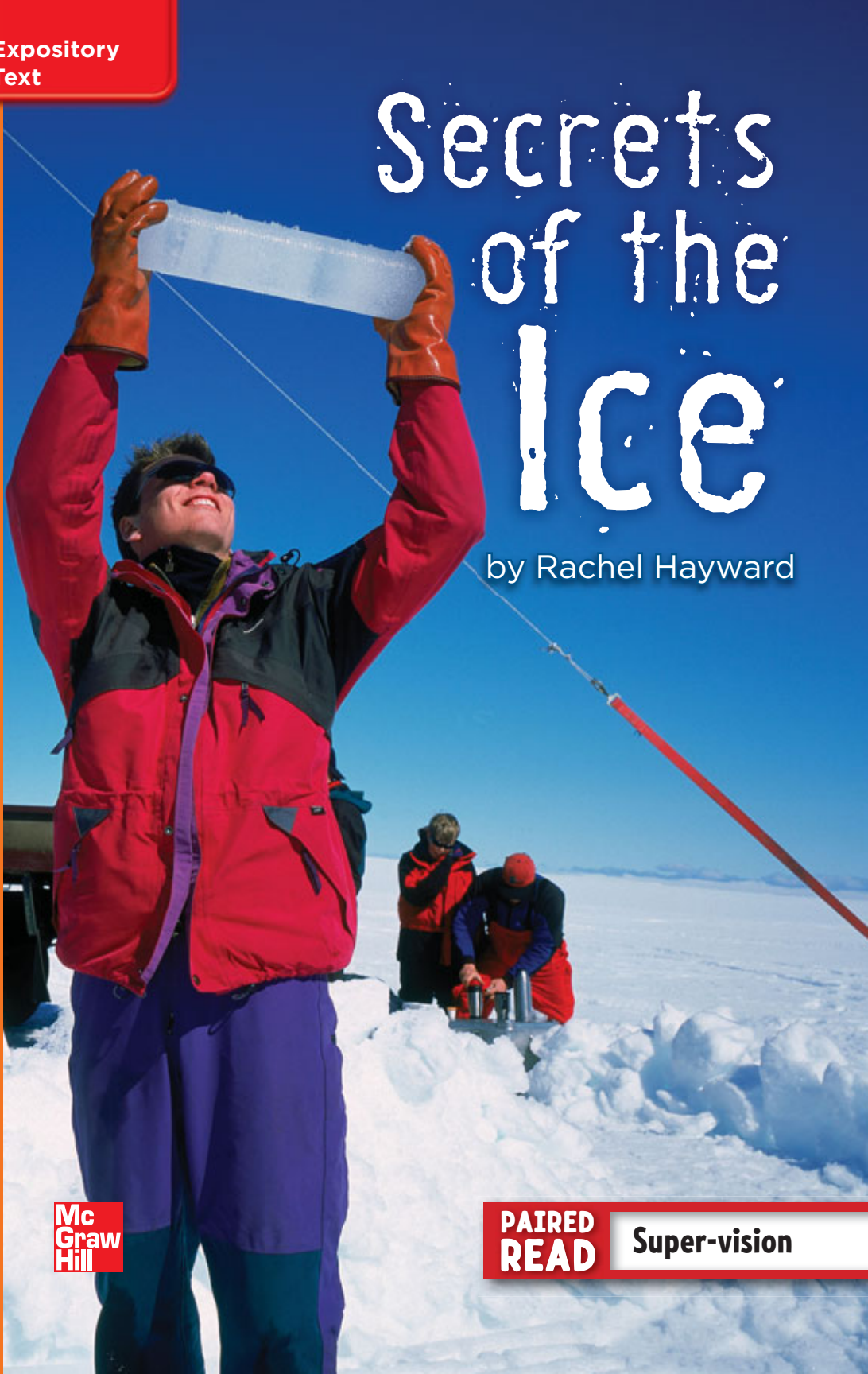
Expository Text

Secrets of the Ice

by Rachel Hayward



PAIRED READ

Super-vision

STRATEGIES & SKILLS

Comprehension

Strategy: Summarize

Skill: Sequence

Vocabulary Strategy

Antonyms

Vocabulary

clings, dissolve, gritty, humid, magnify, microscope, mingle, typical

Content Standards

Science

Physical Science

Word Count: 987**

Photography Credit: ARCTIC IMAGES/Alamy

**The total word count is based on words in the running text and headings only. Numerals and words in captions, labels, diagrams, charts, and sidebars are not included.

CCSS **Genre** Expository Text

Essential Question

What can you discover when you look closely at something?

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Kenneth G. Libbrecht

CHAPTER 1

The Properties of Water

What is clear, wet, and runs out of a faucet? What is cold, hard, and floats in your glass? What is invisible and hangs in the air?

The answer is water. Water can be a liquid (water), a solid (ice), or a gas (vapor).

Water occurs naturally on Earth as a liquid, a solid, and a gas.

(tc) Martyn F. Chillmaid/
Photo Researchers, Inc. (bl)
Jupiterimages/Thinkstock Images

When water is a liquid, things dissolve in it easily. Salt, sugar, and some gases dissolve in water.

When water gets very cold, it freezes and becomes ice. Most things shrink when they freeze. But if you freeze a glass bottle filled with water, the water expands and the bottle cracks.

When water is a gas, or vapor, it is usually invisible. Air with a lot of water vapor in it feels sticky and humid.

Water moves around Earth. It can change from a solid to a liquid to a gas. This is called the water cycle.

The sun heats water in lakes, rivers, and oceans. Some of it changes into water vapor. This is called **evaporation**. Then the water vapor rises into the **atmosphere**.

The vapor cools as it rises. It changes back into a liquid. This is called **condensation**. Tiny droplets of water form to make clouds.

Ingram Publishing/SuperStock

When the sun evaporates water from a lake, the vapor can appear as mist.

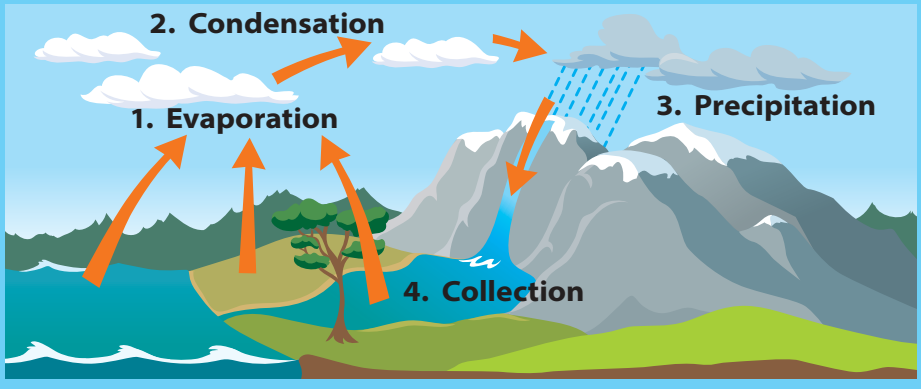
The water droplets join together and become heavy. They fall back to Earth as rain, hail, sleet, or snow. This is called precipitation. The water collects in streams, rivers, or in the ground. Then it's heated by the sun, and the cycle begins again.

Water collects other substances from the environment during the water cycle. We can learn more about our planet by finding out what substances the water collected.

STOP AND CHECK

What happens in the water cycle?

The Water Cycle



1. **Evaporation: Water is heated by the sun and turns into vapor.**
2. **Condensation: Vapor cools and turns into a liquid.**
3. **Precipitation: The liquid falls as rain, mist, fog, hail, sleet, or snow.**
4. **Collection: Water collects in streams, rivers, or on the ground.**

CHAPTER 2

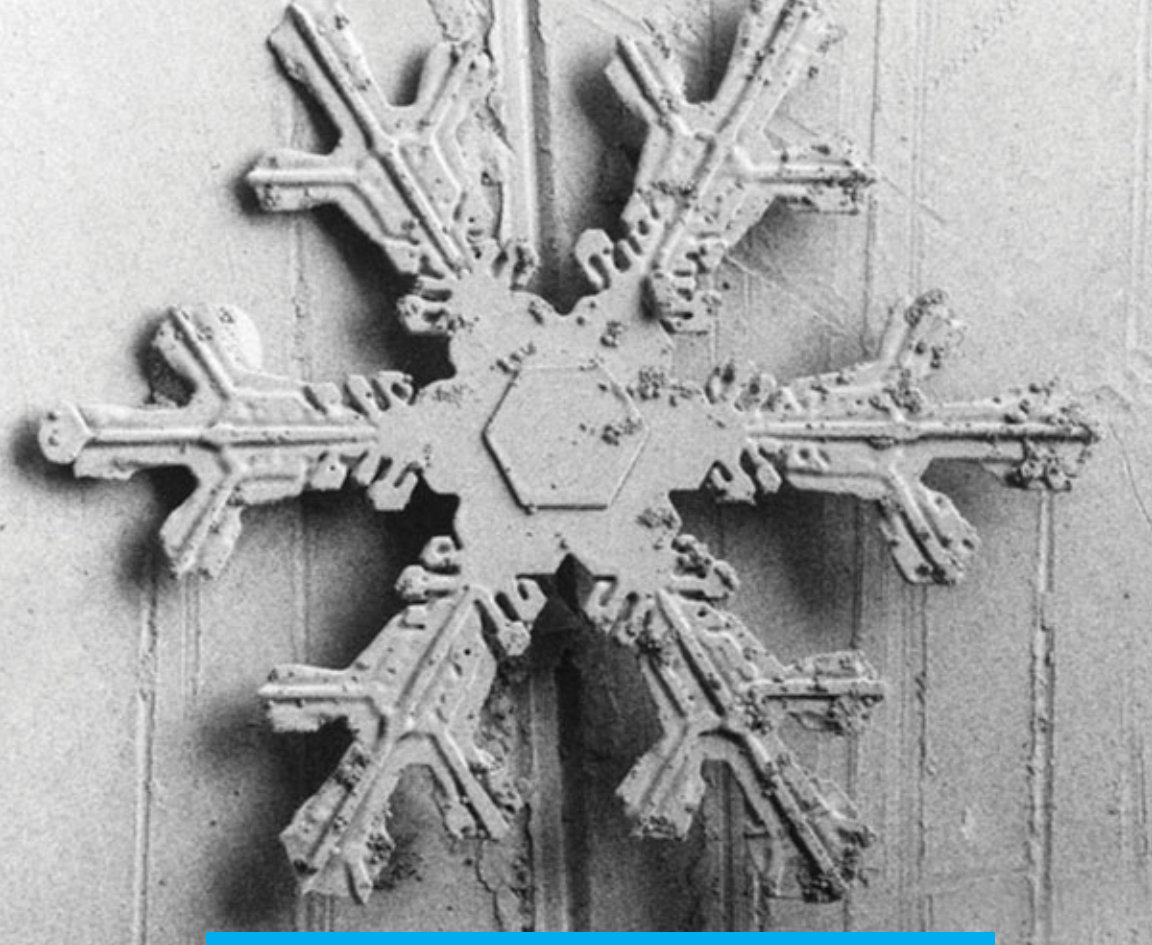
Snow and Ice

Snow forms when water vapor condenses into liquid droplets. Cold air freezes the water droplets into ice crystals. The crystals grow and stick to other ice crystals. The ice crystals fall to Earth as a snowflake.

Ice crystals have different shapes. Colder temperatures make simple shapes. Warmer temperatures make more complicated shapes. Dust can mingle with the water droplets before they freeze. This changes the size and shape of an ice crystal.

This is a close-up image of a snow crystal.

Kenneth G. Libbrecht



You can see the dust particles on this snowflake, which is shown under a microscope.

Ice crystals contain information about the environment. Water vapor clings to **particles** in the air, such as dust or ash. When the vapor changes to liquid and then ice, the particles are frozen into the ice crystals.

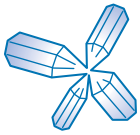
Falling snow also catches bubbles of gas from the atmosphere. Gases and particles are buried with the snow.

Scott Camazine/Alamy

Looking Closely at Snowflakes

You can look closely at snowflakes using a microscope. Most ice crystals have six sides.

Bullet Rosette

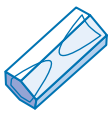


Capped Column

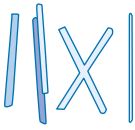
Double Plate

Fernlike Stellar Dendrite

Hollow Column

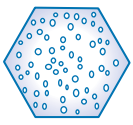


Needle

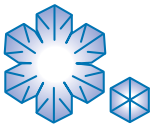


Radiating Dendrite

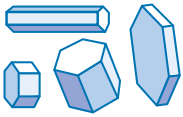
Rimmed Crystal



Sectioned Plate



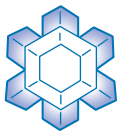
Simple Prisms



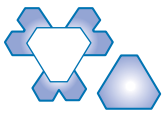
Split Plate and Star

Stellar Dendrite

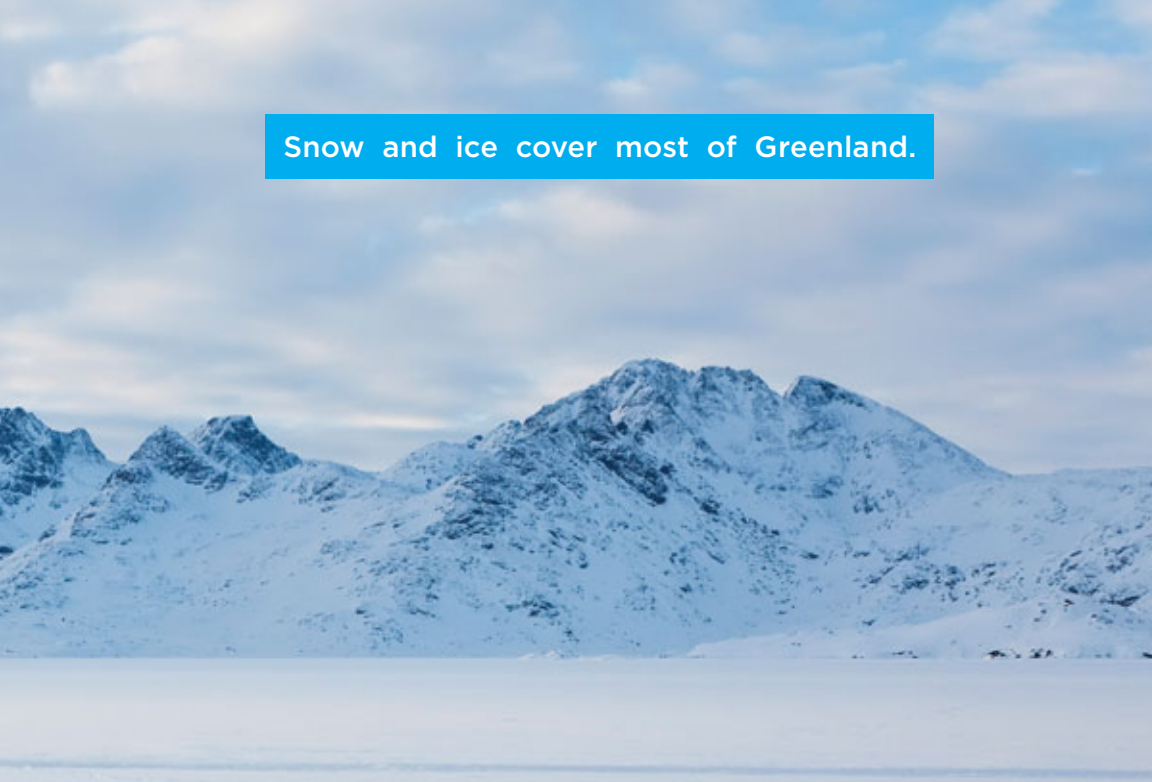
Stellar Plate



Triangular Crystal



12-sided Snowflake



Snow and ice cover most of Greenland.

The ice in the polar regions built up over thousands of years. The snow formed layers. New snow covered the old snow and pressed it down. The snow slowly compacted into ice. Dust, ash, and gases were trapped in the ice.

STOP AND CHECK

What happens when ice forms?

CHAPTER 3

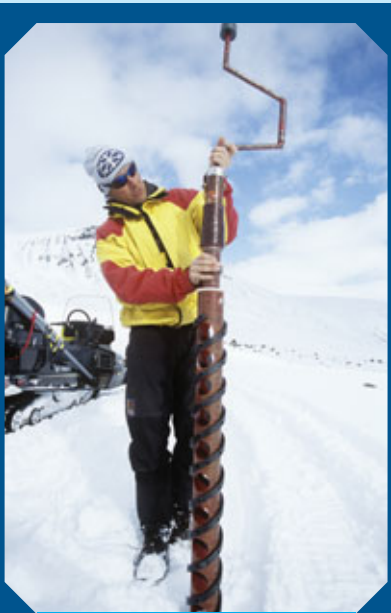
Looking Closely at Ice

Scientists study ice in the polar regions. They want to find out what is buried in the ice.

The scientists use a hollow drill with sharp teeth to remove ice cores. The teeth spin and cut through the ice. As the drill moves down, the inside fills up with ice.

The Best Place to Drill

Scientists look for places where the ice hasn't melted or moved. The scientists use radar to find out how deep the ice is and how many layers of ice there are.



This drill removes ice cores.

David Hay Jones/Photo Researchers, Inc

The ice core is removed in sections. After a section is taken out, the drill is put back into the same hole. It removes an older section of the ice.

A typical section of ice is between 2 feet and 10 feet long. The full ice core could be 300 feet long. In polar regions, the ice is very thick. A polar ice core may be taken from more than 2 miles down in the ice.

ARCTIC IMAGES/Alamy

This scientist is holding a section of ice core.

The sections of ice are taken to a special laboratory.

Scientists **analyze** the sections of ice core. They use microscopes to magnify the particles in the ice. Sometimes scientists find ash and gases in the ice. This could mean a volcano erupted at the time that the layer of ice formed. Traces of salt could mean strong winds were blowing in from the ocean.

The layers of ice can be seen when the ice core is placed over a light.

Photograph by Kendrick Taylor, DRI, University of Nevada-Reno, NOAA/National Geophysical Data Center

Scientists test the ice for gases such as carbon dioxide and methane. These are called "greenhouse gases." They trap the sun's heat inside Earth's atmosphere.

If scientists know how many greenhouse gases were in the atmosphere long ago, they can discover what the temperature was like then.

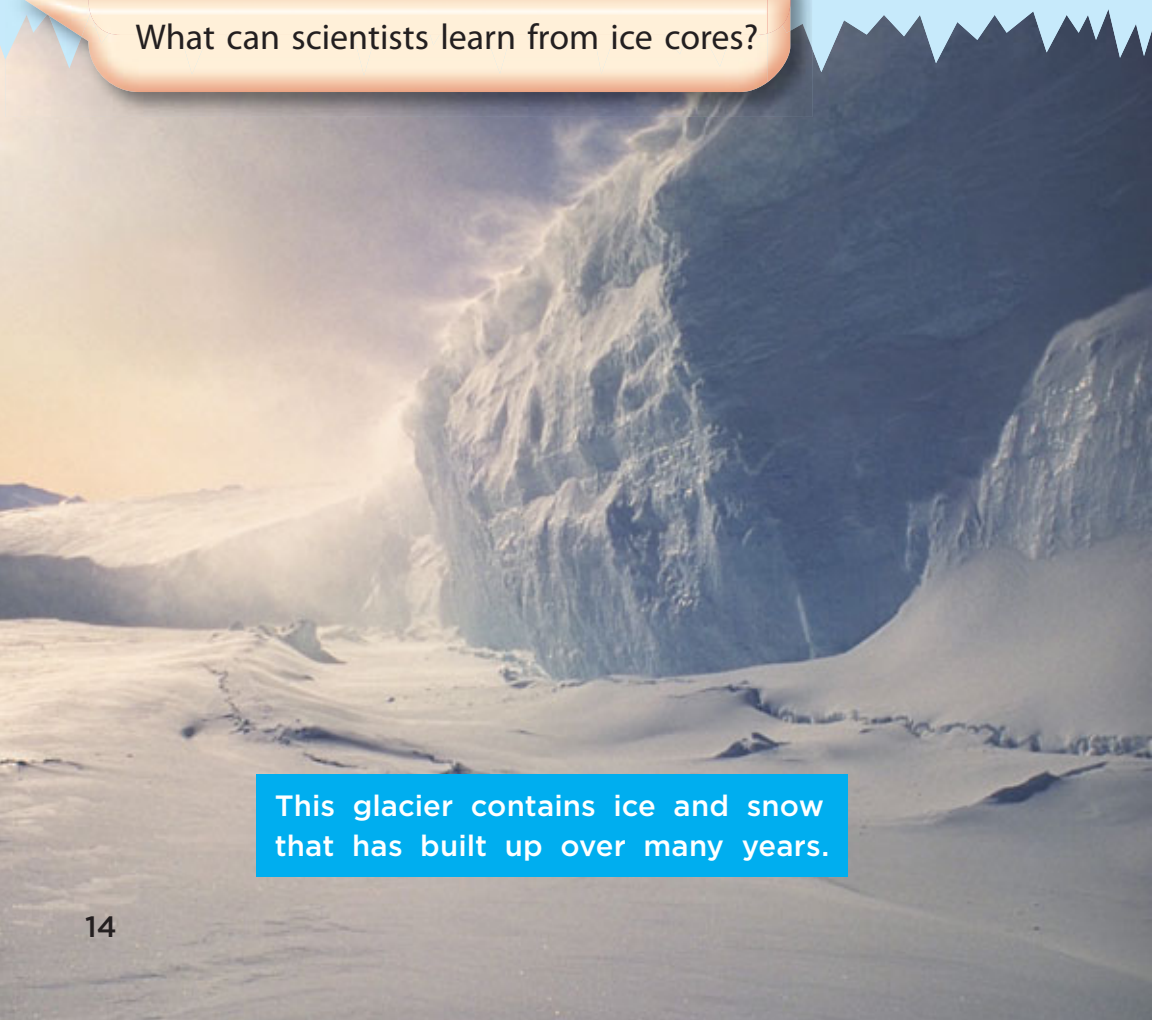
This scientist is looking at an ice core.

The information in ice cores helps us learn about the past. We can find out what the climate was like long ago and how it has changed over the years.

Water captures important information about our world. Who would have thought that ancient ice held so many secrets? We can learn a lot when we look at something closely.

STOP AND CHECK

What can scientists learn from ice cores?



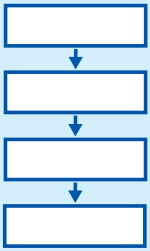
Gerald Kooyman/CORBIS

This glacier contains ice and snow that has built up over many years.

Respond to Reading

Summarize

Summarize how scientists in *Secrets of the Ice* study the ice. Use your graphic organizer to help you.



Text Evidence

1. Look at page 10. What features tell you what kind of text *Secrets of the Ice* is? **GENRE**

2. Look at the diagram on page 5. What does it show? **SEQUENCE**

3. What does the word *expands* mean on page 3. Find the antonym on the same page. **ANTONYMS**

4. Write about how information gets buried in the ice. What happens first, next, last? **WRITE ABOUT READING**

CCSS **Genre** Fantasy

Compare Texts

Read about a girl who can see things up close.

SUPER-VISION

Mia's friends were on vacation. She was bored.

"Cheer up!" said Mom. She wiped an eyelash off Mia's cheek. "Blow this and make a wish."

Mia blew the eyelash and wished. "Let me see something NEW today!"

She opened her eyes. Her little brother, Ben, had spilled salt and sugar on the table. She stared at the gritty crystals, and they grew bigger. She saw that the salt crystals were cubes and the sugar crystals were hexagons.

Mia blinked, and the crystals were tiny again. Things magnified when Mia focused and returned to normal when she blinked.

"Mom," she said, "I've got microscopic vision!"

"That's nice," her mother said distractedly.

Microscopic vision made ordinary things extraordinary. Mia examined the tiny hairs and pores on her arm.

"Earth to Mia!" said Mom. "Please take the trash out, Mia," said Mom.

The front yard contained spiderwebs, leaves, and specks of dirt. Mia saw them all in a new way.

She lifted the lid of the trash can and yelled. The rotten apples and moldy bread looked horrible. Mia ran back to the house.

Illustration: Scott Pearson

Mom was in the yard with Ben. Mia saw ugly monsters marching toward Ben's foot! She gasped.

Then Mia blinked, and the monsters were just ants.

Mia closed her eyes and wished, "Please give me back my boring eyesight!"

She opened her eyes and stared at Ben's curly hair. Her eyesight was normal again.

"Are you okay?" asked Mom.

"Yes. I'm seeing things in a new light!" said Mia.

Illustration: Scott Pearson

Make Connections

What does Mia discover about the world with her microscopic vision? **ESSENTIAL QUESTION**

How are the scientists in *Secrets of the Ice* similar to Mia in *Super-vision*? **TEXT TO TEXT**

Glossary

analyze *(AN-uh-lighz)* study or examine something closely ***(page 12)***

atmosphere *(AT-muh-sfeer)* the layer of gases that surround Earth ***(page 4)***

condensation *(kahn-den-SAY-shuhn)* the process of a gas cooling and becoming a liquid ***(page 4)***

evaporation *(i-va-puh-RAY-shuhn)* the process of a liquid becoming a gas ***(page 4)***

particles *(PAHR-ti-kuhlz)* tiny pieces ***(page 7)***

Index

Focus on Science

Purpose To create a mini water cycle

Procedure

You will need a large bowl, plastic wrap, a glass that is shorter than the bowl, water, and some coins.

Step 1 Pour the water into the bowl until it is about a quarter full.

Step 2 Put the glass in the center of the bowl.

Step 3 Cover the bowl tightly with plastic wrap. Set several coins in the center of the plastic so they are above the glass.

Step 4 Put the bowl on a sunny windowsill for a few days.

Conclusion What happened? Is the water level in the bowl the same? What changed with the glass? Why? The principles of the water cycle work in a mini cycle that you can make, as well as in the natural world around us.

Literature Circles

Nonfiction

Thinkmark

The Topic

What is *Secrets of the Ice* mostly about?

Text Structure

How does the author organize information in *Secrets of the Ice*?

What process does the author explain first?

How does that help you understand the scientists' work?

Vocabulary

What new words did you learn in the text?

What helped you understand what they mean?

Author's Purpose

Why do you think the author wrote *Secrets of the Ice*?

Conclusions

What is the most important thing you learned in *Secrets of the Ice*?