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CURRICULUM GUIDE: ANTARCTICA

IN THIS ISSUE

INSIDE The Washington Post
An Integrated Curriculum For The Washington Post Newspaper In Education Program
Volume 1, Issue 12 February 12, 2002

Antarctica

KidsPost Article: "Deep Freeze"

Lesson: Learn about Antarctica through expeditions

Level: All

Subjects: Geography, Science

Related Activity: English, Language Arts, Mathematics, Reading

Procedure

Study a Map
Before reading the KidsPost article, acquaint students with these terms: latitude, longitude, hemisphere, continent. Find Antarctica on a globe.

1. Have students identify the seven continents on Earth: Africa, Antarctica, Asia, Australia, Europe, North America and South America. Antarctica is the fifth largest.

2. In which hemisphere is the continent of Antarctica located? Antarctica may be found at what latitude and longitude?

3. Locate the Atlantic Ocean, Pacific Ocean and Indian Ocean.

4. What countries are nearest to Antarctica?

5. Locate Tropic of Capricorn, Antarctic Circle, Antarctic Peninsula (northernmost land), Ross Sea, Ross Ice Shelf, and Mount Erebus (largest volcano on Ross Island).

6. What weather conditions might be expected on Antarctica?

Read
Read the KidsPost article and sidebars.

Discuss
After reading the KidsPost article, ask students to answer and discuss these questions.

1. How does the U.S. Coast Guard assist scientists who conduct research on Antarctica?

2. Using the correct scientific terms, explain how an icebreaker breaks ice.

3. Summer occurs during which months in Antarctica?

4. How many hours of sunlight are in an Antarctic summer day?

5. Scientists say between 10 and 25 percent of an iceberg is above the water. If an iceberg is 150 feet above the water, how many feet are likely under the water if 25 percent is above the water? How many feet are likely under the water if only 10 percent is above the water?

6. What are some of the animals found on land and in the water near Antarctica?

7. In what ways is the icebreaker similar to a floating city?

Vocabulary

Antarctic: Pertains to the region of, at, or near the South Pole

Antarctica: The continent that surrounds the South Pole

Buoyancy: The tendency or capacity to remain afloat in a liquid or rise in air or gas. The upward force that a fluid exerts on an object less dense than itself.

Continent: One of the principal land masses of the earth.

Desert: A barren or desolate area; a region of permanent cold that is largely or entirely devoid of life

Gravity: The natural force of attraction exerted by a celestial body, such as Earth, upon objects at or near its surface, tending to draw them toward the center of the body

Hemisphere: A half of a sphere bounded by a great circle. Either the northern or southern half of Earth as divided by the equator or the eastern or western half as divided by a meridian

Iceberg: A massive floating body of ice broken away from a glacier

Indigenous: Originating and growing or living in an area or environment

Latitude: The angular distance north or south of the earth's equator, measured in degrees along a meridian, as on a map or globe

Longitude: Angular distance on the earth's surface, measured east or west from the prime meridian at Greenwich, England, to the meridian passing through a position, expressed in degrees (or hours), minutes, and seconds

Ozone Hole: A thinned region of the ozone layer, develops in the Antarctic spring and continues for several months before thickening again

Definitions are from The American Heritage Dictionary

Antarctica

Continued

Read
Give students "Icebreaker Q and A." Do students have additional questions about Antarctica?

Take a Quiz
Now that students have read the article and discussed its content through the discussion questions and map study, give students the Deep Freeze Quiz.

Read and Write
Explain why Antarctica is called the coldest place on Earth: the rotation of the earth, the 23.5-degree axial tilt, angle at which the sun's radiation hits earth and the geography of Antarctica as a continental ice desert.

Give students "Word Study: a look at temperature." After reading about the etymology of "temperature," have students play a word game. Ask them to write "temperature" on a sheet of paper. How many words can each student make from the letters in "temperature"?

You may begin by asking students to find words that begin with the letter "p" from the letters in "temperature." This will allow you to clarify the rules: "Pre" is a prefix, not a word. Will you allow "perm" and "Pam"? Then have them find their own words.

After the time you designate has elapsed, ask each student to share a new word that he or she discovered. After you have compiled a full list of words on the board, ask students to write about Antarctica using as many of the words on the board as they can.

Plan a Polar Expedition
If you teach younger students, you may wish to read a book about an Antarctic expedition to them. Have them discuss how the environment influenced what happened to the explorers. What animals were included in the story and why they were there.

If you have more time or older students, go to "Teacher Guidelines: Plan a Scientific Expedition to Antarctica." Procedures to follow are suggested. A reproducible version, "Plan a Scientific Expedition to Antarctica," is provided for students. Activities are provided for an interdisciplinary study of Antarctica.

Enrichment
Complete one or more of the Enrichment activities found in "We Read It in the Post."

ANSWERS
Deep Freeze Quiz. *True or False*: 1. True, 2. True, 3. False, 4. False, 5. True, 6. False. *What Is It?* 7. Scientist, 8. Military activity, nuclear testing and disposal of radioactive wastes, 9. 90%, 10. Southern. *Map It:* a. Antarctic Peninsula, b. Ross Ice Shelf, c. South Pole, d. McMurdo Station, e. Antarctic Circle.

We Read It in the Post. 1. Mt. Christmas is located on the Shackleton Coast of the Ross Ice Shelf.

Temperature Word Game: We found over 40 words. Here are ten for your list: temper, era, temperate, rue, turret, trumpet, matter, mature, rapture, putter.

"Deep Freeze" can be found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/niel/A60621-2002Feb11.html*

"A Land on Ice" can be found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/niel/A60623-2002Feb11.html*

Discover Antarktikos

ON THE WEB

http://www.terraquest.com/antarctica/
Virtual Antarctica
Live Web coverage of the December 1995 voyage of the expedition ship Livonia is archived at this award-winning site. From Ushuaia, Argentina, across Drake's Passage to Antarctica, "TerraQuest made history by becoming the first commercial travel expedition to make live uplinks to the Internet from Antarctica." Special sections on history, science and ecology provide materials for teachers and students. The Guidebook section provides an Antarctic glossary, checklist of birds and animals and reading list.

http://www.glacier.rice.edu/invitation/1_introduction.html
Glacier Invitation
Be sure to visit the Antarctica Picture Gallery, a wonderful collection of photographs to bring the continent to life. A great site for students to get an introduction to seasons, types of ice, polar comparisons and those who live there. The glossary can't be beat.

http://www.aad.gov.au/
Antarctica Online
Site includes science and environment sections, history of expeditions and "This Week in Antarctica," highlighting a current Australian venture on Antarctica.

http://www.bartleby.com/151/c8.html
Antarctica
World Factbook information on the continent.

http://www.mna.unisi.it/TAP/terranta.html
Terra Antarctica
An online scientific journal that focuses on geology, geophysics, glacial geology and glaciology from the Antarctic region. A resource for teachers.

http://www.vb-tech.co.za/Antartica/
The Official Antarctica Home Page

http://www.deltaenviro.org.za/resources/enviro-facts/antartica.html
Enviro Facts: Antarctica

http://www.andrewcollins.net/page/interactive/antartica.htm
Atlantis as Antarctica
Speculation on whether Antarctica could be the lost city.

http://www.foei.org/campaigns/Antarctica/index-antartctica.html
Friends of the Earth International Campaign: Antarcticas
Identifies key environment concerns. Learn about the Antarctic and Southern Oceans Coalition.

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Icebreaker Q&A: U.S. Coast Guard's Christopher G. Burris

After reading an article in the newspaper, have you ever had questions you want to ask the person interviewed? We did. Christopher G. Burris, an officer on the Coast Guard icebreaker Polar Star*, answered our questions via e-mail from the ship.*

Q: Is sunscreen sold in the ship's store?
A: The ship's store does not sell sunscreen; however, it is an important item to bring on the trip.

Q: Why is sunscreen needed?
A: Regardless of the low temperatures, the sun is quite potent down here for a couple of reasons. One, the sun shines 24/7, so you are constantly exposed. Two, this is the land of the ozone hole, which means much more of the sun's harmful ultraviolet radiation makes it to the earth's surface. This brings to mind another must have item for this trip: good sunglasses! Enough can't be said about protecting your vision.

We are exposed to all kinds of extremes — from the frigid cold to the intense sunlight. You should always be concerned with protecting yourself.

Q: Do you bring bottled water or use the ice for drinking water?
A: We do not bring bottled water nor do we melt ice for drinking water. Like most other ships, we are equipped with means of converting sea water to fresh water. We have two systems aboard to accomplish this task. We have evaporators which distill saltwater to fresh water. Our second system is a Reverse Osmosis (RO) purifier. RO works by pressing saltwater (really hard) against a filter that only lets molecules of water through. We keep the fresh water and pump the brine back overboard.

UNITED STATES COAST GUARD

When these ships sail, the sun never sets, so don't forget your sunscreen—and some shades.

Q: How long does the channel that the icebreaker opens stay open? When you return home is it still open?
A: First a little background about the fast ice in McMurdo Sound. Historically, after the icebreakers leave, the ice in McMurdo Sound erodes away, usually in late February, and then the whole sound begins to freeze over again. However, last year the ice never fully left McMurdo Sound, instead the channel refroze and the ice just got thicker. Both icebreakers were deployed this year because of the challenge that was expected with this second-year ice.

Now to try and answer your questions. The channel isn't really "open," actually the ice we broke to make the channel this year is still in the channel, it's just loose. If we aren't driving up and down the channel, it will begin to refreeze. So, when we leave this year the channel will probably refreeze. The real concern is whether the ice will erode away or stay another year and get even thicker. Obviously, this wish is that it erodes away and provides new ice for next year.

Q: How many trips do you make leading supply ships in and out?
A: Traditionally, two ships visit McMurdo Station each year. A tanker that supplies the town with its fuel needs for the next year. The second is a cargo ship that brings every other type of supplies and takes all the waste away. Therefore, there are two escorts per ship. An ice escort to bring each ship into the channel, and one to get them back out. There have been years when more ships were necessary to get all the supplies to McMurdo. Just last year three ships came south, one tanker and two cargo ships.

NAME _____ DATE _____

Deep Freeze Quiz

Imagine a place that is cold all the time. A place you can only get to by airplane, or, at the one time of year when the ice surrounding it is thin enough to be broken, by ship. That place is Antarctica. What do you know about life on Antarctica?

True or False
Write "true" on the line before statements that are accurate.
Write "false" on the line before statements that are inaccurate.

_____ 1. Antarctica is primarily composed of ice.

_____ 2. Antarctica is a continent, not a country.

_____ 3. Antarctica is the only continent safe from ozone.

_____ 4. Antarctica is flat, much like a large plateau.

_____ 5. Penguins and seals live on Antarctica.

_____ 6. Inuits are indigenous to Antarctica.

AP PHOTO/GREENPEACE

DEPARTMENT OF DEFENSE

The flags of 13 nations, which have officially adopted the Antarctic Treaty, fly at the Amundsen-Scott South Pole Station.

What Is It?

You are asked questions in this section. Write your answer in the space provided.

7. What is the chief occupation of those who live on Antarctica?

8. What does the international treaty that governs Antarctica forbid?

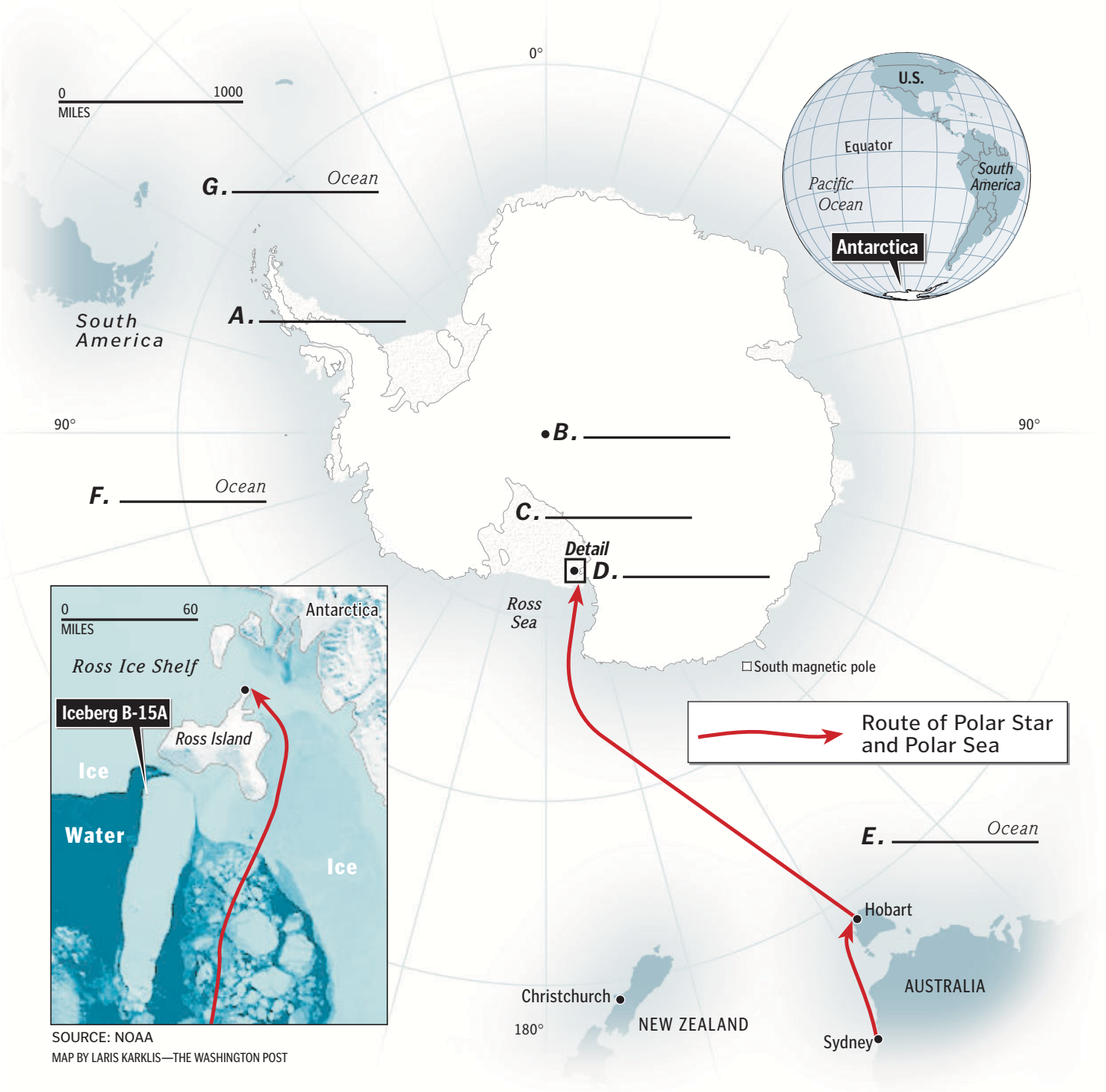
9. What percent of the world's ice is in Antarctica?

10. In what hemisphere is Antarctica located?

NAME _____ DATE _____

Map It

Name the locations that are marked on the map of Antarctica.



SOURCE: NOAA

MAP BY LARIS KARKLIS—THE WASHINGTON POST

NAME _____ DATE _____

Plan a Scientific Expedition to Antarctica

You will study the people who dared to explore beyond the Tropic of Capricorn. Learn from them as you plan your own expedition to study the animals of Antarctica.

Who Are the Great Explorers?

Before beginning our expedition to Antarctica, we are going to meet some of the explorers who went before us. Don't be confused. We are going to start at the North Pole. D.C. Mayor Anthony Williams admires Matthew Henson who was born in Maryland. Read "Present & Past: D.C. Mayor Recalls Arctic Pioneer." Why is Henson considered an American hero?

We could learn more about Robert E. Peary and Matthew Henson, but our task is to prepare to explore Antarctica. You are going to read about one of the following Antarctic explorers. Read about each expedition and learn from the mistakes and wise decisions made by each leader.

National Expeditions, 1840-1841
Jules-Sébastien-Caésar Dumont d'Urville, France
Charles Wilkes, United States

Heroic Age
Roald Amundsen, Norway
Adrien de Gerlache, Belgian
Douglas Mawson, Australia
Robert Falcon Scott, England
Ernest Shackelton, England

Air Exploration
Richard Evelyn Byrd, United States
Lincoln Ellsworth, United States
Herbert Hollick-Kenyon, England
Hubert Wilkins, Australia

Make two lists to report information about your explorer: "Mistakes Not To Be Repeated" and "Wise Decisions." What traits would you want the leader of your expedition to have? What skills should different members of the team have?

What happens when someone becomes ill while in Antarctica. Groups that venture south will have medical supplies and a doctor. What happens when the doctor gets sick? Read of one recent experience.

What Will You Study?

Geologists, biologists, oceanographers and many other scientists have conducted research on Antarctica. You have come to study the sea animals and birds of the continent that has been inhospitable to humans.

More than 40 species of birds enjoy an Antarctic summer. Seabirds and shorebirds include abatrosses, terns and penguins. From Antarctic krill to seals and southern right whales, sea animals inhabit the Southern Ocean. Which will you study?

Explorer's Vocabulary

Ecosystem: A large group of plants and animals (biotic community), plus its non-living (abiotic) environments (temperature, moisture, rock, water) functioning as a unit

Food chain: An arrangement of organisms showing how each organism feeds on the one before it

Krill: Type of shrimp-like animal belonging to the class Crustacean; a Norwegian word meaning "whale food"

Magnetic South Pole: Region where the magnetic force is vertically upward. The position of the south magnetic pole in 1912 was near 71 degrees S and longitude 150 degrees E. In 1970 it was estimated at latitude 66 degrees S and longitude 139.1 degrees E.

McMurdo Sound: The destination of Captain Scott's ship, the "Discovery"; located on the western side of Antarctica, now the site of the U.S. base, McMurdo Station

Oceanography (oceanology): The exploration and scientific study of marine resources and its phenomena

Palmer Station: U.S. base on the Antarctic peninsula

South Pole: The southern end of Earth's axis of rotation; the point at which all the south latitudinal lines meet. On December 14, 1911, Roald Amundsen became the first person to reach the South Pole.

Vinson Massif: Highest point on Antarctica, 16,860 feet, in the Ellsworth Mountains of western Australia

Teacher Tips: Plan a scientific expedition to Antarctica

Who Are the Great Explorers?

Although no one had seen a large southern land mass, the Greek philosopher Aristotle was sure there had to be land in the Southern Hemisphere to balance the land mass in the north. He called this unknown land anti-Arctic or Antarktikos. Teacher Tips gives you a launching point for study of Antarctica — through its explorers and a study of its animal life, stories of survival.

1: Student Activity: Read "Present & Past: D.C. Mayor Recalls Arctic Pioneer." Why is Henson considered an American hero?

1b: Teacher Preparation: Download and make copies of "Present & Past: D.C. Mayor Recalls Arctic Pioneer" (*http://www.washingtonpost.com/wp-dyn/education/kidspost/nie/A6169-2002Jan31.html*). This KidsPost article was published Feb. 1, 2002.

2: Student Activity: You are going to read about one of the following Antarctic explorers. Read about each expedition and learn from the mistakes and wise decisions made by each leader.

2b: Teacher Preparation: Students will study about Antarctic explorers in groups, pairs or alone. They will give an oral report to the class.

You may wish to collect resources for students so they can get into groups to begin reading immediately. Or students may be asked to find their own sources in the library and on the Internet. You may wish to form groups to focus only on the Heroic Age of Antarctic exploration or expand the list to give historic perspective. Quick profiles of 15 Antarctic explorers can be found at *http://70south.com/resources/history/explorers/*.

Sealing expeditions that sought blubber for oil are not included in this list. Students could research **Captain James Cook** whose reports of seals and whales in the Antarctic started an industry. American sealer **John Davis** and English sealer and explorer **James Weddell** could be studied to give students a perspective on human and animal interaction before they study the seals and other animals indigenous to the area.

Another group could report on the controversy over who was first to see the continent of Antarctica. Was it Russian explorer **Fabian von Bellingshausen** (Jan. 27, 1820), English explorer **Edward Bransfield** (Jan. 30, 1820) or American sealer **Nathaniel Palmer** (Nov. 18, 1820). The importance of keeping accurate records and the role of national pride are lessons to be learned.

You may have students who would enjoy reading about the ships more than the explorers. You could add Raold Amundsen's *Fram*, Robert Scott's *Terra Nova* and Sir Ernest Shackleton's *Endurance* to the list.

You could summarize air exploration for students. *Enchantment of the World: Antarctica* by **Henry Billings** gives a quick introduction to all the explorers.

3: Student Activity: What happens when someone becomes ill while in Antarctica? Groups that venture south will have medical supplies and a doctor. What happens when the doctor gets sick? Read of one recent experience.

3b: Teacher Preparation: Younger students can be given the KidsPost coverage of the event that was reported on April 25, 2001. "Antarctic Rescue" can be found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/nie/A61411-2001Apr24.html.*

Older students should be given "Plane Evacuating Sick Doctor Leaves South Pole Station" by Rick Weiss. His April 26, 2001, account is found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/nie/A898-2001Apr25.html*

What Will You Study?

Student Activity: More than 40 species of birds enjoy an Antarctic summer. Seabirds and shorebirds include abatrosses, terns and penguins. From Antarctic krill to seals and southern right whales, sea animals inhabit the Southern Ocean. Which will you study?

Teacher Preparation: It is up to you whether you wish students to study the birds, penguins (Adélie, Chinstrap, Emperor, Gentoo, King, Macaroni and Rockhopper), the six species of seals or six species of whales that are at home in Antarctic waters. You can look at the ecosystem and what happens if too many krill are harvested.

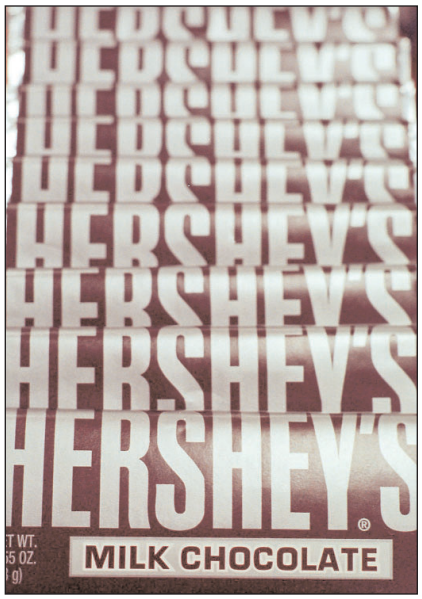
Once they know their assigned scientific area of study, ask students to compile a list of basic supplies they will need. Place them under the following headings: food, medicine, clothing and scientific equipment. Why is a regular compass useless at the South Pole? Will they need dogs? If yes, what are their needs?

Reading Comprehension

While students are conducting research, you might have time for a reading comprehension exercise. **Susan Fineman**, a reading specialist in the New Haven, Conn., school district wrote it. "Frozen '37 Hershey Bar Gives Taste of History" appeared in the Post, Sept. 9, 2001. After students read the article, give them the quiz. The article can be found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/nie/A63134-2001Sep8.html*

True or False?

This quiz was published in the Sept. 9, 2001, Post. When you are discussing what food to pack for your expedition, you might see what you know about chocolate in Antarctica.



ASSOCIATED PRESS

1. In 1937, the Hershey Chocolate Corp. made special chocolate bars for the military.
2. The Field Ration Bars weighed a little more than a pound and were designed to melt easily.
3. The Army requested that the energy-producing food taste like a baked potato.
4. The chocolate was valued for its nutritional content rather than its taste.
5. Hershey sent modern-day explorer Douglas Stoup to Antarctica to look for one of the 60-year-old bars.
6. Stoup discovered a bar of Hershey chocolate buried in the ice in Antarctica.
7. It is believed the Ration Bar was brought to the South Pole by members of Adm. Richard Byrd's third expedition team.
8. While out on a field trip, Byrd's men dropped rations along their route to mark the way back to the base.
9. Museum spokeswoman Amy Taber thought it was possible the bars were to be eaten only if no other food was available.
10. As soon as Stout returned to the United States, he took a bite out of the chocolate.

ANSWER KEY: 1. True, 2. False, 3. False, 4. True, 5. False, 6. True, 7. True, 8. False, 9. True, 10. False

More Antarctica Lesson Ideas

ON THE WEB

http://www.geophys.washington.edu/People/Students/ginny/antarctica/lesson1.htm
How Unique Is Antarctica?
Illustrated, information and activity

http://www.eecs.umich.edu/~coalitn/sciedoutreach/funexperiments/agesubject/lessons/newton/AntarcticII.html
Antarctica II: Why is Antarctica so important to our planet?
This Newton's Apple lesson asks students to write their own treaty of governance for Antarctica.

http://www.pbs.org/ktca/newtons/12/arctcnut.html
Arctic Nutrition
Considers the nutritional needs of Arctic explorers and their sled dogs

http://abcteach.com/Themeunits/Antarctica/AntarcticaTableofContents.htm
Antarctica and Penguin Activities
A variety of activities is provided.

http://www.sonrisa.com/teacher.htm
Teacher Resources for a Study of Antarctica
Class projects, worksheets and Web resources

http://www.exploratorium.edu/origins/antarctica/
Origins: Antarctica
Scientific journeys on Thanksgiving Day 2001 from McMurdo to the Pole are relived through Web casts, people, tools and field notes. Includes a short history of women in Antarctica. Exploratorium and The Ice project are supported by the National Science Foundation.

http://coolspace.gsfc.nasa.gov/nasamike/essays/women/women.htm
Women Working in Antarctica
A short article on the NASA site about contemporary activities of women in Antarctica.

http://www.enn.com/enn-features-archive/2000/03/03302000/bancroft_10685.asp
Lessons from Antarctica
Environmental News Network March 2000 report on the 2000 first all-woman team attempt to cross Antarctica.

http://askeric.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Social_Studies/Geography/GGR0203.html
Mapping Antarctica
Ask Eric lesson plan for geography and mathematics integration.

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We Read It in the Post

1

EXTREME Travel Trivia, Contest 114, asked Post readers this geographic puzzler. Can you name the mountain and find it on the map of Antarctica?

It's been a while since D.C. has had a white Christmas. To compensate, Santa has made a special trip to Antarctica to pick up some snow to deliver with his presents. His base of operations is on the top of a mountain on the Shackleton Coast of the Ross Ice Shelf. Name the mountain.

2

On Sept. 28, 2001, columnist Charles Krauthammer wrote:

Yes, we need to get Osama bin Laden. Yes, we need to bring down the terrorist networks. But the overriding aim of the war on terrorism is changing regimes. And it starts with the Taliban. Searching Afghan caves for bin Laden is precisely the trap he would wish us to fall into. Terrorists cannot operate without the succor and protection of governments. The planet is divided into countries. Unless terrorists want to camp in Antarctica, they must live in sovereign states.

Two days later, Washington Post writers Dan Eggen and Bob Woodward wrote:

"The disclosures provide the most complete picture yet of the direction and scope of the U.S. investigation into the deadliest terror attack in American history, which has left 6,500 people missing or dead in New York, Washington and Pennsylvania. The hijackings have led to arrests on every continent but Antarctica."

1. Why does Krauthammer not classify Antarctica as a sovereign state?
2. Give at least two different reasons why terrorists would not locate in Antarctica.
3. Do a Web search to find news accounts of arrests of individuals related to the terrorist attacks on America. Make six columns, one for each continent on which arrests have taken place, Under the appropriate continent, list the news source, the date, and who and why each was arrested.

3

Suzanne Richardson introduced readers to the "Lush Growth at the New Botanic Garden" on Dec. 21, 2001. Richardson's article begins:

"On the morning of Aug. 18, 1838, Lt. Charles Wilkes led a U.S. squadron of six ships and 440 men on a scientific voyage of exploration around the world. Four years and 87,000 miles later, he sailed into New York harbor to face public vilification and court-martial. Wilkes's irascible, rash and impetuous personality, said to be the model for Captain Ahab in Herman Melville's classic, *Moby Dick*, brought upon him the charge of cruelty to his men.

Wilkes weathered these stormy seas and was eventually acquitted, both by a military court and by history. Today the Wilkes Expedition is considered one of the most important voyages of discovery in our young nation's past. Wilkes accurately surveyed vast portions of the Pacific Ocean, established that Antarctica was a continent (not a series of islands) and, incidentally, brought back 10,000 plant specimens, portions of which would form the core collection of the U.S. Botanic Garden on the Mall.

From a modern perspective, the excitement generated by this rich bounty of flora may be hard to understand. But the gleeful rubbing of hands was not for the aesthetic beauty or exoticism of these plants; it was for their utility as commercial products. America's Founding Fathers, Washington, Jefferson, Madison and Monroe, had long urged Congress to 'collect, cultivate and distribute the various vegetable productions of this and other countries, whether medicinal, esculent, or for the promotion of arts and manufactures.'

The seeds of the Wilkes Expedition, much like stocks or bonds, were traded and leveraged internationally; they were industriously propagated and disseminated throughout the country to foster growth, not merely of plants, but of American livelihoods. The venture was so successful that by May 1850 Congress had authorized the construction of a botanical conservatory on the Mall to house the growing collection."

1. Who was Charles Wilkes? Research to learn more about Wilkes and the Wilkes Expedition.
2. What is a literary allusion? What is added to a reader's under-

standing of Wilkes through the allusion to Captain Ahab?

3. Why would the Founding Fathers all agree on the economic importance of the "vegetable productions"? Were they right?

4. Take a field trip. Visit the renovated National Botanic Garden on the Mall.

4

Read "Sanctuary of Science Facing Extinction: Budget Cuts Would Threaten Decades of a Wide Range Of Environmental Research." Anita Huslin on January 31, 2002, reports on the Smithsonian Environmental Research Center in Edgewater, Md.

1. What is the news related to SERC?

2. What work is done at SERC on the Rhode River? After a general statement about the purpose of SERC, list specific projects and research conducted here.

3. Why is it important to conduct research on sites such as SERC?

4. What organizations have benefited from the work done at SERC?

5. Who is supporting the continued funding of SERC?

6. According to Huslin, federal research funds for Smithsonian research is to be transferred to the National Science Foundation. The reader is not told what the NSF would do with the funds. Do you think readers should have been given this information?

7. Which do you think are the three most important arguments for SERC to continue receiving federal funding? Put these in order from least to most persuasive. Write a letter to your member of Congress. If you do not think funding should continue, list your arguments, then compose a letter to your member of Congress.

8. You can learn more about SERC on the Web (http://www.serc.si.edu/) and its educational programs. Check out Watershed Radio (www.watershedradio.org) for daily one-minute radio reports.

Huslin's article can be found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/nie/A62047-2002Jan30.html*

5

Icebergs, ozone hole, low temperatures. What a great place for a scientist to be. Read "In Antarctica, No Warming Trend: Scientists Find Temperatures Have Gotten Colder in Past Two Decades," Guy Gugliotta's January 2002 article about climate change studies.

1. Is Antarctica a desert?

2. How does temperature influence the fragile ecosystem of Antarctica?

3. Why are the scientists who have been collecting data confused?

Gugliotta's article can be found at *http://www.washingtonpost.com/wp-dyn/education/kidspost/nie/A40974-2002Jan13.html*

Expedition Sources

ON THE WEB

http://www.nationalgeographic.com/sealab/antarctica/

National Geographic Sea Lab: Antarctica
Images and dispatches from a 44-day study of krill; the research team lived on an icebreaker.

http://www.eecs.umich.edu/~coalitn/sciedoutreach/funexperiments/agesubject/lessons/newton/AntarcticI.html

Antarctica I: Why do scientists go to Antarctica
A Newton's Apple lesson for upper elementary students. Contains resources and main activity, "Explore an 'unknown' place and experience the excitement of an expedition."

http://www.things.org/music/al_stewart/history/antartica.html

Scott expedition

http://www.yourexpedition.com/bae_site_pages/index.html

Bancroft Arnesen Expedition official Web site
In addition to pictures and log of the expedition, a curriculum guide is provides for K-6 grades.

IN PRINT

Billings, Henry. **Enchantment of the World: Antarctica**. Childrens Press, 1994. The land, the animals and the explorers are clearly presented through photographs and text.

Flaherty, Leo. Roald **Amundsen and the Quest for the South Pole**. Chelsea House Publishers, 1992. Although primarily the story of Amundsen, the author includes the story of his rival Robert Scott. Photographs and illustrations from the expeditions are helpful.

Hackwell, W. John. **Desert of Ice: Life and Work in Antarctica**. Charles Scribner's Sons, 1991. A member of the Australian National Antarctic Research Expedition of 1989, Hackwell tells of a more recent exploration of the continent. His colored pencil drawings add to the vitality of the reporting.

Kimmel, Elizabeth Cody. **Ice Story: Shackelton's Lost Expedition**. Clarion Books, 1999. Illustrated with photographs and maps, a very readable account of the survival of Shackelton's party.

Kulling, Monica. **Sea of Ice: The Wreck of the Endurance**. Random House, 1999. Appropriate for grades 2-4.

Sipiera, Paul. **The World's Great Explorers: Roald Amundsen and Robert Scott**. Childrens Press, 1990. Illustrations and photographs, diary entries and a list of the daily rations of Scott's and Amundsen's men compliment the text.

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Word Study: A look at temperature

Which characters in stories you have read storm into a room or cause a whirlwind of activity? Can you think of characters or people who are peaceful as a spring breeze or as sunny as a summer day?

There are reasons we often relate seasons to temperature and temperament. They are derived from the same Latin root. "Temper" and "temperament" come from *temperare*, which means to mix, which is believed to come from *temper* or *tempus*, which means time or season.

"Temper," when used as a noun, means a state of mind or emotions. If you lose your temper often, you are considered irritable or easily angered. You are said to be quick-tempered. People who are temperate are self-restrained. They are neither icy-cold nor hotheaded.

Look at the globe to find the Tropic of Cancer north of the equator. The North Temperate Zone lies between the Tropic of Cancer and the Arctic Circle. The South Temperate Zone lies between the Antarctic Circle and the Tropic of Capricorn. These zones often experience warm climate in summer and cold in winter and have moderate conditions in the spring and fall. They are definitely temperate.

"Temperate" comes from Middle English, *temperat*, which is from *temperatus*, past participle of our verb *temperare*. Its relation to "temperature" is clear.

"Temperature" comes from the Middle English *temperate* weather, from Latin *temperatura*, meaning due measure, which is formed from *temperatus*.

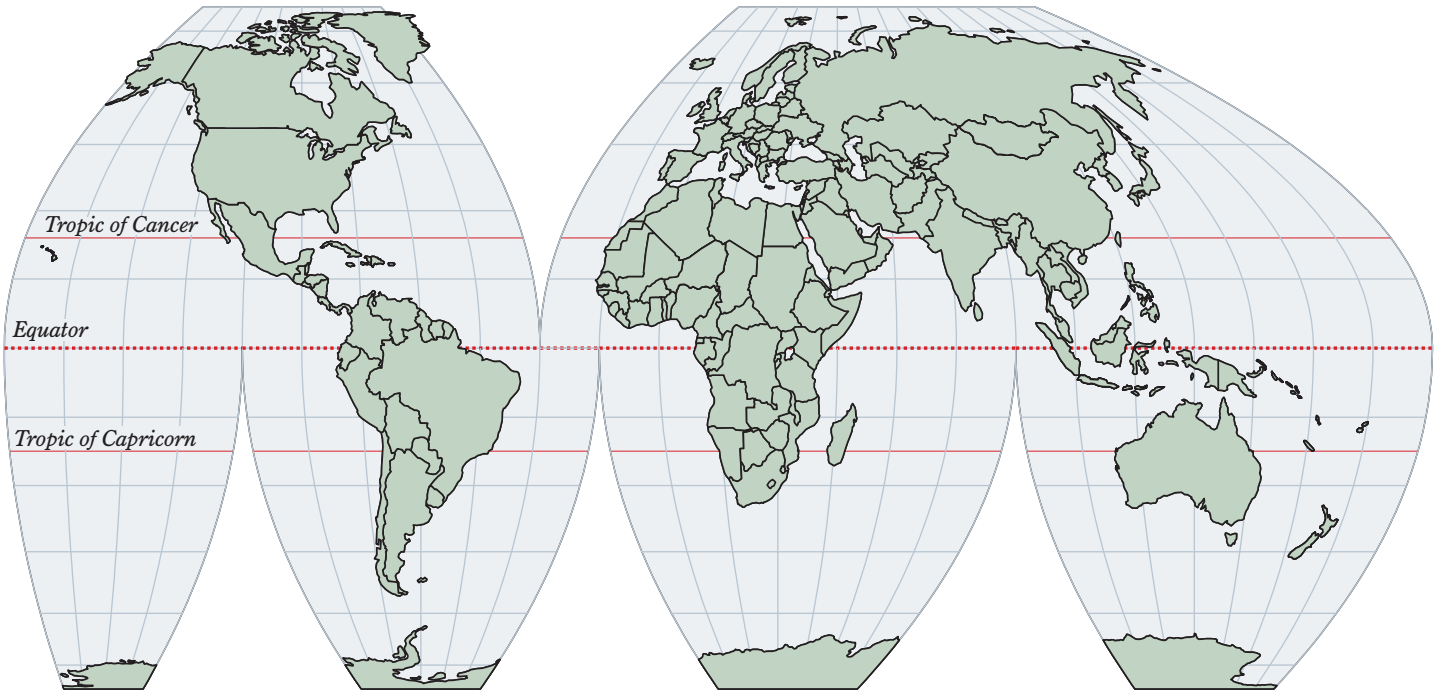
"Temper" used as a verb means to moderate or to strengthen through experience or hardship.

Meteorologists have been tempered by katabatic winds on George V Coast. In addition to these strong winds, scientists taking measurements outside have to worry about the temperature dropping. They could easily suffer frostbite. They make sure to cover their heads and hands so they don't lose body heat.

Having shelter in Antarctica, whether at one of the scientific research centers or onboard an icebreaker, is important to maintaining a healthy body temperature.

Of course, it is also important to maintain a healthy temper.

If you were onboard the USCGC *Polar Star* with 10 scientists, 130 enlisted personnel and 20 officers, would you maintain your temper?



Academic Content Standards

This lesson addresses academic content standards of Maryland, Virginia and the District of Columbia. Among those that apply are:

Maryland

Science

Life Science (3.0): Students will use scientific skills and processes to explain the dynamic nature of living things, their interactions and the results from the interactions that occur over time. Ecology: By the end of grade 5, students know and are able to cite evidence that individuals and groups of organisms interact with each other and their environment (i.e., food chain, reproduction, decomposition)

Environmental Science (6.0): Students use scientific skills and processes to investigate the interrelationships of the natural world. By the end of grade 3, students know and are able to explain that the amount of water on earth continues to stay the same even though it may change from one form to another (water cycle).

Social Studies

Geography: Students will use geographic concepts and processes to examine the role of culture, technology, and the environment in the location and distribution of human activities and spatial connections throughout time. 4.2 Students demonstrate understanding of the physical and human characteristics of places and use this knowledge to define regions and their patterns of change. 4.2.3.2 describe ways in which people perceive places and regions, drawing from personal experience and literature

A complete list of Standards of Learning of Virginia can be found on the Web at http://www.mdk12.org/mspp/standards/.

Virginia

Science

Living Systems, Grade 4: 4.5 The student will investigate and understand how plants and animals in an ecosystem interact with one another and the nonliving environment. Key concepts include

- behavioral and structural adaptations
- habitats and niches
- influence of human activity on ecosystems

Earth Patterns, Cycles and Change, Grade 4, 4.7: The student will investigate and understand the relationships among the Earth, moon and sun. Key concepts include

- the motions of the Earth, moon and sun (revolution and rotation)
- the causes for the Earth's seasons and phases of the moon

History and Social Science

Geography, Grade 3: 3.5: The student will distinguish between meridians of longitude and parallels of latitude and use the equator and prime meridian to identify the Northern, Southern, Eastern, and Western hemispheres and the locations of the ancient civilizations, European nations, and American colonies which the student is studying. 3.6: The student will use maps, tables, graphs, and charts to classify regions with common characteristics, such as deserts.

A complete list of Standards of Learning of Virginia can be found on the Web at http://www.pen.k12.va.us/.

Washington, D.C.

Science

Earth and Space Sciences, Content Standard 4: Observe, investigate, describe and explain the properties, structure, and origin of the earth system, the solar system and the universe. Grade 6: The student uses knowledge of the earth's rotation and the size and shape of angles formed by its tilting axis to explain the seasons and weather patterns. The student explains how the misuse of natural resources affects the quality of life for all species and develops a list of ways people can reuse, recycle and reduce the use of resources to improve and protect the quality of life (water, air, soil, trees).

A complete list of Standards for Teaching and Learning of the District of Columbia Public Schools can be found at http://www.k12.dc.us/.