



## HANDS-ON SCIENCE ACTIVITIES



---

### Activity 8

# Polar Bears or Penguins?

---

For use with participants ages 10 to 13



LUNAR AND  
PLANETARY  
INSTITUTE



ALA American  
Library  
Association



# Contents

<i>Discover Earth</i> Themes and Overview of Activities .....	3
How to Use These Activities in Your Programs .....	5
Correlations to National Standards .....	6
Activity Procedure .....	7
Overview .....	7
What's the Point? .....	7
Materials .....	7
Preparation .....	9
Activity .....	10
Conclusion .....	14
Contact Information .....	15
<i>STAR_Net</i> Project Overview .....	15
Online Community .....	16
Credits and Acknowledgements .....	17
Appendix: Activity Materials to Print .....	19



---

# *Discover Earth* Themes and Overview of Activities

The *Discover Earth* activities focus on Earth science topics close to home – such as local weather and the plants, animals, crops, and environmental features particular to your region – as well as a global view of our changing planet. Through hands-on investigations and discussions, young audiences discover that Earth’s global environment changes – and is changed by – the local environment. The activities explore three key messages relating to this overall theme: A. We belong to Earth; B. Each region is unique; and C. Your home is changing. These messages all relate to the overall theme: Earth’s global environment changes – and is changed by – the local environment. The activities were developed with guidelines set forth by the National Science Education Standards and American Association for the Advancement of Science (AAAS) benchmarks, and they were designed for audiences in the following four age ranges: 5 to 7, 8 to 9, 10 to 13, and teens.

## **Overall Theme**

Earth’s global environment changes – and is changed by – the local environment.

## **A. We Belong to Earth**

We belong to a complex system of interacting water, ice, air, and life.

### **Community Activities**

The community contributes to two exhibits: In *Century of Change Display*, the community gathers and compares photos and/or illustrations of the local areas taken a century and more ago with more contemporary photos of the same areas. In *Weather Wall*, children track the local weather over a period of two months or more, plotting weather data on a kid-friendly sticker chart.

### **Icebreaker Activities**

Children ages 5 and up are introduced to Earth’s major characteristics (or parts or systems) -- water, ice, air, and life – through the brief icebreaker activities *Catch!...the World’s Ocean*, *Ice-y Experience*, *Share the Air*, and *Web of Life*.

### **Discover Earth through Reading**

*I Belong to Earth* can serve either as part of a kick-off celebration or as an outreach program to area schools. Children and teens discover Earth science questions and answers using the library’s resources and participate in reading games — customized for ages 5 to 9, 10 to 13, and teens — that combine book lists and reading logs into take-home adventures! After this activity, the reading



games continue to connect patrons with the *Discover Earth* activities and resources. Participants advance by reading, engaging in suggested at-home activities, attending *Discover Earth* library programs, or investigating Earth and the environment through a variety of citizen science programs. Completed game boards may be submitted to the library for display, and if desired, entry into promotional drawings. Participants earn a decal upon completion.

## **B. Each Region Is Unique**

Changes to distant oceans, air moving freely around our globe, and all living things have an influence on our regional environment, now and in the past and future.

### **Weather Explorations**

Children ages 5 to 7 explore various aspects of weather through a series of stations featuring games, crafts, and weather observations in *Weather: The Many Faces of Mother Nature*. Children ages 8 to 9 and 10 to 13 undertake more advanced investigations of rain, wind, clouds, and weather instruments and consider how locally collected weather data relate to the broader Earth systems of water, ice, air, and life in *Weather Stations*.

### **Regional Explorations**

In *Climate Tour*, children ages 10 to 13 celebrate their region of the United States by creating a regionally-inspired postcard and recipe. Finally, they use a set of *What if...* cards about their region to reconsider their postcards and recipes in light of future climate change. In *Polar Bears or Penguins?*, children ages 10 to 13 use a fast-action matching game to demonstrate how each of Earth's polar regions is distinct and special.

## **C. Your Home Is Changing**

Earth's water, ice, air, and life will continue to interact over long-term scales, shaping the particular features of that place we each call home.

### **Environmental Stewardship**

In teams, children ages 11 to 13 build an understanding of how human actions impact global change by playing a board game, *Polar Bears Go with the Floes*, in which chance and choice determine the fate of a lone polar bear on an ice floe. Teens, ages 14 to 18, engage their communities in science through art in *Earth: Artistically Balanced*. The teens first interact with a climate scientist to unravel, on a very basic level, the complexities of Earth's climate system, and then they create a three-dimensional artistic representation of Earth's climate. The art may be created on a large scale and displayed at the library or made on a smaller scale to take home.



## How to Use These Activities in Your Programs

You may design your own program of one or more of these flexible activities, or you may choose to build the story of Earth and its changing environment through the complete series of activities! Background information and facilitator resources are provided to help you prepare to lead the activities. Encourage further exploration with the books, websites, and videos listed in the *Facilitator's Resources* packet. Programming ideas for all ages, infant to adult, are also provided.

Reading games, geared toward different age levels, support this module and connect the activities and resources. The games combine the traditional reading log and book list into a board game, where participants advance by reading, engaging in suggested at-home activities, attending library programs, or investigating Earth and the environment through a variety of citizen science programs. These games are introduced in Activity 4: *I Belong to Earth*. The game boards may be customized with your institutions' address, and if desired, an additional step in the instructions for winning prizes. Matching decals may be printed and awarded as prizes. *Read Me* bookmarks are available as a way for children to read, review, and recommend titles to others. These materials (shown below), including the supporting book lists, are available free for educational use at [www.lpi.usra.edu/explore/discoverEarth](http://www.lpi.usra.edu/explore/discoverEarth).

The collage features several educational resources:

- Weather Watcher:** A reading log for ages 6 to 9 with a grid for tracking reading progress and activities.
- Thoughtful Steward of the Earth:** A reading log for teens and adults with sections for 'Belong', 'Change', 'Balance', and 'Nurture'.
- Roaming Reader:** A circular board game for ages 10-18 featuring a map of the continental U.S. with various reading and activity prompts for different regions.
- Read Me!** A bookmark template for recommending books.
- Discover Earth's Special Places in the Continental U.S.:** A reading list for ages 10 to 18.



# Correlations to National Standards

## National Science Education Standards

---

### Grades 5-8

Life Science - Content Standard C

*Populations and Ecosystems*

- Populations of organisms can be categorized by the function they serve in an ecosystem. All populations living together and the physical factors with which they interact compose an ecosystem.

Earth and Space Science - Content Standard D

*Structure of the Earth System*

- Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere (and cryosphere) in what is known as the "water cycle."

## Language Arts Focus

---

- Practice listening to and understanding nonfiction text.
- Understand scientific terms and descriptive scientific language.
- Children use a variety of information resources to gather and synthesize information.



---

# Activity Procedure

## Overview

---

Divided into teams, children ages 10 to 13 match Arctic and Antarctic facts to one of three of categories — "North Polar Region," "South Polar Region," and "Both." The teams compare their categorization of the facts and use any discrepancies as a springboard for further exploration. The group comes to a consensus using library resources, including possibly a movie as well as books. The children come away with a clear understanding of how each of Earth's polar regions is distinct and special, including that polar bears are found in the Arctic and penguins are found in Antarctica. Suggestions for facilitating a tween- or teen-led puppet show for young children are included. The activity requires about an hour, with additional time necessary if a video is incorporated.

Ideally, the icebreaker activity *Ice-y Experiences* is conducted immediately preceding this activity.

## What's the Point?

---

- Earth is home to many different regions, each with unique characteristics.
- A given area is shaped by the amount and forms of water, ice, air, and life found there.
- Earth's north and south polar regions have distinct physical characteristics and different organisms live in each place.
- Changes to distant oceans, air moving freely around our globe, and all living things have an influence on our local environment, now and in the past and future.

## Materials

---

### Facility Needs

- Access to a six-foot or larger section of wall or dry erase/chalk board
- Optional: DVD or Blu-Ray player, projector, projection screen to play videos
- Optional: Writing space viewable by the entire group, such as white board or poster paper and markers, or a black board and chalk



## For Each Group of 6 to 10 Children

- 2 sets (or more) of *Polar Fact Cards* (one for each team of 3 to 5 children), with each set printed on a different color
- Optional: 2 sets of small cards, pieces of paper, or Post-it® Notes (in the same colors as the paper for the *Polar Fact Cards*, if desired)      AND       6-10 pencils, pens, or markers
- 3 poster boards
- Optional: maps of the north and south polar regions, printed on 8.5" x 11" paper
  - Arctic without Ice Cover*
  - Antarctic without Ice Cover*
- 2 (or more) rolls of tape
- Access to videos and books about the polar regions, such as (refer to the *Facilitator's Resources* packet for other suggestions):

### **THE BLUE PLANET: SEAS OF LIFE**

*BBC Warner, 2007, AISBN: B001957A4E*

Narrated by Sir David Attenborough, the "Frozen Seas" episode provides a visually stunning introduction to the Arctic and Antarctic, with a focus on the animals that live in the distinct regions. Appropriate for ages 5 and up.

### **EYEWITNESS: ARCTIC & ANTARCTIC**

*DK Publishing, 2008, ASIN: B002EP8F9M*

Martin Sheen narrates this tour of the north and south polar regions and the animals that inhabit them.

### **ARCTIC AND ANTARCTIC (EYEWITNESS BOOKS)**

*Barbara Taylor, DK Children, 2012, ISBN 0756690714*

Populated with numerous photographs, this book examines the north and south pole regions — climate, plants, animals, cultures, and exploration — in an engaging beautifully illustrated manner for children ages 8 and up.

### **THE SECRETS OF THE POLAR REGIONS: LIFE ON ICEBERGS AND GLACIERS AT THE POLES AND AROUND THE WORLD**

*Barbara Wilson, London Town Press, 2008, ISBN: 0979975905*

Children ages 9–12 will enjoy this exploration of the geology, environment, and ecosystems of the north and south polar regions. Wilson also shares implications of global warming on these delicate systems.



## **POLES APART: WHY PENGUINS AND POLAR BEARS WILL NEVER BE NEIGHBORS**

*Elaine Scott, Viking Juvenile, 2004, ISBN: 0670059250*

Children ages 10 to 13 are given insight into the rigors of polar exploration, the current scientific research at both poles, and interesting facts about the two environments.

### **For Each Child**

- Optional: His/her *Discover Earth* reading game board

### **For the Facilitator**

- Facilitator's Resources* packet (available at [www.lpi.usra.edu/explore/discoverEarth](http://www.lpi.usra.edu/explore/discoverEarth)), which includes:
  - Background information
  - Be a Science Guide!*
  - Resource lists
  - Shopping list

### **Preparation**

- Review the *Facilitator's Resources* packet.
- Advertise the program separately to tweens and teens, and keep the ages separate, if possible. If mixed ages might attend the program, plan to separate into two groups guided by two or more facilitators.
- Prepare an area large enough for each team to work separately to view their *Polar Fact Cards* together. Plan to have access to a six-foot or larger section of wall or dry erase/chalk board for the race to the poles. If a video will be incorporated, set up the equipment to play the video (or segments). Display several books about the Arctic and Antarctic regions in a place where the children can page through them during and after the activity.
- Label three posters, one with "North Polar Region," one with "South Polar Region," and one with "Both." If desired, print the maps of the two regions and add them to the posters. Use these posters to designate three different areas on the wall where the teams will tape their polar cards during the game. "Both" should come between the posters for the north and south polar regions.
- Make a set of *Polar Fact Cards* for each team on different-colored card stock and cut out the cards.



- Set out the tape and cards, as well as small cards, pieces of paper, or Post-it Notes and pens, pencils, or markers.
- If desired, prepare a "Wall of Ice," an area that is easily visible to the group, with a white board or poster paper on which children can record new vocabulary and definitions.

**Facilitator's Note:** If your tweens or teens are invested in supporting library programming, consider expanding this activity to produce a puppet show. Children ages 8 and up could write a puppet show script based on the Arctic and Antarctic facts explored in *Polar Bears or Penguins?*. The goal of the show would be to showcase Earth's unique polar environments and dispel the misinformation that polar bears and penguins live in the same place. Depending on the age of the puppet show audience, and with careful guidance from the adult facilitator, the show could discuss the peril that polar bears — and humans — face as Arctic sea ice melts due to climate change.

Kid-friendly instructions for making paper bag puppets can be found online, for example:

- Polar bear: [www.enchantedlearning.com/crafts/puppets/paperbag/](http://www.enchantedlearning.com/crafts/puppets/paperbag/)
- Penguin: [www.nwf.org/Kids/Wild-Animal-Baby/Fun/Crafts-and-Activities/Birds/Penguin-Puppet.aspx](http://www.nwf.org/Kids/Wild-Animal-Baby/Fun/Crafts-and-Activities/Birds/Penguin-Puppet.aspx)

Videos of puppet shows by 9-year-olds may provide inspiration: "Feeding on Ice" ([www.climatechangeexplorer.org.uk/polarpuppets](http://www.climatechangeexplorer.org.uk/polarpuppets)) and "The Bear Facts" ([www.climatechangeexplorer.org.uk/bearfacts](http://www.climatechangeexplorer.org.uk/bearfacts)).

## Activity

1. **Conduct the icebreaker activity *Ice-y Experiences* to set the stage for deeper explorations and a positive social experience.** Briefly highlight the library's resources and remind the children how they can use their participation in today's activity to advance on their "Discover Earth" games. Children who were not able to attend the activity *I Belong to Earth* will benefit from this orientation.
2. **Introduce the idea that the children will be demonstrating how each of Earth's polar regions is distinct and special by sorting polar facts in a fast-paced game.** Divide the children into two teams and provide each team with a different color of *Polar Fact Cards* (turned face-down to conceal the facts). Invite them to play a game in which they will work with their teams to determine which cards describe



conditions that are unique to the Arctic or Antarctic and which are true for both. Before they turn over their cards, explain the rules of the game:

- a. Each team has received an identical set of *Polar Fact Cards*. On each card is a fact about the north polar region, or the south polar region, or both.
  - b. Each team will work to determine to which region the fact applies.
  - c. Once they have determined the region, they will take the fact and tape it on the wall in the appropriate space: "North Pole", "South Pole", or "Both".
  - d. The team that gets all the facts — in the correct locations — first, wins.
3. **Play the game!** Allow the children several minutes to read and sort the cards. Observe the teams for signs of teamwork.
  4. **Regroup with the children and review the card area.** Congratulate the team that finished the fastest and the team that employed the best teamwork. Highlight the cards that were correctly placed by both teams. Identify the cards that were placed on different posters by each of the teams, i.e., where the team's don't "agree." If any cards were not correctly placed, gently point out that that polar fact will need to be reconsidered. At this time, do not correct any of the incorrectly placed polar fact cards, but gather them for the next step.

**Facilitator's Note:** Answers to the Polar Fact Cards are below (with additional information added in parentheses).

#### **Arctic**

- Polar bears live here.
- There are lots of mammals here, like musk ox, reindeer, caribou, foxes, and wolves. (There are also many birds, including those that migrate from afar and breed in the Arctic.)
- This region is an ocean surrounded by land.
- There are native cultures that have been living here for many, many generations.
- It is winter in December here.
- Much of the floating sea ice is thick here — up to 12 to 15 feet thick (and it is sometimes ridged into even thicker piles) — and lasts many years.
- The North Pole is here.



### Antarctic

- Penguins live here.
- This region is a continent surrounded by an ocean.
- People have only been visiting this place for a few hundred years.
- This location is protected by a treaty that says it can only be used for peaceful, scientific purposes.
- This is the highest, driest continent on Earth.
- It is winter in July here.
- There are no land mammals native to this place!
- The average temperature at this pole is -58F.
- The area covered by ice doubles in the winter! A thin sheet of floating sea ice forms on the ocean surface.
- The South Pole is here.
- There are no trees and only two types of flowering plants here.

### Both

- Scientists study ice here.
- The amount of ice here is getting smaller (overall). (The amount of land ice, such as ice sheets and glaciers, is getting smaller in both regions; in the Arctic, the amount of sea ice is also decreasing.)
- There is ice — called glaciers — flowing down from mountain ridges and ice sheets here.
- Floating sea ice forms every winter here.
- There are lots of marine mammals — like whales, seals, walruses, and sea lions — in this region. (Fishes also live in Arctic and Antarctic waters; microorganisms live on land and in the water.)
- There are icebergs here. (Antarctic icebergs are more numerous and are generally larger.)

5. **Invite the teams to go on a quest for the correct information and challenge them to correctly place the polar fact cards gathered in the previous step.** Distribute the misplaced cards between the teams. If desired, and especially if relatively few or no cards were misplaced, encourage the children to collect and record additional information using the small cards, pieces of paper, or Post-it Notes and pens, pencils, or markers. If needed, have the children list any new vocabulary words on the "Wall of Ice." Offer library resources to assist them in their search for information:



- a. Optional: Together, watch a video — or select segments of a video — about Earth’s polar regions.
- b. Provide various books about the polar regions.

**Facilitator’s Note:** Through their reading, the children will come across diverse information, possibly including:

- Antarctica is the fifth largest and southernmost continent and, on average, is the coldest driest, windiest continent.
- Antarctica is the highest continent (if its ice sheet is included in the measurement).
- While it snows in the coastal regions, there is very little precipitation in the interior of Antarctica. About 98% of the continent is covered by ice.
- Antarctica is the only continent with no permanent human residents.
- The Arctic Circle encompasses the area around the Earth's north pole, which includes the Arctic Ocean and parts of Canada, Greenland, Russia, Alaska, Iceland, Norway, Sweden, and Finland.
- Unlike Antarctica, which is land covered by thick ice sheets, much of the Arctic region is an ocean covered by thin, floating sea ice.
- There are differences in the organisms that live in the Arctic and the Antarctic; the Arctic, unlike the Antarctic, has indigenous populations of people.
- Polar bears and penguins do not inhabit the same poles! Polar bears are found in the northern polar region and penguins live (among other places) in the southern polar region.
- The early exploration of the Arctic and Antarctic involved numerous individuals, teams, and countries, as does the ongoing scientific exploration of these polar regions.
- In 1959, a treaty was signed by twelve countries establishing Antarctica as a scientific preserve and prohibiting military activities. The treaty, which protects the continent's ecozone, has now been signed by 46 countries.

6. **After the teams have collected their information and placed the polar fact cards on a poster, invite each team to choose one or more volunteers to share their information with the group.** Verify that each card has been correctly placed during the discussion.
  - What was your most surprising discovery?

Point out that information about the extent of Arctic sea ice coverage may have varied between books.



- Can you guess why that information might vary? *Accept all answers and guide the conversation to the answer: Different books use different sources for their information. In addition, the percentage of permanent sea ice coverage is different each year, so the percentage in any given book will be determined by the year of the publication. In addition, scientists use different ways of measuring the extent of Arctic sea ice coverage that may give slightly different values.*

**Facilitator's Note:** In recent years, scientists have observed an alarming trend: ice is melting across the world. Since 1979, scientists have documented an overall downward trend for sea ice in the Arctic Ocean (with more ice observed in some years than others): Each winter, less sea ice forms, it melts earlier in the spring, and less ice remains at the end of summer. For polar bears, climate change means the gradual loss of the sea ice that forms the necessary platforms from which they hunt.

## Conclusion

**Summarize how each of Earth's polar regions is distinct and special in terms of temperatures, animals and plants that live there, and changes in climate.** Point out a few of the features both polar regions have in common.

- In which polar region are polar bears found? *The Arctic/north polar region!*
- In which polar region are penguins found? *The Antarctic/south polar region!*

If possible, build on the children's knowledge by offering them a future *Discover Earth* activity.



## Contact Information

Your questions and comments about the *Discover Earth: Hands-on Science Activities* are welcome!

*Explore* Program Team  
Department of Education and Public Outreach  
The Lunar and Planetary Institute  
3600 Bay Area Boulevard  
Houston, Texas 77058  
explore@lpi.usra.edu

## *STAR\_Net* Project Overview

The *STAR Library Education Network* project (*STAR\_Net* for short) is part of a national initiative to support libraries that are already providing informal STEM learning, or want to provide it. The *STAR\_Net* project has a number of components, including:

- Two traveling exhibits for libraries: *Discover Earth: A Century of Change*, and *Discover Tech: Engineers Make a World of Difference*.
- An Education Program, which includes developing exemplary hands-on activities for libraries, as well as conducting training (both online and in-person) for library staff.
- An Outreach Program that helps libraries to develop STEM programming and find local partners for collaborations on programming.
- An online Community of Practice (CoP) (<http://community.discoverexhibits.org>) for librarians (both hosts and non-hosts of the exhibits) and STEM professionals who want to support STEM programming in public libraries.

The National Science Foundation (NSF) provided funding the *STAR\_Net* project. *STAR\_Net* is led by the National Center for Interactive Learning (NCIL) at the Space Science Institute. Dr. Paul Dusenbery is the project director. STAR stands for “Science-Technology Activities and Resources.” In addition to NCIL staff, the project team includes:

- The American Library Association (ALA), which is managing the exhibit tours and helping to raise awareness among librarians of the many opportunities for providing STEM programming



- The Lunar and Planetary Institute (LPI), which is leading the Education Program component. For some years, LPI has led the *Explore* program for libraries, which has been at the forefront of developing STEM programming and training for librarians.
- The National Girls Collaborative Project (NGCP), which is leading the project's Outreach Program. As a project partner, this NSF-funded project is helping libraries across the country partner with a variety of organizations to provide STEM programming.
- NCIL's Kate Haley Goldman and staff from Evaluation and Research Associates are conducting evaluations of the project's components. The project also includes a research component that explores how public libraries can serve as STEM learning centers in rural, under-served communities. The evaluation and research results will be shared with the informal science education community.

The activity described in this packet was developed for libraries to use in support of the *Discover Earth* traveling exhibit, though it may be implemented independently.

## Online Community

---

Librarians, scientists, engineers, educators, museum staff, and others are invited to join the *STAR\_Net* online community! The website fosters collaboration among professionals who want to provide or support Science, Technology, Engineering, and Mathematics (STEM) learning experiences in libraries. The *STAR\_Net* project team hopes you find the following activity useful. Please join the online community (<http://community.discoverexhibits.org>) and share your experiences implementing it with your colleagues.

For more information about the *STAR\_Net* project, please contact:

Lisa Curtis  
Projects and Exhibits Manager  
National Center for Interactive Learning at the Space Science Institute  
Boulder, CO  
(720) 974-5821  
[curtis@spacescience.org](mailto:curtis@spacescience.org)

# Credits and Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. DRL- 1010844. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

## **Development Team (Lunar and Planetary Institute, Houston, TX)**

*Discover Earth: Hands-on Science Activities* was developed by the Lunar and Planetary Institute's *Explore* program team in support of the *Discover Earth* travelling exhibition by the Space Science Institute's National Center for Interactive Learning ([www.DiscoverExhibits.org](http://www.DiscoverExhibits.org)).

### **Module Development and Workshop Implementation**

Keliann LaConte  
Dr. Stephanie Shipp  
Yolanda Ballard–Zimmermann

### **Web Development and Graphics**

John Blackwell  
Ronna Hurd

### **Resources**

Linda Chappell

Thanks to Andrea Vaughn, coordinator of Central Library Youth Services at Brooklyn (N.Y.) Public Library, and the Public Library Association Virtual Symposium for reading game ideas.

## **Content and Education Review**

Dr. Gil Compo, Research Scientist, *Cooperative Institute for Research in Environmental Sciences, University of Colorado , Boulder, CO*  
Dr. Sara Harris, *University of British Columbia, Vancouver, BC Canada*  
Dr. Walt Meier, *National Snow and Ice Data Center, University of Colorado, Boulder, CO*

Beth Barrett, *Louisville Public Library, Louisville, CO*  
Dr. Susan Buhr, *Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO*  
Tiffany Clendenin, *Ruby M. Sisson Memorial Library, Pagosa Springs, CO*  
Dr. Paul Dusenbery, *National Center for Interactive Learning at the Space Science Institute, Boulder, CO*  
Deborah Morrison, *University of Colorado, Boulder, CO*  
Karen Peterson, *National Girls Collaborative Project, Lynnwood, WA*



## **Field Tests**

Appreciation is extended to the librarians who field tested the materials in their children's, youth, and teen programs.

Justin Barkley, *TLL Temple Memorial Library, Diboll, TX*

Sally Blevins, *Bitterroot Public Library, Hamilton, MT*

Laura Goss, *Adams County Library System, Gettysburg, PA*

## **Evaluation Team**

John Baek, *National Oceanic and Atmospheric Administration*

Vicky Ragan Coulon, *Evaluation & Research Associates, Lynnwood, WA*

Ginger Fitzhugh, *Evaluation & Research Associates, Lynnwood, WA*

Kate Haley Goldman, *National Center for Interactive Learning at the Space Science Institute*



# Appendix: Activity Materials to Print



It is winter in  
December here.



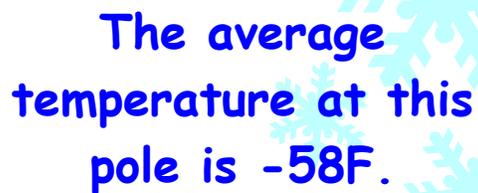
This region is a  
continent  
surrounded by an  
ocean.



People have only  
been visiting this  
place for a few  
hundred years!



There are no  
trees and only  
two types of  
flowering plants  
here.



The average  
temperature at this  
pole is -58F.



It is winter in  
July here.



There are no *land* mammals native to this place!



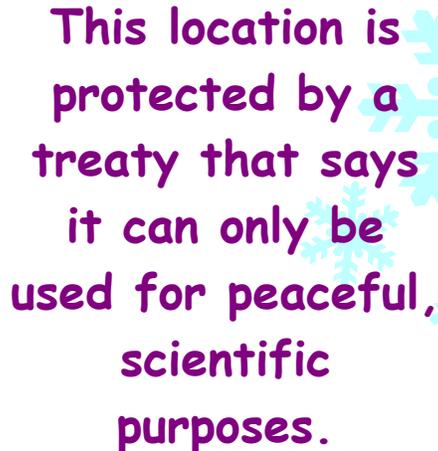
The South Pole is here.



Much of the floating sea ice is thick here — up to 12 to 15 feet thick — and lasts many years.



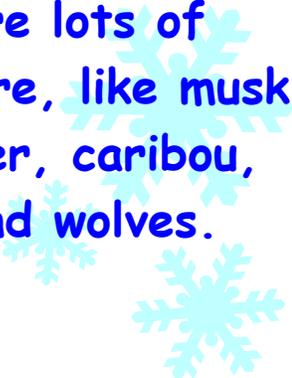
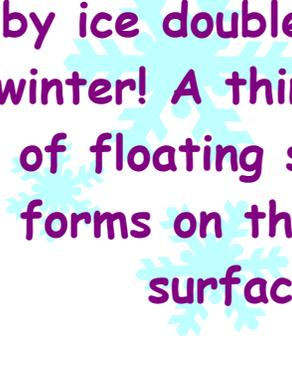
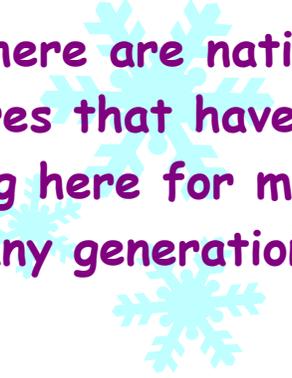
The North Pole is here.



This location is protected by a treaty that says it can only be used for peaceful, scientific purposes.



This is the highest, driest continent on Earth.

 <p><b>Polar bears live here!</b></p>	 <p><b>This region is an ocean surrounded by land.</b></p>
<p><b>There are lots of mammals here, like musk ox, reindeer, caribou, foxes, and wolves.</b></p> 	<p><b>The area that is covered by ice doubles in the winter! A thin sheet of floating sea ice forms on the ocean surface.</b></p> 
<p><b>There are native cultures that have been living here for many, many generations.</b></p> 	 <p><b>Penguins live here!</b></p>



Scientists study  
ice here.



The amount of ice here  
is getting smaller  
(overall).



There are lots of  
marine mammals —  
like whales and penguins —  
in this region.



Floating sea ice forms  
every winter here.

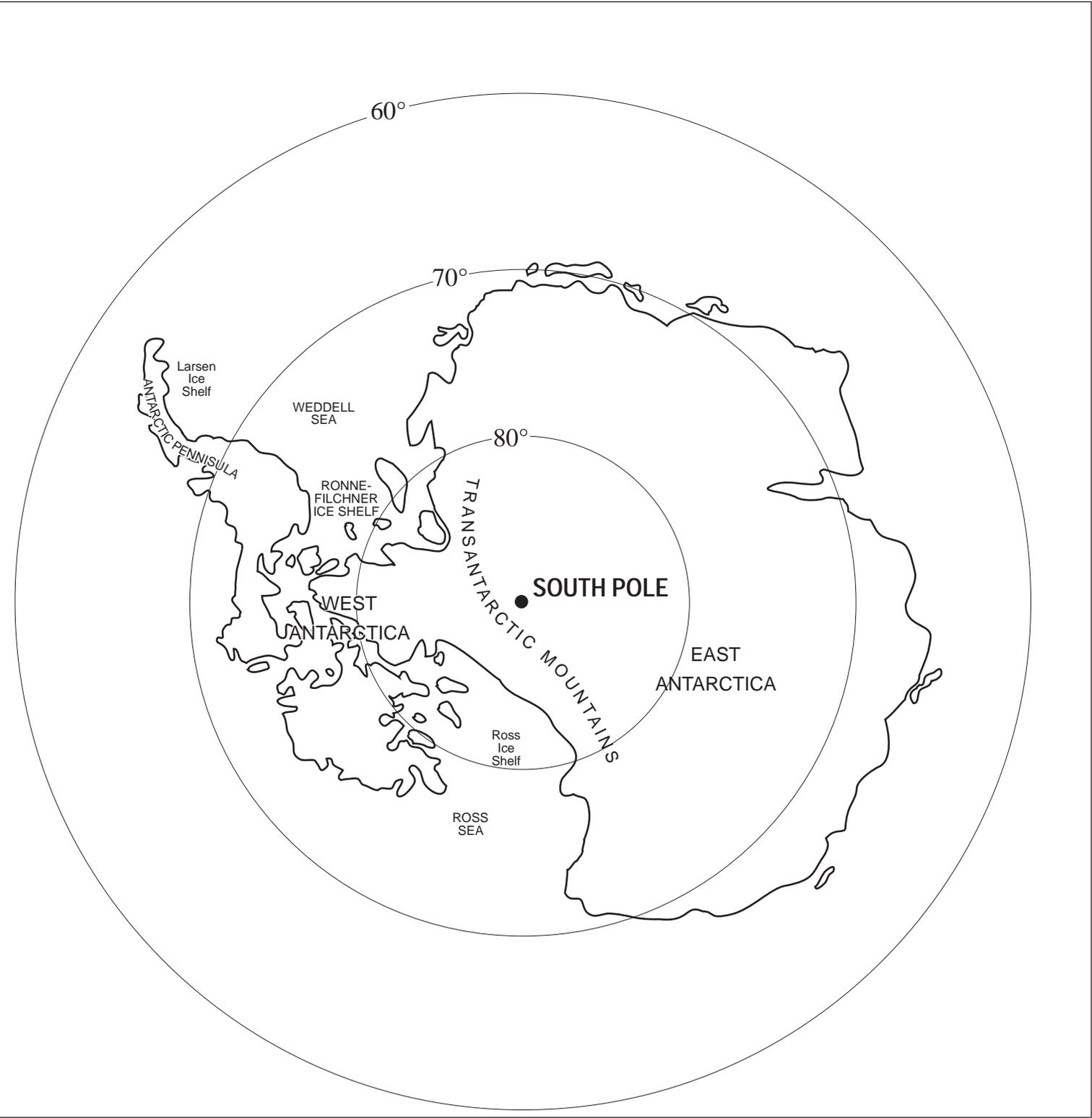


There are lots of  
marine mammals —  
like whales and penguins —  
in this region.



There are  
icebergs here.

# ANTARCTICA WITHOUT ICE COVER



# ARCTIC WITHOUT ICE COVER

