



## Educator Guide: *Antarctic Dinosaurs*

Grades 1 - 12

### Duration

30 minutes

### Location

*Antarctic Dinosaurs*  
Exhibit, Ground Level

### NGSS Alignment

#### DCIs

3-LS4-1  
4-ESS1-1  
4-ESS2-2  
MS-LS4-1,2  
MS-ESS2-3  
HS-LS4-5  
HS-ESS1-5

#### S+E Practices

1,3, 4

#### Crosscutting Concepts

1, 7

#### CA EP&Cs

III.a

### Materials for Museum Visit:

Paleontology Field  
Journal (p.5-6)

Clipboards

Pencils

### Exhibit Overview

*Antarctic Dinosaurs* tells the story of modern day paleontologists, NHM's Dr. Nathan Smith and Dr. Pete Makovicky, Curator of Dinosaurs at Chicago's Field Museum, and their expedition to excavate fossils from the few places in the continent not covered in thick layers of ice. This Teachable Moments guide uses highlighted objects throughout the *Antarctic Dinosaurs* exhibit to transport students to an Antarctic expedition. Students will experience the process of paleontology as scientists and researchers excavate fossils beneath the snow-dusted rock and use fossil finds to build an understanding of Antarctica's past. By uncovering how different Antarctica was in the past, students discover more about our changing planet.



### Pre-Visit

- Review the Geological Time Chart with your students (p. 8)
- Print copies of the *Paleontology Field Journal* (p. 5-6) for your students to use during their exhibit visit.

### In the Exhibit

*Antarctic Dinosaurs* has six sections that immerse students in the thrilling hunt for never-before-seen fossils and shed new light on our planet's ever-changing climate and geology. *Antarctic Dinosaurs* is presented with bilingual text in English and Spanish.

Highlighted exhibit objects and suggested prompts for exhibit sections are **bolded** in this guide. Use our "Exhibit Tips" to help you organize your students as you move throughout the galleries.

Our appendix includes key terms and definitions relevant to the exhibition for you to utilize with your students during your exploration of *Antarctic Dinosaurs*.

*Antarctic Dinosaurs* was developed by the Field Museum, Chicago in partnership with the Natural History Museum of Los Angeles County, Discovery Place – Charlotte, NC, and the Natural History Museum of Utah. Generous support was provided by the Kenneth C. Griffin Charitable Fund.

*Expedition Photo 2 by Eva Koppelhus. Photography of Cryolophosaurus skull by Research Casting International.*

## Section 1 | Journey to Antarctica

One big challenge for research expeditions in Antarctica is finding the right gear! In this section, you'll see some of the gear used by researchers on past Antarctic expeditions and get a sense of the way the design and capabilities of gear have changed over time.

### Highlight Piece: Terra Nova Sledge

Early explorers arrived on ship and relied on sleds, skis, and snowshoes to move around on land. This sledge (a type of low sled) was used on the 1910-1913 Terra Nova Expedition led by British Royal Navy officer and explorer Robert Falcon Scott. His team was the second to reach the geographic South Pole but did not survive the return journey. **Take a look at the Terra Nova Sledge. What do you notice about it? What might this tell us about the type of weather researchers face in Antarctica?**

### Highlight Piece: Extreme Cold Weather gear

Modern explorers heading to Antarctica are issued a set of extreme cold weather gear. The clothing items are made from synthetic materials such as fleece, insulated thermal felt, and Thermolite fiber for insulation. To waterproof these layers, outer layers are made from nylon and polyester. **What type of weather is this gear well-suited for? What might be challenging about working while wearing gear like this?**

**Exhibit Tip:** There is an interactive touchscreen in this section of the exhibit which allows visitors to play a "game" that simulates gearing up for an expedition. This game is best suited for groups of six students or less.

**Middle School/High School Extension:** Ask your students to consider the pros and cons of the different gear used for Antarctic expeditions over the past century (including dress, transportation, equipment, and food). How might the type of gear used affect the success of expeditions?

## Section 2 | Fossil Hunting in Antarctica

**Exhibit Tip:** This section of the exhibit has loud noises that emulate excavation equipment and multiple videos that shift around the perimeter of the room. The full running time for the video sequence is approximately 12-13 minutes.



*Scientists excavate fossils from frozen rock with power tools.*

*Expedition Photo 4 by Phil Currie*

This section chronicles the steps involved in the paleontological process. Give students time to explore this section and imagine what it would be like to work in such a barren landscape. Be sure to check out the different "tools of the trade" that are involved in each different step of the process.

Bones aren't the only things that can be fossilized!  
**Ask your students to consider: What is a fossil?**

See our definition of "fossil" in the Appendix and discuss with your students the different types of materials that can fossilize.

**Middle School/High School Extension:** What other types of evidence of life from the past can be preserved?

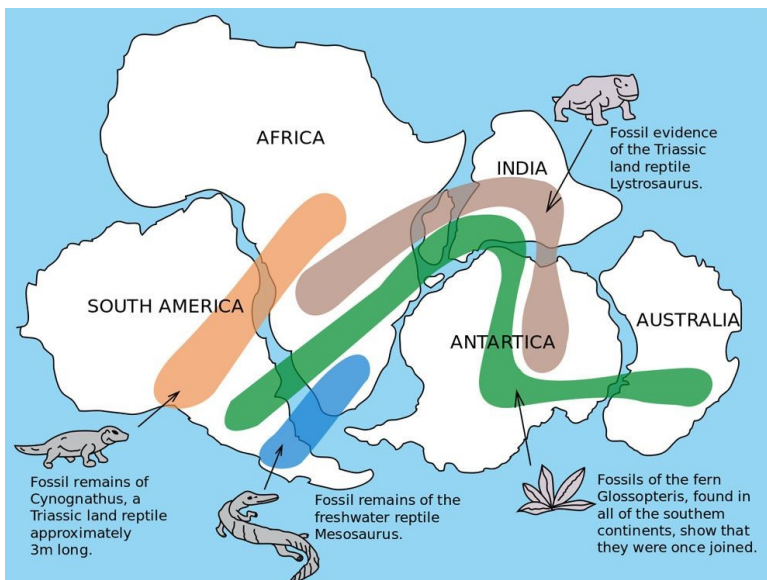
## Section 3 | Antarctica: Before the Dinosaurs

In this next section, students will enter and see a warmer, greener environment with a forest mural, *Glossopteris* tree reconstruction, and *Glossopteris* fossil (among other Permian-Triassic Period fossils in a case). You are now in an environmental representation of Antarctica 260-242 million years ago - a time long before dinosaurs even existed! Time to stop, look around, and discuss what is different between the previous section (modern-day Antarctica) and this section (Permian-Triassic Antarctica).

### Highlight Piece: *Glossopteris* fossils

*Glossopteris* is a deciduous tree that grew from 10 - 90 feet high, and inhabited lowland forests throughout Southern Continents during the Permian period (260 million years ago). **What does knowing this type of plant grew in Antarctica tell us about the climate of Antarctica during the Permian Period?**

**Middle School/High School Extension:** Look at the map on the table next to *Glossopteris* (also included below). What other places in the world have these fossils been found? What does this tell us about how continents may have shifted over time?



### MAP OF GONDWANA

Featured in Section 3 of the exhibit (*Antarctica: Before the Dinosaurs*)

Source: <https://pubs.usgs.gov/gip/dynamic/continents.html>

## Section 4 | The World of Antarctic Dinosaurs

As we saw in the last section, plant fossils have provided evidence that Antarctica was not always a cold and harsh environment. The environment was likely much warmer and wetter than the extreme snowy landscape of today. Researchers have continued to find other types of fossils in Antarctica that represent a vast range of points in time and show that life continued to thrive and diversify: from the Permian Period (included in the previous section) throughout the Mesozoic Era - the Age of Dinosaurs - which lasted over 175 million years. This section highlights some of the dinosaurs discovered through expeditions to Antarctica and what we think they may have looked like.

Use this time to allow students to explore this section and **make observations of the specimens from this time period**. Students may choose to utilize the Paleontology Field Journal to jot down notes or draw their observations.

Before moving on to the next section, gather your students and ask them to share some of their observations with the group, and reflect on what life might have been like for these animals.

**Middle School/High School Extension:** How do scientists determine what these animals may have looked like? Using evidence provided in the exhibit, explain why *Cryolophosaurus* was depicted with these facial colorations.

## Section 5 | From Lush to Barren: A Transformed Antarctica

After the warmer, greenhouse earth environments of the Permian Period and Mesozoic Era, the world began to switch into a new extreme - an icehouse earth. This gradual but dramatic change was marked by dropping temperatures, leading to an environment in Antarctica more similar to what we know today.

Entering this new exhibit space in Section 5, we have not only moved forward in time (from the Early Jurassic to the end of the Cretaceous and into the Paleogene), but we have also moved geographically across the continent. Sections 3 and 4 highlight fossils from terrestrial rocks in the central part of Antarctica's Transantarctic Mountains, and Section 5 highlights fossils preserved in marine rocks from the Antarctic peninsula, showing us that Antarctic animal life in the Late Cretaceous was concentrated in the sea.

### Highlight Piece: *Taniwhasaurus* (Marine Reptile)



*Taniwhasaurus antarcticus* belongs to a group of extinct carnivorous aquatic reptiles called Mosasaurs. While Mosasaurs existed during the same time as many dinosaurs, they are NOT dinosaurs themselves, but are instead more closely related to modern monitor lizards like the Komodo dragon.

Look at the cast of the *Taniwhasaurus*. Though this animal is extinct, scientists can make educated inferences about its lifestyle based on the fossils left behind.

Ask students to take a closer look at this animal. **Where do you think this animal lived and what do you think it ate? What do you see that makes you say that? How is *Taniwhasaurus* different or similar from the animals you saw in the previous sections?**

**Middle School/High School Extension:** How is *Taniwhasaurus* different or similar to animals in Antarctica now? What does that tell us about how Antarctica has changed and/or stayed the same?

## Section 6 | Lessons from Antarctica

We've followed along expeditions to Antarctica and asked questions through the eyes of a paleontologist. The research currently happening in Antarctica extends beyond the excavation of dinosaurs. Many different types of scientists and researchers are studying Antarctica. Though their specialties differ, they are all working to piece together the continent's past and present conditions to better understand Earth's possible future. This section explores the diverse scientific disciplines, including paleontology, that allow for a greater understanding of our changing planet—past, present, and future.

Research in Antarctica is ongoing - and there are still more questions to ask! Take a look at the various fields of study represented in this section. **What new questions have arisen for your students as you've explored these expeditions?**

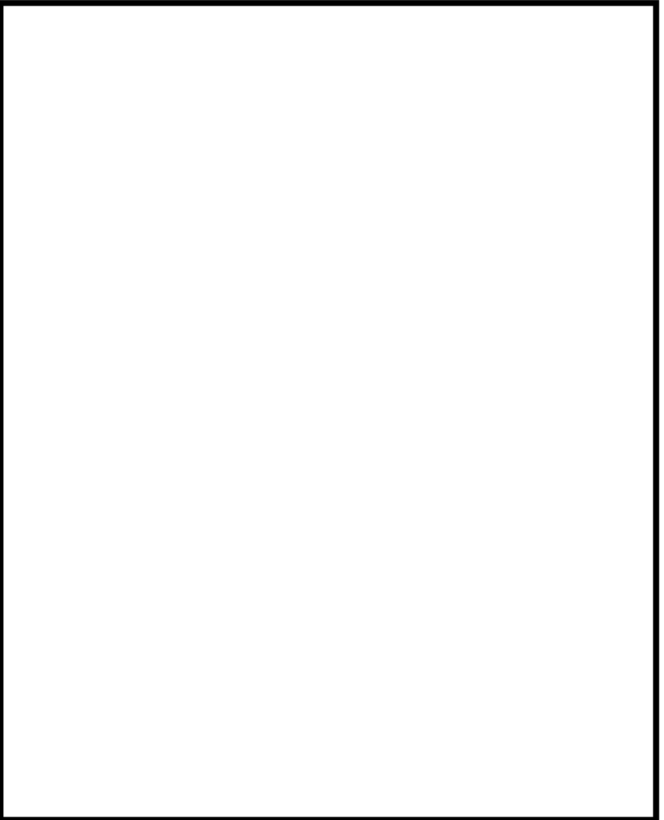
**Middle School/High School Extension:** What field of study would you use to answer these questions? If you were a scientist studying in Antarctica today, what questions would you want to ask?

# **PALEONTOLOGY FIELD JOURNAL**

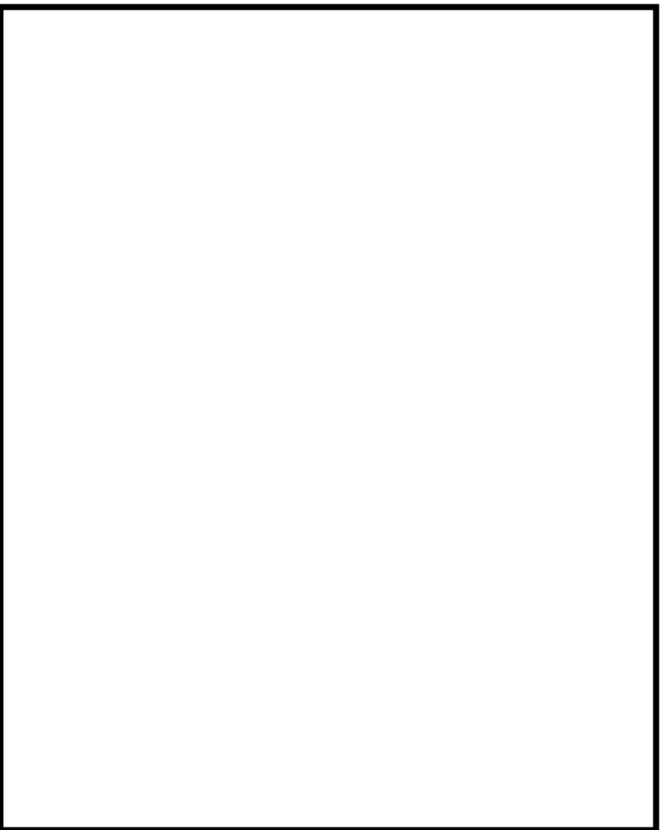
**THESE OBSERVATIONS BELONG TO:**



Draw/Describe the environment you observed



Draw/Describe the animal(s) you observed



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# Vocabulary

**Botany:** The scientific study of plants; including their classification, anatomy, physiology, ecology, genetics, and more.

**Climate:** Describes the weather conditions of a place over a long timespan; including patterns of temperature variation, humidity, wind, precipitation, etc.

**Era:** A division of geologic time; eras are subdivided into periods (just as one year is divided into multiple months).

**Fossil:** Any preserved evidence of ancient life. Can be everything from a skeleton, to a footprint, or even a leaf! Ancient is usually defined as older than 10,000 years.

**Geology:** The study of the processes that have shaped Earth; also known as “earth science” or “geoscience”.

**Greenhouse Earth:** Refers to periods in the Earth’s history in which carbon dioxide levels are high, temperatures are warmer, and there are no continental glaciers.

**Icehouse Earth:** Periods on Earth when greenhouse gases are less abundant, global temperatures are cooler, and sheets of ice are present (though the degree of glaciation can vary). Also known as an “ice age”!

**Mesozoic:** The Mesozoic Era is when the dinosaurs lived, from around 251 million to 66 million years ago. The Mesozoic Era is divided into three periods:

- **Triassic:** The Triassic Period is the first subdivision of the Mesozoic Era and lasted from 251 million to 201 million years ago. It followed the great mass extinction at the end of the Permian Period and marks the first appearance of dinosaurs.
- **Jurassic:** The Jurassic Period is the second subdivision of the Mesozoic Era and lasted from 201 to 145 million years ago.
- **Cretaceous:** The Cretaceous Period is the third subdivision of the Mesozoic Era and lasted from 145 to 66 million years ago. It ended with the second largest mass extinction in Earth's history, which marked the end of the age of dinosaurs.

**Paleontology:** The science which studies the history of life on Earth by examining fossil evidence.

**Period:** A subdivision of geologic time; multiple periods are encompassed by an era (just as multiple months are contained in one year).

- **Permian:** The Permian Period preceded the time of dinosaurs, spanning from around 299 to 251 million years ago, and ending with the largest mass extinction in Earth's history.

# Geological Time Chart

NATURAL HISTORY MUSEUM  
LOS ANGELES COUNTY

## GEOLOGICAL TIME CHART

