

# EXPLORE ENVIRONMENTS & ADAPTATIONS

## OVERVIEW

Students will explore the environment of Antarctica and identify how animals, including humans survive in Antarctica's extreme environment.

### NYS Science Core Curriculum

**LE Standard 4, 3.1c:** In order to survive in their environment, plants and animals must be adapted to that environment.

## BACKGROUND FOR EDUCATOR

Antarctica is Earth's southernmost continent. It is the coldest place on Earth with temperatures that can fall below  $-57$  degrees Celsius ( $-70^{\circ}\text{F}$ ). Winds that can reach over 322 kilometers per hour (200 mph) make it the windiest. Most life is concentrated on the shoreline and surrounding waters, although some microbes thrive in unexpected places like dry valleys and ice-capped brine lakes. The few species, including penguins, seals, seabirds, and tundra vegetation, that can live in Antarctica have features that help them survive extreme conditions. For example, penguins and seals have a thick layer of insulating fat called blubber.

For humans, living and working in Antarctica's extreme cold presents challenges. They must wear extreme weather gear to protect themselves against frostbite, ice, severe winds, and snow blindness.

## BEFORE YOUR VISIT

### Class Discussion: How Do We Dress for the Weather?

Invite students to describe the weather they experience throughout the year. Ask:

- What clothes do you wear when it's sunny and very hot outside? (*Answers may include: light-weight and light-colored clothing, shorts, tee-shirts, sandals, etc.*)
- How would you dress for a very cold, snowy winter day? (*Answers may include: heavy clothes, sweater, down coat, boots, gloves, scarf, hat, etc.*)

Tell students that Antarctica is the coldest, windiest place on Earth. Display photos of people working in Antarctica. (You can search for and download photos from [photolibrary.usap.gov](http://photolibrary.usap.gov)) Ask:

- What do the photos show about the Antarctic environment? (*Answers will include: It's a cold place with a lot of snow and ice.*)
- How do people in Antarctica dress for the cold climate? (*Answers may include: They wear heavy winter clothing.*)

Have students imagine that they will go to Antarctica to study penguins.

For older students: Have students work in groups to come up with a list of what clothing they would bring. Call on groups to share their lists and compare their items with other groups.

For younger students: Create a poster in the shape of a suitcase. Ask students to name things they would pack to go to Antarctica. Have them draw and cut out pictures of what they would bring and paste them on the suitcase.

**Plan how your students will explore *Race to the End of the Earth*.** In the exhibition, students will use their **student worksheets** to investigate how penguins and humans survive in the harsh environment of Antarctica.

Distribute copies of the student worksheets to students before coming to the Museum. You may want to review the worksheets with students to make sure they understand what they are to do.

### Activity: How Do Penguins Stay Warm?

Explain that some animals live on Antarctica. Ask: How do you think they are able to live in such a cold place? (*Answers will vary.*) Tell students they will watch a video about one Antarctic animal, the Emperor penguin. As they watch, have students identify how the penguins stay warm, keep their young warm, and find food.

Show the video from National Geographic Kids:

[kids.nationalgeographic.com/Animals/CreatureFeature/Emperor-penguin](http://kids.nationalgeographic.com/Animals/CreatureFeature/Emperor-penguin)

After showing the video, have students share their ideas with the class. Elicit that one way Emperor penguins stay warm is by huddling together. Create a class huddle. Call on volunteers to walk like penguins and try to find the warmest spot. Ask: Which penguins in the huddle will stay warmest? (*Answer: Penguins in the center*) Tell students they will have the opportunity of seeing a penguin diorama when they visit the *Race to the End of the Earth* exhibition.

## DURING YOUR VISIT

### *Race to the End of the Earth* Exhibition

4th floor (30–45 minutes)

**Visit the Emperor penguin diorama.** Call on students to share what they notice about the penguins. Have them focus on the body shape, feathers, wings, beak, claws, and pouch. Ask:

- How does its body shape help the penguin? (*Answers may include: A streamlined body shape enables penguins to slide along the ice and to swim quickly through water.*)
- How do feathers help the penguin?  
(*Answers may include: Thick layers of feathers keep the penguin warm. They have a waterproof waxy oil coating.*)
- Penguins don't fly, so how do the wings help them?  
(*Answers may include: They act like flippers and enable penguins to "fly" through the water.*)
- How does the penguin use its beak? (*Answers may include: the long beak helps the penguin catch fish.*)
- How do you think the claws help the penguin? (*Answers may include: They help the penguin grip the ice.*)
- How do penguins use their pouches? (*Answers may include: the pouches keep the eggs and chicks warm.*)

On their **student worksheets**, have students draw and label a picture of the penguin.

**Visit the *Living in Antarctica Today* display** near the end of the exhibition. Have students examine the clothing worn by scientists living and working in Antarctica. Call on students to suggest other items they might add to their list of what to bring or to add to their suitcase. Have students note the number of layers of clothing people in Antarctica have to wear. Ask them, if they were to live in Antarctica, how long it would take them to get dressed.

**Stop by the brightly colored igloo satellite cabin** used by scientists working in remote locations. Have students share what they think living in the cabin would be like. On their **student worksheets**, have students draw a picture showing polar gear and/or housing.

### Millstein Hall of Ocean Life

1st floor (15–20 minutes)

**Visit the Polar Ice diorama** on the upper level of the hall. Have students look for the organisms that Emperor penguins eat (krill, squid, and fish). Have students point to the krill. Explain that almost all Antarctic sea animals depend on this tiny animal to live. Have students select any organism that lives under the ice and look for it in the video above the diorama. Point out that without krill, this animal could not survive. Direct students to the blue whale in the center of the hall. Explain that krill is the only thing the enormous blue whale eats.

**Just beyond the theater, students can "Meet the Men."** As students go through the exhibition, encourage them to pay close attention to the decisions the British and Norwegian teams made about clothing, transportation, and timing, and to the consequences of those choices.

## BACK IN THE CLASSROOM

### Discussion: Survival in Antarctica

Talk about the Museum experience with your class. Ask: What did you learn about penguins? (*Answers will vary.*) How do they live in Antarctica? (*Answers may include: They have features that enable them to live in the harsh climate.*) Have students revisit the list of items or polar suitcase they made before the Museum visit. Ask: What did you learn about polar clothing? (*Answers may include: It is designed for extreme cold and windy conditions.*) What other items would you now include in your list of clothing to take to Antarctica? (*Answers will vary.*)

### Activity: Rubber Blubber Gloves

[amnh.org/ology/rubber\\_blubber\\_gloves](http://amnh.org/ology/rubber_blubber_gloves)

In this hands-on experiment, students investigate how blubber keeps marine mammals warm in cold ocean waters.

### Activity: Create a Polar Creature

[amnh.org/resources/rfl/pdf/aa\\_a10\\_polar\\_creature.pdf](http://amnh.org/resources/rfl/pdf/aa_a10_polar_creature.pdf)

In this hands-on activity students will create a polar creature with features that will allow it to live in Antarctica's harsh climate. Simplify this activity to meet the needs of your students.

## SUGGESTED READINGS

### Letter from Stephanie: Antarctic Adaptations

[amnh.org/resources/rfl/pdf/aa\\_ss08\\_adaptation.pdf](http://amnh.org/resources/rfl/pdf/aa_ss08_adaptation.pdf)

*Antarctica* by Helen Cowcher

*Penguins* by Seymour Simon

*The Emperor's Egg* by Marten Jenkins

*Mrs. Chippy's Last Expedition* by Caroline Alexander

## ONLINE RESOURCES

### Antarctica: The Farthest Place Close to Home

[amnh.org/resources/antarctica](http://amnh.org/resources/antarctica)

This award-winning curriculum connects students to the continent's biology and geology, and helps them master important science skills. Easily tailored to your time frame and grade level.

### National Geographic Kids

[kids.nationalgeographic.com/Animals/CreatureFeature/Emperor-penguin](http://kids.nationalgeographic.com/Animals/CreatureFeature/Emperor-penguin)

This site provides information, photos, and video footage of Emperor and Adelie penguins.

### United States Antarctic Program

[photolibrary.usap.gov](http://photolibrary.usap.gov)

This photo library has thousands of photos that feature people, stations, scenery, transportation, and wildlife.

### Penguin Science

[penguinscience.com/media.php](http://penguinscience.com/media.php)

Hundreds of still Antarctic pictures, including images of the landscape, people, and animals.

In Antarctica, animals, including humans, must protect themselves from the harsh environment.

**1 How Do Penguins Live in Antarctica?**

Find the penguin diorama. Pick a penguin and draw a picture of it in the box.

Draw a line to connect each body part with its name.

**BODY PARTS**

beak

feathers

wings

pouch

claws

**2 How Do Humans Survive in Antarctica?**

Find the bright red polar clothing and shelter.

Draw a picture of a polar clothing or shelter in the box.

# Race to the End of the Earth • New York State Science Core Curriculum

**KEY:** LE = Living Environment  
PS = Physical Setting

● = Content alignment addressed in-depth in exhibition section  
○ = Content alignment addressed in some depth in exhibition section

ELEMENTARY SCHOOL									
Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
LE 4	1.1a: Animals need air, water, and food in order to live and thrive.								●
	3.1a: Each animal has different structures that serve different functions in growth, survival, and reproduction.	●			●				●
	3.1c: In order to survive in their environment, plants and animals must be adapted to that environment	●			●				●
	5.1b: An organism's external physical features can enable it to carry out life functions in its particular environment.	●			●				●
	5.3a: Humans need a variety of healthy foods, exercise, and rest in order to grow and maintain good health.						○	○	
PS 4	1.1a: Natural cycles and patterns include the length of daylight and darkness varying with the seasons.				●				
	3.1b: Matter has properties color, hardness, odor, sound, taste, etc. that can be observed through the senses.	●			●				
PS 7	Connections: The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.				●	●	●		
	Strategies: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.				●	●	●		

# Race to the End of the Earth • New York State Social Studies Core Curriculum

**KEY:** LE = Living Environment  
PS = Physical Setting

● = Content alignment addressed in-depth in exhibition section  
○ = Content alignment addressed in some depth in exhibition section

## ELEMENTARY SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
2: World History	2.1a: Read historical narratives, myths, legends, biographies, and autobiographies to learn about how historical figures lived, their motivations, hopes, fears, strengths, and weaknesses.		●	●	●	●	●		
	2.2d: Compare important events and accomplishments from different time periods in world history		●	●	●	●	●		●
	2.3a: Understand the roles and contributions of individuals and groups to social, political, economic, cultural, scientific, technological, and religious practices and activities.		●	●	●	●	●	●	
	2.4c: View historic events through the eyes of those who were there, as shown in their art, writings, music, and artifacts.		●	●	●	●	●		
3: Geography	3.1c: Locate places within the local community, State, and nation; locate the Earth's continents in relation to each other and to principal parallels and meridians		●	●	○				●
	3.2a: Ask geographic questions about where places are located; why they are located where they are; what is important about their locations; and how their locations are related to the location of other people and places.	●	●	●					

## MIDDLE SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
2: World History	2.1c: Interpret and analyze documents and artifacts related to significant developments and events in world history		●	●	●	●	●		
	2.4a: Explain the literal meaning of a historical passage or primary source document, identifying who was involved, what happened, where it happened, what events led up to these developments, and what consequences or outcomes followed.		●	●	●	●	●		
	2.4c: View history through the eyes of those who witnessed key events and developments in world history by analyzing their literature, diary accounts, letters, artifacts, art, music, architectural drawings, and other documents		●	●	●	●	●	●	

3: Geography	3.1a: Map information about people, places, and environments		•	•	o				•
	3.1b: understand the characteristics, functions, and applications of maps, globes, aerial and other photographs, satellite-produced images, and models		•	•	o				•

## HIGH SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
2: World History	2.2c: Analyze evidence critically and demonstrate an understanding of how circumstances of time and place influence perspective		•	•	•	•	•		
	2.4b: Interpret and analyze documents and artifacts related to significant developments and events in world history		•	•	•	•	•		
3: Geography	3.1a: Understand how to develop and use maps and other graphic representations to display geographic issues, problems, and questions		•	•	o				•
	3.1b: Describe the physical characteristics of the Earth's surface and investigate the continual reshaping of the surface by physical processes and human activities			•					•
	3.1e: Analyze how the forces of cooperation and conflict among people influence the division and control of the Earth's surface								•