



DISCOVERY ROOM

EDUCATOR'S GUIDE

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COME PREPARED

GLOSSARY

adaptation: a heritable change that improves the ability of an individual or species to survive in its environment

anthropology: study of the origins, biological characteristics, physical and cultural development, and social customs of humans

astronomy: study of the universe, including stars, planets, moons, asteroids, solar systems, and galaxies

biodiversity: the variety of life, including genetic variation, number of species, and types of ecosystems

ecosystem: a community of organisms interacting with each other and their environment

field biology: study of biodiversity and interactions of organisms, communities, and ecosystems in their natural environments

geology: study of the planet's structure and composition, and the physical and biological processes acting upon it

hominid: biological family of primates, including humans, chimpanzees, gorillas, orangutans, and their ancestors

invertebrate zoology: study of the behavior, structure, physiology, classification, and distribution of animals without backbones

mineral: a naturally occurring inorganic solid with definite chemical composition and crystal structure

paleontology: study of fossils and what they tell us about the ecologies and evolution of past life

rock: a naturally occurring solid containing one or more minerals

-logy: suffix indicating a subject of study or a branch of knowledge.

Plan your visit

For information about field trip reservations and additional educational content visit museumatpf.org/schools.

Come Prepared

Students enter and discover a world of hands-on science and interactive discovery. Explore major fields of scientific research, from anthropology to zoology. Excited children will find an array of artifacts, specimens, puzzles, and scientific challenges to explore.

Read the **Key Concepts** section in this guide to see how themes in the Discovery Room connect to your curriculum. Identify the important points that you want your students to learn from the experience.

Review the **Teaching in the Discovery Room** section of this guide to become familiar with some of the objects, models, and interactives that you and your class will find. This section also provides guiding questions to facilitate the learning process.

Exploration

The Discovery Room is divided into sections of scientific fields of study:

- PALEONTOLOGY
- ANTHROPOLOGY
- INVERTEBRATE ZOOLOGY
- FIELD BIOLOGY
- GEOLOGY
- ASTRONOMY

Use the **Glossary** section of this guide to familiarize yourself with terms your class might encounter.

Organize students into groups with at least one chaperone per group (up to six groups with at least 1 chaperone for every 10 students). A staff member will direct each group to a section of the Discovery Room. Chaperones determine when their group is ready to rotate to the next section. The session is 45 minutes long and students must stay with their assigned chaperone while in the Discovery Room.

Discovery Room staff will circulate through the room to assist student learning and provide additional hands-on educational opportunities. Chaperones can facilitate the experience using the Teaching in the Discovery Room section of this guide.

CORRELATIONS TO STANDARDS

Your visit to the Discovery Room can be correlated to the standards listed below. Visit museumatpf.org/schools/#materials for a full listing of curriculum standards.

Next Generation Science Standards

K-LS1-1 From Molecules to Organisms: Structures and Processes; K-ESS3-1 Earth and Human Activity; 1-ESS1-1 Earth's Place in the Universe; 2-LS4-1 Biological Evolution: Unity and Diversity; 2-ESS2-2 Earth's Systems; 3-LS4-1 Biological Evolution: Unity and Diversity; 3-LS4-3, 4 Biological Evolution: Unity and Diversity; 4-LS1-1, 2 From Molecules to Organisms: Structures and Processes; 4-ESS1-1 Earth's Place in the Universe; 4-ESS2-2 Earth's Systems; 4-ESS3-2 Earth and Human Activity; 5-ESS1-2 Earth's Place in the Universe; MS-LS2-2-1 Ecosystems: Interactions, Energy, and Dynamics; MS-LS2-2-4 Ecosystems: Interactions, Energy, and Dynamics; MS-LS4-1, 2 Biological Evolution: Unity and Diversity; MS-ESS1-4 Earth's Place in the Universe; MS-ESS2-2, 3 Earth's Systems

Missouri State Standards, Science

Kindergarten: Strand 7.1.A.a, 7.1.B.a-b; Grade 1: Strand 3.1.A.c-d, 3.1.D.a-d, 3.1.E.a, Strand 7.1.A.a, 7.1.B.a-b; Grade 2: Strand 5.1.A.a-b, Strand 5.2.A.a, Strand 7.1.A.a, 7.1.B.a-b; Grade 3: Strand 7.1.A.a, 7.1.B.a-b; Grade 4: Strand 1.1.B.a-c, Strand 4.3.C.b, Strand 5.1.A.b, Strand 5.2.A.a, Strand 7.1.B.a-b; Grade 5: Strand 3.1.E.a-d, Strand 6.1.B.a, Strand 7.1.B.a-b

KEY CONCEPTS

SO MANY PLANTS, SO MANY ANIMALS

Scientists estimate 2 – 8 million species live on planet Earth. People have been counting and naming life forms for centuries and we still discover new types of life every year! The diversity of plant and animal life arises from the wide variety of environments on land and in water. Animals that live in different environments need special adaptations to help them survive.

Help students describe an ecosystem by selecting an environment and describing the plants and animals that live in it. Ask students what qualities help plants and animals live in those conditions. For example, bearded dragons have tough scales that prevent them from drying out in desert environments. Poison dart frogs do not need these protective scales because they live in moist environments like the rainforest

EYE OF THE BEHOLDER

Unlike animals with backbones, bees and other arthropods (insects and crustaceans) have compound eyes – a large eye made of many smaller, separate eye units (photoreceptor cells). Thousands of images from each photoreceptor cell are organized by the brain to create a detailed image. Compound eyes help arthropods see and react to quickly moving objects – like a swatting hand.

Using the Bug's Eye View interactive in the Invertebrate Zoology section, ask students to compare how a flower appears to a honey bee versus a person.

LANGUAGE OF SCIENCE

Part of science education is learning a foreign language. Scientific terms can be an unfamiliar component of a child's vocabulary.

Help students explore complex language by breaking down polysyllabic words to highlight prefixes, roots, and suffixes and explore their meaning.

Examples from the Discovery Room:

a-, dino-, micro-, bio-, zoo-, astro-, paleo-, exo-, anthropo-, -morph-, -saur, -logy, -therm, -vore



The Discovery Room offers an informal learning space for kids to explore science topics. The following concepts highlight areas of student inquiry to connect to your curriculum.

PLANET EARTH: HISTORY OF OUR HOME

Rock strata contain observable patterns that chronicle the history of the planet, from ancient environments – and the flora and fauna that inhabited them – to the constructive and destructive processes that shaped our planet for billions of years.

A long time ago, people noticed the continents look like separated pieces of a jigsaw puzzle; this observation made them think the continents might have been connected in the past.

By investigating evidence in the rock record, geologists determined the continents came together to form a supercontinent, called Pangea, approximately 300 million years ago, which re-separated 175 million years ago.

A process, called Plate Tectonics, allows the continents and ocean basins to change position. This motion continues today, which causes earthquakes when plates rub together. Ask students to explore the continents' shapes with the Pangea puzzle.

YOUR BONES

The fossil record shows the sequence of anatomical changes in the history of life. Similarities and differences in body plans offer evidence of evolutionary relationships. Things with many similarities are often more closely related than things with few similarities. For example, students can observe that they resemble their family members more than a stranger, a stranger more than an ape, an ape more than a crocodile, and a crocodile more than a fish.

The Discovery Room offers many opportunities for students to compare the bones of extinct and extant vertebrates. Ask them to start by comparing the hominid skeletons. Then ask them if any of the hominid bones are similar to those of *Prestosuchus*.

ROCKS AND FOSSILS, A STORY TO TELL

Although most plant and animal species that lived on Earth are no longer alive, we can learn a lot about ancient life and environments from fossils and the rocks that preserve them. Ask students to examine fossils in the paleontology area. Can students identify if the fossil is a plant or an animal? What does the shape of a fossil tell us about the environment in which an animal lived? For example, fins for swimming in water versus legs for walking on land; broad leaves adapted to life in wet environment versus needles for plants adapted to living in dry habitats.

TEACHING IN THE DISCOVERY ROOM

The Discovery Room is a distinctive learning space that encourages active exploration of the sciences through hands-on and digital interactives, puzzles and games, models, videos, wall panels, specimens, and live animals. This guide describes the scientific disciplines presented in the Discovery Room and strategies to help guide your students.

PALEONTOLOGY



Exploration Areas:

- **Prestosuchus Puzzle:** Assemble the skeleton of a life-size, 12-foot Mesozoic reptile.
- **Dig Pit:** Uncover fossils like a real paleontologist while excavating scientifically-accurate recreations of fossil sites.
- **T. rex Foot:** Piece together a *Tyrannosaurus rex*'s foot bones in this life-size reconstruction.

Guiding Questions:

- What are some ways paleontologists determine what dinosaurs and other ancient animals ate?
- Dinosaurs are ancient relatives of birds and reptiles. What are some similarities and differences that you can observe?
- How do fossils form?

Balcony Extra: Step outside onto the balcony to find fossils within the Kansas limestone façade. Ask students, in what kind of environment these fossils lived? Can they identify any similarities between the fossils and animals living today?

ANTHROPOLOGY



Exploration Areas:

- **Wearing Masks:** Try on masks from different cultures and time periods.
- **Hominid Ancestors:** Get to know our hominid ancestors by taking a close look at their skulls and skeletons.
- **Tea Sets:** Enjoy a tea party with sets from around the world to explore similarities and differences among world cultures.

Guiding Questions:

- What similarities can you identify between similar objects from different cultures?
- Why might you wear a mask?
- Can you identify a mask that was used for protection, in a dance, in a play, in a sport?
- What are some differences between *Homo sapiens* and other hominids? Are there any similarities?

INVERTEBRATE ZOOLOGY



Exploration Areas:

- **Bug's Eye View Interactive:** Discover how honey bees and other arthropods view the world around them.
- **Handling a Cockroach:** With the help of a staff member, students may pet or hold a Madagascar hissing cockroach to closely observe a living insect.
- **Praying Mantis Puzzle:** Reconstruct a praying mantis' body to learn about the anatomy of insects.

Guiding Questions:

- Why is it advantageous for a honey bee to see ultraviolet light?
- How can you tell the difference between an insect and an arachnid?
- Why do you think some insects look very similar to a leaf or another animal?

FIELD BIOLOGY



Exploration Areas:

- **Sycamore Tree Challenge:** Locate animals in the sycamore tree to explore biodiversity and food chains.
- **Animal Encounters:** With the assistance of a staff member, have an up-close experience during our animal presentations.

Guiding Questions:

- What is an ecosystem? Can you identify one represented by a plant or animal in the Discovery Room?
- Can you identify adaptations that help an animal survive in their habitat?
- What are some interesting behaviors that the animals are displaying? What might those behaviors mean?

Balcony Extra: Step outside onto the balcony to look over the wetlands area and observe native Kansas plants and animals. Ask students what kinds of birds they notice around the museum. Do they have special adaptations for living near water?

GEOLOGY



Exploration Areas:

- Rock and Mineral Observation: Get a closer look at samples from all stages of the rock cycle.
- Seismograph Station: View earthquakes in real time on an interactive global map.
- Pangea Puzzle: Reconstruct the continents to form Pangea, a supercontinent that persisted from the Late Paleozoic Era through the Early Mesozoic Era.

Guiding Questions:

- Can you find examples of the three main rock types?
- What is the difference between a rock and a mineral?
- Why do you think fossils of similar species are found on different continents?
- How are rocks and minerals useful to people and society?
- Why do earthquakes and volcanoes appear in predictable patterns across the Earth's surface?

ASTRONOMY



Exploration Areas:

- Constellations: Draw constellations found in the night sky or create your own! Create a myth or legend about your constellation.
- The Hans: Through guided tours or using a video game controller, explore the surface of Mercury, Earth, the Moon, or Mars in a Google Earth-like experience.
- Meteorites: With assistance of a staff member, hold real meteorites and learn what the different types tell us about our solar system.

Guiding Questions:

- Before GPS, why were constellations important for mariners when navigating the ocean?
- What are some differences between Earth and other planets in our solar system?

CENTRAL MICROSCOPES



Twelve microscopes located in the middle of the room allow students to take a closer look at various objects, artifacts, and specimens.

Guiding Questions:

- What are some details that are only observable under the microscope?
- What did you see that surprised you most?



CABINET OF CURIOSITY



Find an amazing object in each drawer in the Cabinet of Curiosity.

Guiding Questions:

- What are some interesting observations about the object you are looking at?
- Can you organize objects into collections based on shared characteristics?



BACK IN THE CLASSROOM

ACTIVITIES

TRY THIS!



Ask students to develop their own Try This! Activity about a favorite item in the Discovery Room. A Try This! Activity highlights a specific topic for additional explanation to further the reader's appreciation for the item. Students should describe basic concepts and develop questions to guide inquiry.

Example: Plate Tectonics



Concept: The locations of mountain ranges, volcanoes and ocean trenches appear in patterns associated with the position and motion of tectonic plates.

Question: Where do most earthquakes and volcanic eruptions occur? Use the seismograph station in the Geology section or ds.iris.edu/seismon/ to explore the location of recent activity.

Students may submit their Try This! Activity to education@museumatpf.org for a chance to have their idea incorporated into the Discovery Room.

CROSS SECTION CONNECTION



Have students think of an object, artifact, or animal that could be featured in more than one area of the Discovery Room. Ask students to write a description of the item and identify the Discovery Room sections to which it relates to and why.

Example: Coal



Coal is heated and compressed plant matter. Different coal varieties reflect the amount of heat and pressure they experience.

Coal could be featured in the geology or the paleontology section. Coal belongs in the geology section because it is a series of rock types that show changes over time. The lowest grade of coal is peat. Over time, pressure and heat change peat into anthracite - the highest grade of coal. Coal could also be found in the paleontology section because it is evidence of plants that lived a long time ago. Coal is made of plant matter that was heated and compressed over time.



INVESTIGATE A LOCAL SCIENTIST



Have students report on the important contributions of one of these local scientists! See our book list for potential sources.

Kansas: Barnum Brown, Paleontologist; Charles Sternberg, Paleontologist; Carl Owen Dunbar, Paleontologist; David Fairchild, Botanist; Clyde Tombaugh, Astronomer

Missouri: Edwin Harris Colbert, Paleontologist; Andrew Still, Doctor; George Washington Carver, Botanist; Edwin Hubble, Astronomer

CRYSTAL GARDEN



Ask students to explore mineral growth in this classroom experiment. Students will dissolve magnesium sulfate, commonly known as epsom salt, in hot water to create a supersaturated solution - where the solvent (water) contains more of the solute (Epsom salt) than possible at room temperature. Temperature is important because heating spreads the water molecules apart, allowing more solute to be dissolved. When the solution cools, the water molecules condense, forcing the magnesium sulfate to condense into its crystal form.

Working as a class, small groups, or individuals, each experimental setup will need two containers.

1. In each container, mix $\frac{1}{2}$ cup of Epsom salts with $\frac{1}{2}$ cup of very hot water (at least 100°F) for two minutes.
2. Add one pinch of sand to one cup, but not to the other. Add two drops of food coloring if you want your crystals to be colored.
3. Place uncovered cups in the refrigerator and allow cups to stand for at least 24 hours.
4. Check on the cups the next day to see your crystals! Carefully pour off the remaining solution to examine them. Discuss with your students why each crystal is the same shape. Ask students how the sand granules affected crystallization.

BIOBLITZ



Have your students explore the biodiversity of your school's campus while collecting plant and insect specimens. Students can use web resources to learn more about their collections:

<http://mdc.mo.gov/discover-nature/field-guide>

<http://www.insectidentification.org/>

<http://www.amnh.org/explore/ology/biodiversity>

Ask students in what ways the environment is modified by people (e.g. landscaping) and how that might influence their findings.

Museum at Prairiefire Discovery Room

CONNECTIONS TO LITERATURE

To build a foundation for college and career readiness, students must read widely and deeply from a broad range of high-quality, increasingly challenging literary and informational texts. Use these Connections to Literature to allow students to gain literary and cultural knowledge, as well as familiarity, with various text structures and elements from the Common Core Standards.

PRESCHOOL - 3RD

***A Weed Is a Flower: The Life of George Washington Carver* by Aliko** Brief text and pictures present the life of the man, born a slave, who became a scientist and devoted his entire life to helping the South improve its agriculture.

***Mister Bones: Dinosaur Hunter* by Jane Kurtz, illustrated by Mary Haverfield** Barnum Brown loves to dig in the dirt. He pokes and he sifts and he picks through the dirt. What is he looking for? Not gold, but something just as valuable: Bones! Dinosaur bones! And what he finds is an amazing thing.

KINDERGARTEN - 4TH

***Barnum's Bones: How Barnum Brown Discovered the Most Famous Dinosaur in the World* by Tracey Fern, illustrated by Boris Kulikov** Barnum Brown's (1873-1963) parents named him after the circus icon P.T. Barnum, hoping that he would do something extraordinary—and he did! As a paleontologist for the American Museum of Natural History, he discovered the first documented skeleton of the *Tyrannosaurus rex*, as well as most of the other dinosaurs on display there today.

***National Geographic Readers: Rocks and Minerals* by Kathleen Weidner Zoehfeld** From dazzling gemstones to sparkling crystals to molten lava, this brilliantly illustrated book introduces children to the exciting world of rocks and minerals, including both the building blocks and the bling. This level two reader, written in easy-to-grasp text, will help cultivate the geologists of tomorrow!

1ST - 3RD

***Barnum Brown: Dinosaur Hunter* by David Sheldon** Barnum Brown had one ambition as a child: to grow up to be a great dinosaur hunter. And that's just what he did when he was hired by the American Natural History Museum—working to build their astounding collection. Barnum had a knack for finding dinosaur bones, a skill that rivaled the paleontologists before him. His most amazing discovery was uncovering the largest carnivore that ever walked the Earth: the “tyrant lizard king,” *Tyrannosaurus rex*! Dig into the life of the greatest dinosaur hunter of all time with this exciting biography of Barnum Brown.

***A Picture Book of George Washington Carver* by David Adler, illustrated by Dan Brown** A brief biography of the African American scientist who overcame tremendous hardship to make unusual and important discoveries in the field of agriculture.



2ND -5TH

***The Great Human Journey: Around the World in 22 Million Days* by Ian Tattersall, Rob DeSalle, and Patricia J. Wynne** Wallace and Darwin, the Museum Mice from the Halls of the American Museum of Natural History, are off on another adventure! It's amazing what you can find in a museum and how far you can travel in a small time machine made from a yogurt cup! Have you ever wondered where we humans all came from and how there came to be so many of us? The answers, as our two mice will show you, lie everywhere including in our own DNA. So there is the Big Picture of The Great Human Journey: from the middle of Africa to Australia, America and Asia. Then there's the Tiny (really tiny) Picture too: of molecules and cells that we can trace inside ourselves, and our Genome that tells us where we came from, who our ancestors were, where they were and when, and how they got there!

2ND - 5TH

***Clyde Tombaugh and the Search for Planet X* by Margaret K. Wetterer and Laurie A. Caple** The story of the young farm boy who became an astronomer and discovered the planet Pluto at the age of twenty-four.

***Tracks, Scats, and Signs* by Leslie Dendy, illustrations by Linda Garrow** Become a nature detective with this illustrative, engaging and fun Take-Along-Guide. You may not know where to look, or what to look for, but animal signs are everywhere and this guide will help you learn how to read them. You'll learn how to spot and identify common clues that 17 wildlife species leave behind in the woods, in the fields and along ponds.

3ND - 6TH

***Planet Earth: The World in Infographics* by Jon Richards and Ed Simkins** Compare the tallest mountains from each continent, see the entire volume of water on the Earth poured into one glass, stack up Eiffel Towers and compare the height of the world's tallest waterfall, and more! From tectonic plates and meteorites to erupting volcanoes, the atmosphere, and the world's longest rivers, this book explores planet Earth using a wide variety of icons, graphics, and pictograms. Highly visual and accessible, infographics are an increasingly popular way to introduce complex stats, facts, and figures to children, helping them to digest complex information on a number of topics.

4TH AND UP

***The Sternberg Fossil Hunters: A Dino Dynasty* by Katherine L. Rogers** Draws on first-hand accounts to tell the story of the Sternbergs, a father and sons who traveled the New World in search of fossilized flora and fauna. From the late 1800s through the mid-1900s, the Sternbergs searched the American and Canadian West and the Argentine region of Patagonia for dinosaur bones and fossil relics. Specimens they found are on display in museums around the world. Includes black & white historical photos.

Map of the Discovery Room

Exploration Areas



-  **1. *Prestosuchus* Puzzle**
- 2. Dig Pit**
- 3. Invertebrate Fossils**
- 4. Vertebrate Fossils**
- 5. *T. rex* Foot Puzzle**
-  **6. Tea Sets**
- 7. Mask Collection**
- 8. Ancient Games**
- 9. Hominid Skeletons**
-  **10. Bug's Eye View**
- 11. Butterfly Collection**
- 12. Praying Mantis Puzzle**
- 13. Hissing Cockroaches**
-  **14. Sycamore Tree Scavenger Hunt**
- 15. Posion Dart Frog Habitat**
- 16. Live and Preserved Animals**
-  **17. Seismograph Station**
- 18. Rocks and Minerals**
- 19. Fluorescent Rocks**
-  **20. Constellation Creation**
- 21. The Hans**
- 22. Meteorites**
- 23. Smell A Moon Rock**
-  **Microscopes**
-  **Cabinet of Curiosity**
-  **Free Play**
-  **Reading Area**
-  **Balcony**

