of rock containing fossils that have been wrapped in plaster bandages or plaster and burlap strips. A field jacket protects a fossil so that it can be safely transported back to the museum.

Words to Know (continued)

- **fossil** – Evidence of past life (body, part of body, burrow, footprint, etc.) that is at least several thousand years old.
- **fossil preparation** – Preparing a fossil for study or display in a museum. Preparation may include removing the field jacket, cleaning, repairing and protecting the fossil.
- **geologic time** - The period of time covering the formation and development of the Earth, from about 4.6 billion years ago to today.
- **geological time scale** - A chart or arrangement of geological events in time order from oldest to youngest.
- **geologist** – A scientist who studies the origin, history, and structure of the Earth.
- **geology** – The study of the Earth and its natural history, as revealed in its rocks, soil, and other features.
- **herbivore** – An animal that eats plants.
- **mammal** – Animals that have body hair, nourish their young with milk from mammary glands, and typically give birth to live young.
- **meteorite** – A piece of rock from space that lands on Earth.
- **paleontologist** – A scientist who uses fossils to study ancient life.
- **paleontology** – The study of extinct plants and animals by looking at their fossils and other ancient remains.
- **predator** – An animal that kills and eats other animals.
- **prey** – Organisms that are killed and eaten by other animals.
- **reptile** – A group of animals that have scales, breathe air, and usually lay eggs on land.
- **sediment** -Solid fragments of material that come from the weathering of rock and are carried and deposited by wind, water, or ice.
- **sedimentary rock** – Rock that is formed as thousands or millions of years' worth of sediment piles up and hardens.
- **species** – A group of organisms that can freely breed with one another, producing fertile young.
- **terrestrial** – Living on or in the ground.

Pre-visit Activities

1. **KWL chart: Part I**

TEKS: Science - 3.8 (A-C), 3.9 (A, B), 4.8 (A-C), 4.10 (B), 5.9 (A-C), 5.11 (B)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19, 5.21

Students make a KWL chart listing what they know, what they want to know, and what they learned (after visiting the Museum) about prehistoric life in Texas.

2. **What do animals need to survive?**

TEKS: Science - 3.8 (A, C)
Language Arts - 3.1, 3.3, 3.4, 3.20, 4.1, 4.5, 5.1, 5.5, 5.25

All animals share common needs such as food, water, and a place to live. Have groups of students research a prehistoric animal and create a poster illustrating the animal in its natural habitat. Students should include all of the things the animal needs to survive. Groups may present their posters to the class. As a class, brainstorm the impact of different environmental changes (such as temperature changes, drought, introduction of a competing species in the same niche, etc.) on the animal's ability to survive.

Pre-visit Activities (continued)

3. How do adaptations help animals survive and reproduce?

TEKS: Science - 3.9 (A, B), 4.8 (A, B), 5.9 (A, B)
Language Arts - 3.1, 3.3, 3.4, 4.1, 4.5, 5.1, 5.5

Adaptations are characteristics that help an animal survive and reproduce in its environment. Just like animals today, animals that lived in Texas' past had adaptations to help them obtain food, attract mates, and protect themselves. To get students thinking about adaptations, show pictures of animals that are familiar to them and discuss the adaptations they have that help them survive and reproduce. Use the following examples or compile a list of your own:

Giraffes have long necks to help them reach leaves high in the trees of the African savannah.
Camels have humps on their backs to store fat as an energy source for use during times when food is hard to find. (Contrary to popular belief, they do not store water in their humps).
Armadillos have flexible armor that protects their head, neck and body from predators.
Walking sticks look like branches to camouflage themselves from predators.
Male peacocks have large, brightly-colored feathers to help them attract mates.

4. Create-a-saurus

TEKS: Science - 3.8 (A), 3.9 (A, B), 4.8 (A), 5.9 (B, C)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19, 5.25

If you could design your own dinosaur, what would it look like? Have students pretend they are a paleontologist who discovered a new dinosaur and write a news article describing the animal's characteristics and specific adaptations that allow it to thrive in its environment. Students should give their dinosaur a scientific name, describe what the dinosaur's environment was like, and draw a picture of the dinosaur in its environment.

5. How are fossils formed?

TEKS: Science - 4.10 (B), 5.11 (B)
Language Arts - 3.1, 3.14, 3.15, 3.18, 3.20, 4.1, 4.10, 4.15, 4.16, 4.18, 4.19, 5.1, 5.15, 5.16, 5.18, 5.19

Show the short (2 minutes, 34 seconds) video Becoming a Fossil: http://www.pbs.org/wgbh/evolution/library/04/3/l_043_01.html Discuss the fossilization process demonstrated in the video. To assess student understanding, have students create a comic strip depicting the fossilization of an organism of their choosing.

Pre-visit Activities (continued)

6. *How to Take your Grandmother to the Museum*: Part I

TEKS: Science - 3.8 (A, B), 3.9 (A), 4.5 (A), 4.8 (A, C), 4.10 (B), 5.11 (B)
Language Arts - 3.1, 3.6, 3.7, 3.8, 3.9, 4.1, 4.3, 4.7, 4.8, 4.9, 4.10, 5.1, 5.3, 5.7, 5.8, 5.9, 5.10

Read *How to Take Your Grandmother to the Museum* by Lois Wyse and Molly Rose Goldman aloud to your students or assign the book for independent reading. Students then visit the exhibits page of Texas Memorial Museum's website (http://www.utexas.edu/tmm/exhibits/index.html) to familiarize themselves with the exhibits they will see during their visit to the Museum.

During-visit Activities

1. Life in Austin during the Cretaceous

TEKS: Science - 3.2 (B-D), 3.8 (A-B), 3.9 (A-B), 4.2 (B-D), 4.8 (A, C), 4.10 (B), 5.2 (B-D), 5.9 (B)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19

Find the mosasaur in the Cretaceous Period exhibit. This specimen was found in Onion Creek, right here in Austin! Based on the organisms present in the case, have students describe what they think Austin looked like when the mosasaur lived here. Students should be sure to explain the adaptations the mosasaur and other animals in the case have that support their answer.

2. Comparing and contrasting animal adaptations

TEKS: Science - 3.8 (A, C), 3.9 (A, B), 3.10 (B), 4.8 (A-C), 4.10 (B), 5.9 (A-B), 5.10(A)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19

Over its long history Texas has changed dramatically. Significant environmental changes that caused many organisms to either thrive or become extinct have occurred over time. Have students use a graphic organizer (such as T-chart or Venn diagram) to compare and contrast an animal living in Texas during two different geological time periods. Students should be sure to note the type of environment each animal lived in and describe the adaptations each animal had that allowed them to thrive in its environment.

3. Where in Texas?

TEKS: Social Studies - 3.16 (E), 4.6 (A), 4.22 (C), 5.6 (A) 5.25 (C)
Language Arts - 3.14, 3.15, 4.15, 4.16, 5.15, 5.16

The majority of the fossils in the *Hall of Geology and Paleontology* were found in Texas. Give each student a copy of the *Texas Counties* map located at http://www.tpwd.state.tx.us/landwater/land/maps/gis/map_downloads/. While exploring the exhibits, students choose ten fossils found in different counties in Texas and shade each county on the map where the fossil was found. Students should be sure to list the names of the fossils on their map and draw arrows to the county in which they were found. Encourage students to try to find one fossil from the county in which they live.

Post-visit Activities

1. KWL Chart: Part II

TEKS: Science - 3.8 (A-C), 3.9 (A, B), 4.8 (A-C), 4.10 (B), 5.9 (A-C), 5.11 (B)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19

Following your visit, return to the KWL chart started in the pre-activities and fill in the "what I learned" section.

2. A Letter from the Past

TEKS: Science - 3.8 (A), 3.9 (A, B), 4.8 (A), 4.10 (B), 5.9 (B)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19, 5.21

Have students recall an extinct animal they saw at the Museum and write a letter to modern-day people, describing what its life was like. Students should describe when and where the animal lived, what it ate, what ate it, and specific adaptations that made it successful in its environment.

3. Adaptations for Sale

TEKS: Science - 3.9 (A, B), 4.8 (A, C), 5.9 (C)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 4.21, 4.25, 5.15, 5.16, 5.18, 5.19, 5.25

Students take on the role of a salesperson and create an adaptation to "sell" to an extinct animal in Texas' past. Have students think about what the extinct animal's environment was like and what adaptations might have helped it survive. Have students create an advertisement to market to a specific animal during a period of their choice, including a convincing description and a picture of the item for sale. (Example: razor-sharp teeth, bony armor etc…).

4. *How to Take your Grandmother to the Museum*: Part II

TEKS: Science - 3.8 (A, B), 3.9 (A), 4.5 (A), 4.8 (A, C), 4.10 (B), 5.11 (B)
Language Arts/ Reading - 3.1, 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 5.15, 5.16, 5.18, 5.19

Create your own *How to Visit the Texas Memorial Museum* book (based on H*ow to Take Your Grandmother to the Museum* by Lois Wyse and Molly Rose Goldman). Have each student or group of students create one page for the book in which they draw and describe an exhibit they saw at the Museum. Students should include the name(s) of the fossil, when and where it lived, the part of the body the fossil is from (if the specimen is not from a complete skeleton), and any other interesting facts. Combine all the student pages, and make a copy of the book for each student.

Post-visit Activities (continued)

5. Travel Back in Time

TEKS: Science - 3.8 (A), 4.10 (B), 5.11 (B)
Language Arts - 3.14, 3.15, 3.17, 3.18, 3.20, 4.15, 4.16, 4.18, 4.19, 4.21, 4.25, 5.15, 5.16, 5.18, 5.19, 5.25

Students create a travel brochure enticing others to visit Texas during a given time period represented at the Museum. Students should be sure to include information about what visitors to the time period might see and do, climate conditions so visitors know what to wear, plants and animals visitors may encounter, and a list of items to bring to make their visit more enjoyable.

Books for Educators

Hansen, T. & Slesnick, I. (2006). *Adventures in paleontology: 36 classroom fossil activities*. Arlington, VA: National Science Teachers Association.

Lawson, K. (2003). *Darwin and evolution for kids: His life and ideas with 21 activities*. Chicago, IL: Chicago Review.

Lawrence Hall of Science. *Stories in Stone (GEMS)*. Berkeley, California: University of California at Berkeley.

Silver, D.M. & Wynne, P.J. (1997). *The amazing earth model book*. New York: Scholastic Inc.

VanCleave, J. (1994). *Janice VanCleave's dinosaurs for every kid: Easy activities that make learning science fun*. New York, New York: John Wiley & Sons, Inc.

Books for Students

Arnold, C. (2004). *Pterosaurs: Rulers of the skies in the dinosaur age*. New York: Clarion Books.

Arnold, C. (2007). *Giant sea reptiles of the dinosaur age*. New York: Clarion Books.

Atkins, J. (2000). *Girls who looked under rocks: The lives of six pioneering naturalists*. California: Dawn Publications.

Chorlton, W. (2001). *Woolly mammoth: Life, death, and rediscovery*. New York: Scholastic, Inc.

DK Publishing. *(2007). Map: Satellite*. New York: DK Publishing.

Eldredge, N., Eldredge, G. & Eldredge, D. (1989). *The fossil factory: A kid's guide to digging up dinosaurs, exploring evolution, and finding fossils*. Reading, MA: Addison-Wesley Publishing Co., Inc.

Holtz Jr., T. R. (2007). *Dinosaurs: The most complete, up-to-date encyclopedia for dinosaur lovers of all ages*. New York: Random House Children's Books.

Books for Students (continued)

Hurst, C. O. (2001). *Rocks in his head.* New York: Greenwillow Books.

Larson, P. & Donnan, K. (2004). *Bones rock!: Everything you need to know to be a paleontologist.* Montpelier, VT: Invisible Cities Press.

Matejovsky, C. (2007). *Stones and bones.* Santa Rosa, CA: Polebridge Press.

Sheldon, D. (2006). *Barnum Brown: Dinosaur hunter.* New York: Walker Books for Young Readers.

Silverstein, A., Silverstein, V. & Nunn, L.S. (2007). *Adaptation*. Minneapolis, MN: Twenty-First Century Books.

Stille, D. R. (2005). *Erosion: How land forms, how it changes*. Mankato, MN: Compass Point Books.

Sloan, C. (2005). *How dinosaurs took flight: Fossils, science, what we think we know, and mysteries yet unsolved.* Washington, D.C.: National Geographic Children's Books.

Wenzel, G. (2004). *Feathered dinosaurs of China*. Watertown, MA: Charlesbridge Publishing.

Wyse, L. & Goldman, M.R. (1989). *How to take your grandmother to the museum.* New York: Workman Publishing Company, Inc.

Websites for Educators

American Geological Institute, K-5 *GeoSource*
www.k5geosource.org/index.html

American Museum of Natural History, *Resources for Learning*
www.amnh.org/education/resources/index.php

National Geographic, *Sea Monsters*
nationalgeographic.com/seamonsters/index.html

PBS, *Deep Time*
www.pbs.org/wgbh/evolution/change/deeptime/low_bandwidth.html

Teachers' Domain, *Deep Time/History of Life*
www.teachersdomain.org/sci/life/evo/deeptime/index.html

Texas Natural Science Center, *Non-vertebrate Paleontology Laboratory*
www.utexas.edu/tmm/npl/index.html

Texas Natural Science Center, *Vertebrate Paleontology Laboratory*
www.utexas.edu/tmm/vpl/

Websites for Educators continued

University of California Museum of Paleontology, *Teacher Resources* www.ucmp.berkeley.edu/education/teachers.php

University of California Museum of Paleontology, Paleontological Society, Society of Vertebrate Paleontology, and United States Geological Survey, *The Paleontology Portal* www.paleoportal.org/index.php

Websites for Students

American Museum of Natural History, OLogy
www.amnh.org/ology/

Denver Museum of Nature & Science, *Follow a Fossil*
www.dmns.org/main/minisites/fossil/index.html

Enchanted Learning, *Zoom Dinosaurs*
www.enchantedlearning.com/subjects/dinosaurs/index.html

National Geographic, *About the Prehistoric World*
science.nationalgeographic.com/science/prehistoric-world

University of California Museum of Paleontology, *Student Resources in Paleontology*
www.ucmp.berkeley.edu/education/students.php