

NATIONAL GEOGRAPHIC Explorer!

Pioneer Edition

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Dear Teacher:

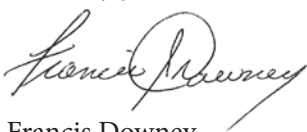
Our new issue offers a trio of opportunities to hone students' reading skills. That's not all, though. It also helps you teach core science that might otherwise be crowded out of your curriculum.

"Making sense of the way organisms live in their environments," say the National Science Education Standards, "will develop some understanding of the diversity of life and how all living organisms depend on the living and nonliving environment for survival."

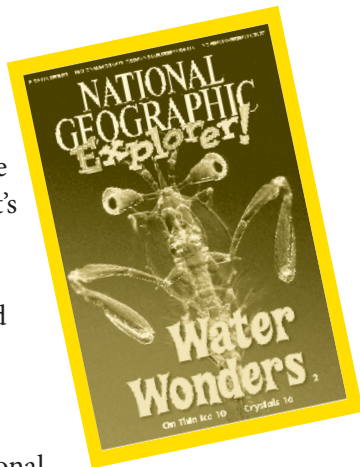
Two of our stories vividly demonstrate this key point. "Water Wonders" introduces students to the riches of marine microfauna and explains how human action—filling the skies with carbon dioxide—is affecting the ocean and its inhabitants. "On Thin Ice" helps students grasp how Arctic ice sustains an entire ecosystem, now threatened by global warming.

These articles teach crucial science—and more. They also underscore the need for responsible stewardship of our Earth. Here at National Geographic, we think that's one of the most vital lessons anyone can teach today.

Sincerely yours,



Francis Downey
Vice President and Publisher



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WATER WONDERS

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• Organisms and environments

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• Characteristics of organisms

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Curriculum Connections

• Earth Science • Reading • Writing

Standards Correlations: Science

• Properties of Earth materials
• Geological processes

Literacy Skills

• Reading Strategy: Ask Questions
• Creative Writing • Pro/Con Essay

Answer Key

Water Wonders • Teacher's Guide, p. 3

1. They are tiny. 2. The Pacific Ocean is Earth's largest ocean. 3. A filter feeder gulps water and filters out the microfauna in it. 4. Carbon dioxide turns seawater acidic, making shells and skeletons weak.

On Thin Ice • Teacher's Guide, p. 5

1. Ice is melting and breaking apart. 2. Ice floes are smaller and more spread out in the water. 3. There is less food for small creatures that eat the plants. 4. Polar bears have less room to hunt and may not be eating enough.

Crystals • Teacher's Guide, p. 7

1. Crystals 2. Mexico 3. truck 4. space
5. minerals 6. blue 7. atoms 8. April 9. gems
10. polished

Review • Teacher's Guide, p. 8

1. b 2. a 3. c 4. c 5. c 6. d 7. d 8. c

Next Issue

Lizards

Meet some cool, colorful creatures.

Oil

Learn how oil became the world's lifeblood.

Under the Volcano

Journey into Roman times at Pompeii.

Water Wonders



Reading Strategy

Use Comprehension Tools: Ask students: *What do you do when you are reading and you don't understand a word or an idea in the text?* List students' suggestions, such as stop to think, reread, read on, look for clues, use a reference book, ask someone, and so on. Explain that those actions are all tools that students can use to boost their reading comprehension. Then read aloud the first two paragraphs on p. 4. Model how students might figure out what *microscope* means (*tool for seeing very small objects*). Challenge them to use comprehension tools to find out what coral (p. 4) is.

Vocabulary

Write *synonym* on the board. Remind students that synonyms are words that mean the same or almost the same thing. Encourage students to find and circle synonyms for *small* in the article (*little, tiny*). Then invite students to think of other synonyms for *small* (*possible answers: bitty, itty-bitty, Lilliputian, microscopic, mini, minute, petite, pint-size, teensy-weensy, wee*).

Fast Facts

- The only light deep in the ocean is caused by bioluminescence, which is a chemical reaction in a sea creature's body.
- Scientists have to be extremely careful while collecting specimens from the ocean depths, where animals live under great pressure. If animals were brought to the surface without regulating the pressure, the creatures' organs would expand, and they would explode.
- Global warming has affected the ocean for decades. Ocean temperatures began to rise in the 1960s. Coral reefs are in danger of dissolving, as the coral is damaged by carbon dioxide.
- The average depth of the ocean is four kilometers (two and a half miles).
- Humans have seen less than 5 percent of the ocean environment that makes life possible on our planet.

Comprehension Check

Copy and distribute the Comprehension Check work sheet (next page) for students to complete.

Critical Thinking and Writing

- **Oral Language:** Have students discuss this question in small groups: *What can people do to help marine microfauna survive?*
- **Figures of Speech:** Read aloud the first paragraph on p. 6. Point out that *like drops of jelly* is a simile, a kind of comparison often used by poets. Then challenge students to look at the photos in the article and think of other similes. They might, for example, note that the blue buttons (p. 6) look like flowers.

Extension Activities

- **Vocabulary:** Write *microfauna* on the board. Explain that *fauna* means "animals." Ask how the prefix *micro-* changes the word. (*Micro-* means "very small." *Microfauna are very small animals.*) Encourage students to consult a dictionary and find other words with the *micro-* prefix (*possible answers: microchip, microcosm, microfilm, microorganism, microscope, microsurgery*).
- **Earth Science:** Direct attention to the map on pp. 8-9. Have students pick an ocean or ocean feature to research and report on.

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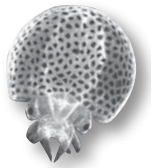
Water Wonders

Read "Water Wonders" in NATIONAL GEOGRAPHIC EXPLORER.
Then answer the questions below.



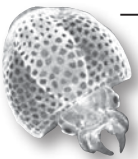
1. Why are marine microfauna difficult to see?

2. What is Earth's largest ocean?



3. What are filter feeders?

4. How does carbon dioxide affect life in the ocean?



On Thin Ice



Reading Strategy

Visualize: Write *visualizing* on the board. Ask what it is. If need be, explain that visualizing is forming a mental picture during reading. Tell students that strategic readers pay attention to details that help them see, hear, feel, and even taste or smell what is happening in a passage. Invite students to close their eyes as you read aloud the first section of the article (p. 12). Encourage them to share what they saw, heard, felt, tasted, or smelled while you read. Then ask: *How did visualizing help you understand the text?*

Vocabulary

Write *homonym* on the board. Explain that homonyms are words that sound alike but have different meanings and may have different spellings. Point out the word *floe* (p. 14) and ask what it means (*large piece of floating ice*). Then ask what its homonym is (*flow*) and what it means (*to gush or pour*). Invite students to identify other homonyms in the article (*possible answers: bear, breaks, holes, know, piece, plants, saw, seal, so, spring, too, way*).

Fast Facts

- Geographers define the Arctic as the area above the Arctic Circle (66½° north latitude).
- Polar bears can weigh more than 450 kilograms (1,000 pounds). When they stand on their hind legs, they can be 3 meters (10 feet) tall.
- Polar bears need to eat an average of 2 kilograms (4.4 pounds) of fat each day to survive. A typical ringed seal could provide up to eight days' worth of energy for a polar bear.
- In winter, a walrus's fat can grow 15 centimeters (6 inches) thick, making up a third of the animal's weight, which can reach 2 tons.
- A walrus's ivory tusks can grow 76 centimeters (30 inches) long.
- Warmer temperatures in Alaska have allowed spruce bark beetles to thrive and destroy vast areas of forest.

Comprehension Check

Remind students that a *cause* makes something happen and an *effect* is what happens. Have them use facts from the article to complete the chart on the Comprehension Check work sheet (next page).

Critical Thinking and Writing

- **Inference:** Tell students that scientists predict that, by 2100, Arctic ice may melt completely every summer. Have students write a paragraph about what that might mean for Arctic wildlife.
- **Persuasive Writing:** Invite students to write the script for a public service announcement that aims to raise awareness about threats to Arctic wildlife. Remind students that good persuasive writing includes opinions, facts that support the opinions, and strong persuasive language.
- **Pro/Con:** Encourage students to share whether they would like to have Paul Nicklen's job as a wildlife photographer. Why or why not?

Extension Activities

- **Science:** Form nine groups. Have each group create a poster about one of the following Arctic animals: arctic fox, arctic hare, beluga, caribou, narwhal, orca, polar bear, snowy owl, walrus. Topics to cover might include appearance, habitat, range, diet, predators, and adaptations that help the animal survive in the cold.
- **Geography:** Encourage students to find the Arctic on a map or globe. Assign them to research the geography of the Arctic (such as temperatures, precipitation, landforms, human population, and so on) and present their findings in a report.
- **Writing:** Review the basics of writing a friendly letter. Then direct students to write a letter that the author might have sent to a friend, describing his encounter with the polar bear.
- **Language Arts:** Have students write a descriptive paragraph about one of the photographs that accompany the article.

On Thin Ice



Read "On Thin Ice" in NATIONAL GEOGRAPHIC EXPLORER. Then complete the chart below. A *cause* makes something happen. The *effect* is what happens.

Cause	Effect
<p>The Arctic is warming twice as fast as most other places.</p>	<p>1.</p>
<p>2.</p>	<p>Polar bears have to swim farther to find ice where they can hunt.</p>
<p>Less ice means fewer plants that grow on the bottom of ice.</p>	<p>3.</p>
<p>4.</p>	<p>Polar bears are getting thinner.</p>

Crystals



Reading Strategy

Ask Questions: Walk students through the article, allowing them to examine photographs and read captions. Ask them what questions they have before reading. Record their questions. Point out that strategic readers use this strategy before, while, and after they read. Encourage them to read to seek answers to the questions they posed.

Vocabulary

Draw attention to the word *minerals* (p. 18). Ask: *If you didn't know the meaning of this word, how could you figure it out? (Possible answers: Look in the Wordwise glossary, use a dictionary, ask someone, make an inference based on context clues.)* Model different ways of finding out the meaning of *minerals*. Then challenge students to do the same thing with *atoms* (p. 18).

Fast Facts

- Crystals are not just gems. They are used in microphones, oscillators, radios, solar batteries, and more.
- In ancient times, birthstones were used as future predictors, therapeutic and medicinal aids, and in religious ceremonies.
- The Hope Diamond weighs 45.52 carats. A carat is 200 milligrams (.01 ounce).
- The Hope Diamond is named for English gem collector Henry Philip Hope, who purchased it in the early 1800s.
- Evalyn Walsh McLean, who bought the Hope Diamond in 1911, sometimes put it on her dog.

Comprehension Check

Copy and distribute the Comprehension Check work sheet (next page) for students to complete.

Critical Thinking and Writing

- **Creative Writing:** At the beginning of the article, Jeffrey Post says that rocks “all tell stories.” Invite students to write creatively from the point of view of a crystal or gem, telling what their “lives” are like, how they were discovered, how they are used, and so on.
- **Pro/Con:** Direct students to write an essay that answers the following questions: *Would you want to own the Hope Diamond? Why or why not?*

Extension Activities

- **Science:** Students can use simple magnifying glasses to examine common crystals, such as salt or sugar. Have them draw the crystals and discuss their shapes. Ask: *Why do you think the crystals are different from one another?*
- **Hands-on Science:** Students will enjoy growing simple crystals. Fill a glass jar half full of warm water and stir salt into the water until no more salt will dissolve. Attach thread or string to a pencil and hang it above the water. The thread should not touch the bottom of the jar. As the water evaporates, cubic salt crystals will form on the thread.
- **Language Arts:** Invite students to make a birthday card that includes a picture of the recipient’s birthstone, facts about it, and a rhyme—funny or serious—about the birthstone.

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Crystals



Read "Crystals" in NATIONAL GEOGRAPHIC EXPLORER. Then imagine that you are in charge of a museum's gem collection. Fill in the blanks in your diary.

Today was really busy. I spent most of the day preparing our show about the Cave of (1) _____. It's an amazing place in (2) _____.

Its crystals are longer than a (3) _____. That means that the crystals there must have had plenty of (4) _____ to grow. They formed long ago when water filled with tiny bits of (5) _____ flooded the cave.

I also wrote labels for two new diamonds in our collection. One is (6) _____, just like the Hope Diamond. The other is pink! I explained that a diamond's color depends on (7) _____ trapped inside the diamond as it grew. I also mentioned that diamond is the birthstone for (8) _____.

Finally, I explained that these diamonds were considered (9) _____ because they had been cut and (10) _____.

COMPREHENSION CHECK

Fill in the circle before the correct answer to each question below.

- What is a gem?
 - crystal found in a cave
 - cut and polished crystal
 - large and rare crystal
 - uncut crystal
- What is the most famous gem in the world?
 - Hope Diamond
 - King Edward's Emerald
 - Smithsonian Sapphire
 - Star of India
- What is the only gem made by living creatures?
 - amethyst
 - emerald
 - pearl
 - topaz
- What are marine microfauna?
 - animals with shells
 - kinds of seaweed
 - tiny sea creatures
 - very large fish
- What does carbon dioxide do when it mixes with water?
 - It boils the water.
 - It freezes the water.
 - It makes acid.
 - none of the above
- Which ocean is the largest?
 - Arctic
 - Atlantic
 - Indian
 - Pacific
- In what way does global warming affect Arctic ice?
 - Ice breaks apart earlier.
 - Ice floes are more spread out.
 - Ice thins sooner in the spring.
 - all of the above
- What is a polar bear's main food?
 - arctic fox
 - cod
 - ringed seal
 - walrus

