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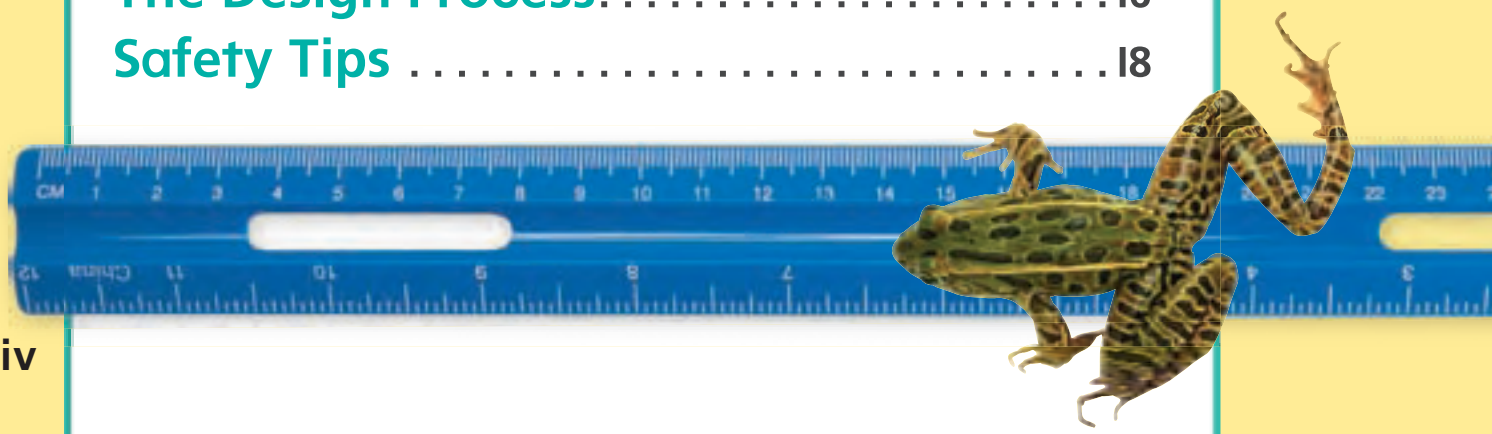
Be a Scientist

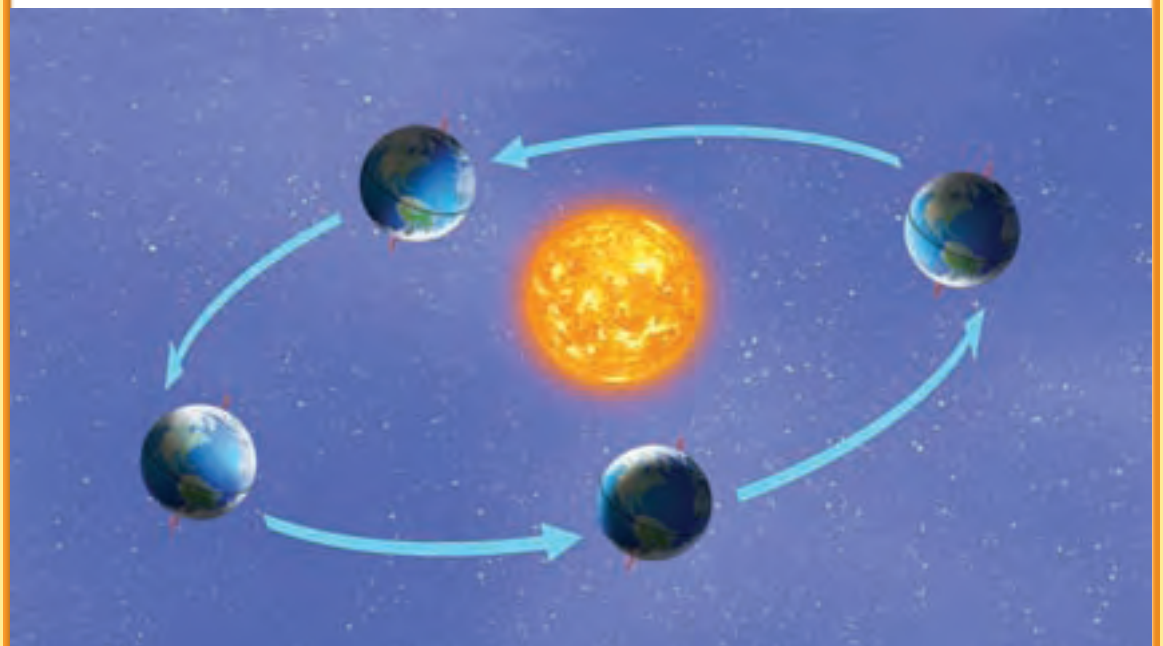


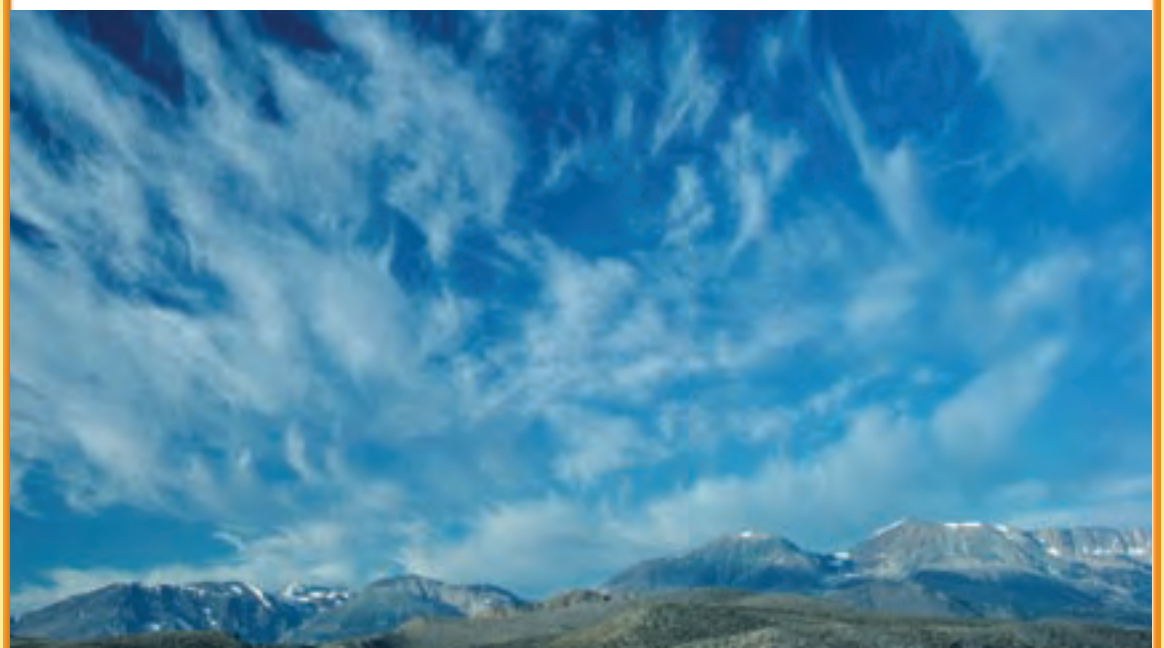

Scientific Method
Observe
Ask a Question
Make a Prediction
Make a Plan
Follow the Plan
Record the Results
Try the Plan Again
Draw a Conclusion

Life Sciences

CHAPTER 3

Looking at Habitats 90



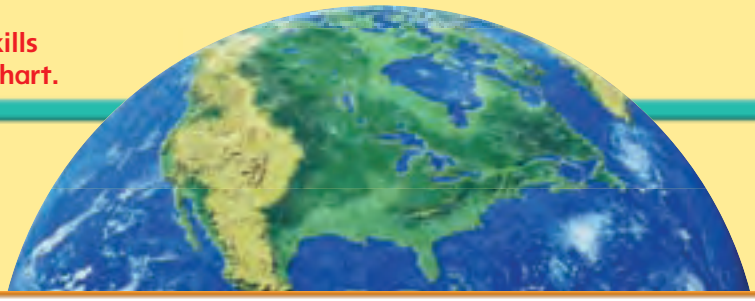


Activities and Investigations

Life Sciences

Be a Scientist investigations and Focus on Skills skill builders are found in the Activities Flipchart.

Earth and Space Sciences



CHAPTER 4

Explore Activities

Quick Labs

CHAPTER 5

Explore Activities

Quick Labs

Physical Sciences

CHAPTER 6

Explore Activities

Quick Labs

Be a Scientist

Some tree frogs lay their eggs on leaves floating on water.

SI-A. Ask a testable question. **SI-B.** Design and conduct a simple investigation to explore a question. **SI-C.** Gather and communicate information from careful observations and simple investigation through a variety of methods.

Science Skills

Look and Wonder

Do you see the frog? How does it stay on the lily pad?

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

Explore

Inquiry Activity

How can a frog float on a lily pad?

What to Do

1. **Predict.** Where should you place the frog on the lily pad so that the frog stays dry?
2. **Make a Model.** Color a paper plate green with crayon. This will be the lily pad.
3. **Be Careful.** Poke a small hole near the edge of the lily pad. Tie a six-inch piece of string through the hole.
4. Place the lily pad in a pan of water with the string below it.
5. **Record Data.** Draw and write down where you placed the frog.

You need


paper plate

green crayon


scissors


string


pan of water


toy frog

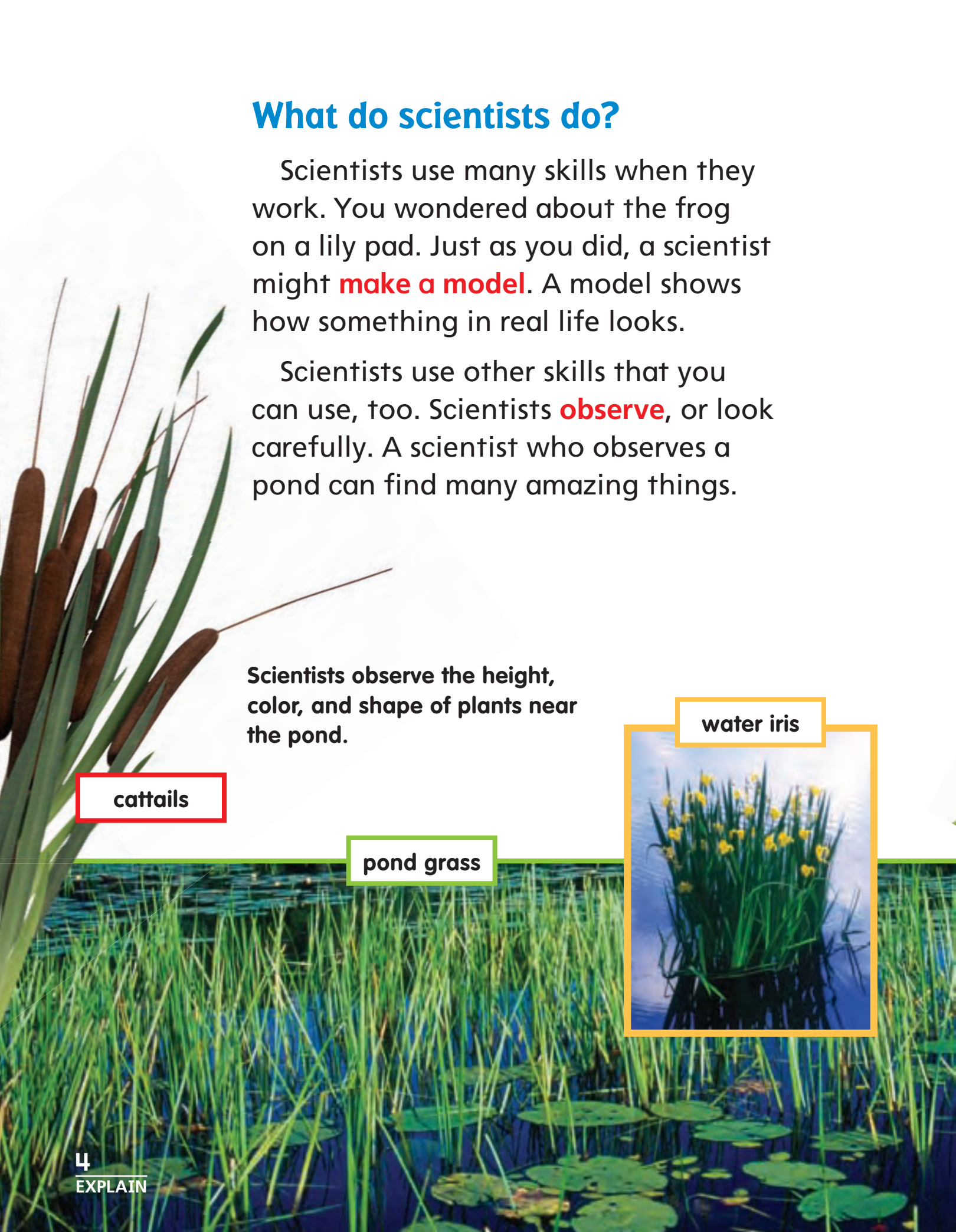
SI-7. Use appropriate tools and simple equipment/instruments to safely gather scientific data (e.g., magnifiers, non-breakable thermometers, timers, rulers, balances and calculators and other appropriate tools).

What do scientists do?

Scientists use many skills when they work. You wondered about the frog on a lily pad. Just as you did, a scientist might **make a model**. A model shows how something in real life looks.

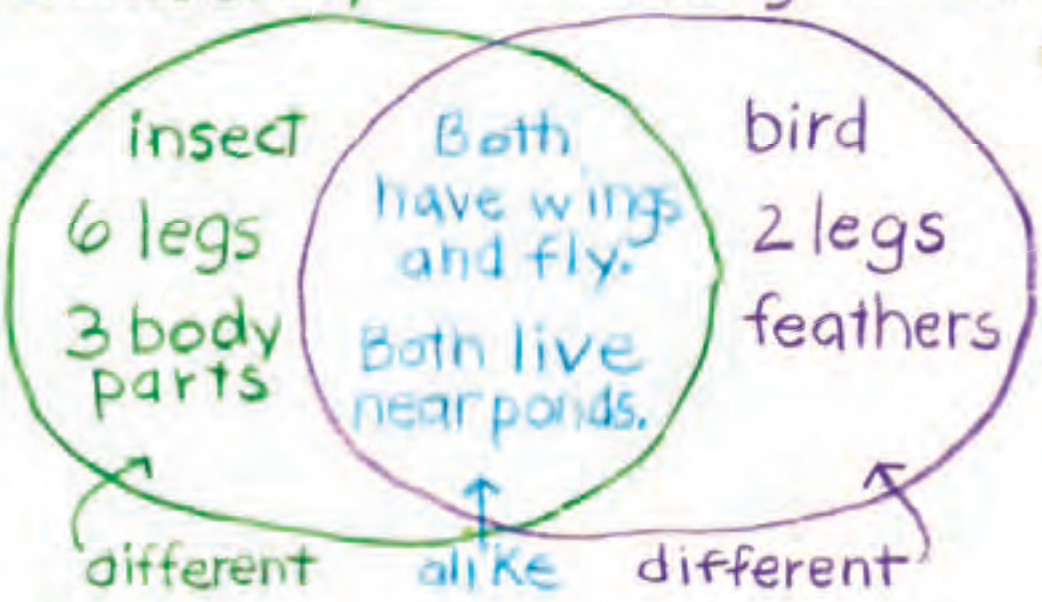
Scientists use other skills that you can use, too. Scientists **observe**, or look carefully. A scientist who observes a pond can find many amazing things.

Scientists observe the height, color, and shape of plants near the pond.



Scientists **compare** things by telling how they are alike or different. Look at the two pond animals on this page. How might a scientist compare them?

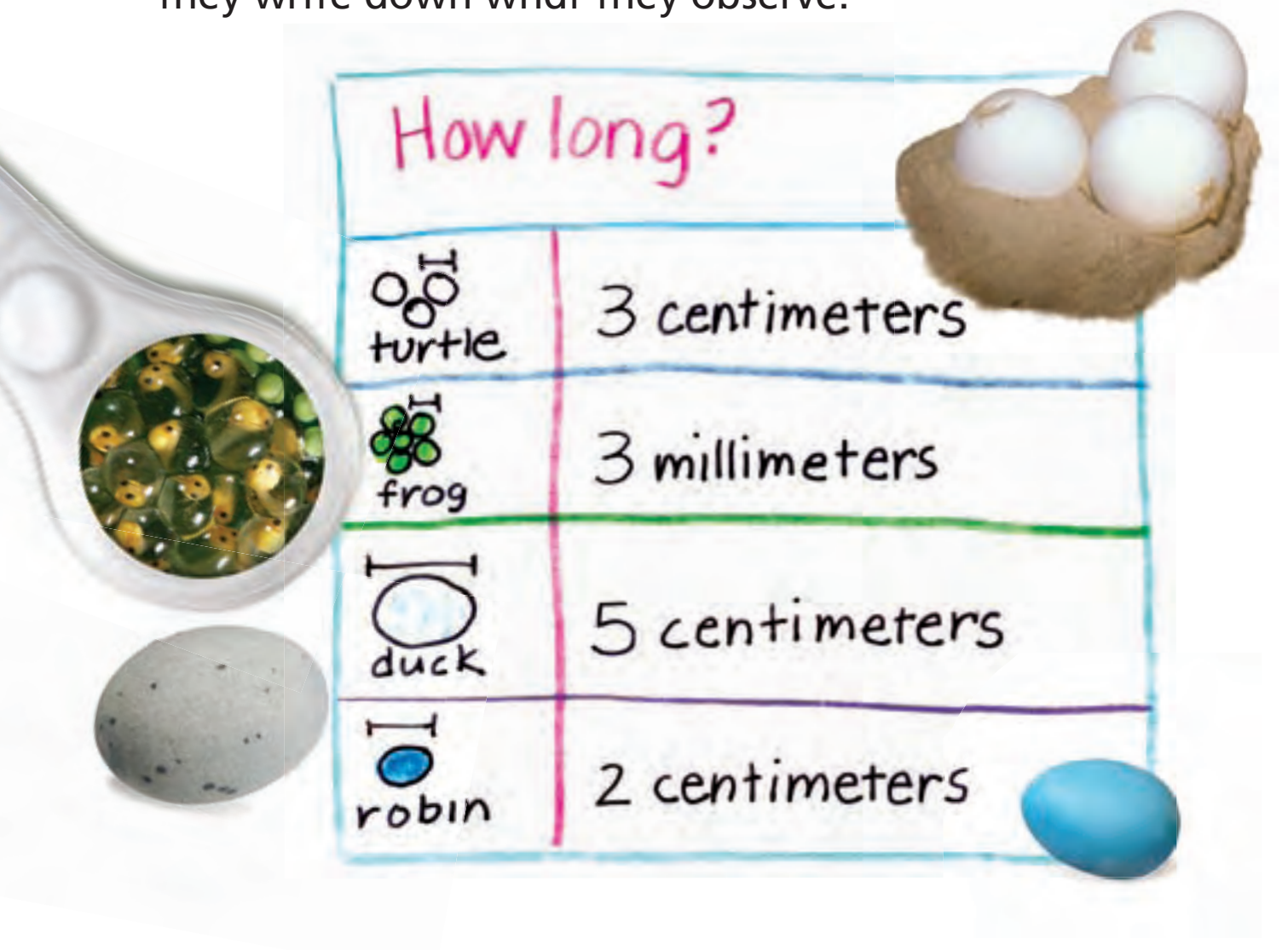
Look closely. Both animals have wings. They both live near ponds. But they are different in many other ways. Scientists find ways to **classify** things, or put them in groups. Insects and birds are different animal groups.



How do scientists work?

Look at all the eggs a scientist found near a pond! Scientists can **measure** how large or how heavy the eggs are. When you measure, you find out how long or how heavy something is. You can also find out how hot or how cold something is.

The facts scientists find are called data. When scientists **record data**, they write down what they observe.



After scientists collect data, they can put their data in order. **Put things in order** means to arrange them in some way. For example, you can order the eggs by their size. Which egg is smallest? Which is largest?

Another skill scientists use is **infer**. When you infer, you use what you know to figure something out. Can you infer which eggs belong to the animals on this page?

frog

duck

turtle

robin

How do scientists learn new things?

Scientists learn new things by investigating. When you **investigate**, you make a plan and try it out.

Scientists start by asking a question. They predict what the answer might be. When you **predict**, you use what you know to tell what you think will happen.

Look at the pictures of the tadpole and young frog. What do you predict the young frog will look like next?

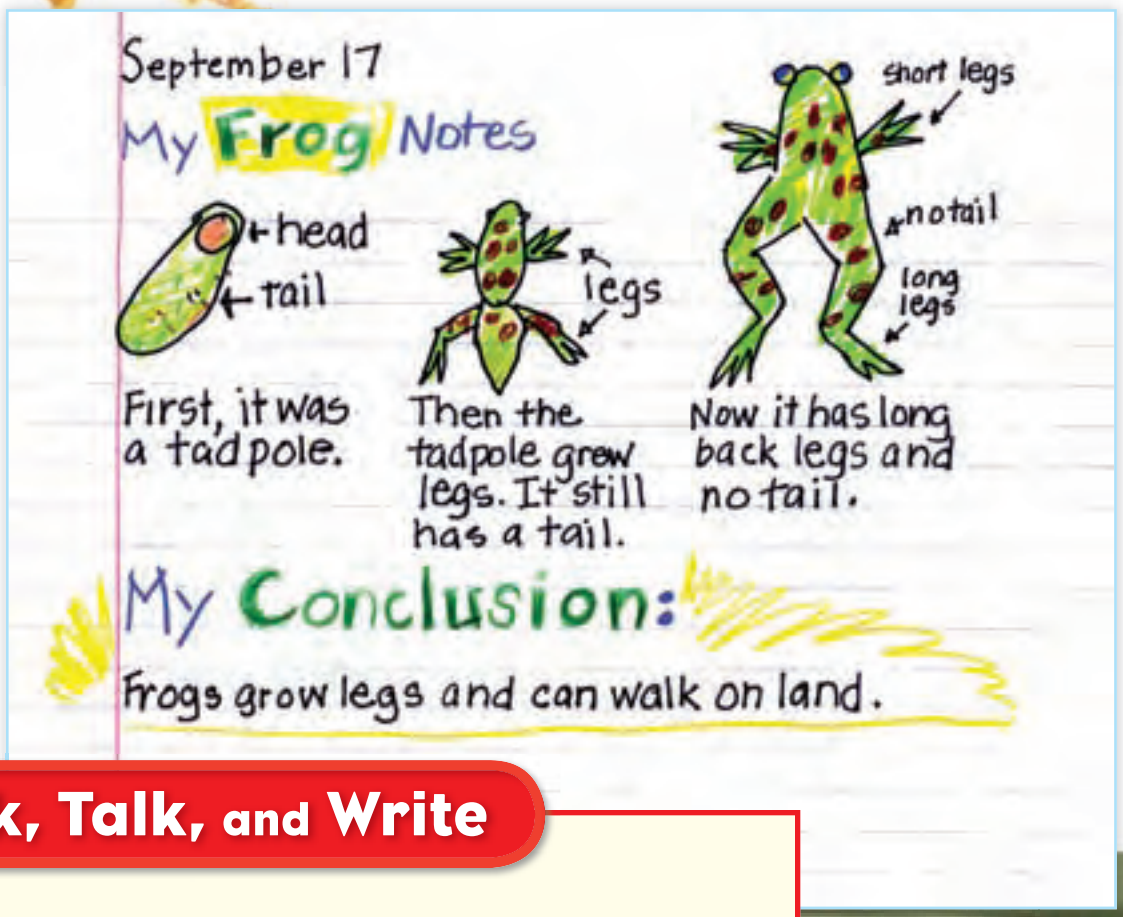
tadpole

young frog

?

When you **draw conclusions**, you use what you observe to explain what happens. Scientists draw conclusions. They conclude tadpoles live in the water, grow legs, and climb onto land.

Scientists communicate their ideas to other people. When you **communicate**, you write, draw, or tell your ideas.



Think, Talk, and Write

1. Which skill helps scientists put things into groups?
2. Write about what new things you might want to learn if you were a scientist.

Scientific Method

Look and Wonder

This frog can swim! How else can a frog move? Scientists ask questions like this. They follow certain steps to find the answers.

SWK-I. Describe that scientific investigations generally work the same way under the same conditions.

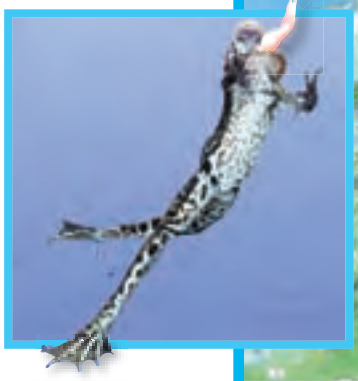
Explore

Inquiry Activity

How does a frog move?

What to Do

1. **Observe.** Look at the pictures on this page. Think about how the frogs are moving.
2. **Record Data.** Make a list of the different ways you see the frogs moving.
3. **Draw Conclusions.** Add to your list. Write the body part the frogs use to move in each way.
4. **Communicate.** How do frogs move?



SI-6. Recognize that explanations are generated in response to observations, events and phenomena.

How high can a frog jump?

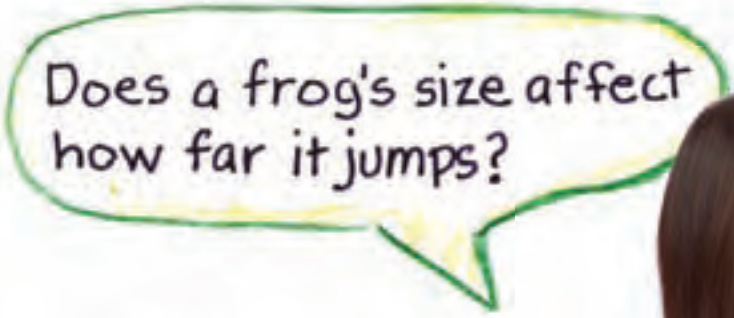
Scientists investigate by following steps called the **Scientific Method**. Here is how one student scientist follows the Scientific Method.

Observe

Lola uses her science skills to observe the frogs in her classroom.

Ask a Question

Lola's question is:



Make a Prediction

Lola predicts the answer is yes. She thinks Andy will jump farther because his legs are longer.

Andy

Molly

Make a Plan

Lola writes down a plan to test her idea. When she writes the plan, other people can follow it too.

Follow the Plan

Lola follows her plan. She changes the plan if parts of it do not work.

What did you find out?

Record the Results

Lola makes a chart to show how far each frog jumps.

How far can each frog jump?

frog	1st try	2nd try	3rd try
Andy	20 cm		
Molly	25cm		

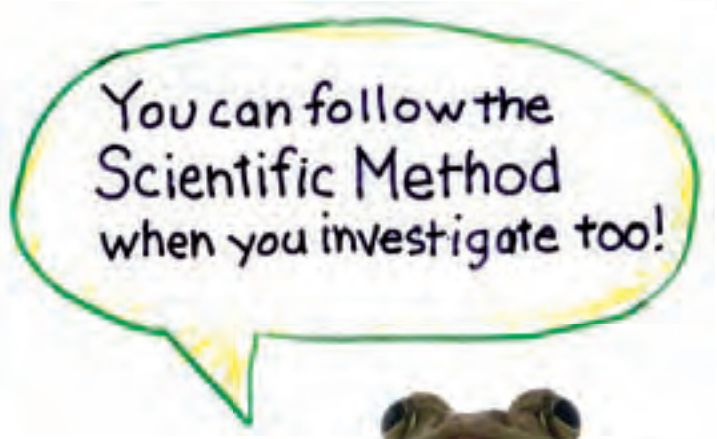
Try the Plan Again

Lola tests each frog three times. This helps her know if her results are correct.

Draw a Conclusion

Lola explains what her results mean.

Lola talks to her classmates about what her results mean. This can lead to new questions and new investigations.



Think, Talk, and Write

1. Why do you think it is important for scientists to make a plan?

2. Write about why scientists write down their plans.

Science and Technology:
The Design Process

Have you ever had a problem? How did you solve it? Scientists use the **design process** to solve problems.

▶ Learn It

When you use the design process, first you identify a problem. Next you think of a solution. A solution is a way to fix a problem. You can get ideas from your friends, a teacher, or books. Then you design your solution. To design is to draw, plan, and build your idea.

Do you have trouble finding your school supplies? You can design a way to keep track of your pencils, crayons, and other supplies.

▶ Try It

Michael designed a box to hold all of his school supplies. Michael's box had a place for his pencils, crayons, glue, and eraser.

Design a way to store your school supplies. Make a sketch of your idea. Share your idea with your teacher. Gather the materials that you need for your design. Build your invention and test your design.

1. How did your design compare to Michael's?
2. Did your design solve your problem?
3. Write about it. How could you change your design to make it better?

ST-4. Communicate orally, pictorially, or in written form the design process used to make something.

Safety Tips

When you see ⚠ Be Careful, follow the safety rules.

Tell your teacher about accidents and spills right away.

Be careful with sharp objects and glass.

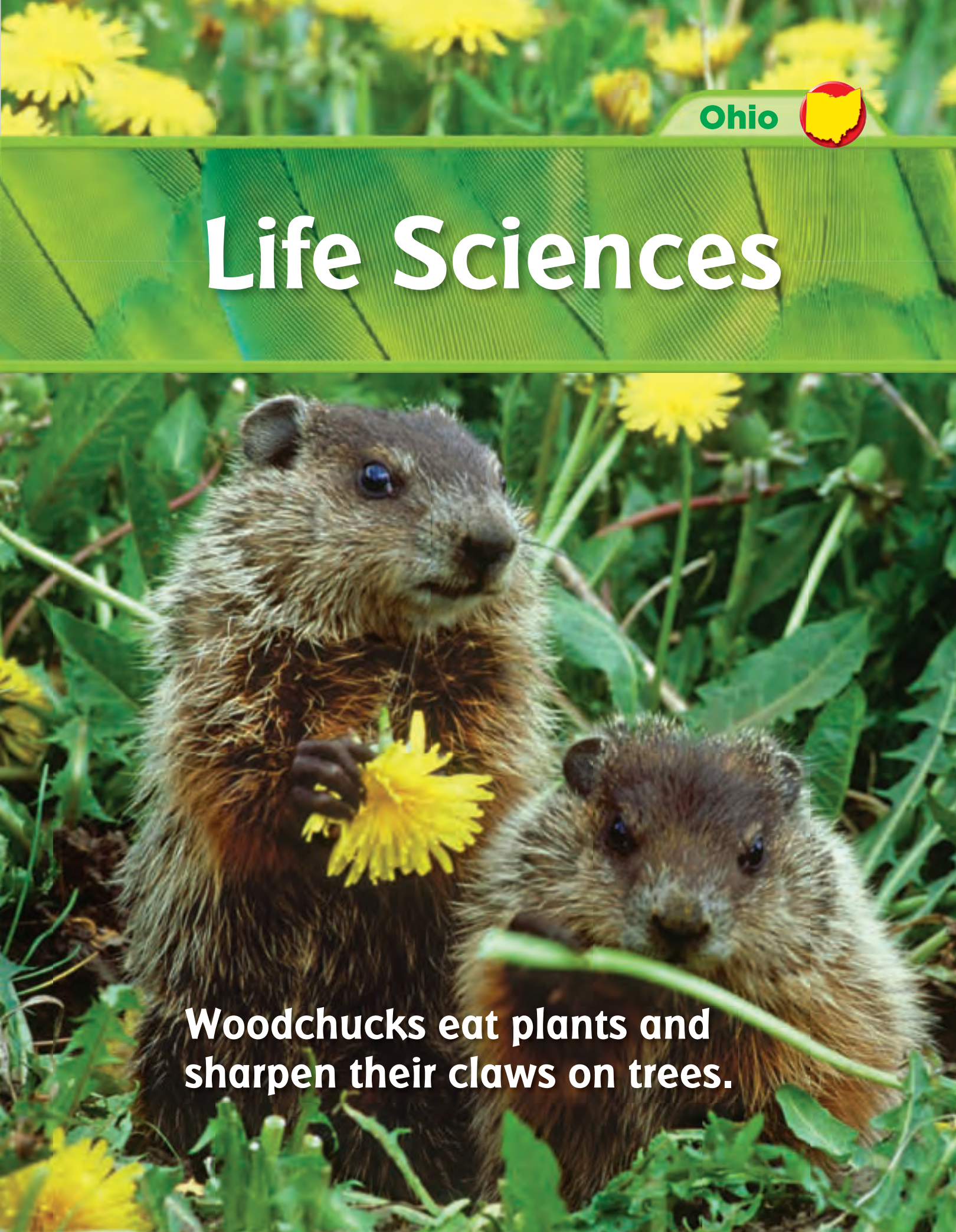
Wear goggles when you are told to.

Wash your hands after each activity.

Keep your workplace neat. Clean up when you are done.

Ohio

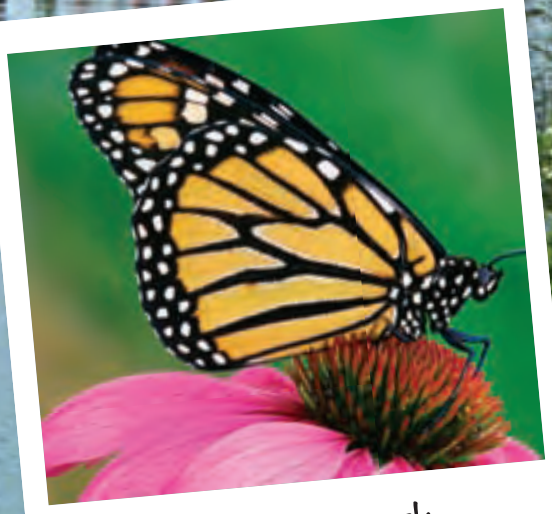
Life Sciences



Woodchucks eat plants and sharpen their claws on trees.

Cuyahoga Valley National Park

monarch butterfly larva



adult monarch butterfly

Staying Warm in Winter

Cuyahoga Valley National Park is home to many animals. Monarch butterflies live there in the summer. In the fall, they fly to Mexico and stay there for the winter.

The monarchs can fly only during the day. The trip takes a very long time.

Super Food!

The park has the food the monarchs need. They eat flower nectar. Monarchs need plenty of food to survive. This food helps them make the long trip. It also helps them stay warm in winter.

Think, Talk, and Write

Critical Thinking Why can monarchs live in Ohio?

Ohio

A CLOSER LOOK

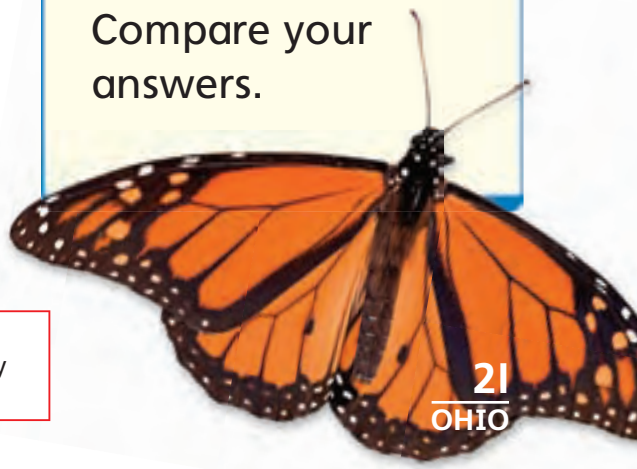
Main Idea

Monarch butterflies stop in Ohio on their way to Mexico.

Activity

Communicate. Think about what living things need.

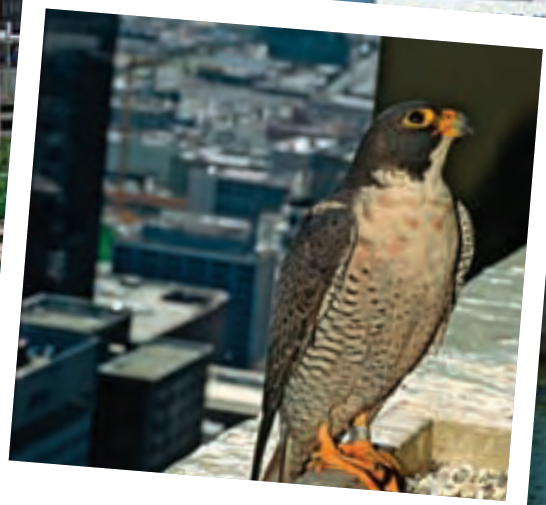
- Why do Monarch butterflies stop in Ohio? Why is it important to maintain their Ohio habitat?
- Find a partner. Compare your answers.



LS-3. Explain why organisms can survive only in environments that meet their needs . . . **LS-7.** Compare the habitats of many different kinds of Ohio plants and animals . . .

Peregrine Falcons on the Rhodes Tower

Rhodes State Office Tower



a peregrine falcon

Falcons in the City?

Peregrine falcons are birds of prey, like hawks or eagles. Peregrine falcons usually nest on rocky cliffs. However, some of them have adapted or changed their behavior, and now they live in the city!

From Rare to Recovered

For a while there were very few peregrine falcons. People put up nest boxes to help the falcons live on buildings like the Rhodes State Office Tower in Columbus. Because the birds adapted to city life, the number of peregrine falcons is much higher now.

Think, Talk, and Write

Critical Thinking Why can peregrine falcons live in the city?

Ohio

A CLOSER LOOK

Main Idea

Animals can sometimes adapt to different environments.

Activity

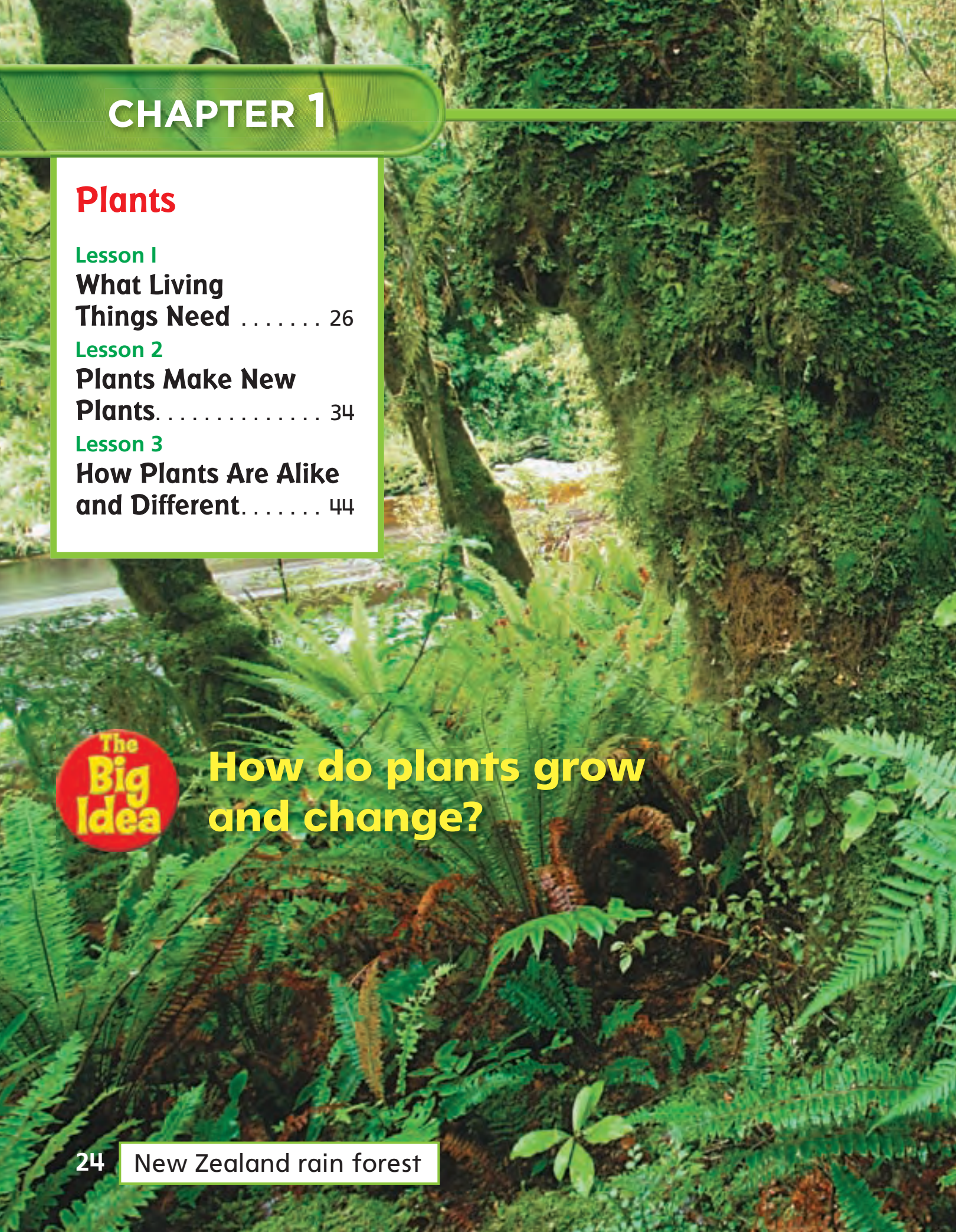
Compare Look at pictures of peregrine falcon habitats in the wild and in the city.

■ How are they alike? How are they different?

LS-1. Explain that animals . . . and . . . plants need air, water, nutrients, . . . living space, and light to survive. **LS-2.** Identify that there are many distinct environments . . .

CHAPTER 1

Plants



The Big Idea

How do plants grow and change?

New Zealand rain forest

Key Vocabulary

flower plant part that makes seeds or fruit (page 36)

seed plant part that can grow into a new plant (page 36)

pollen sticky powder inside a flower that helps make seeds (page 36)

seedling a young plant (page 40)

More Vocabulary

minerals, page 30

oxygen, page 31

life cycle, page 40

trait, page 47

LS-A. Discover that there are living, non-living, and pretend things, and describe the basic needs of living things (organisms). **LS-B.** Explain how organisms function and interact with their physical environment. **LS-C.** Describe similarities and differences that exist among individuals of the same kind . . .

Lesson 1

What Living Things Need

Farm in Pomfret, Vermont

Look and Wonder

What things in this picture are alive? How can you tell?

LS-I. Explain that animals . . . and . . . plants need air, water, nutrients, . . . living space, and light to survive. **LS-5.** Explain that food is a basic need of plants and animals . . .

Explore

Inquiry Activity

What do leaves need?

You need

two potted plants

foil

What to Do

1. Put the plants in a sunny place. Choose one plant and cover its leaves with foil. Keep the soil moist in both pots.
2. **Predict.** What will happen to each plant in a week?
3. **Record Data.** Write down what you observe for a week.
4. Were your predictions correct? What do leaves need?

Explore More

5. **Predict.** What will happen if the foil is removed? Observe the plant for a week. Was your prediction correct?

Step 1

SI-6. Recognize that explanations are generated in response to observations, events and phenomena.

Read Together and Learn

Vocabulary

minerals

oxygen

What do living things need?

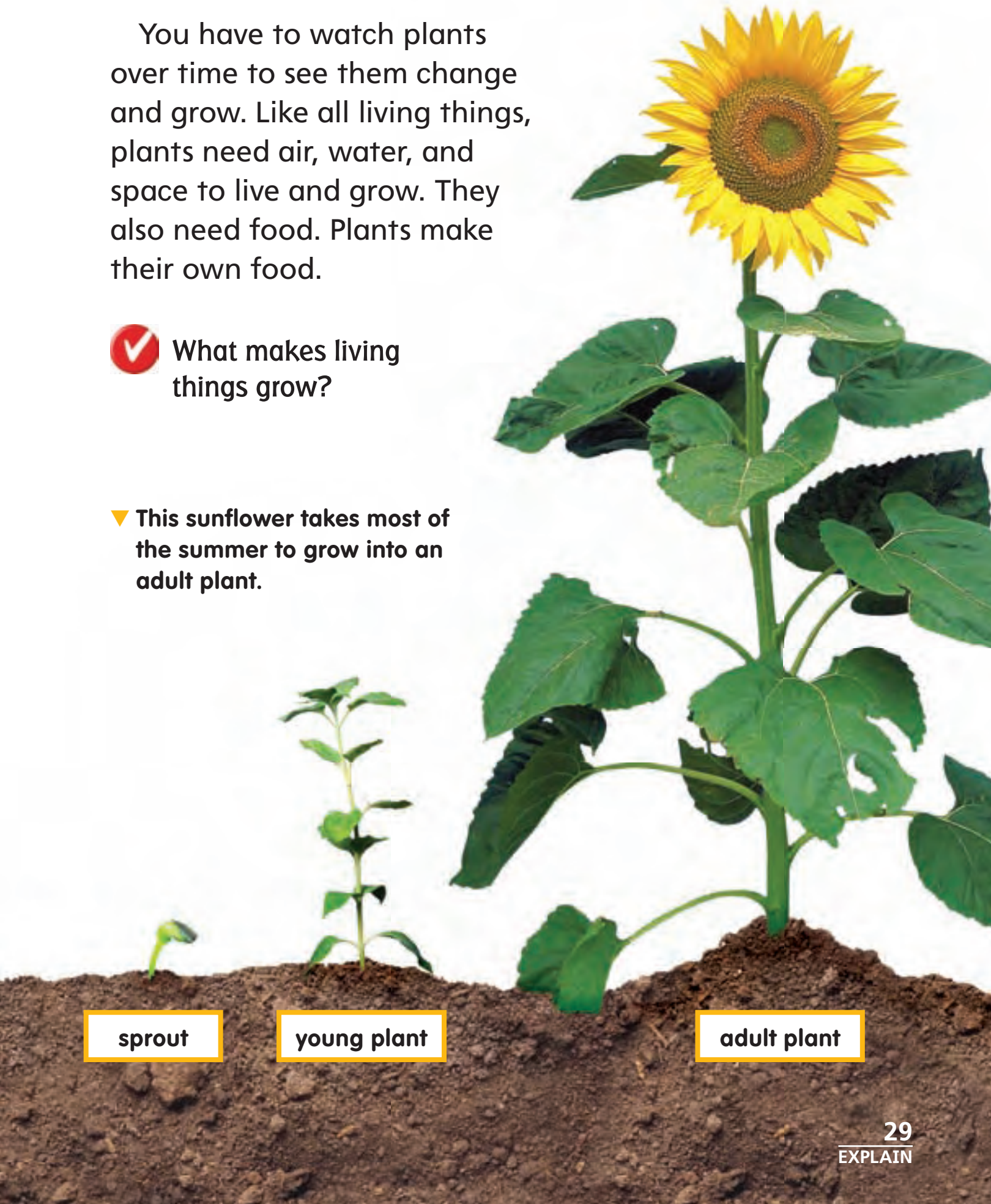
Living things grow and change. Sometimes it is easy to tell when something is living. You can see animals move, breathe air, eat food, and drink water. It might be harder to tell, but plants are living things, too.

▶ **A grasshopper eats a dandelion flower.**

The swan makes a nest for her chicks near a pond.

You have to watch plants over time to see them change and grow. Like all living things, plants need air, water, and space to live and grow. They also need food. Plants make their own food.

What makes living things grow?



▼ **This sunflower takes most of the summer to grow into an adult plant.**

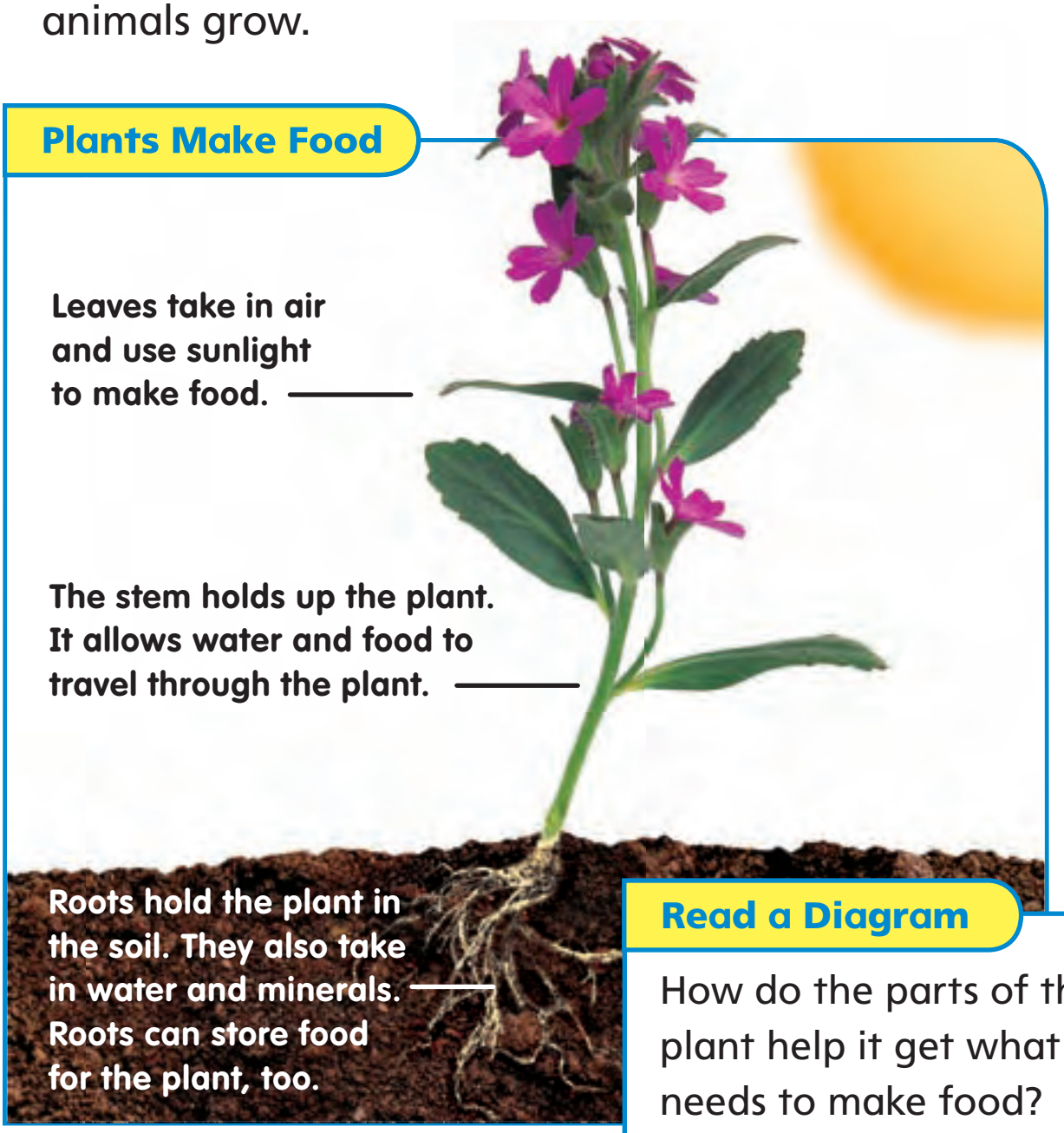
How do plants make food?

Plants have parts that they use to help them make food. Plants need sunlight, air, and water to make their own food. Plants also need minerals. **Minerals** are bits of rock and soil that help plants and animals grow.

Quick Lab

Observe a plant. See what parts take in water.

Plants Make Food



Read a Diagram

How do the parts of the plant help it get what it needs to make food?

When plants make food they give off a gas called oxygen into the air. **Oxygen** is what humans and other animals breathe in order to live.

What do plants need to make food?

▼ **These plants make oxygen that the boy and the dog need to live.**

Think, Talk, and Write

1. **Compare and Contrast.** How are plants and animals alike? How are they different?
2. What do roots, stems, and leaves do?
3. Write about how you can tell that a plant is living.

Art Link

Draw how a seed grows. What direction do the roots grow? What direction do the stem and leaves grow?

LOG ON e-Review Summaries and quizzes on line at www.macmillanmh.com.

Inquiry Skill: Observe

To **observe,** you use your senses to learn about something. You use senses to see, hear, taste, smell, and touch.

jasmine

▶ Learn It

You can use some of your senses to learn about flowers. You can make a chart to write down what you observe.

jasmine

See	
feel	The leaves feel smooth.
hear	
smell	The flowers smell sweet.

▶ Try It

Find a flower to observe or look at the pictures below.

bougainvillea

yucca plant

1. What color is your flower? Which sense did you use to find out?
2. How do you think the leaves will feel to your touch?
3. **Write About It.** Find another flower and compare.

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

Lesson 2

Plants Make New Plants

Look and Wonder

Where do you think the seeds in this plant are?

LS-4. Compare similarities and differences among individuals of the same kind of plants and animals, including people.

Explore

Inquiry Activity

What are the parts of a seed?

What to Do

1. **Observe.** What does the outside of a dry lima bean feel like? Use a hand lens. What do you see?
2. **Predict.** Draw what you think is inside the seed.
3. Use your fingernail to open the wet seed. Use your hand lens to observe the wet seed. Draw what you see.
4. **Communicate.** Compare your two drawings. What was different? What was the same?

Explore More

5. **Observe.** Look at other wet and dry seeds to see how they compare.

You need

dry lima bean

wet lima bean

hand lens

Step 3

SI-7. Use appropriate tools and simple equipment/instruments to safely gather scientific data (e.g., magnifiers, non-breakable thermometers, timers, rulers, balances and calculators and other appropriate tools).

Read Together and Learn

Vocabulary

flower
seed
pollen
life cycle
seedling

SCIENCE QUEST Explore plant life cycles with the Treasure Hunters.

Where do seeds come from?

A **flower** is the part of a plant that makes seeds and fruit. A **seed** is the part of a plant that can grow into a new plant.

Part of the flower makes pollen. **Pollen** is a sticky powder inside the flower that helps make seeds.

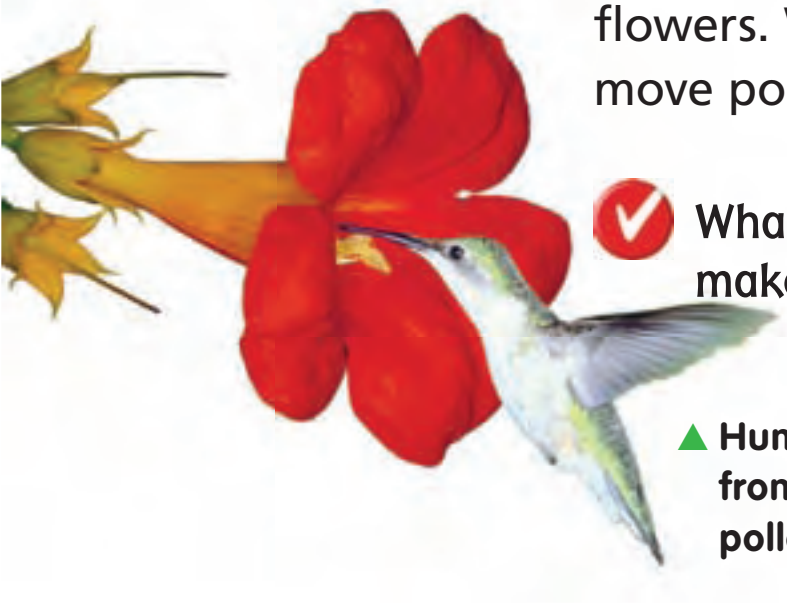
Cantaloupe

Pollen lands on this part of the flower and helps it make seeds.

This part of the flower grows into a fruit with seeds.

Animals such as birds and bees can move pollen between flowers. Wind and water can move pollen, too.

What does pollen help a plant make?



▲ **Hummingbirds drink nectar from flowers and move pollen from plant to plant.**

▲ **The fruit protects the seeds inside.**

▲ **When the fruit is ripe, it can be picked.**

▲ **The seeds inside the fruit can grow into new plants.**

How do seeds look?

Most plants have seeds to make new plants. Seeds have food inside them to help the new plant grow. There are many different shapes and sizes of seeds.

Some seeds are small. Wind or water can carry them away. Other seeds stick to the fur of animals and get a ride to a new place.

Quick Lab

Observe the seeds inside an apple. Talk about how the fruit protects the seeds.

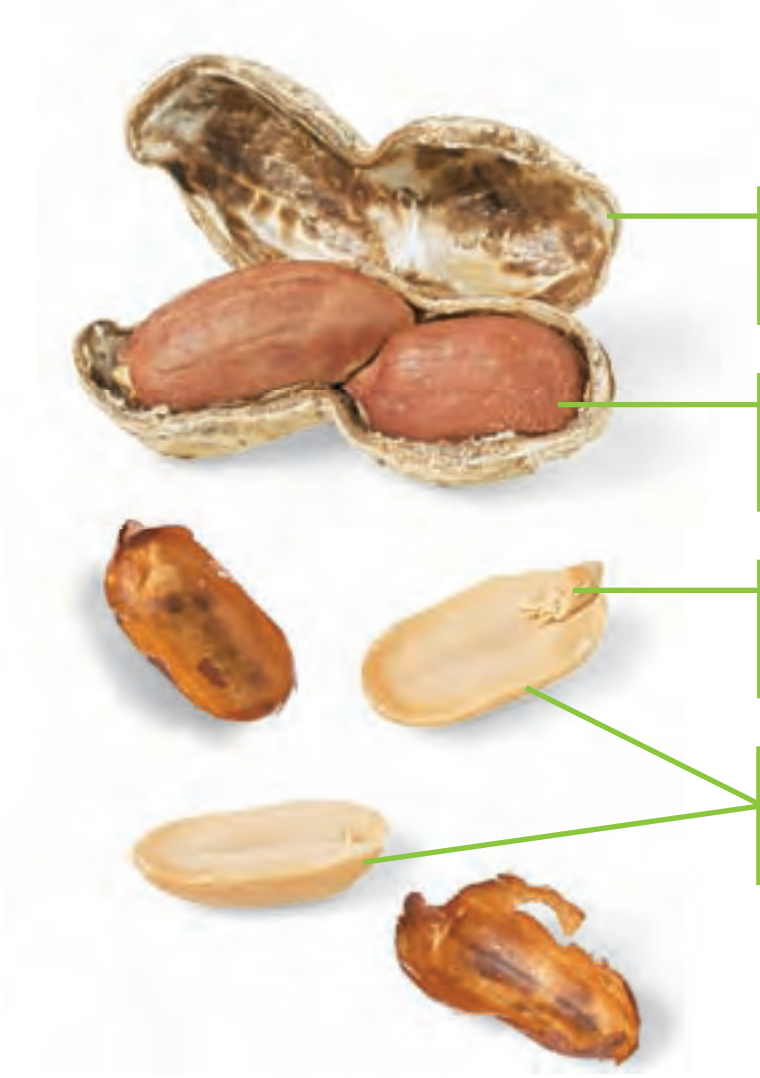
◀ **There are many anise seeds inside this star-shaped pod. The shapes of the pod and the flower are alike.**

▲ **A marigold seed is small and thin. It does not have much food inside.**

Seeds have many parts. All seeds have seed coats which protect the seed. Seed coats also help keep the seeds from drying out. Some seeds also have hard shells.

Why do you think some seeds have shells?

▲ Peanuts are seeds. They come from peanut plants.



The shell of a peanut is hard and light brown.

The seed coat is thin and dark brown.

This part is a tiny plant. It will grow bigger.

These parts give food to the tiny plant so it can grow.

FACT Seeds are living things.

How do seeds grow?

A **life cycle** shows how a living thing grows, lives, makes more of its own kind, and dies. The plant life cycle begins with a seed. Seeds need a warm place, light, water, and food in order to grow.

Life Cycle of a Pine Tree

Adult pine trees make seeds in cones instead of flowers.

The pine cones fall to the ground. Some seeds get moved to other places.

A seed sprouts and becomes a **seedling**, or young plant.

The seedling grows into an adult pine tree. It grows cones so it can make new plants.

Read a Diagram

What does a pine tree have instead of flowers?

LOG ON *Science in Motion* Watch a plant grow at www.macmillanmh.com

Most plants follow the same life cycles as their parent plants. Different kinds of plants have different life cycles. Some plants live for just a few weeks. Other plants live for many years.

What will a pine seed grow into?

▲ **Redwood trees take more than two years just to make cones.**

◀ **These flowers go through their whole life cycle in just a few months.**

Think, Talk, and Write

1. **Sequence.** How do flowers make new plants?
2. How would you take care of seeds to help them grow?
3. Write or draw pictures to show the steps in the life cycle of a plant.

Health Link

We eat the fruit and seeds of many plants. How many can you think of? What other plant parts do we eat?

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Main Idea and Details

Read about a plant that uses wind to move its seeds. The main idea is circled. The details are underlined.

Dandelions

Dandelions use the wind to move their seeds. Dandelion petals dry out when the flower dies. Then the seeds are ready to come off the flower. The seeds have long light tufts that can float in the air. Wind blows the seeds. They land in places where new plants can grow.

Write About It

Write a paragraph about a flower that you observed. Make sure you have a main idea and details.

Remember

The main idea tells what a paragraph is about. Details tell more about the main idea.

LOG ON e–Journal Write about it online at www.macmillanmh.com

SI-6. Recognize that explanations are generated in response to observations, events and phenomena. ELA WP 2.2. Develop a main idea for writing.

How Many Seeds?

Some fruits, like watermelons, have many seeds. Other fruits, like peaches, have just one seed.

Solve a Problem

Suppose each apple on this tree had about 5 seeds. If you picked 3 apples, about how many seeds would you have? Show how you found the answer.

Write a number sentence about fruit seeds. Show your work.

Remember

You can draw pictures to help you find the answer.

SI-9. Use whole numbers to order, count, identify, measure and describe things and experiences. **M NS 2.7.** Model, represent and explain multiplication as repeated addition, rectangular arrays and skip counting.

Lesson 3

How Plants Are Alike and Different

Mangrove roots in the Philippines

Look and Wonder

Look at these plants. Which way do you think the roots are growing?

LS-4. Compare similarities and differences among individuals of the same kind of plants and animals, including people. **LS-6.** Investigate the different structures of plants and animals that help them live in different environments (e.g., lungs, gills, leaves and roots).

Explore

Inquiry Activity

How do roots grow?

What to Do

1. Put three bean seeds on a damp paper towel. Put them in the bag and tape it to a bulletin board.

2. **Observe.** Which part grows first? Which way did the roots grow?
3. After the roots grow, turn the bag upside down. Tape it to the board again. Make sure the paper towel stays wet.
4. **Draw Conclusions.** What happened to the roots?

Explore More

5. **Investigate.** What happens to the roots if left in the dark?

You need

3 bean seeds

paper towels

tape

plastic bag

hand lens

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

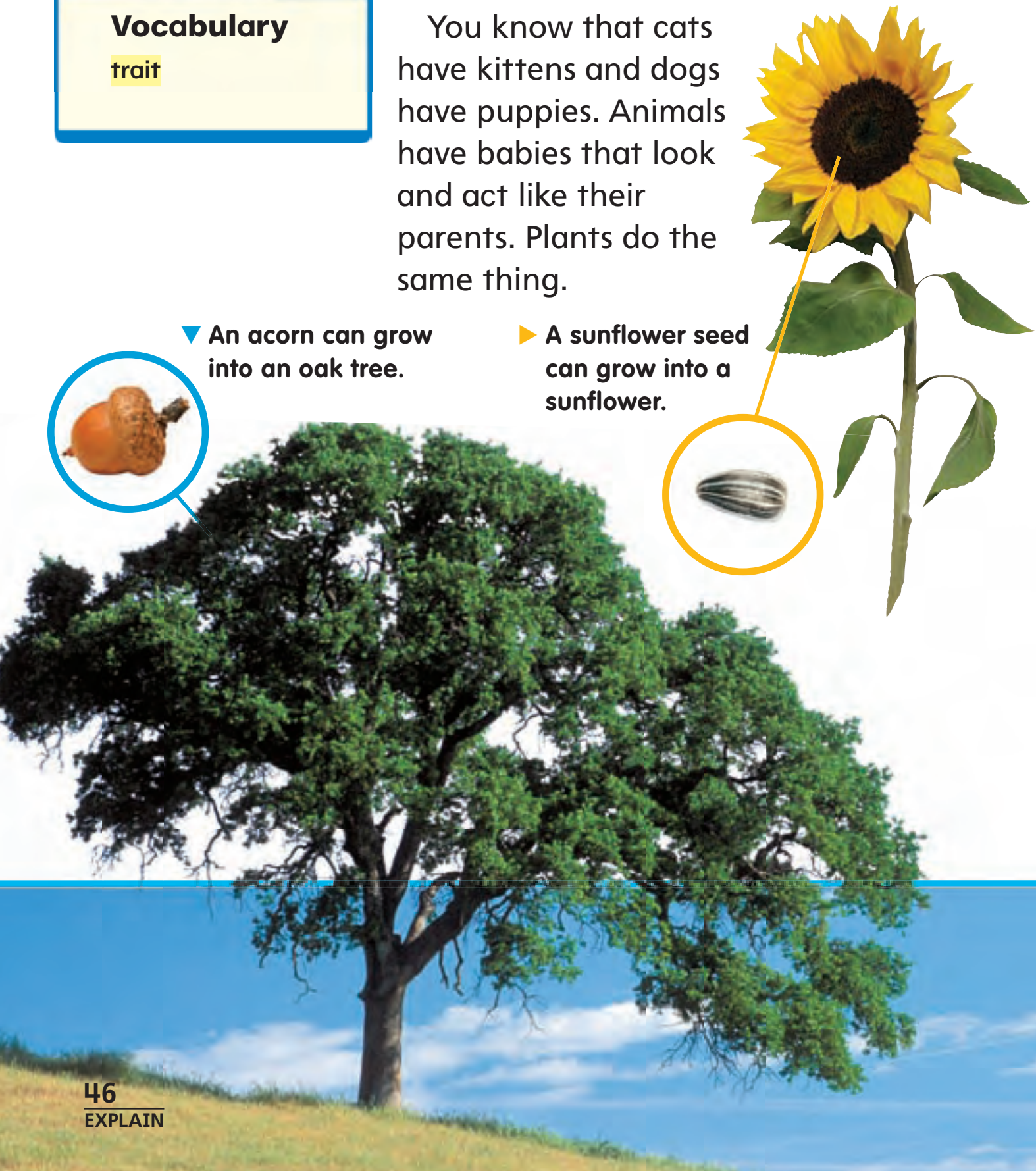
Read Together and Learn

Vocabulary

trait

How are plants like their parents?

You know that cats have kittens and dogs have puppies. Animals have babies that look and act like their parents. Plants do the same thing.



▼ An acorn can grow into an oak tree.

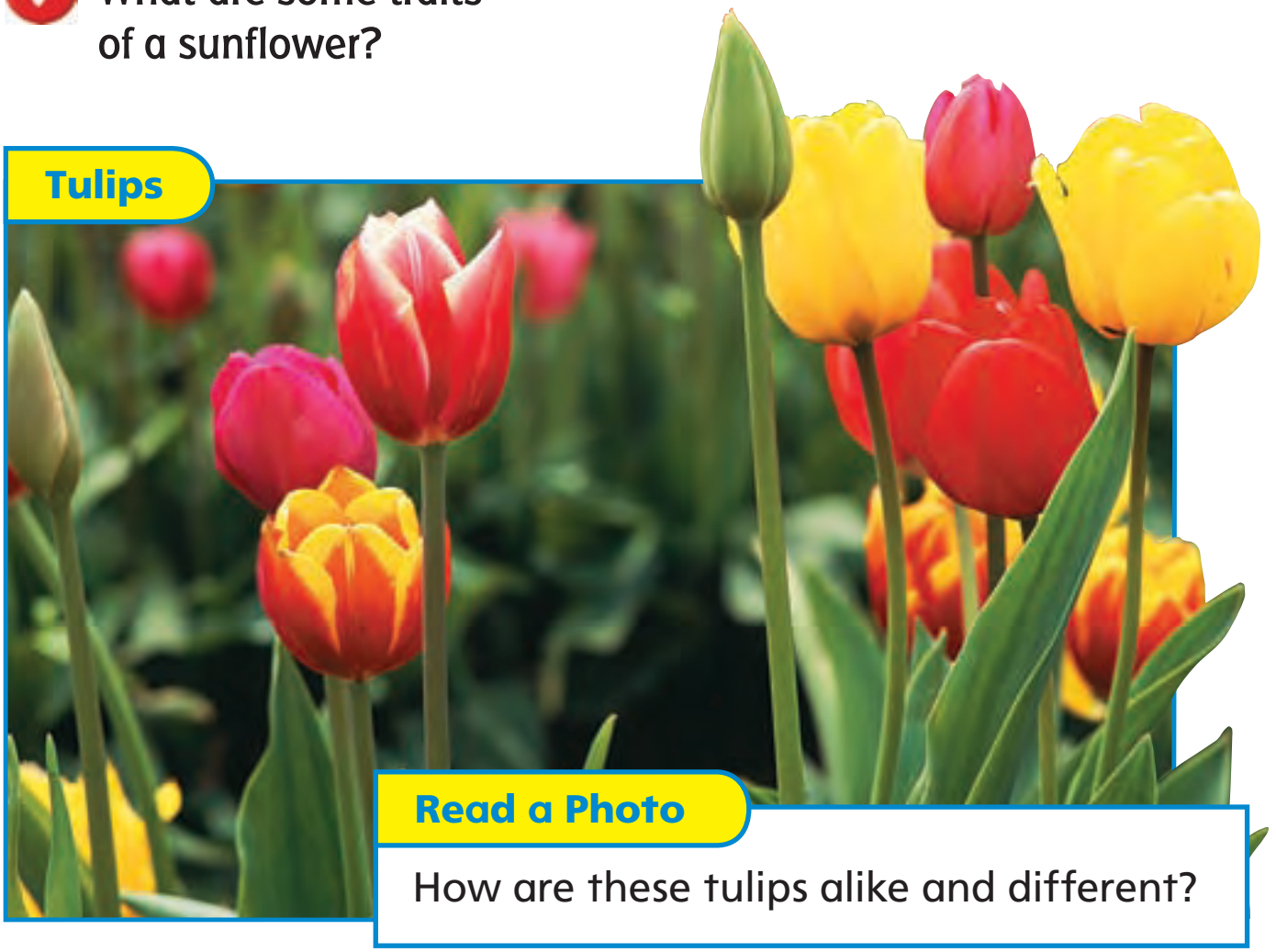
▶ A sunflower seed can grow into a sunflower.

The way plants or animals look or act is called a **trait**. Young plants will have many of the same traits as their parents. Some plants might look a little different from their parents. The plant will still have the same shape of flowers, petals, and leaves.

▲ **Long ears are a trait of Basset hounds.**

What are some traits of a sunflower?

Tulips



Read a Photo

How are these tulips alike and different?

How do plants survive in different places?

Plants change to get what they need from the place where they live. When a seed begins to grow, the roots always grow down. Plant parts may look different in different places, but their parts still help make food.

Quick Lab

Observe two plants. Draw conclusions about why some plants grow toward the light.

▲ **This Joshua tree and other plants in very dry places have few or no leaves. These plants store water in thick stems.**

▲ **This banana tree and other plants in very wet places have large leaves. They help get light in the thick, dark forest.**

Plants can change to stay safe, too. Some plants have ways to stay safe from animals. Other plants need to stay safe from the weather where they live. When plants change during their lives, those traits are not passed down to their offspring.

Why do you think some plants have thorns?

On the coast, the wind is so strong that the branches on the trees bend.

Think, Talk, and Write

1. **Classify.** Think of four ways that plants are like their parent plants.
2. What changes the way plants grow?
3. Write about the way a plant grows from a seed. How do the roots grow? Why?

Art Link

Make a crayon rubbing of two different leaves. How are they alike? How are they different?

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The Power of Periwinkle

People who live in forests all over the world know about helpful plants. They use plants for food and for building homes. They also use plants to make medicine.

One helpful plant is the rosy periwinkle. It first grew in Madagascar, and later people spread it around the world. People now use the plant to treat fevers, sore throats, toothaches, and upset stomachs.

Today some forests in Madagascar are being cut down. People clear the land to grow food. Scientists want to keep these forests safe. There may be more helpful plants to study and use.

LS-3. Explain why organisms can survive only in environments that meet their needs (e.g., organisms that once lived on Earth have disappeared for different reasons such as natural forces or human-caused effects). **ELA RP 2.I.** Establish a purpose for reading (e.g., to be informed, to follow directions or to be entertained).

▲ Scientists and local people use the rosy periwinkle to treat diseases.

This woman gathers rosy periwinkle plants. ▶

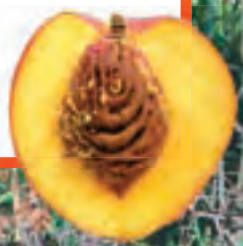
Talk About It

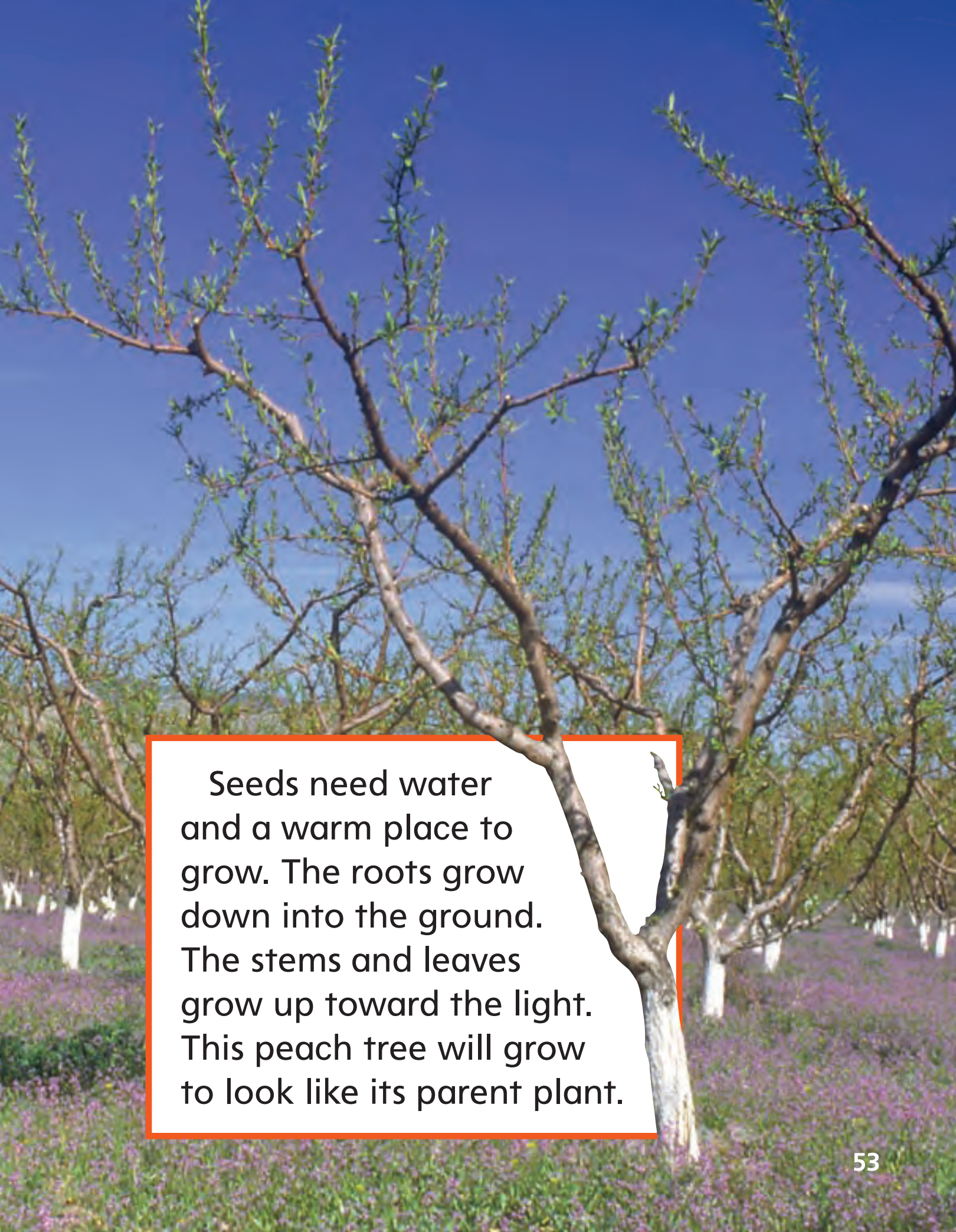
Classify. Make a list of plants you know. Classify them by how they help people.

I Read to Review

Peach Tree

This plant is a peach tree. It is living. Its leaves use light from the Sun to make food. Its roots get water from the ground. The peaches it makes are fruit. Each peach has a seed inside.





Seeds need water and a warm place to grow. The roots grow down into the ground. The stems and leaves grow up toward the light. This peach tree will grow to look like its parent plant.

The tree grows bigger and makes flowers. Flowers help the plant make new plants. Many of these flowers will grow into peaches.

This tree is covered in peaches. People and animals eat the peaches and leave the seeds behind. The seeds can grow into new peach trees.

CHAPTER 1 Review

Vocabulary

Use each word once for items 1–5.

flower
life cycle
pollen
seed
traits

1. A _____ shows how something grows, lives, and dies.

2. The part of the plant that makes the seed is called the _____.
LS-6

3. The ways that plants and animals look like their parents are called _____.
LS-4

4. Flowers need a sticky powder called _____ to make seeds.
LS-6

5. This is a _____. It will grow into a new plant.
LS-6

Answer the questions below.

6. **Compare and Contrast.** Look at the pictures below. What traits do these plants share?
LS-4

7. What do seeds and seedlings need to live and grow?
LS-1

8. **Observe.** Look at the plants in the picture below. Describe them.
LS-6

The Big Idea

9. How do plants grow and change?

CHAPTER 2

Animals

The Big Idea

How do animals grow and change?

Key Vocabulary

mammal animal with hair or fur that feeds milk to its young (page 62)

insect animal with six legs, antennae, and a hard outer shell (page 64)

larva stage in the life cycle of some animals after they hatch from an egg (page 72)

adaptation body part or way animal acts that helps it stay alive (page 78)

More Vocabulary

amphibian, page 63

reptile, page 63

life cycle, page 70

pupa, page 72

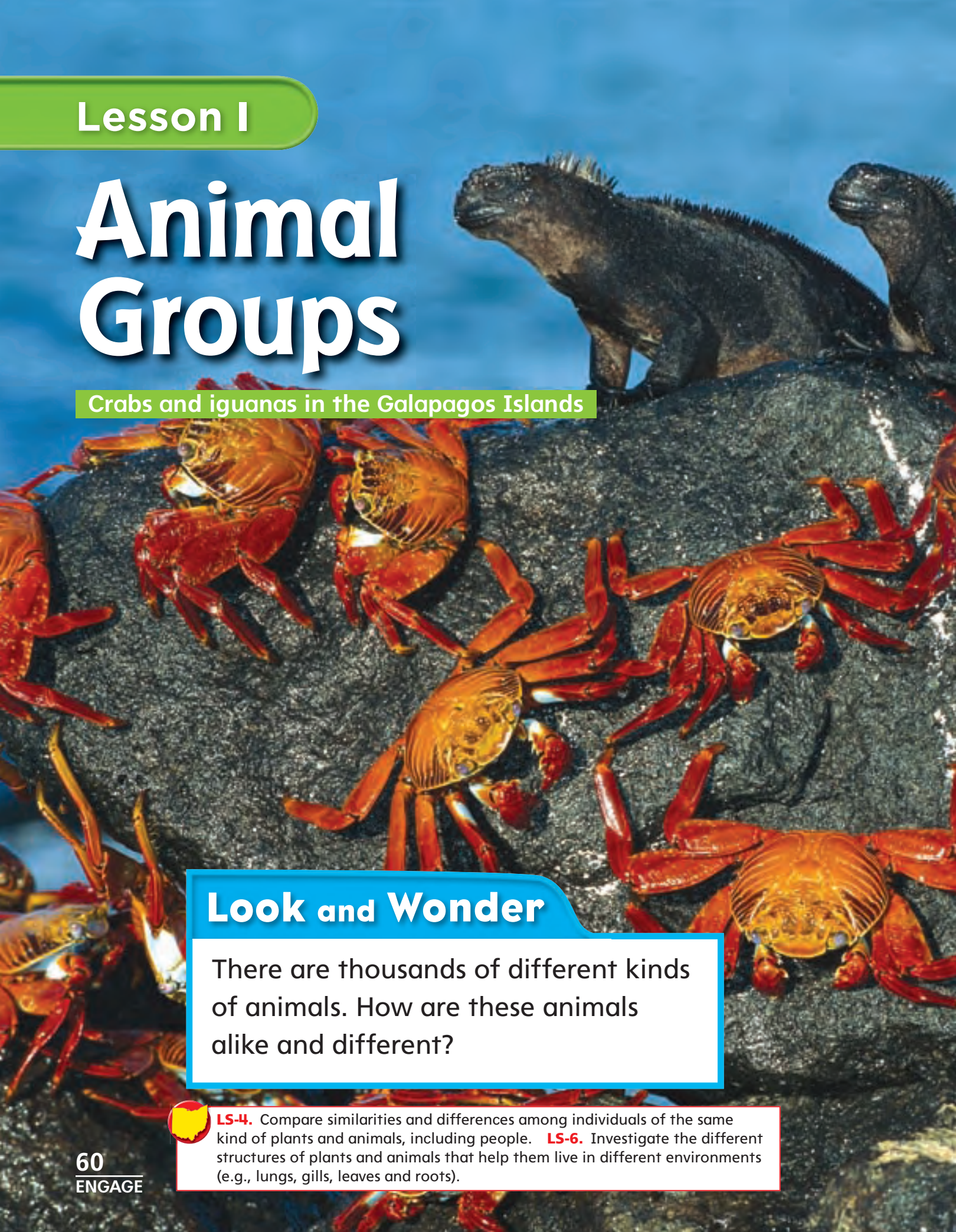
camouflage, page 79

LS-A. Discover that there are living, non-living, and pretend things, and describe the basic needs of living things (organisms). **LS-B.** Explain how organisms function and interact with their physical environment. **LS-C.** Describe similarities and differences that exist among individuals of the same kind . . .

Lesson 1

Animal Groups

Crabs and iguanas in the Galapagos Islands



Look and Wonder

There are thousands of different kinds of animals. How are these animals alike and different?

LS-4. Compare similarities and differences among individuals of the same kind of plants and animals, including people. **LS-6.** Investigate the different structures of plants and animals that help them live in different environments (e.g., lungs, gills, leaves and roots).

Explore

Inquiry Activity

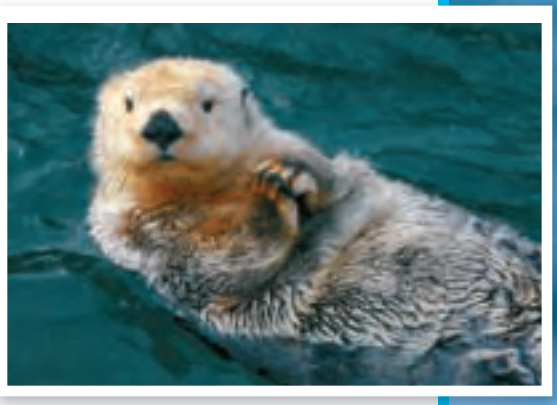
How can we put animals into groups?

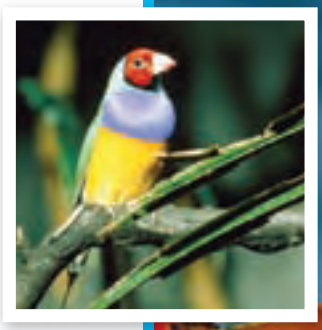
What to Do

1. **Classify.** Look at the pictures of the animals. Put the animals into groups. How did you decide to group the animals?
2. Talk about the animal groups with a partner. What groups did your partner use?
3. **Compare.** How are your groups and your partner's groups alike? How are they different?

Explore More

4. **Classify.** Think about animals that live on land. How can you classify them?





SI-I. Ask "how can I/we" questions.

Read Together and Learn

Vocabulary

mammal
amphibian
reptile
insect

How do we group animals?

All animals need food, water, air, shelter, and space to live. They have different parts that help them get what they need to live.

Scientists classify animals into two main groups. One group has backbones. The other group does not have backbones. Here are some animals with backbones.

These lions are mammals. A mammal is an animal that has hair or fur. A female mammal makes milk for her babies. Mammals breathe through their lungs. ▼

This is a bluebird. Birds are the only animals with feathers. All birds have two wings and a beak to help them get food. They lay eggs to hatch their young. ▶

▲ Fish, such as this salmon, live in water. Their gills help them breathe. Their fins help them swim.

▶ This salamander is an amphibian. Most amphibians begin their lives in water. Their moist skin helps them live on land and in water.

This baby alligator is a reptile. It has rough, scaly skin to help protect it. ▼

Why is a lion a mammal?

FACT Birds are not the only animals that hatch from eggs. Other animals such as alligators, butterflies, and snakes do, too!

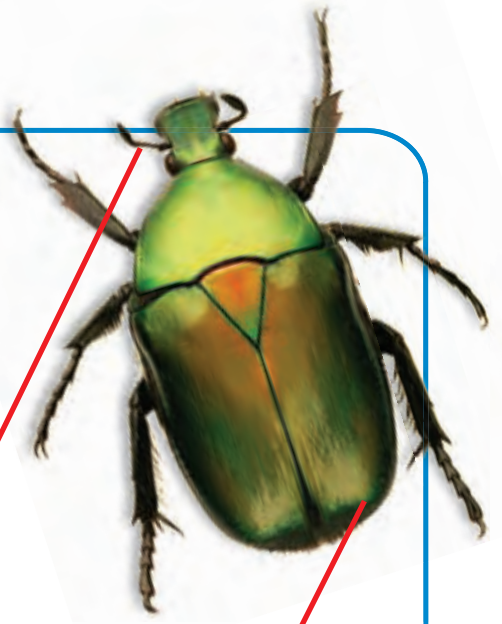
What are some animals without backbones?

There are many kinds of animals that have no backbones. There are more without backbones than with backbones! Some animals without backbones have hard body coverings to help them stay safe.

These jellyfish have no hard body coverings. They sting other animals to stay safe and get food.

Beetle

An insect is an animal with six legs, antennae, and a hard, outer shell.



The antenna helps insects feel, taste, and smell.

The outer shell helps keep insects safe. The legs help insects climb on smooth or rough places.

Read a Diagram

How do the body parts of a beetle help it meet its needs?

The dragonfly has a hard body covering. It uses its wings to fly away from its enemies.

Quick Lab

Make a model of an animal. Talk with a partner about how the animal meets its needs.

How do animals without backbones stay safe?

blue crayfish

Think, Talk, and Write

1. **Classify.** How can you classify a lion and a salamander?
2. What do animals need to stay alive?
3. Choose one animal. Write about a body part from that animal. Describe how it helps the animal meet its needs.

Social Studies Link

Make a collage of other animals without backbones. Find out where they live.

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earthworm

Focus on Skills

Inquiry Skill: Classify

When you **classify**, you put things into groups to show how they are alike.

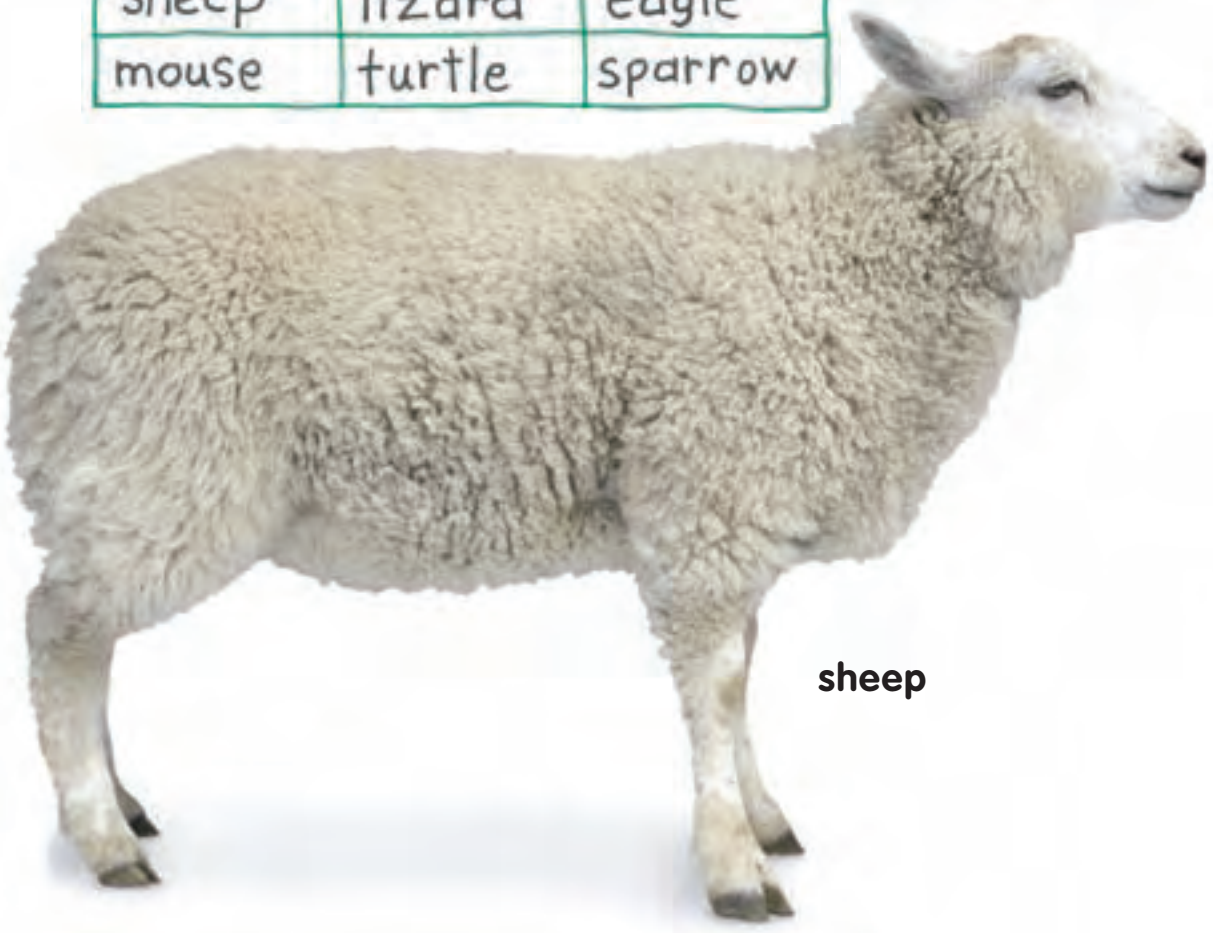
rabbit

▶ Learn It

You can use a chart to classify what you learned about animals.

sparrow

Different Animals		
Mammals	Reptiles	Birds
sheep	lizard	eagle
mouse	turtle	sparrow



sheep

SI-I0. Share explanations with others to provide opportunities to ask questions, examine evidence and suggest alternative explanations.

▶ Try It

Use a chart to classify these animals. Add other animals to your chart. Share your chart with a partner.

parrot

guinea pig

penguin

iguana

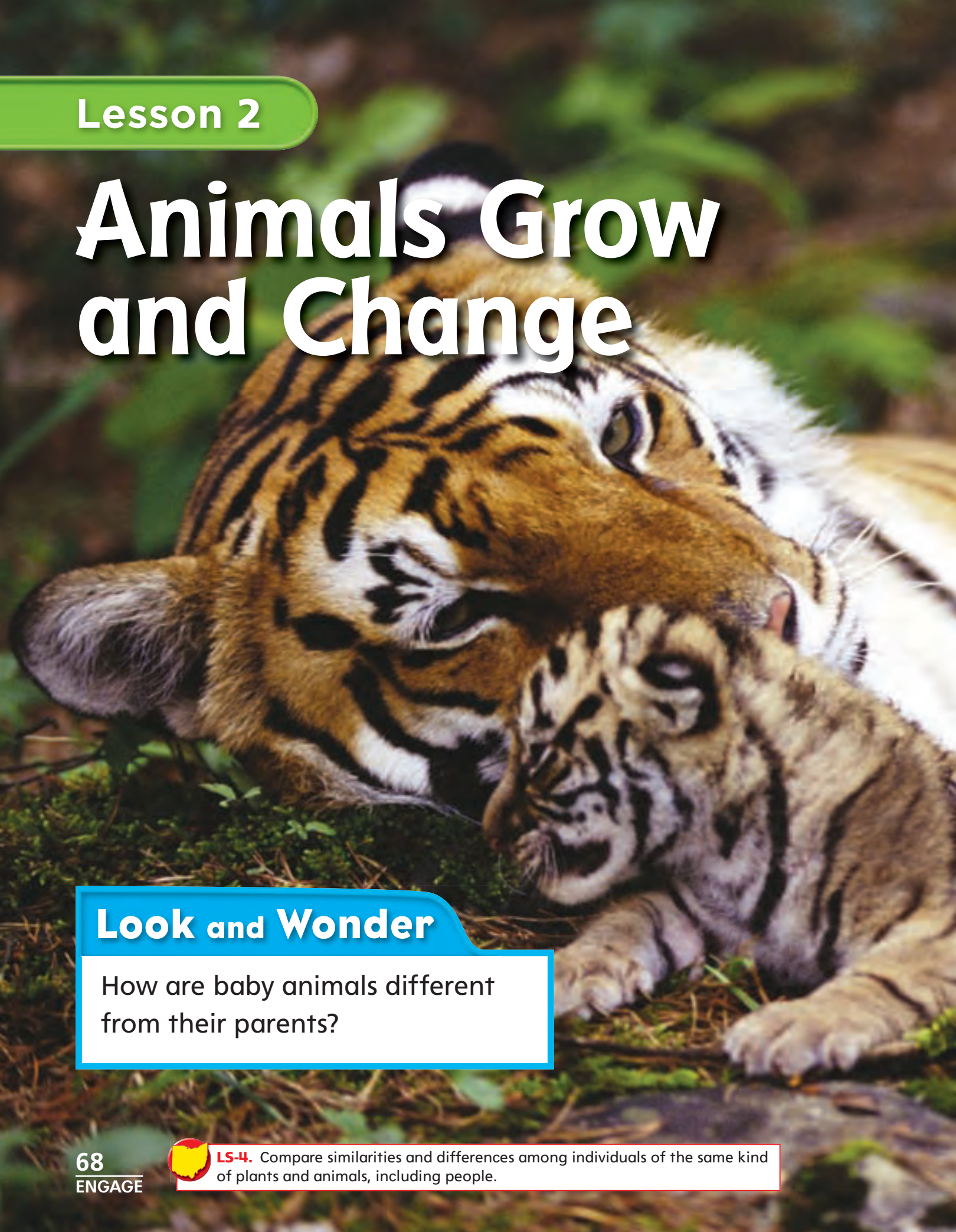
▶ Try It

1. How are mammals and birds alike? How are they different?
2. What ways did you classify the animals in your chart?
3. **Write About It.** How is your chart different from the chart your partner made?

snake

Lesson 2

Animals Grow and Change



Look and Wonder

How are baby animals different from their parents?

LS-4. Compare similarities and differences among individuals of the same kind of plants and animals, including people.

Explore

Inquiry Activity

How are babies and adults alike and different?

What to Do

1. What are some things that babies do?
2. What are some things adults do?
3. **Compare.** Make a Venn diagram to compare babies to adults.

Explore More

4. How are baby humans and baby tigers alike and different?

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

Read Together and Learn

Vocabulary

life cycle
larva
pupa

SCIENCE QUEST Explore animal life cycles with the Treasure Hunters.

What is a life cycle?

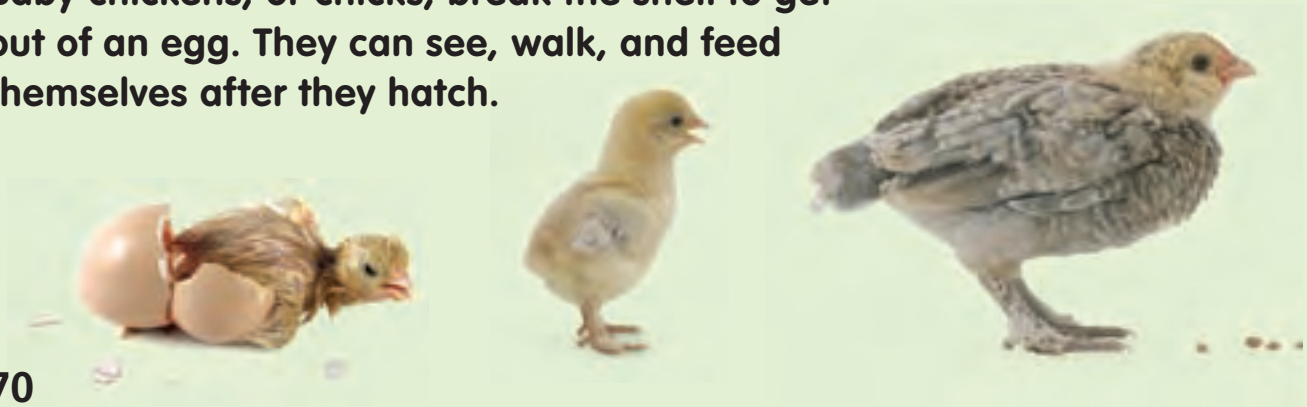
Insects, birds, fish, reptiles, and amphibians lay eggs. Mammals give birth to live babies. Chickens are birds and they lay eggs. All animals have a life cycle. A **life cycle** tells how an animal starts life, grows to be an adult, has young, and dies.

Giant Panda Life Cycle

Baby pandas grow inside their mothers' bodies. They drink milk from their mothers so they can grow.

Chicken Life Cycle

Baby chickens, or chicks, break the shell to get out of an egg. They can see, walk, and feed themselves after they hatch.



Quick Lab

Communicate.
Act out a life cycle of an animal.

What are the stages of a life cycle?

A baby panda grows up to be an adult. It may find a mate and have a baby of its own.

The chicks grow up to be adult chickens. This is a rooster, or a male chicken.

Read a Diagram

How is the life cycle of a panda different from the life cycle of a chicken?

LOG ON *Science in Motion* Watch animals grow at **www.macmillanmh.com**

FACT It takes 9 months for baby humans to grow before they are born. It takes 4 months for a baby panda to grow.

Butterfly Life Cycle

butterfly egg

caterpillar

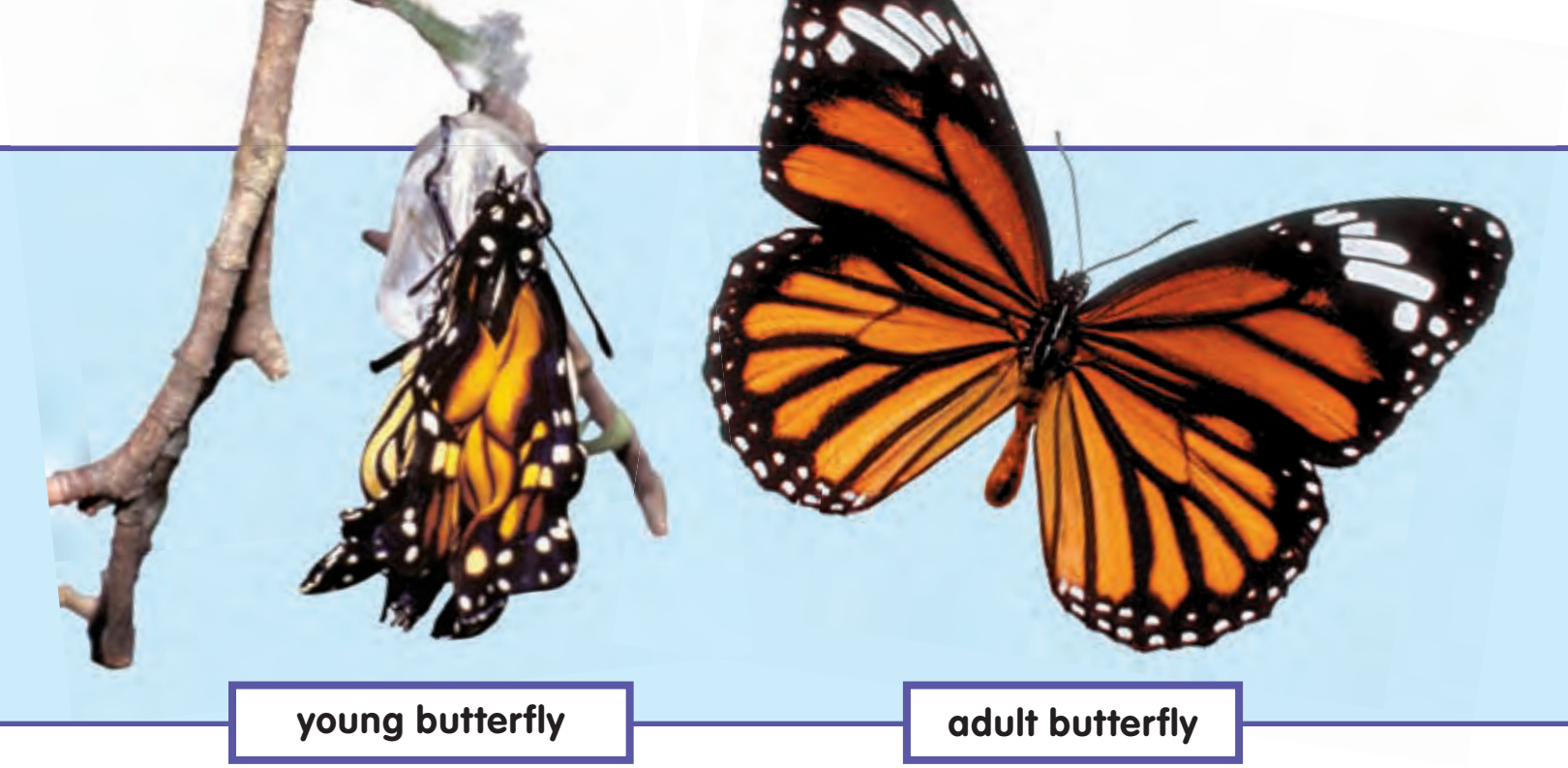
pupa

What are some other animal life cycles?

Animals such as butterflies, frogs, and crabs do not start out looking like their parents. They change during their lives.

Butterflies begin as eggs. The next stage after an egg hatches is called the **larva**. A caterpillar is the larva of the butterfly. Caterpillars eat plants to grow.

When a caterpillar is ready to change, it stops moving. Its skin becomes a hard shell. Inside the shell, the caterpillar is slowly changing. This is the **pupa** stage. Soon a butterfly comes out of the shell.



young butterfly

adult butterfly

How does a caterpillar become a butterfly?

Think, Talk, and Write

1. **Predict.** What will the butterfly do when it is an adult?
2. How is the life cycle of a panda the same as the life cycle of a human?
3. Write and draw an example of a life cycle.

Social Studies Link

Research how long five different animals live. Make a chart to put them in order.

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Meet Nancy Simmons

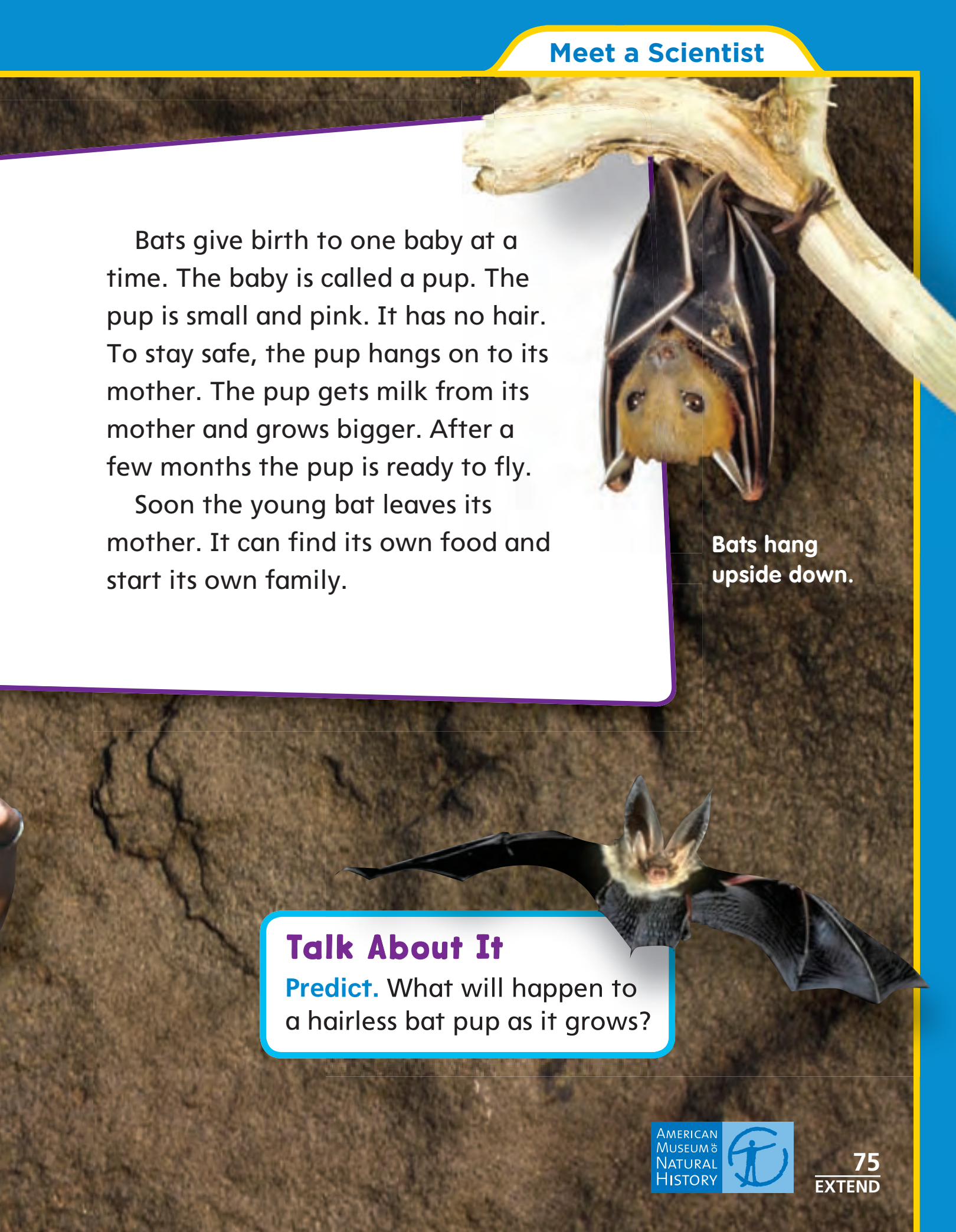
Nancy Simmons is a scientist at the American Museum of Natural History. She studies bats all around the world. She has found more than 80 different kinds of bats in one forest. Nancy learns about what bats eat and where they live.

Nancy Simmons is holding a false vampire bat. It is one of the largest bats in the world.

LS-2. Identify that there are many distinct environments that support different kinds of organisms. **ELA RP 2.I.** Establish a purpose for reading (e.g., to be informed, to follow directions, or to be entertained).

Bats give birth to one baby at a time. The baby is called a pup. The pup is small and pink. It has no hair. To stay safe, the pup hangs on to its mother. The pup gets milk from its mother and grows bigger. After a few months the pup is ready to fly.

Soon the young bat leaves its mother. It can find its own food and start its own family.



Bats hang upside down.

Talk About It

Predict. What will happen to a hairless bat pup as it grows?

Lesson 3

Staying Alive

Look and Wonder

This chameleon searches for food every day. How can it keep from being food for other animals?

LS-4. Compare similarities and differences among…plants and animals…
LS-5. Explain that food is a basic need of plants and animals…

Explore

Inquiry Activity

How does the color of an animal keep it safe?

What to Do

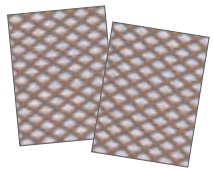
1. Cut one piece of patterned paper into eight shapes.
2. Put the eight shapes on the other sheet of patterned paper.
3. Time your partner while he or she picks up the shapes.
4. Now put the shapes on plain paper and time your partner again.
5. Which was easier to find? Which was faster? Why?

Explore More

6. **Infer.** How would the activity be different if the shapes were placed on solid colored paper?

You need

scissors



2 pieces of patterned paper

stopwatch

plain paper

Step 1

SWK-4. Demonstrate that in science it is helpful to work with a team and share findings with others.

Read Together and Learn

Vocabulary

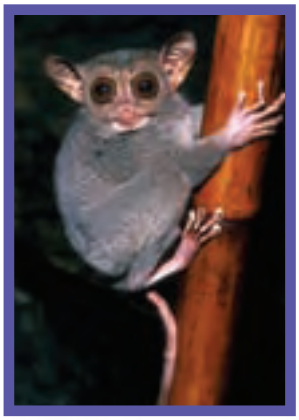
adaptation

camouflage

Why do animals act and look the way they do?

Animals have adaptations to help them stay alive. An **adaptation** is a body part or a way an animal acts that helps it stay alive.

◀ Giraffes have long necks that help them reach leaves in the tops of trees.

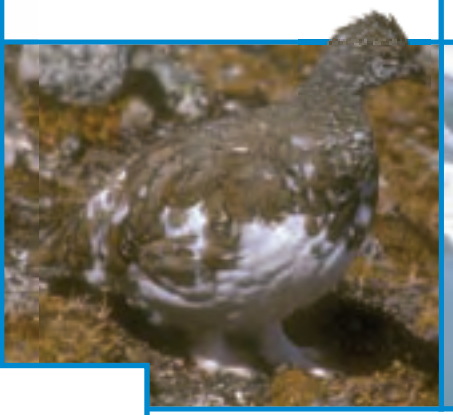


A tarsier has big eyes to see at night and long fingers to dig for food. ▶

An anteater can reach insects underground with its long snout. ▶

Camouflage is a way that animals blend into their surroundings. The color or shape of an animal helps it hide. Camouflage keeps animals from being seen by their enemies.

Ptarmigan Feathers

In summer, a ptarmigan has brown feathers.	In fall, the bird's feathers begin to turn white.	In winter, its feathers blend with the snow.
		

Read a Photo

Why does a ptarmigan turn white in winter?

What helps animals stay alive?

The pattern of a snow leopard is hard to see against the rocks.

How do animals stay safe?

There are many different ways that animals act to stay safe. Some animals stay in large groups. Others leave their homes in winter to be in a warm place and to find food.

▲ Sandhill cranes fly south for the winter.

◀ Some animals, like this dormouse, sleep during the cold winter.

Swimming in a large group helps protect these fish from getting eaten by bigger fish.

Animals have body parts to keep them safe. Some animals have shells or smells to protect them from other animals.

Quick Lab

Investigate to find out why eyes are where they are on different animals.

What are some ways animals protect themselves?

Turtles stay safe by hiding in their shells.

Think, Talk, and Write

1. **Cause and Effect.** How does the white fur of a polar bear help it stay alive?
2. Why is it helpful for fish to stay in a group?
3. Write about one adaptation of an animal that keeps it safe.

Skunks spray a bad smelling liquid to keep other animals away.

Health Link

Draw pictures or talk about how you stay safe.

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Helpful Traits

Animals have traits that help them live in their environments. Ants have powerful jaws that help them bite and carry food. Frogs have strong legs that help them swim and hop.

angler fish

hummingbird

Write About It

Describe one of the animals above. Where does it live? What do you think it eats? What traits help it live in its environment?

Remember

When you describe, you give details about something.

LOG ON e –Journal Write about it online at www.macmillanmh.com

LS-6. Investigate the different structures of plants and animals that help them live in different environments (e.g., lungs, gills, leaves and roots).
ELA WA 2.4. Produce informal writings (e.g., messages, journals, notes and poems) for various purposes.

Parts of a Group

This dog had 5 puppies. Even though the puppies share many traits, they look different from each other. In this family, 3 of the 5 puppies are brown. You can write this as the fraction $\frac{3}{5}$.

Write Fractions

How many of the 5 puppies are black? Write a fraction to show your answer.

Now draw a group of 3 puppies. Make one third of the group brown.

Remember

You can use a fraction to tell about parts of a group.

M NS 2.5a. Recognize that a fractional part can mean different amounts depending on the original quantity.

I Read to Review

So Many Animals!

There are so many kinds of animals! They are alike in many ways. They need food, water, air, and a place to live. Their body parts help them get what they need to stay alive.

Animals are different in many ways, too. Fish have fins to swim and gills to breathe. Birds have feathers to keep warm. Mammals have hair on their bodies and breathe with lungs.

Animals grow in many ways. Some lay eggs. Some give birth to live babies. All of them will grow to look like their parents.

Animals have many ways to keep safe. Some move together in big groups. Others use their colors or shapes to help hide. In the animal world, keeping safe means staying alive!

CHAPTER 2 Review

Vocabulary

Use each word once for items 1–5.

adaptation
amphibian
larva
life cycle
mammal

1. An animal that lives the first part of its life in water and another part on land is an _____.
2. An animal that feeds milk to its young is a _____.
3. How an animal grows and changes is called its _____.
4. This caterpillar is a _____.

5. The blubber of a whale keeps it warm. An _____ like this helps an animal stay alive where it lives.

LS-6

Answer the questions below.

6. **Classify.** How would you classify these two animals? List their traits.
LS-6

7. **Predict.** What will happen when a chick hatches from an egg?

8. Put these pictures of a frog life cycle in order.

tadpole

adult frog

eggs

tadpole with legs

9. What are some ways animals can keep safe?
LS-1

The Big Idea

10. How do animals grow and change?

CHAPTER 3

Looking at Habitats

The Big Idea

What are habitats?

Beavers making a dam in Wyoming

Key Vocabulary

habitat a place where plants and animals live
(page 94)

predator an animal that hunts other animals for food
(page 103)

drought a long period of time with little or no rain
(page 110)

fossil what is left of a living thing from the past
(page 116)

More Vocabulary

food chain, page 102

prey, page 103

food web, page 105

endangered, page 114

extinct, page 117

LS-B. Explain how organisms function and interact with their physical environment.

Lesson 1

Places to Live

Reef fish in the Bahamas

Look and Wonder

What can you tell about the place these plants and animals live?

LS-2. Identify that there are many distinct environments . . . **LS-3.** Explain why organisms can survive only in environments that meet their needs . . .

Explore

Inquiry Activity

Where do animals live?

What to Do

1. **Observe.** Look at the footprints below. What animal do you think made them?
2. **Infer.** How does the shape of its feet help this animal? Share your idea with a partner.
3. Draw a picture of the animal and the place where it lives.

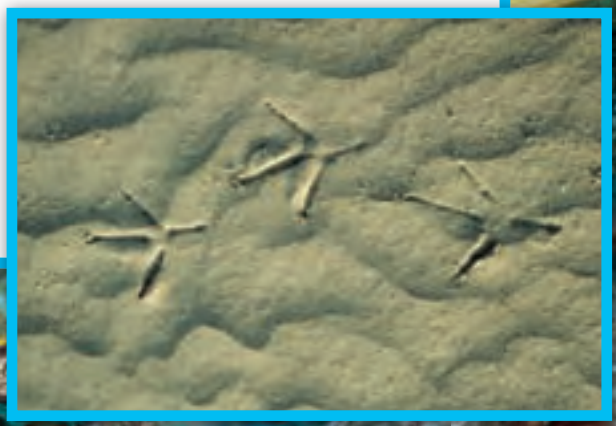
Explore More

4. **Communicate.** What other animals could live near this animal? What do they need to live? How do they get food and water? Make a chart.

You need

paper

crayons



SI-10. Share explanations with others to provide opportunities to ask questions, examine evidence and suggest alternative explanations.

Read Together and Learn

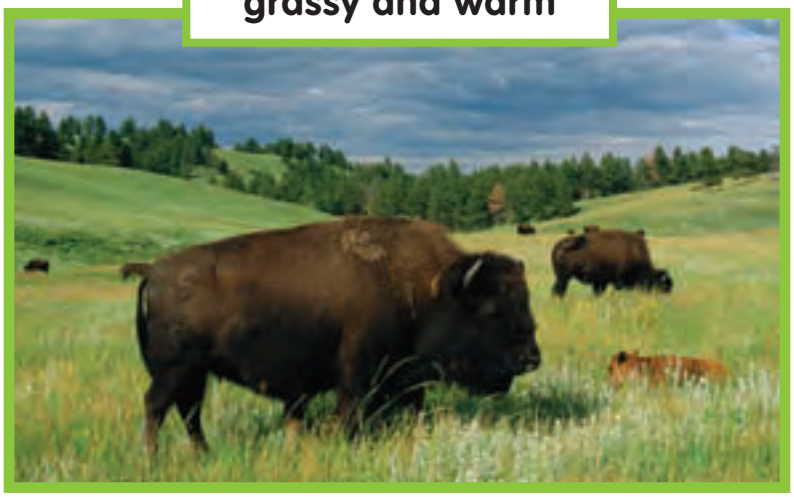
Vocabulary

habitat

What is a habitat?

A **habitat** is a place where plants and animals live. In a habitat, animals can find the food, homes, and water they need to live. Plants need soil, rain, sunlight, and animals in their habitats to live.

grassy and warm



wet and grassy

cold and snowy

There are many kinds of habitats. Some have lots of rain. Some are dry. Some places are windy and others are cold.

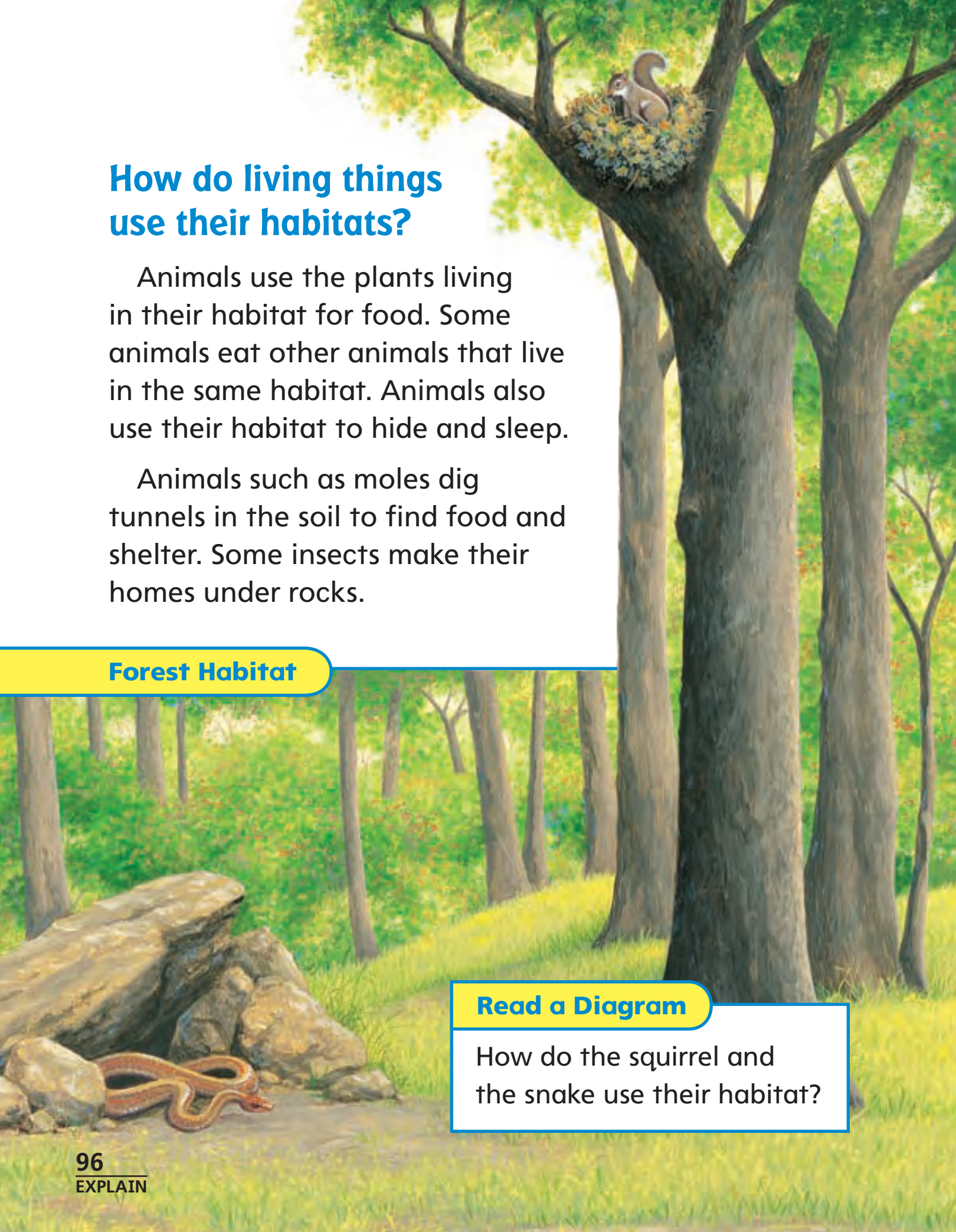
Different plants and animals need different habitats to live. These pictures show some kinds of habitats.

What are some kinds of habitats?

How do living things use their habitats?

Animals use the plants living in their habitat for food. Some animals eat other animals that live in the same habitat. Animals also use their habitat to hide and sleep.

Animals such as moles dig tunnels in the soil to find food and shelter. Some insects make their homes under rocks.



Forest Habitat

Read a Diagram

How do the squirrel and the snake use their habitat?

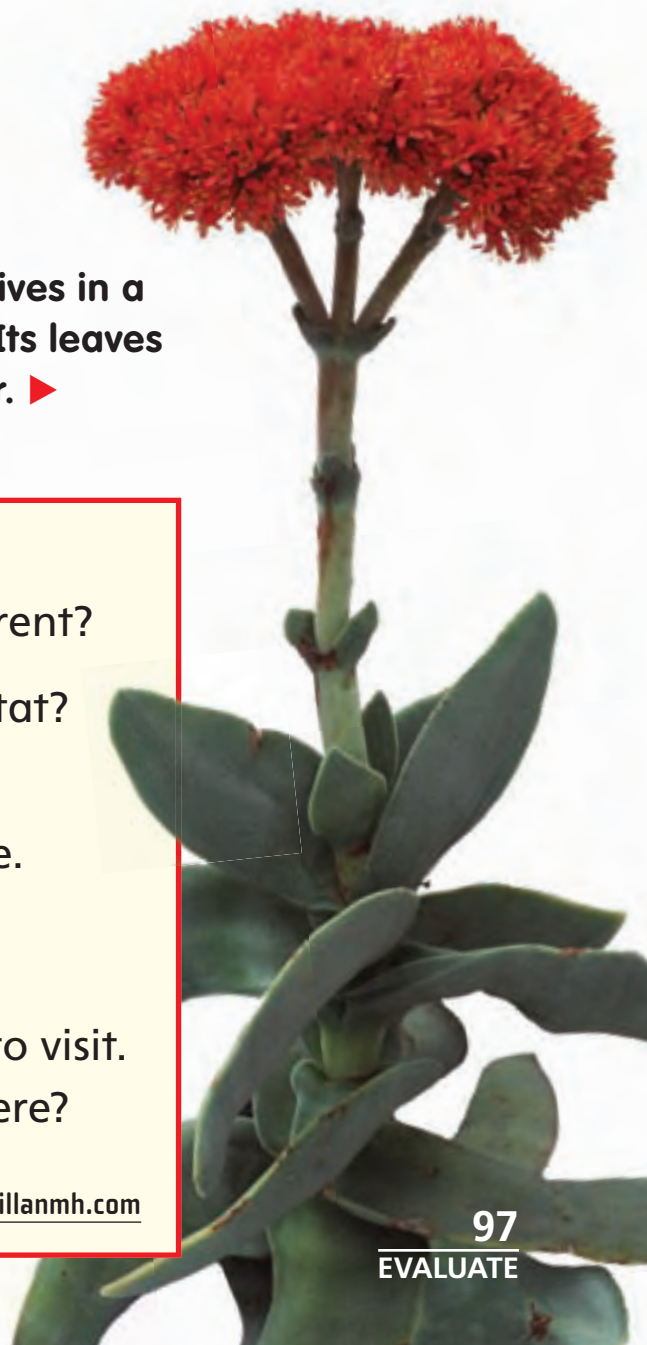
Different plants need different kinds of soil to live. Some plants grow in sandy soil and some plants grow in rocky soil.

Plants that live in dry places can hold water. Plants that live in very wet places can get rid of extra water. They have leaves that point down so water can roll off them.

Quick Lab

Find a picture of a habitat. Draw and write to **communicate** what could live there.

How do animals and plants use their habitats?



This plant lives in a dry place. Its leaves store water. ▶

Think, Talk, and Write

1. **Summarize.** How are habitats different?
2. How do plants survive in their habitat?
3. Write about a hot, dry habitat. Describe what you would find there.

Art Link

Draw a picture of a habitat you want to visit. How would you get what you need there?

LOG ON e-Review Summaries and quizzes online at www.macmillanmh.com

Inquiry Skill: Put Things in Order

When you **put things in order**, you tell what happens first, next, and last.

▶ Learn It

Think about how a plant grows. Then look at the pictures and put them in order. You can use a chart to help you tell the order.

The plant gets bigger.

A seedling grows.

I plant a seed.

first	next	last
I plant a seed.	?	?

Try It

Look at the pictures below.

beaver dam and pond

beaver cutting trees

stream in the woods

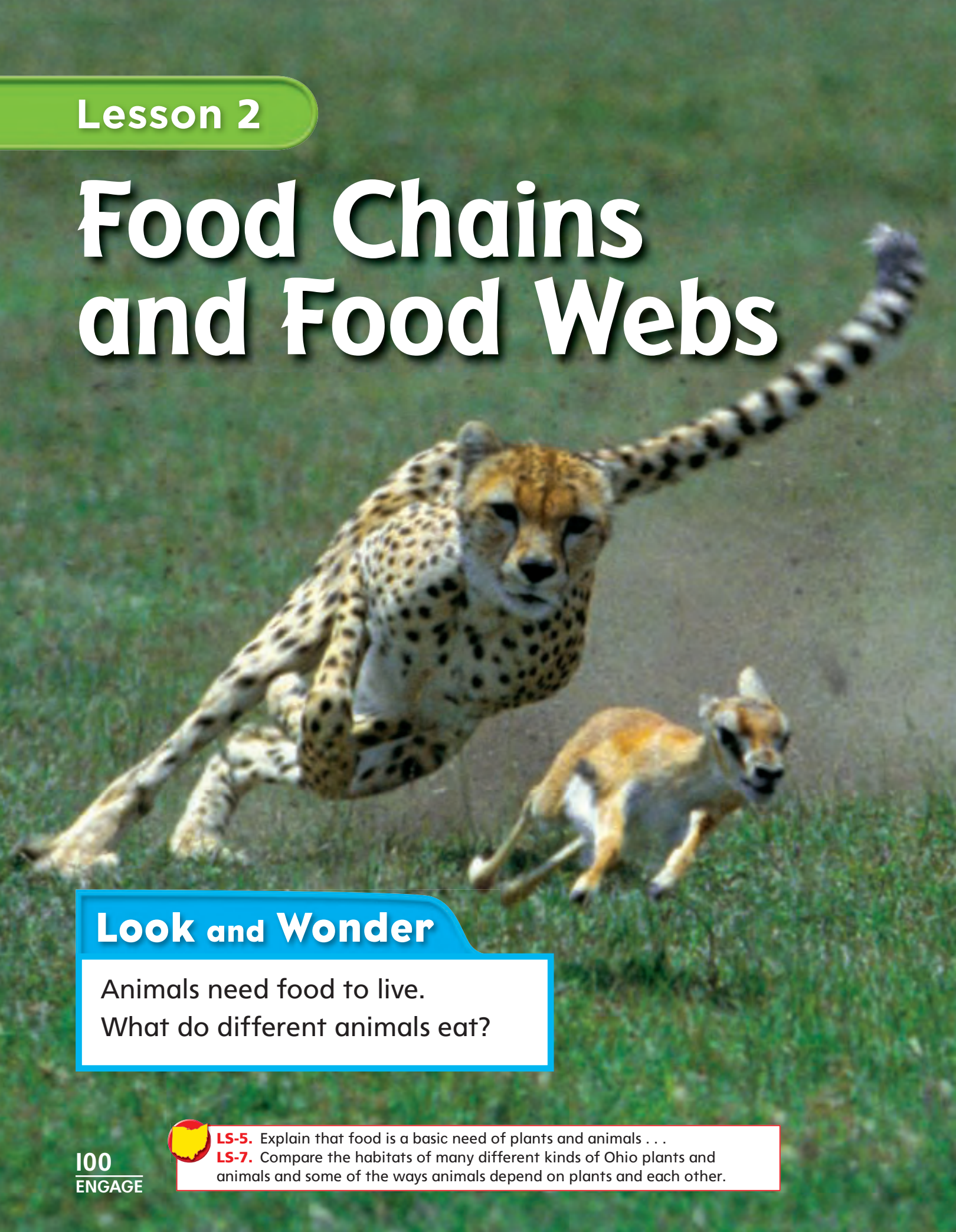
1. What picture comes first? next? last?

2. **Write About It.** Write about what happens to the stream and woods when beavers build a dam.

SI-6. Recognize that explanations are generated in response to observations, events and phenomena.

Lesson 2

Food Chains and Food Webs



Look and Wonder

Animals need food to live.
What do different animals eat?

LS-5. Explain that food is a basic need of plants and animals . . .
LS-7. Compare the habitats of many different kinds of Ohio plants and animals and some of the ways animals depend on plants and each other.

Explore

Inquiry Activity

What do animals eat?

You need

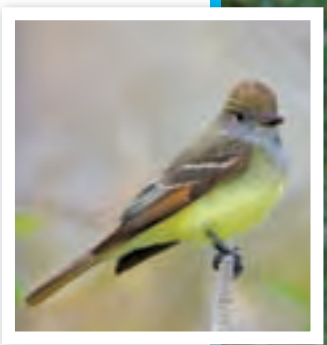
paper strips

crayons

glue

What to Do

1. The Sun makes plants grow. Which animals eat plants? Which animals eat those animals?
2. Draw the Sun on the yellow strip. Draw some grass and trees on the green strip. Then draw a bird on the red strip and a grasshopper on the brown strip.
3. **Put Things in Order.** Make a chain of strips. Glue them in their order as food.
4. **Communicate.** Describe the order of your chain with a partner.



Explore More

5. Repeat the activity with three other animals. Communicate how you put the animals in order.

SI-10. Share explanations with others to provide opportunities to ask questions, examine evidence and suggest alternative explanations.

Read Together and Learn

Vocabulary

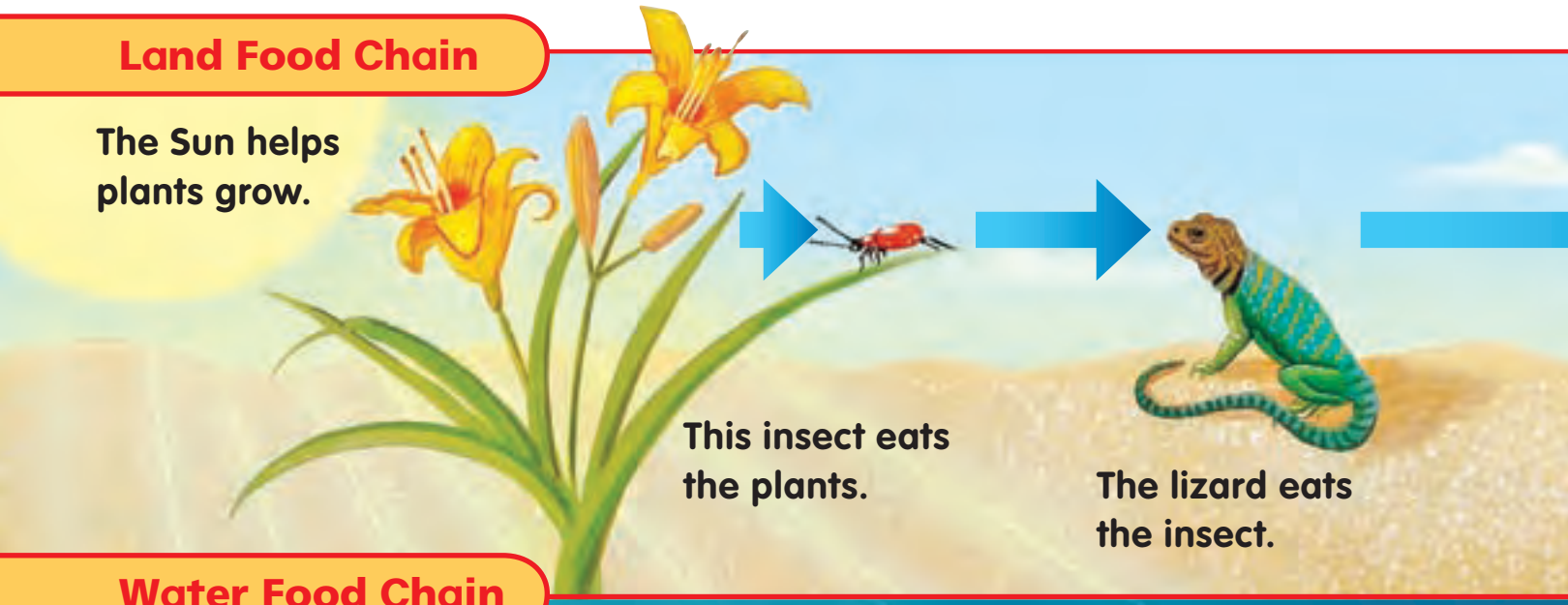
food chain
predator
prey
food web

What is a food chain?

A **food chain** is a model of the order in which living things get the food they need. Most food chains start with the Sun.

There are many food chains. Some are on land and some are in the water. Some can be both on land and in water!

Land Food Chain



Water Food Chain

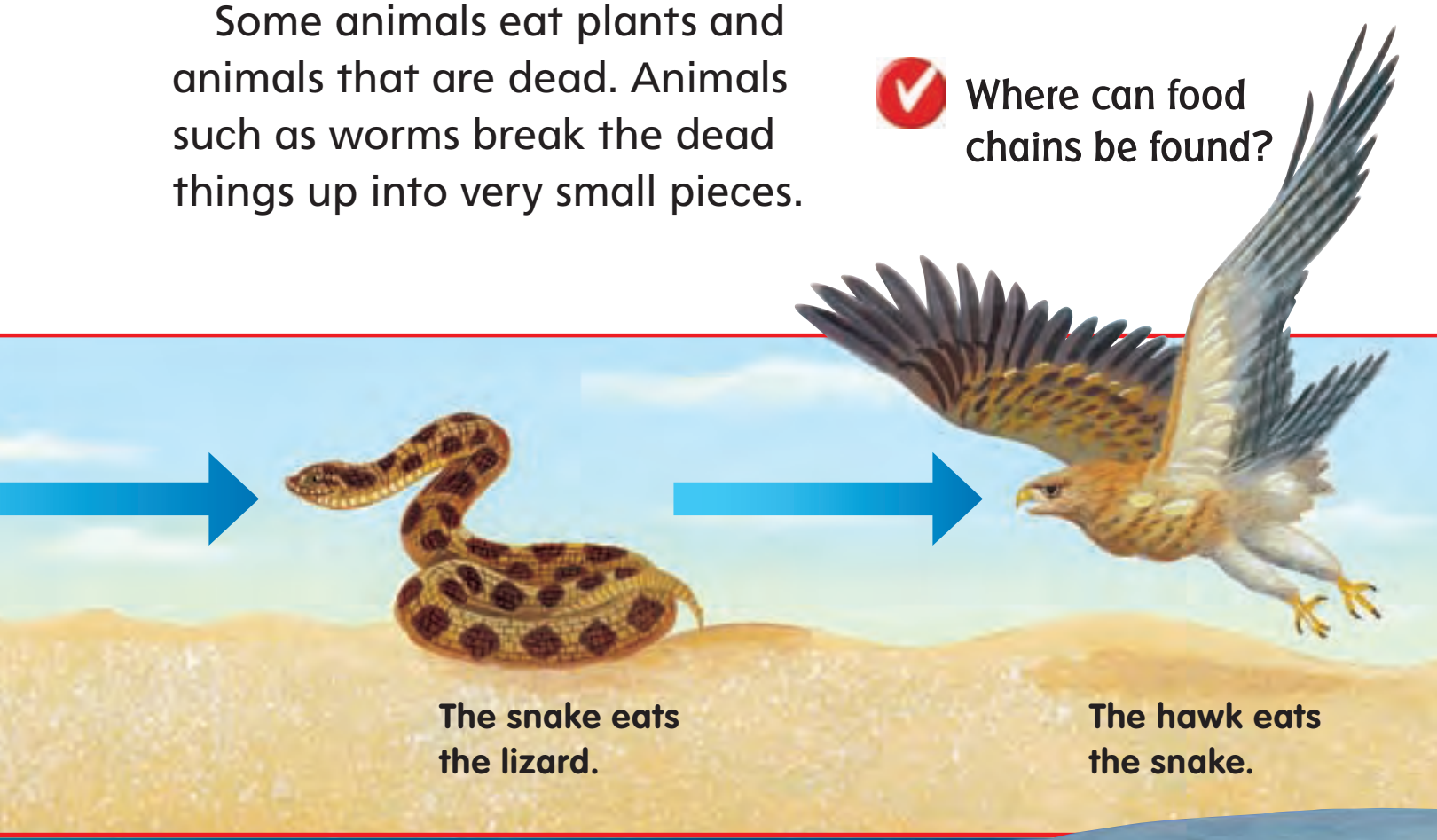
Animals can eat plants or other animals. An animal that hunts other animals for food is a **predator**. Animals that are hunted by predators are called **prey**.

Some animals eat plants and animals that are dead. Animals such as worms break the dead things up into very small pieces.

Quick Lab

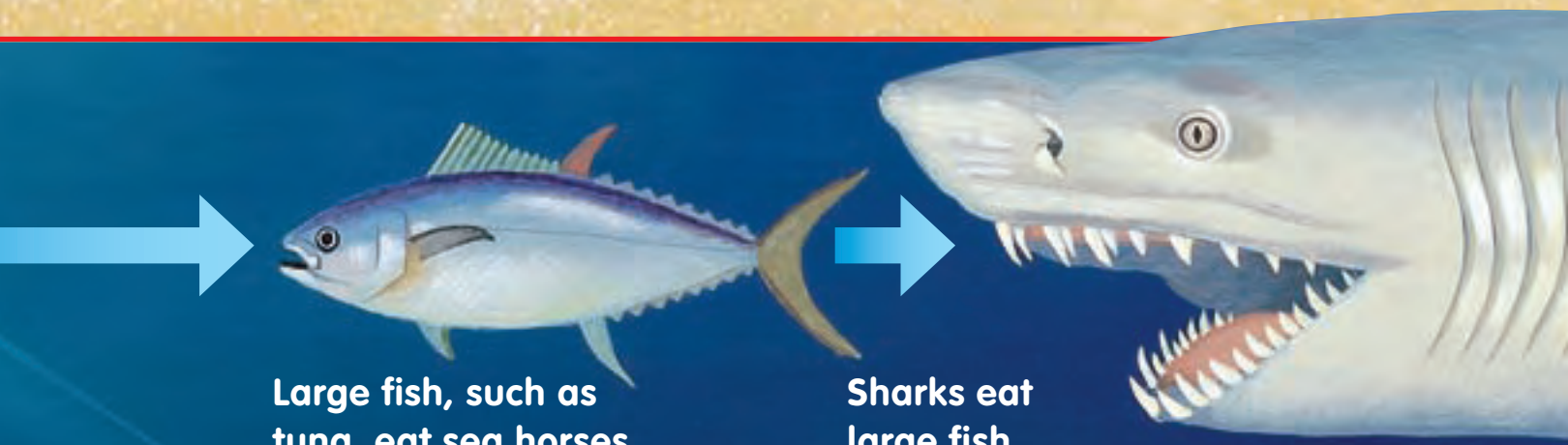
Communicate. Act out a food chain with puppets.

Where can food chains be found?



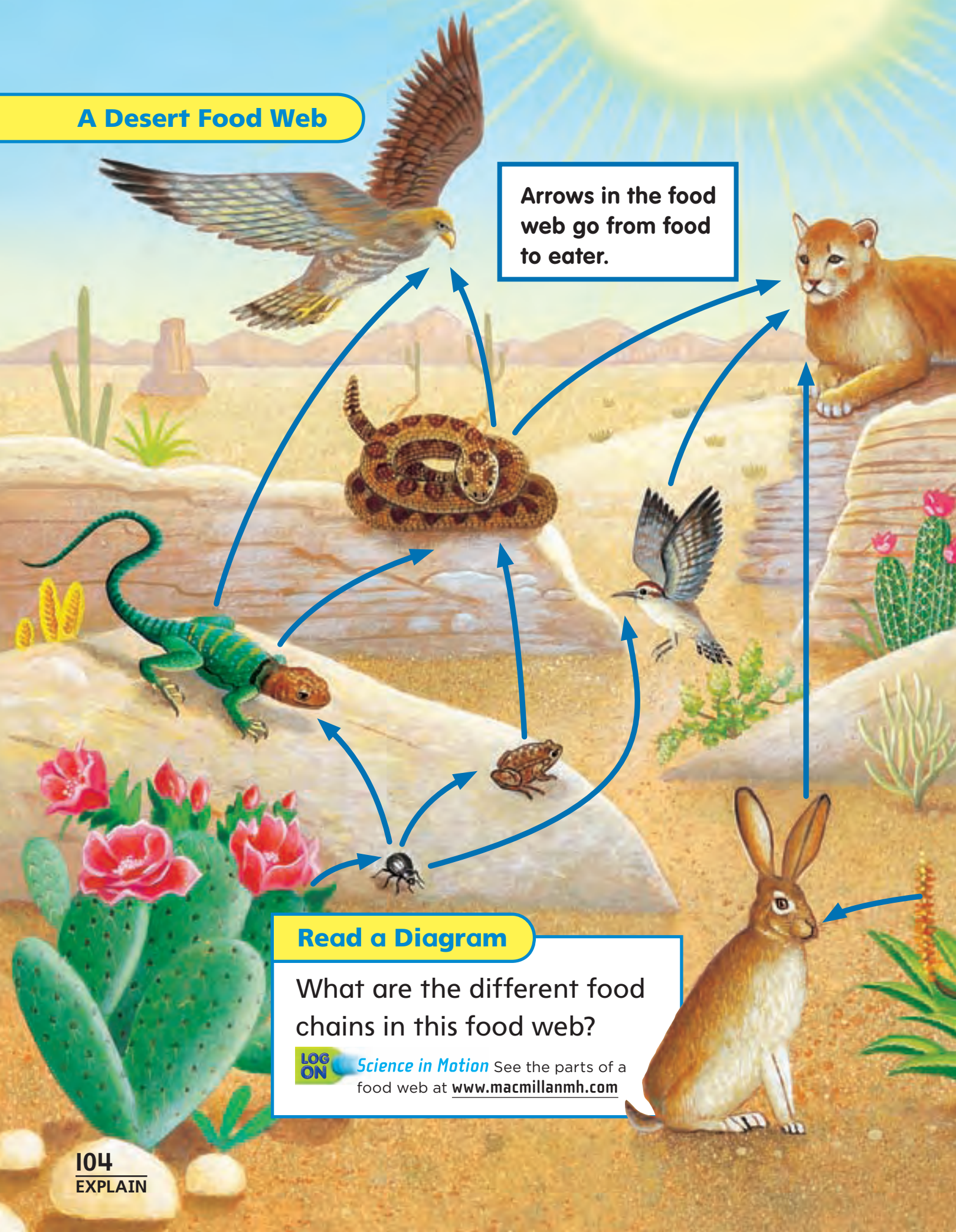
The snake eats the lizard.

The hawk eats the snake.



Large fish, such as tuna, eat sea horses.

Sharks eat large fish.


A Desert Food Web
Arrows in the food web go from food to eater.
Read a Diagram
What are the different food chains in this food web?
LOG ON Science in Motion See the parts of a food web at www.macmillanmh.com

What is a food web?

A **food web** is two or more food chains that are connected. Sometimes one kind of animal is food for many animals. Mice are eaten by hawks, owls, and snakes.

Animals also eat more than one kind of animal. Hawks eat mice, rabbits, frogs, and snakes. If you put those food chains together, you have a food web.

The insect is prey for the bird.

What are some other predators and their prey?

Think, Talk, and Write

1. **Main Idea and Details.** Describe an example of a food chain.
2. What is a food web?
3. Write about how you are part of a food chain.

Art Link

Think of a healthy lunch. Show how your meal is part of a food web. Draw the web.

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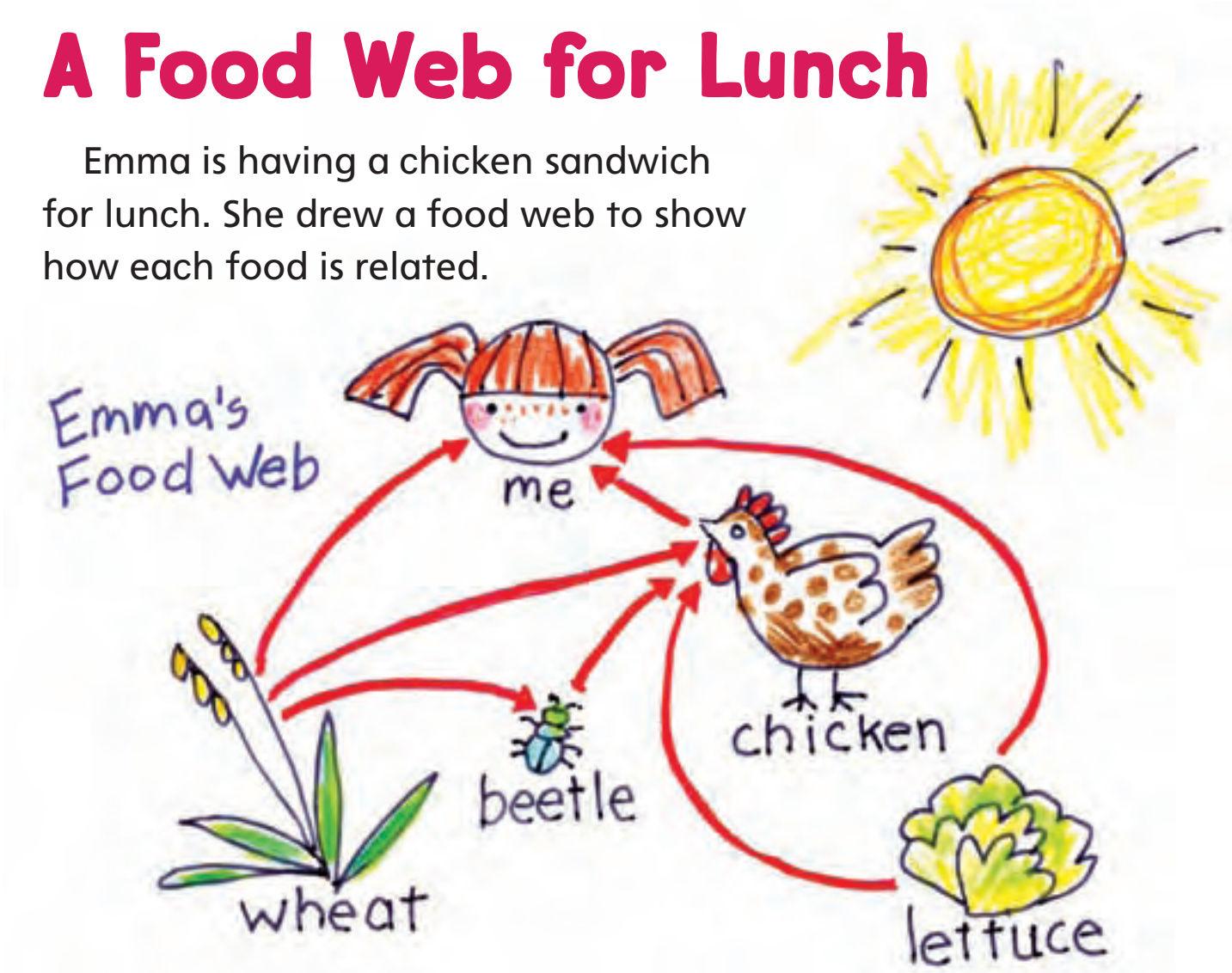
A Food Web for Lunch

Emma is having a chicken sandwich for lunch. She drew a food web to show how each food is related.



Write About It

Explain how Emma, the chicken, lettuce, and wheat form a food web. Think about the food chains in Emma's lunch to help you form a food web of your own lunch.

Remember

When you are writing to explain, you tell the steps in order.

LOG ON e **–Journal** Write about it online at www.macmillanmh.com

LS-5. Explain that food is a basic need of plants and animals (e.g., plants need sunlight to make food and to grow, animals eat plants and/or other animals for food, food chain) and is important because it is a source of energy (e.g., energy used to play, ride bicycles, read, etc.). **ELA WA 2.4.** Produce informal writings (e.g., messages, journals, notes and poems) for various purposes.

Food for a Toad

Most animals eat different foods to stay alive.

Problem Solving

A toad ate 3 grasshoppers on Monday. It ate 5 ants on Tuesday. It ate 4 crickets on Wednesday. How many animals did the toad eat in all?

Remember

Making a sketch can help solve problems. Think about whether you need to add or subtract.

SI-9. Use whole numbers to order, count, identify, measure and describe things and experiences. **M NS 2.I3.** Estimate the results of whole number addition and subtraction problems using front-end estimation, and judge the reasonableness of the answers.

Lesson 3

Habitats Change

Doylestown, Pennsylvania

Look and Wonder

Does your habitat always look the same? How does it change?

LS-8. Compare the activities of Ohio's common animals . . . during the different seasons . . . **LS-9.** Compare Ohio plants during the different seasons . . . **SWK-3.** Describe ways in which the solution to a problem might affect . . . the environment.

Explore

Inquiry Activity

What happens when habitats change?

What to Do

1. On a large sheet of paper, draw a large meadow, woods, and river.
2. Place the animals where they would live.
3. Use blocks as houses and buildings. Build a town with houses and stores.
4. **Observe.** What happens to the meadow, woods, and animals that live there?
5. **Infer.** How does building a town affect the animals, meadow, woods, farms, river, and people?

Explore More

6. **Predict.** What will happen if a highway is built?

You need

large pieces of paper

crayons

small toys and blocks

SWK-2. Explain why scientists review and ask questions about the results of other scientists' work.

Read Together and Learn

Vocabulary

drought

endangered

fossil

extinct

SCIENCE QUEST Explore fossils with the Treasure Hunters.

How do habitats change?

Nature can change habitats in many ways. A **drought** is a long period of time when there is little or no rain. Plants and animals can not live without water. Floods or fires can also change habitats.

Drought

Read a Photo

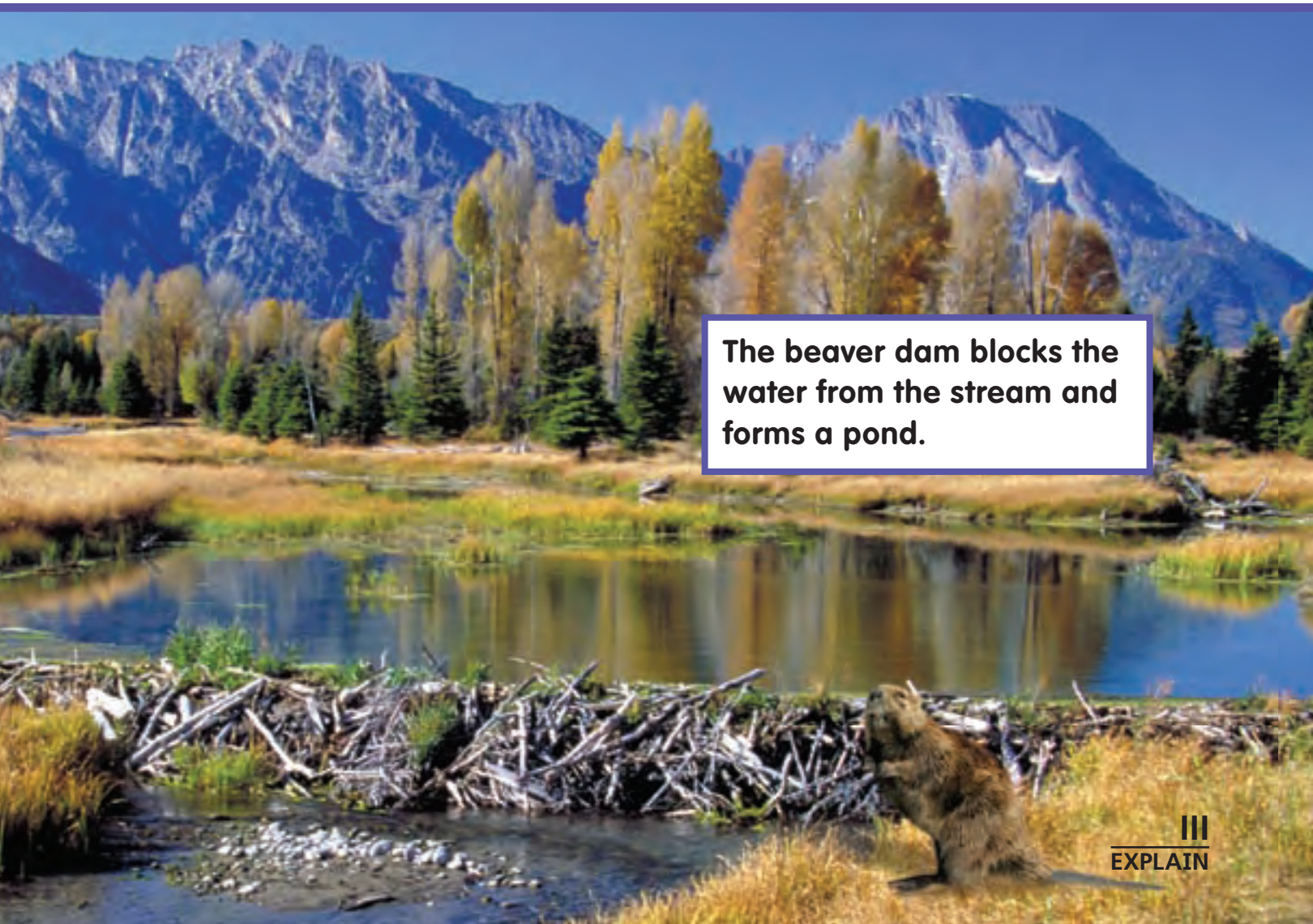
How does a drought change a habitat?

Animals can change habitats. Beavers make dams. The dam can make a pond.

People can change habitats, too. People build houses and other buildings where grass, plants, and trees were growing.

▲ **Bulldozers help people clear land to build on. Clearing the land changes the habitat.**

How can a habitat change?



The beaver dam blocks the water from the stream and forms a pond.

▲ **Squirrels stay warm in their nests in the winter.**

How do Ohio habitats change in fall and winter?

Ohio habitats change when the weather becomes cooler in fall and winter. Water in small ponds can freeze. Trees lose their leaves, and smaller plants die. Some animals, such as big brown bats, find hiding places for the winter. Some birds, such as robins, fly south to warmer regions.

Ohio ponds can freeze in winter.

How do Ohio habitats change in spring and summer?

Ohio has warmer weather in the spring and summer. Trees grow new leaves, and smaller plants make flowers and seeds that animals can eat. Animals that hid or slept become active again. Birds that had flown south for the winter come back to Ohio.

▲ **Birds, such as robins, build new nests and lay eggs.**

Plants make flowers and deer have babies, called fawns, in the spring and summer.

What happens when habitats change?

When a habitat is changed, animals may not be able to find the things they need. Some animals may die. When many of one kind of animal die and only a few are left, that animal is **endangered**. All these animals are endangered.

Quick Lab

Draw a comic strip about a habitat. **Communicate** how habitats can change.

tigers

People hunt tigers for their fur and cut down their forest homes.

whooping crane

People built over the marshes where cranes live.

Animals can become endangered when people hunt them or build on their habitats.

When habitats change, some animals have adaptations that help them live in their new habitat. Animals may find new places to get food and live.

Why do animals become endangered?

People have taken over many rivers where manatees live. Fishing nets and powerboats also hurt manatees.

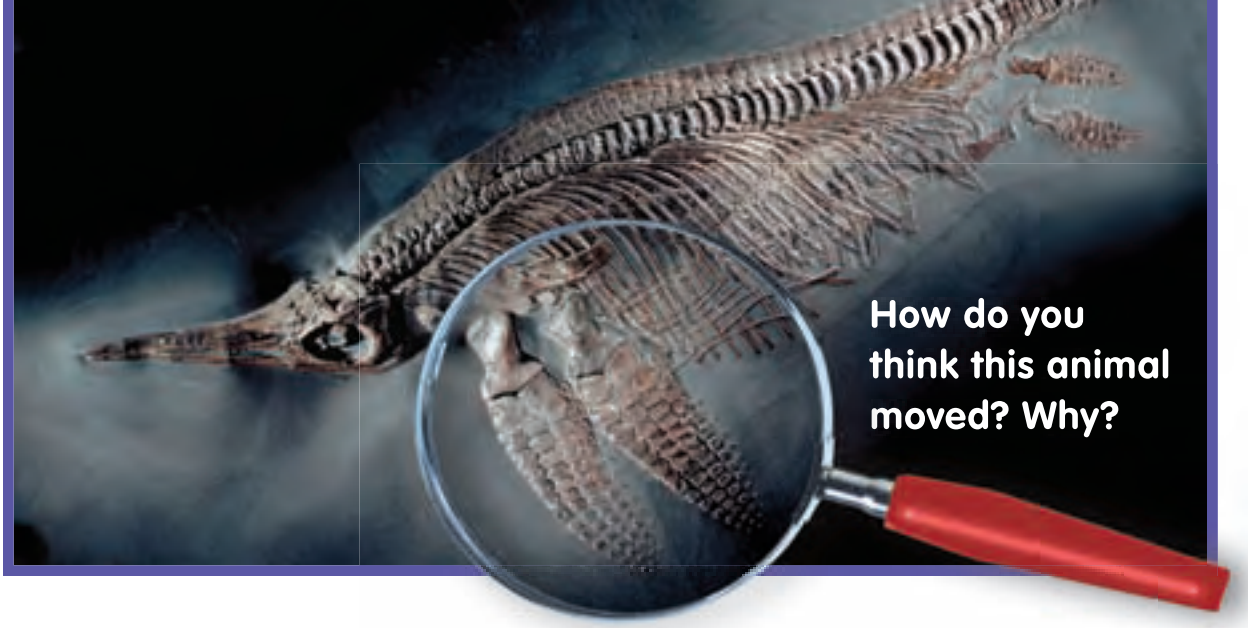
FACT People helped American alligators survive so they are not endangered anymore.

How can we tell what a habitat used to be like?

Scientists study fossils to learn about Earth's past. A **fossil** is what is left of a living thing from the past. Scientists get clues about habitats of the past from the plant and animal fossils they find.

Some fossils do not match the habitat they were found in. Then scientists can tell that the habitat has changed.

Look at the fossil found here. What do you think the habitat used to be?



Some plants and animals that lived long ago still live today. Some have died out, or become **extinct**. Now we only have their fossils. Fossils can help tell how animals may have looked or moved.

What can fossils tell us about habitats long ago?

Think, Talk, and Write

1. **Cause and Effect.** What happens to plants and animals when their habitat changes?
2. What are some ways animals can stay alive when their habitat changes?
3. Write about how people can change habitats and what might happen to animals and plants.

Art Link

Make a poster about endangered animals.

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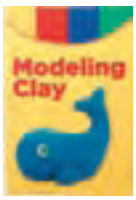
Be a Scientist

You need



clay


leaves


plastic knife

hand lens

How do clues help scientists put fossils together?

Find out how scientists put fossils together.

What to Do

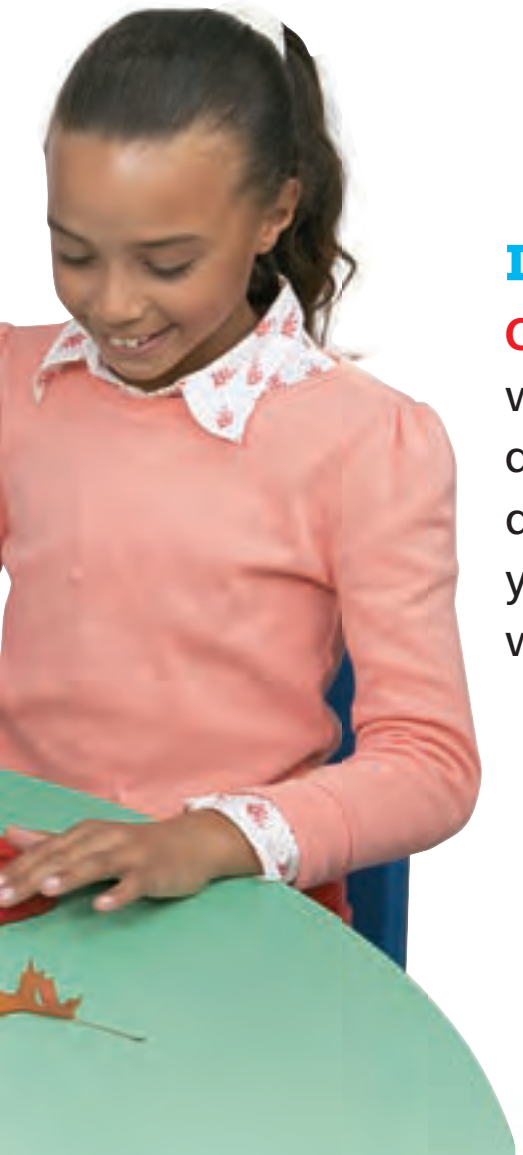
1. Work in a small group. Roll out some clay and press a leaf into it. Peel the leaf off carefully.

SWK-2. Explain why scientists review and ask questions about the results of other scientists' work.

2 Cut your leaf print into two pieces. You do not have to use straight lines.

3 Trade your leaf prints with another group.

4 **Infer.** Use clues in the prints to match them and put them together.



Investigate More

Communicate. How would you put together a dinosaur fossil? How did this activity help you learn how scientists work?

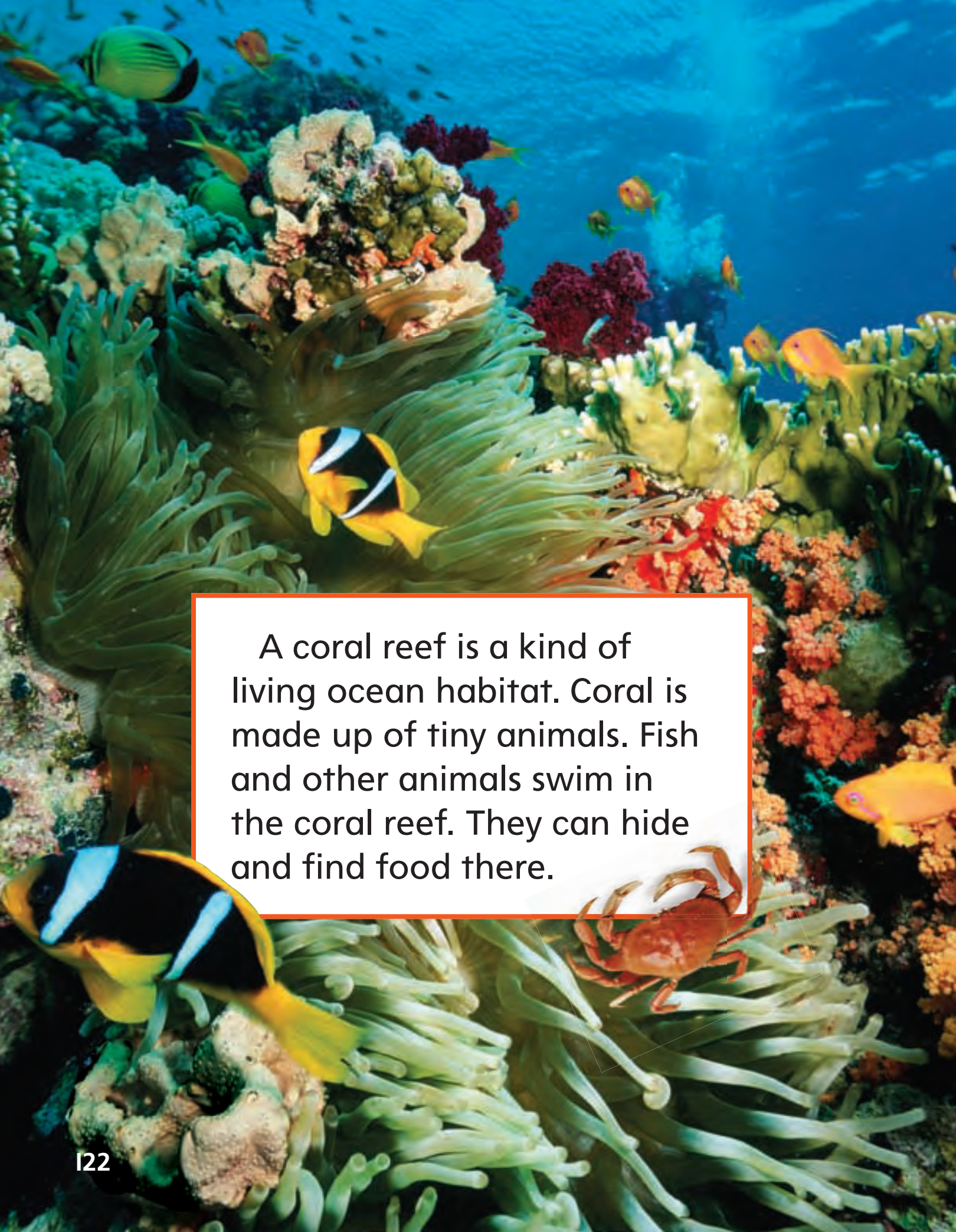
I Read to Review

Different Habitats

A woodland forest is one kind of habitat. Bears and mice live in woodland forests. Most trees have leaves that change colors when seasons change. Some other plants stay green all year.

LS-7. Compare the habitats of many different kinds of Ohio plants and animals and some of the ways animals depend on plants and each other.

Some animals live in cold places such as the Arctic. The Arctic is a kind of desert. Musk oxen, polar bears, and reindeer live there. They all have different ways to survive the cold winters.



A coral reef is a kind of living ocean habitat. Coral is made up of tiny animals. Fish and other animals swim in the coral reef. They can hide and find food there.

A pond is another kind of water habitat. Alligators live in some ponds. The alligator can hide under the water to catch food. Fish and other animals can hide among the roots of the trees.

CHAPTER 3 Review

Vocabulary

Use each word once for items 1–5.

drought
endangered
food chain
habitat
prey

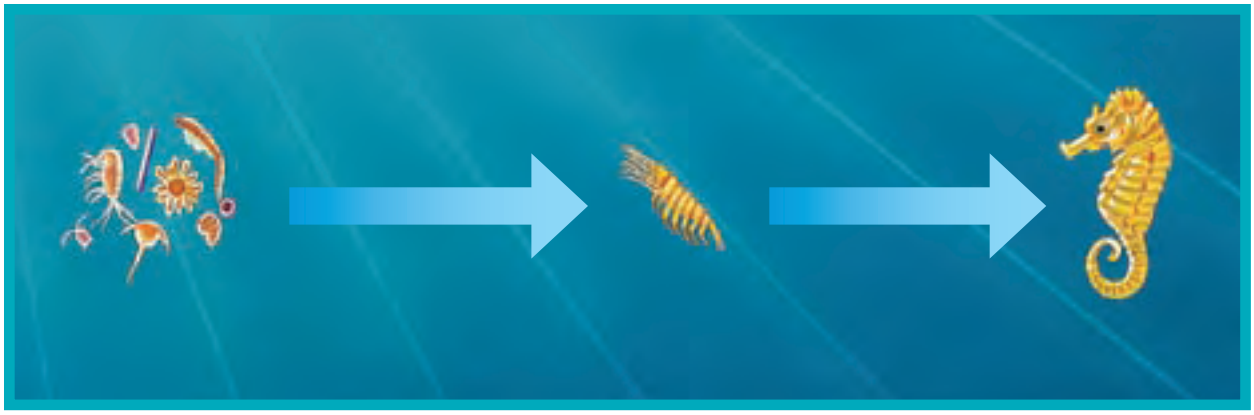
1. When there are not many of one kind of animal left, the animal is called _____.
LS-3

2. When it does not rain for a long time there is a _____.
LS-1

3. A place where animals and plants live together is called a _____.
LS-2

4. The dragonfly in this picture is the _____.
LS-1

5. The picture below shows part of a _____.
LS-5



Answer the questions below.

6. **Summarize.** How do plants and animals use each other?
LS-1, LS-5

7. Compare the pictures below. How are they different? What do you think happened?
LS-3

8. **Put Things in Order.** Put this food chain in order.

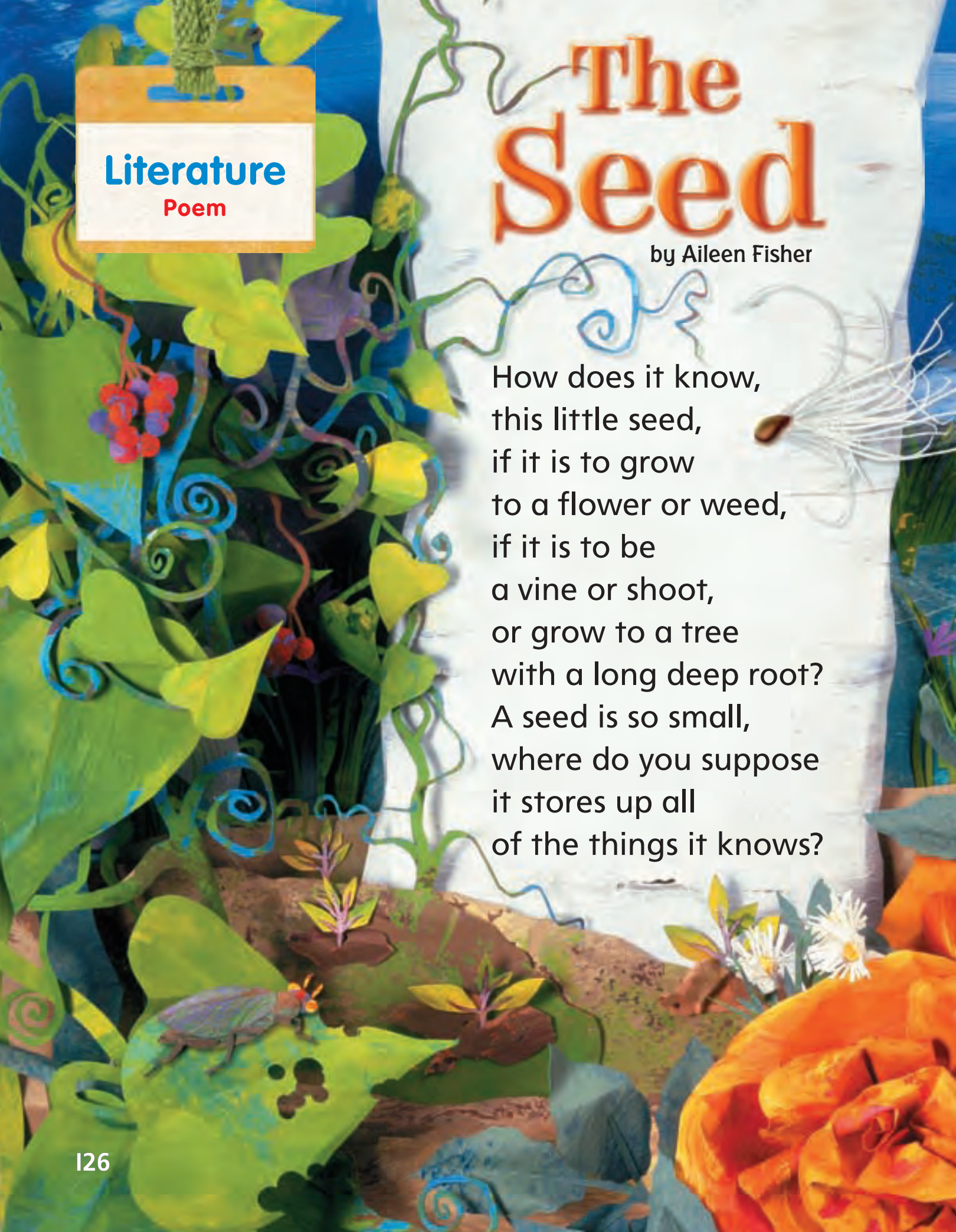
rabbit	Sun	fox	grass

LS-5

9. What happens to animals and plants when habitats change?
LS-3

The Big Idea

10. What are habitats?
LS-2, LS-7



Literature
Poem

The Seed

by Aileen Fisher

How does it know,
this little seed,
if it is to grow
to a flower or weed,
if it is to be
a vine or shoot,
or grow to a tree
with a long deep root?
A seed is so small,
where do you suppose
it stores up all
of the things it knows?

Talk About It

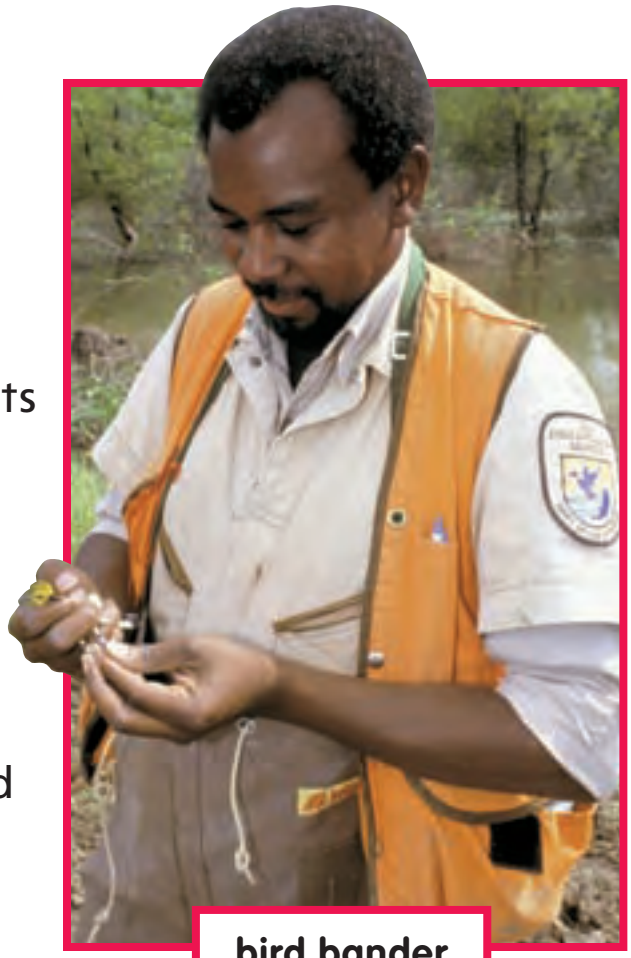
What do you know about seeds?

Bird Bander

Do you love to learn about birds? You could become a bird bander. A bird bander helps scientists keep track of birds.

The bander catches a bird and puts a tiny band around its ankle. This band has a number on it, and the bander writes it down. The bander also writes the bird's age and size.

Then the bander returns the bird to the wild. Later, other banders and scientists might trap the same bird. They can look up the bird's number and see how it grew and changed.



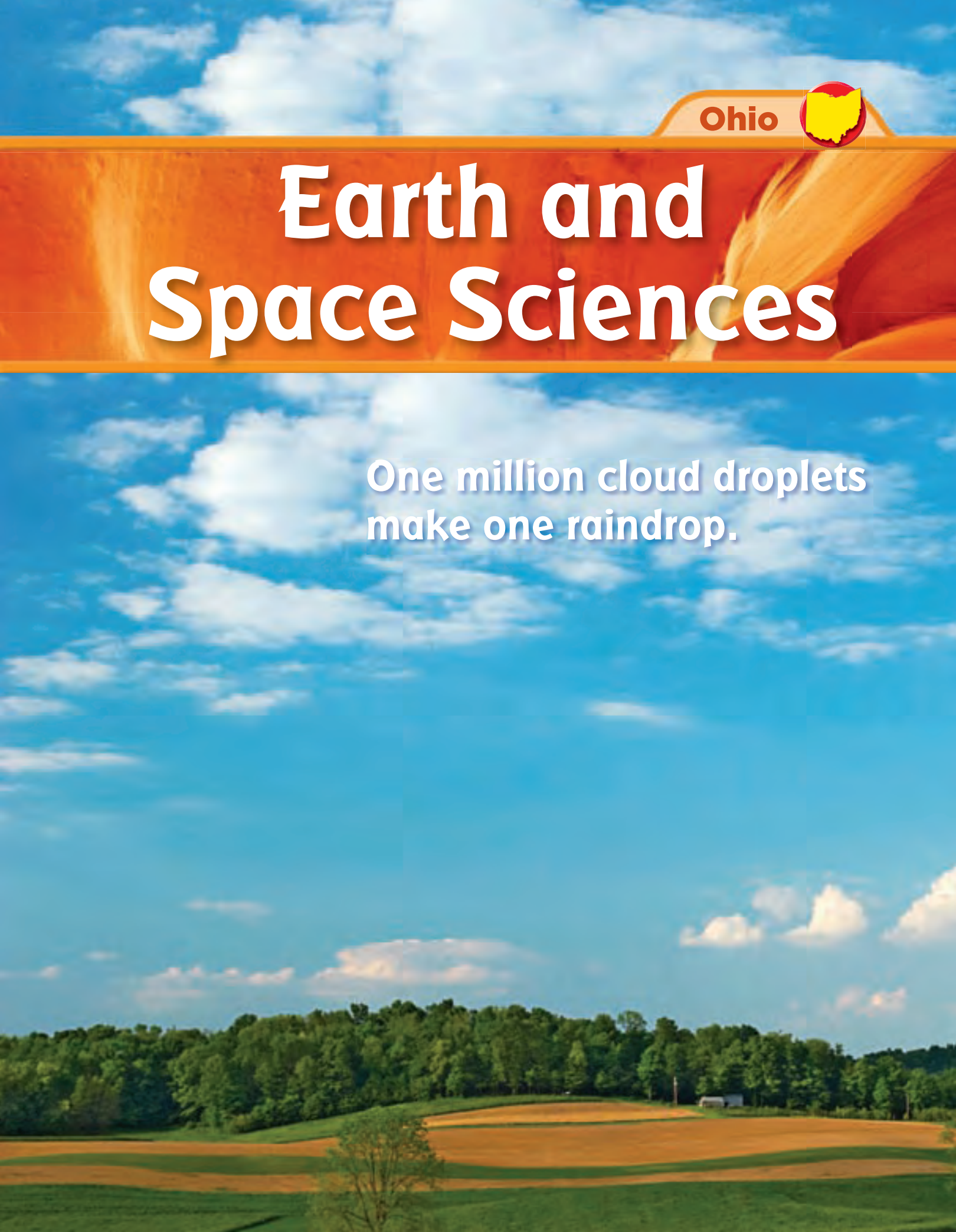
bird bander

More Careers to Think About

wildlife guide

veterinarian

LOG ON e-Careers at www.macmillanmh.com


Ohio
Earth and Space Sciences
One million cloud droplets make one raindrop.

Cincinnati Observatory

the telescope at the observatory

image from a telescope

Studying Space

The Cincinnati Observatory is located in Cincinnati, Ohio. It is one of the oldest observatories in the United States. Observatories often have telescopes. Telescopes can make faraway objects seem larger and closer. Scientists can use telescopes to study other planets and moons.

Star Study

With a telescope, scientists can also study stars. A star is an object that makes its own light. There are more stars in the night sky than you can easily count. The closest star to Earth is the Sun. Other stars are very far away. With a telescope, scientists can study these faraway stars.

Think, Talk, and Write

Critical Thinking Why do scientists use telescopes to study objects in outer space?

Ohio

A CLOSER LOOK

Main Idea

Observatories can be used to study faraway objects such as planets, moons, and stars.

Activity

Compare Think of objects in outer space.

- Make a list of the objects you can see with your own eyes.
- Make a list of the objects you would need a telescope to see.

ESS-I. Recognize that there are more stars in the sky than anyone can easily count.

The John H. Glenn Research Center at Lewis Field

a scientist doing research

John Herschel Glenn, Jr., circa 1964

John Glenn

John Glenn is a retired astronaut. He was born in Cambridge, Ohio. He was the first American to pilot a spacecraft around Earth. He orbited Earth three times.

Discovery

The John H. Glenn Research Center is at Lewis Field in Cleveland, Ohio. The center is part of NASA. Scientists there study space flight and air travel.

Over 3,300 people work at the John H. Glenn Research Center. Each person has special tasks to perform. It is important that the workers share their research findings with others. Sharing scientific findings helps scientists learn and discover new things.

Think, Talk, and Write

Critical Thinking What is the purpose of the John H. Glenn Research Center at Lewis Field?

SWK–4. Demonstrate that in science it is helpful to work with a team and share findings with others.

Ohio

A CLOSER LOOK

Main Idea

Research and communication lead to discovery.

Activity

Observe Look at the photo of the scientist on page I32.

- Describe what you think the scientist is studying.
- Why is it important for this scientist to share his research with others?

CHAPTER 4

Earth in Space

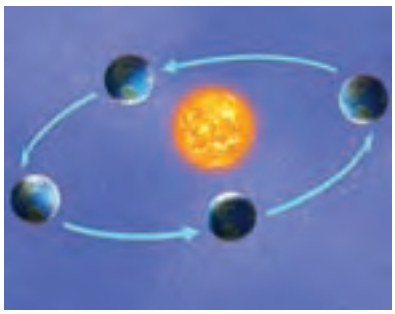
The Big Idea

What can we see in the night sky?

A view of Earth from the Moon

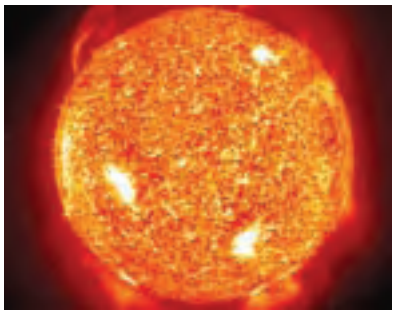
Key Vocabulary

axis a center line that an object spins around (page 139)



orbit the path Earth takes around the Sun (page 148)

phase the Moon's shape as we see it from Earth (page 157)



star an object in space made of hot, glowing gases (page 158)

More Vocabulary

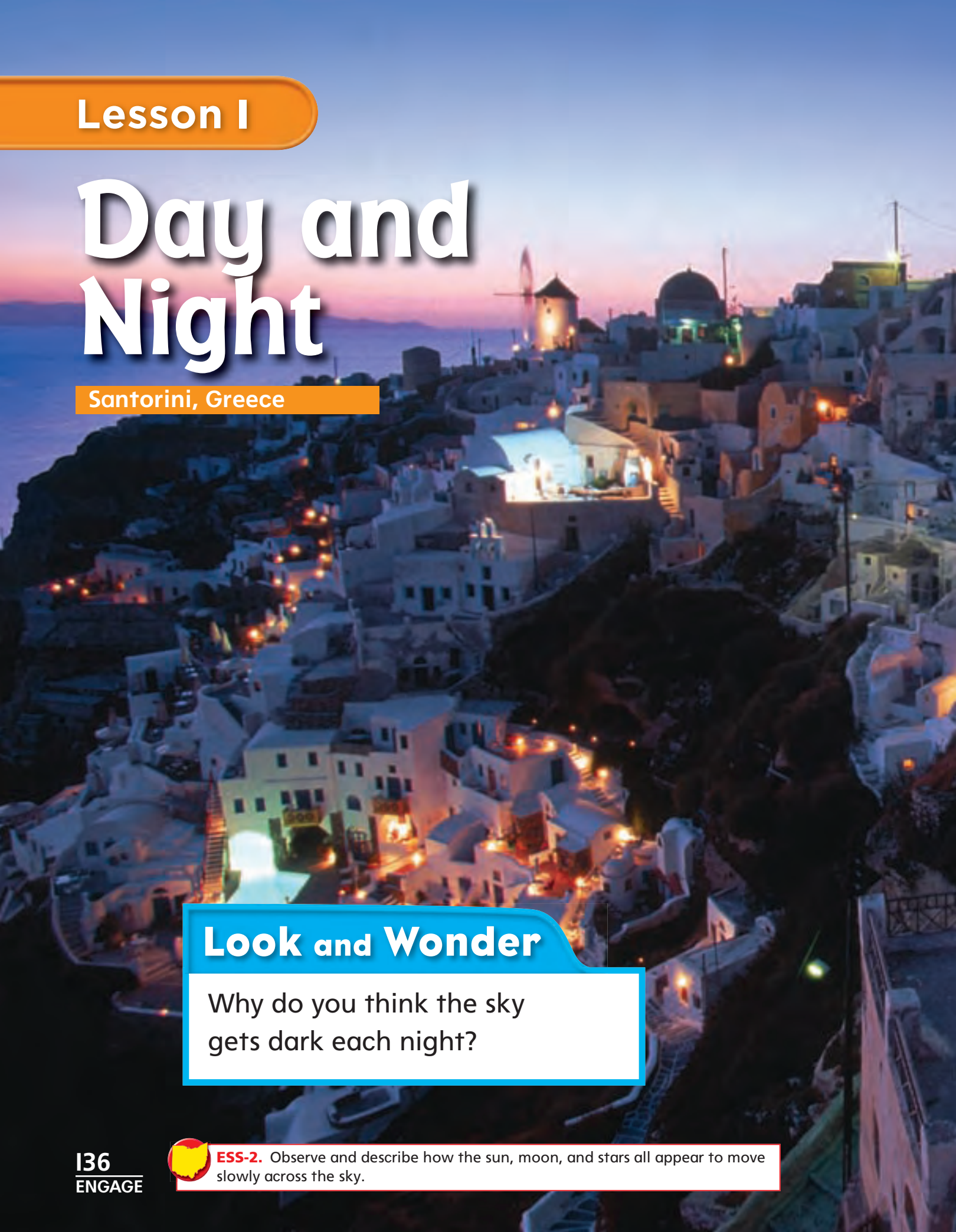
rotation, page 138

ESS-A. Observe constant and changing patterns of objects in the day and night sky.

Lesson 1

Day and Night

Santorini, Greece



Look and Wonder

Why do you think the sky gets dark each night?

ESS-2. Observe and describe how the sun, moon, and stars all appear to move slowly across the sky.

Explore

Inquiry Activity

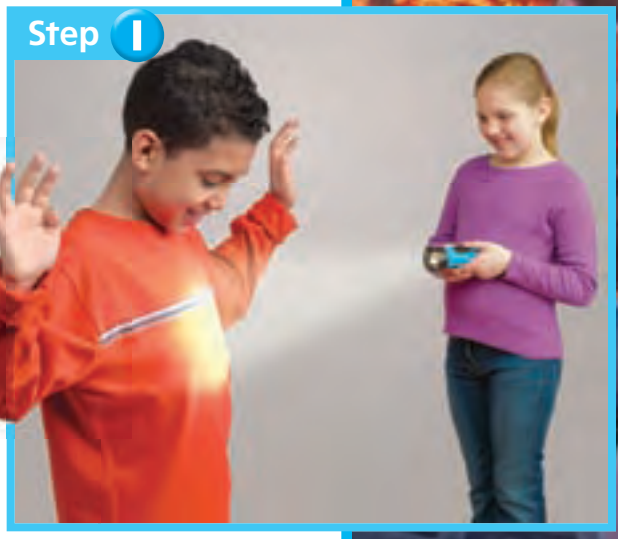
Why can't we see the Sun at night?

You need

flashlight

What to Do

1. Stand 12 steps away facing a partner.
2. Point a flashlight at your partner. The flashlight is the Sun. The partner is Earth.
3. **Predict.** Let your partner turn around slowly in front of the flashlight. Will he or she always be able to see the light? Try it.
4. **Infer.** How does this model show why we can not see the Sun at night?



Explore More

5. **Make a Model.** What pattern is made when your partner turns around in front of the flashlight three times? Try it.

SWK-4. Demonstrate that in science it is helpful to work with a team and share findings with others.

Read Together and Learn

Vocabulary

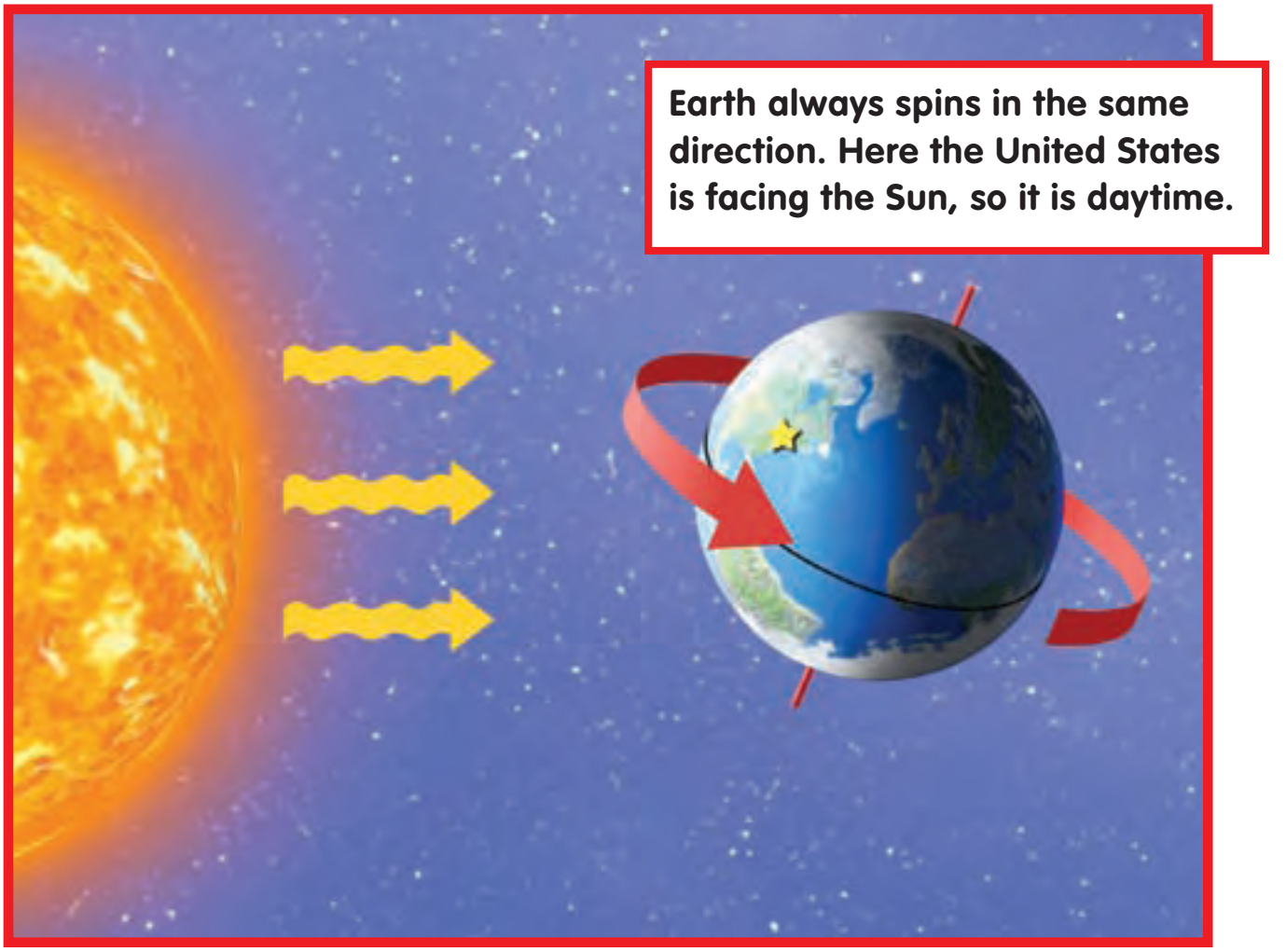
rotation

axis

What causes day and night?

Earth spins every moment of the day and night. You do not feel it, but it is happening right now. The spinning of Earth is called **rotation**.

Earth's rotation causes day and night. When one side of Earth faces the Sun, it is day. At the same time, it is night on the other side of Earth.



Earth always spins in the same direction. Here the United States is facing the Sun, so it is daytime.

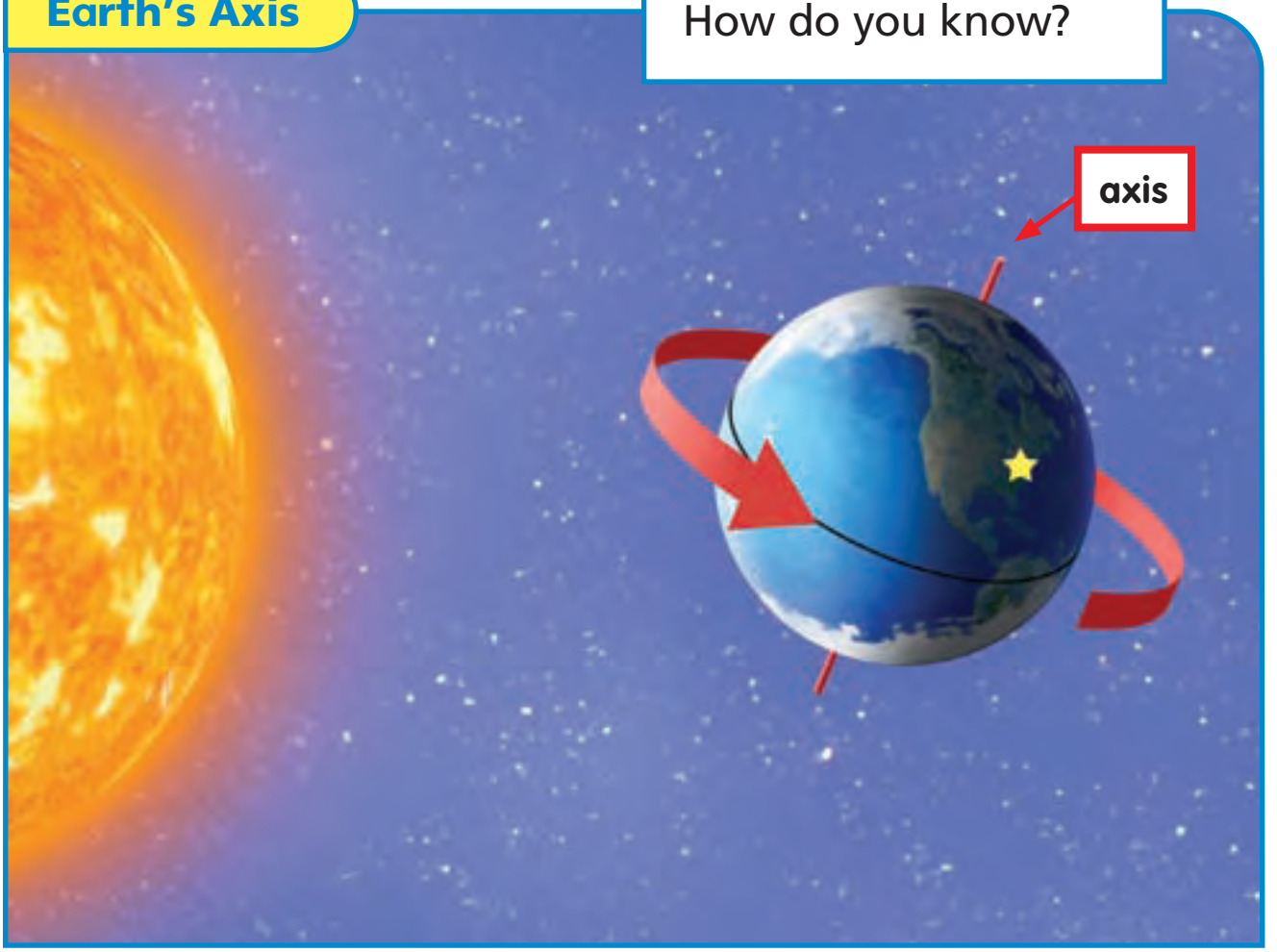
Earth rotates around an imaginary line called an **axis**. The axis goes through the center of Earth from north to south. Every 24 hours, Earth makes one full turn on its axis. This pattern of day and night repeats again and again.

Why can we see sunlight only during the day?

Read a Diagram

Is it day or night in the United States? How do you know?

Earth's Axis



Why do the Sun and Moon seem to move?

We live on Earth and look out toward the sky. As Earth rotates, the Sun and Moon seem to move across the sky.

You can see the Sun make different shadows during the day. As Earth rotates, shadows on the ground change. Longer shadows mean the Sun is lower in the sky.

Quick Lab

Make a flip book of the Moon. **Observe** how the Moon seems to move across the sky in one night.

▼ **The length of the shadow changes as the Sun seems to move across the sky.**

8:00 a.m.

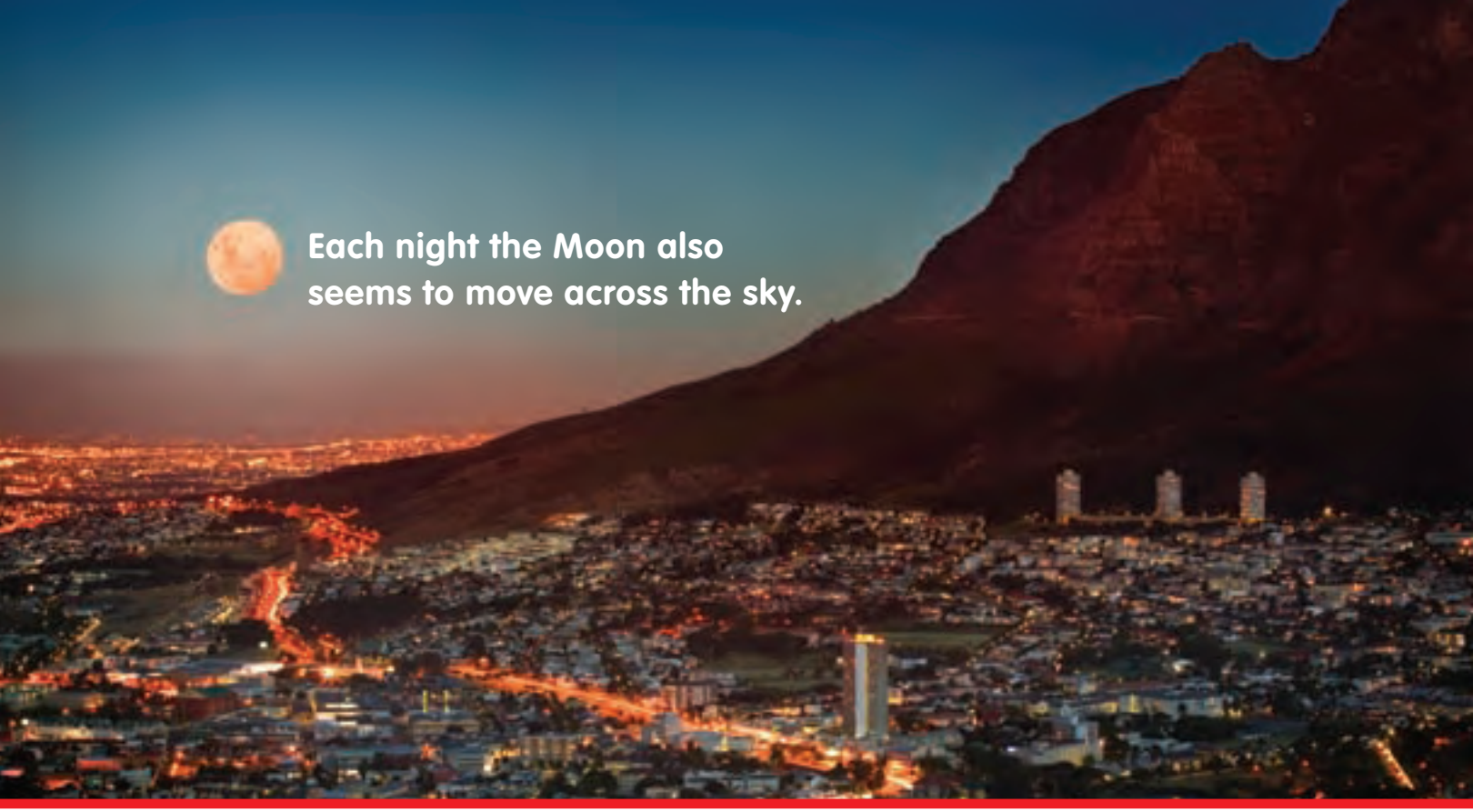
In the morning, the Sun seems to rise in the sky.

12:00 noon

By the middle of the day, we see the Sun high in the sky.

4:00 p.m.

As it gets dark, the Sun seems to set in the sky.



Each night the Moon also seems to move across the sky.

Why does the Sun appear to move in the sky?

Think, Talk, and Write

1. **Problem and Solution.** How can you tell what time it is if you do not have a watch?
2. What causes day and night?
3. Draw and write about how the Sun or Moon seem to move.

Music Link

Write a song about day and night to the tune of "Twinkle Twinkle Little Star."

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Inquiry Skill: Draw Conclusions

▶ Learn It

When scientists **draw conclusions**, they use what they observe to explain what happens.

Linda looks at this picture.

She sees the lights on and the dark sky. Linda has seen some of the houses before. She draws the conclusion that this picture was taken at night in her town.

▶ Try It

Observe the lengths of shadows. Then draw conclusions about the time of day.

1. Push a stick straight into a pot of dirt. Place the pot in a sunny spot.

2. Look at the stick at different times of day. Sit in the same spot each time. Draw the Sun, stick, and shadow. Write the time of day on each drawing.

3. **Compare.** Talk to your partner about how the shadows changed. When was the shadow longest?

4. **Draw Conclusions.** What does the time of day have to do with the length of shadows?

SI-6. Recognize that explanations are generated in response to observations, events and phenomena.

Lesson 2

Why Seasons Happen

Marshfield, Vermont

Look and Wonder

What time of year is shown here? How can you tell?

ESS-2. Observe and describe how the sun, moon, and stars all appear to move slowly across the sky. **ESS-4.** Observe and describe that some weather changes occur throughout the day and some changes occur in a repeating seasonal pattern.

Explore

Inquiry Activity

What clothes do people wear in each season?

What to Do

1. Write the name of a different season in each corner of your paper.
2. Cut out pictures of different kinds of clothes from magazines.
3. **Classify.** Glue the pictures near the seasons where they belong.
4. **Draw Conclusions.** What do people wear in different seasons?

Explore More

5. **Classify.** Sort your clothes at home by season. Explain how you grouped your clothes.

You need

paper

markers

magazines

scissors

glue stick

SI-7. Use appropriate tools and simple equipment/ instruments to safely gather scientific data (e.g., magnifiers, non-breakable thermometers, timers, rulers, balances and calculators and other appropriate tools).

Read Together and Learn

Vocabulary

orbit

What are the seasons like?

Each season has a different kind of weather. In fall, the air can become cool. Leaves on some trees turn colors and fall off.

In winter the air is cold. In some places it snows. Animals must keep warm. Some birds fly to warmer places. People wear warmer clothes.

▲ There are fewer hours of daylight in fall.

▲ In many places it can snow in winter.

In spring the weather becomes warmer. There are many rainy days. Trees and flowers bloom. Birds return from their winter homes.

Summer is the hottest season. There are more hours of sunlight than of night. What season comes after summer? The seasons start all over again!

Quick Lab

Divide a plate into four parts to show each season. Draw and **communicate** what you do in each season.

▲ **There are many rainy days in spring.**

▲ **The days are hot and long in summer.**

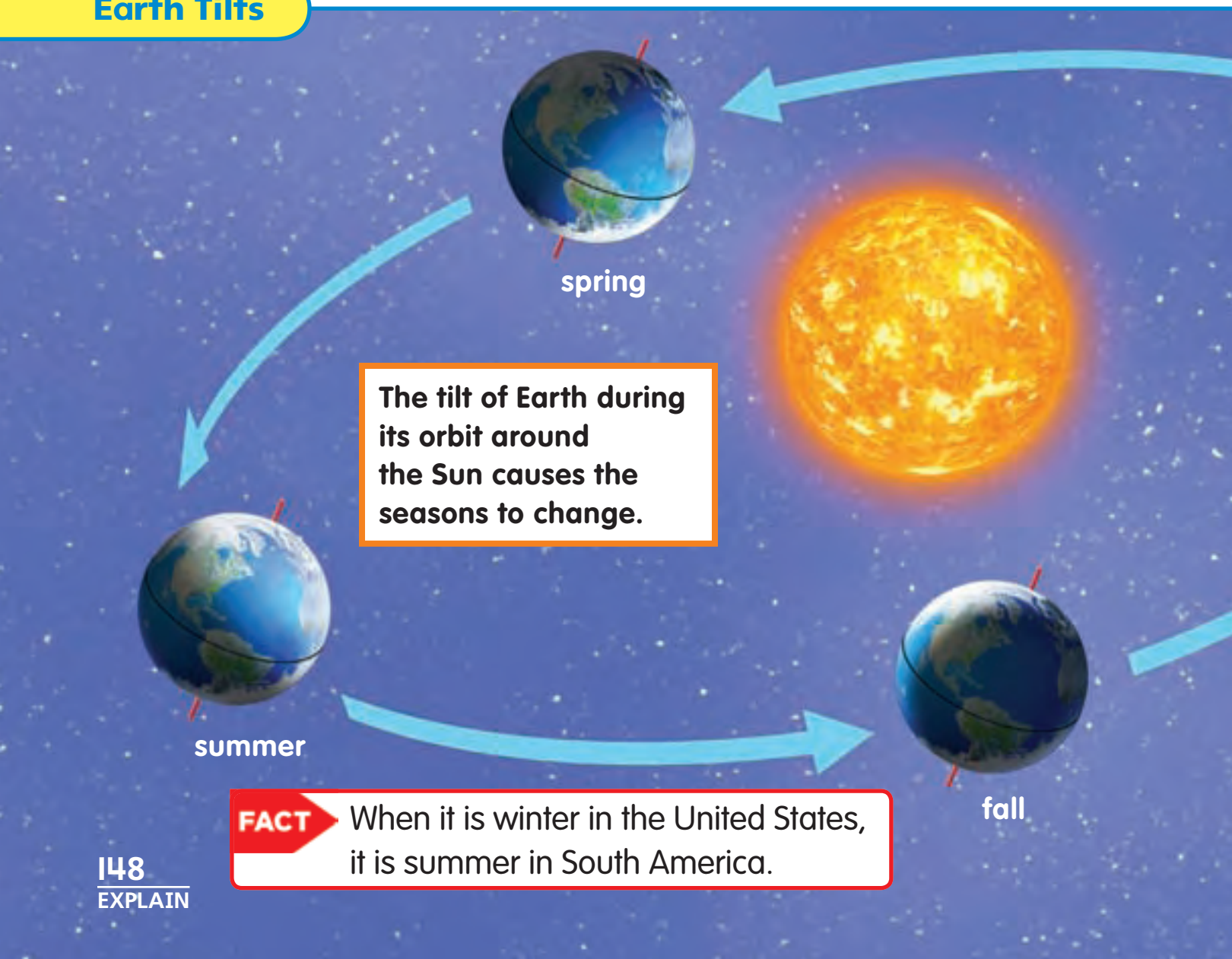
How is summer different from winter?

What causes the seasons?

Did you know that Earth moves around the Sun? The path Earth takes around the Sun is called its **orbit**. Earth takes about 365 days, or one year, to orbit the Sun.

We know there is day and night because Earth spins on its axis. The axis also is tilted. Earth always tilts in the same direction on its axis.

Earth Tilts

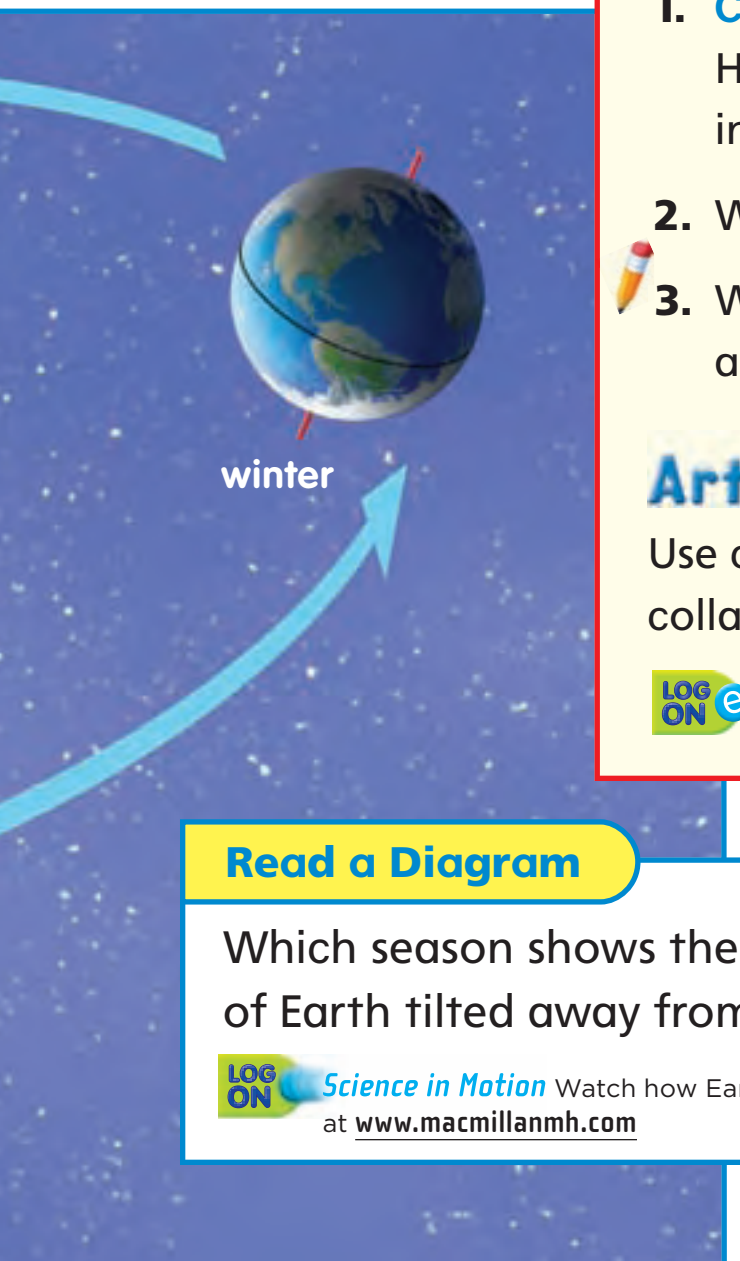


The tilt of Earth during its orbit around the Sun causes the seasons to change.

FACT When it is winter in the United States, it is summer in South America.

As Earth moves around the Sun, the tilt of Earth causes the seasons. The part of Earth that tilts toward the Sun is warmer. The part of Earth that tilts away from the Sun is colder.

What happens on Earth during one orbit around the Sun?



Think, Talk, and Write

1. **Compare and Contrast.** How does the weather change in each season?
2. What causes summer and winter?
3. Write about how summer and winter are different.

Art Link

Use colored paper to make four collages. Make one for each season.

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Read a Diagram

Which season shows the top half of Earth tilted away from the Sun?

LOG ON *Science in Motion* Watch how Earth tilts at www.macmillanmh.com

Fun with the Seasons

Think about the seasons and the different things you do all year. Use the photographs to help you think about what you like to do.

Write About It

Write a story to compare what you do in winter and in summer. Include details about how the seasons are alike and different.

Remember

Writing to compare tells how things are alike and different.

LOG ON e –Journal **Write about it online at www.macmillanmh.com**

ESS-4. Observe and describe that some weather changes occur throughout the day and some changes occur in a repeating seasonal pattern. **ELA WA 2.I.** Write stories that convey a clear message, include details, use vivid language and move though a logical sequence of steps and events.

How Much Sunlight?

We get more sunlight in the summer than we do in the winter. How many hours of sunlight do we get in each season? Use this chart to find out.

Put in Order

Put the seasons in order from least to most hours of sunlight. Make a new chart to show this.

Remember

Look at the whole numbers first to put numbers in order.

SI-6. Recognize that explanations are generated in response to observations, events and phenomena. **M DAP 2.I.** Pose questions, use observations, interviews and surveys to collect data, and organize data in charts, picture graphs and bar graphs.

Lesson 3

The Moon and Stars

Look and Wonder

The Moon is bright in the night sky. Where does the Moon's light come from?

ESS-I. Recognize that there are more stars in the sky than anyone can easily count. **ESS-2.** Observe and describe how the sun, moon and stars all appear to move slowly . . . **ESS-3.** Observe and describe how the moon appears a little different every day . . .

Explore

Inquiry Activity

How do we see the Moon at night?

You need

flashlight

white ball

What to Do

1. Use a white ball as the Moon. Turn out the room lights. Is it easy to see the Moon?
2. **Make a Model.** Shine a flashlight on the Moon. The flashlight is the Sun. Is the Moon easier to see now? Why?
3. **Draw Conclusions.** Where does the Moon's light come from?

Explore More

4. **Investigate.** What if the Moon were a different color? How would that affect the brightness of the Moon? Make a model to find out.

SI-I. Ask "how can I/we" questions.

Read Together and Learn

Vocabulary

phase

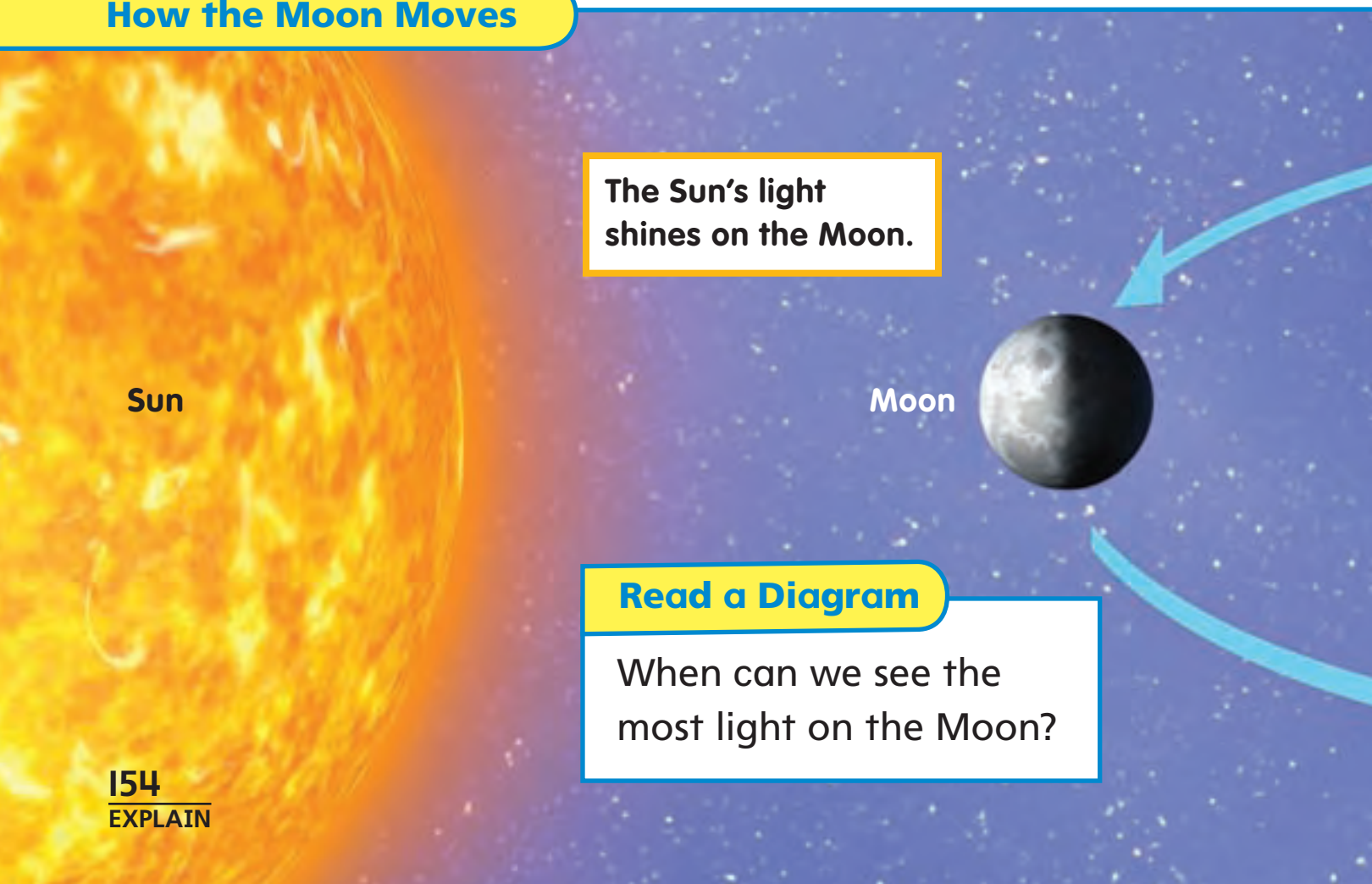
star

Why can we see the Moon from Earth?

The Moon does not shine the way the Sun does. The Moon is made of rock! We see the Moon because light from the Sun shines on the Moon.

Look at the picture below. Point to where it is night on Earth. Then point to the part of the Moon that is lit by the Sun. You sometimes see this part of the Moon at night.

How the Moon Moves



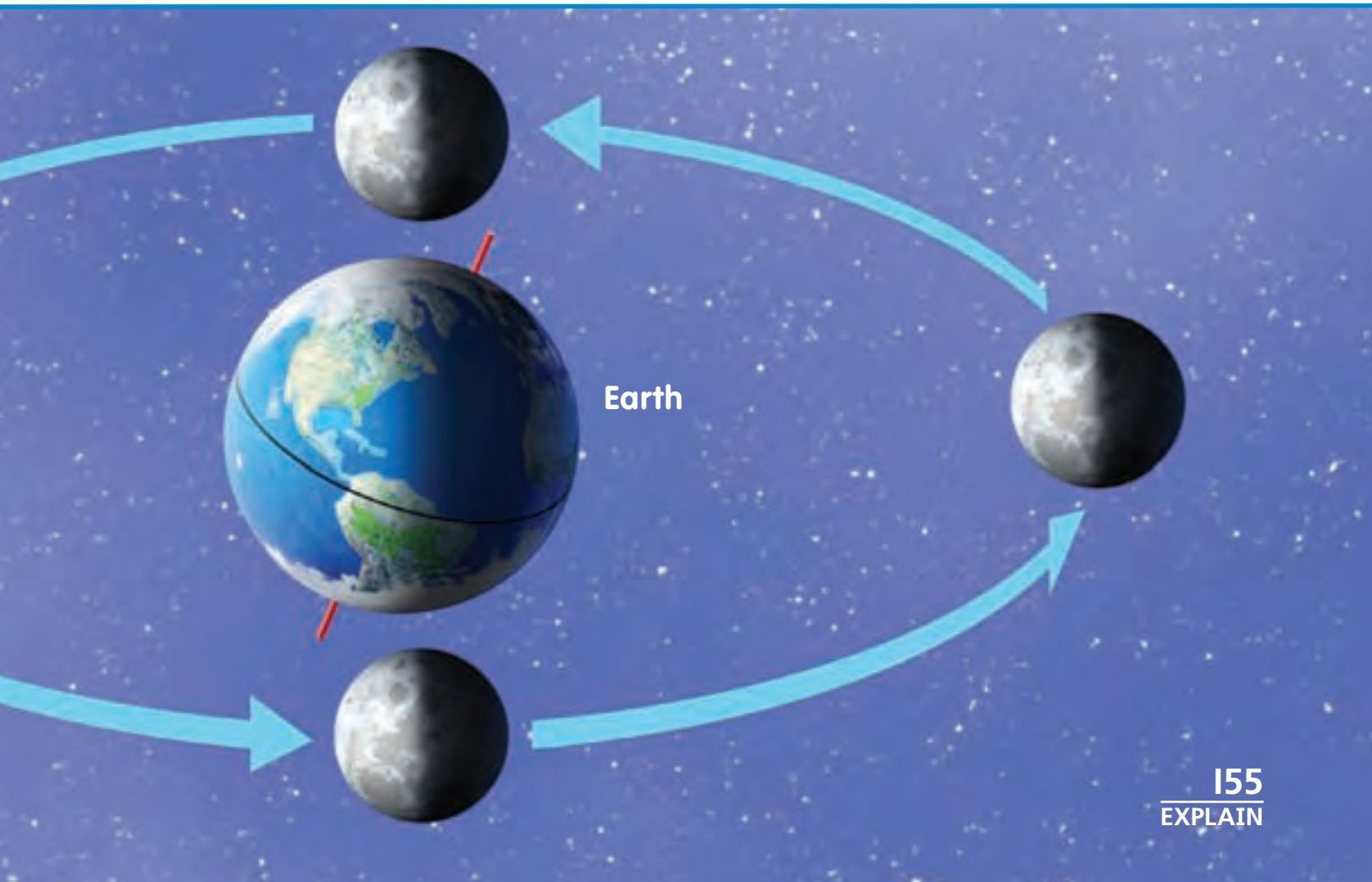
Read a Diagram

When can we see the most light on the Moon?

The Moon does not just stay still in the night sky. The Moon moves in a path around Earth. It takes the Moon about a month to make one orbit around Earth. The Moon's path around Earth repeats again and again.

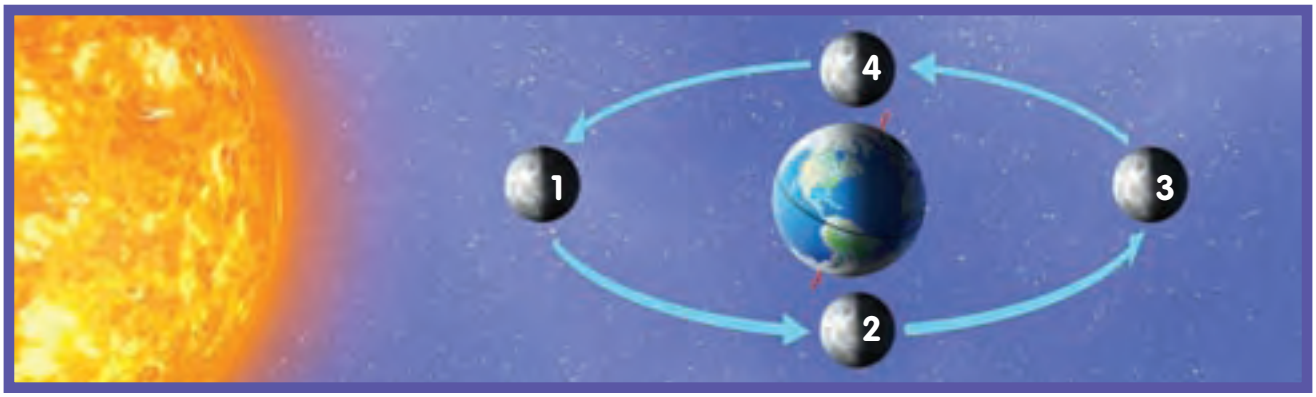
Why can we see the Moon?

▲ **The Moon has a light color because it is covered in dust.**



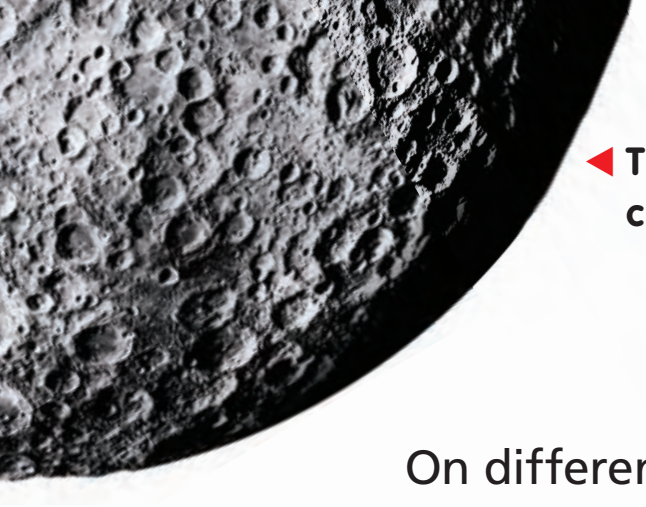
Why does the Moon seem to change shape?

From Earth the Moon looks as if it is changing shape. The Moon does not really change shape. Our view of the Moon changes as the Moon moves during one month.



When the Moon is between Earth and the Sun, we can not see the Sun's light shining on the Moon. It looks as if there is no Moon at all!

After a week the Moon looks like this. It is called the First Quarter Moon. The Moon has completed $\frac{1}{4}$ of its orbit around Earth.



The Moon is Earth's closest neighbor in space.

On different nights we see different amounts of sunlight shining on the Moon. Each shape of the Moon we see during one month is called a **phase**. The phases appear in the same order every month. The phases repeat each month.

What happens as the Moon orbits Earth?

The Moon moves to a new place by the next week. We can see all of the Moon's lit side. This phase is called the Full Moon.

By the third week, the Moon is $\frac{3}{4}$ of its way around Earth. It is called the Last Quarter Moon.

FACT The Moon can sometimes be seen during the day.

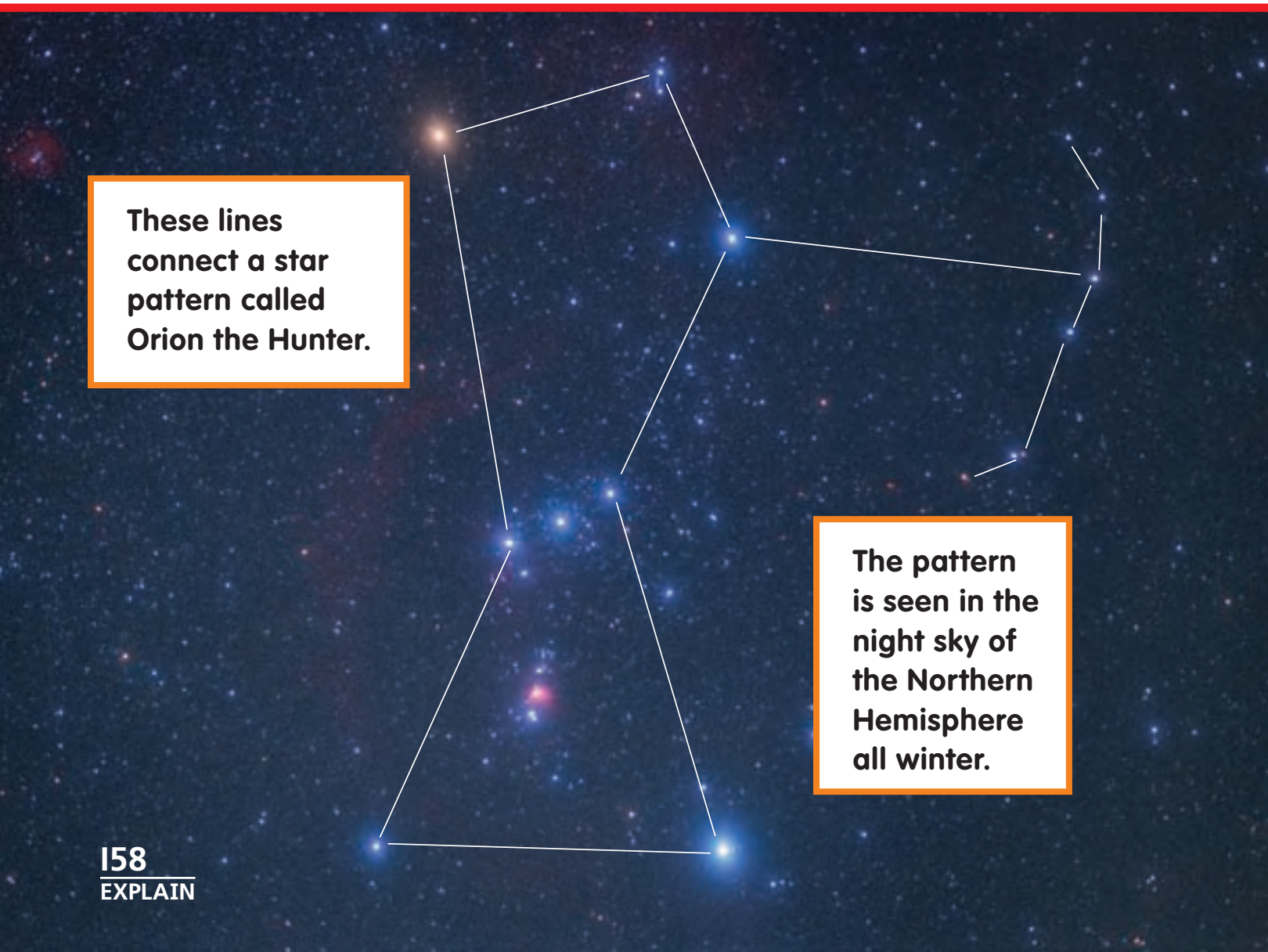
What are stars?

A **star** is an object in space made of hot, glowing gases. The gases give off heat and light. Some stars are very bright. Stars can be different colors and sizes.

Some stars make patterns in the sky. Stars seem to move across the sky during one night.

Quick Lab

Observe the night sky. Collect data about the stars you see. Communicate what you see to your class.



These lines connect a star pattern called Orion the Hunter.

The pattern is seen in the night sky of the Northern Hemisphere all winter.

From Earth, stars look like tiny points of light. They look tiny because they are far away.

There is one star that is close to Earth. That star is the Sun! The Sun is an average size star. It looks large to us because it is close to Earth.

How are stars different from each other?

▲ **The Sun lights up the sky during the day. We can not see other stars in the sky until night.**

Think, Talk, and Write

1. **Predict.** What do you think will happen a week after a New Moon?
2. What star is closest to Earth?
3. Draw and write about how the Moon seems to change during one month.

Art Link

Draw a pattern of stars on paper. Connect the stars. Give your star pattern a name.

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Be a Scientist

You need

calendar

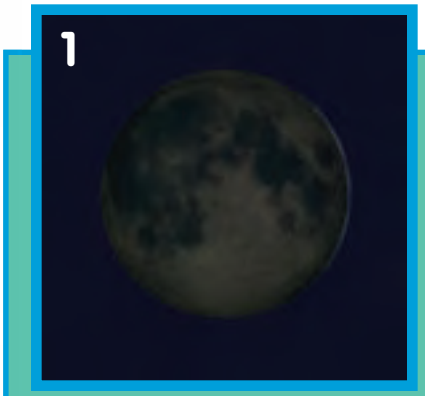
markers

How does the Moon seem to change during one month?

Find out how the Moon seems to change shape each week.

What to Do

1. **Observe.** Look outside tonight. Find the Moon in the night sky.
2. **Record Data.** Draw what the Moon looks like on today's date on the calendar.
3. Repeat steps 1 and 2 each night for a month.



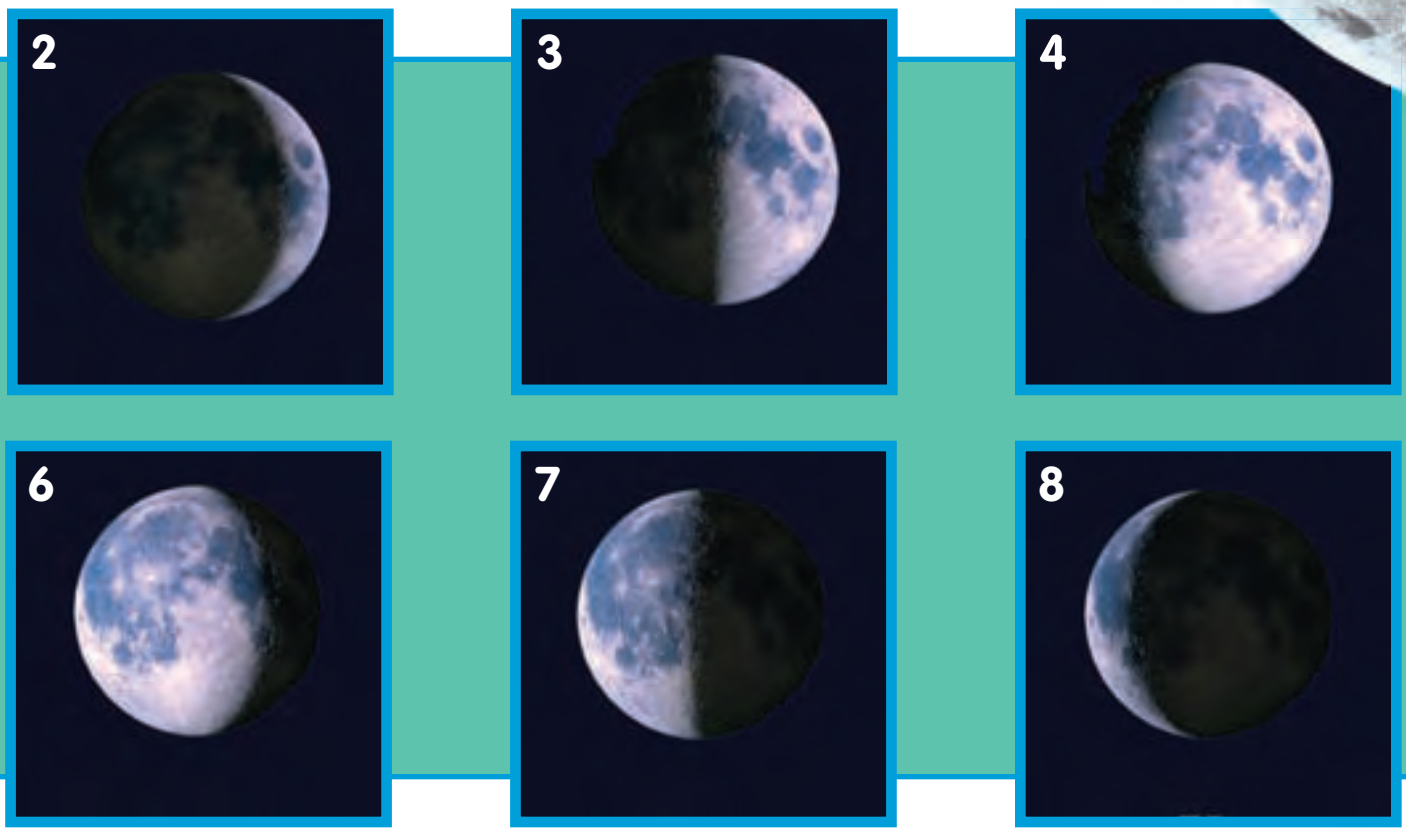
4. When did you see a Full Moon during the month? When did you see a New Moon?

5. **Draw Conclusions.** What do your drawings tell you about the phases of the Moon?

Investigate More

Predict. How would the Moon look in the sky during the next month? Test your idea. Compare it to the calendar for this month.

These photos show how the Moon seems to change during one month.



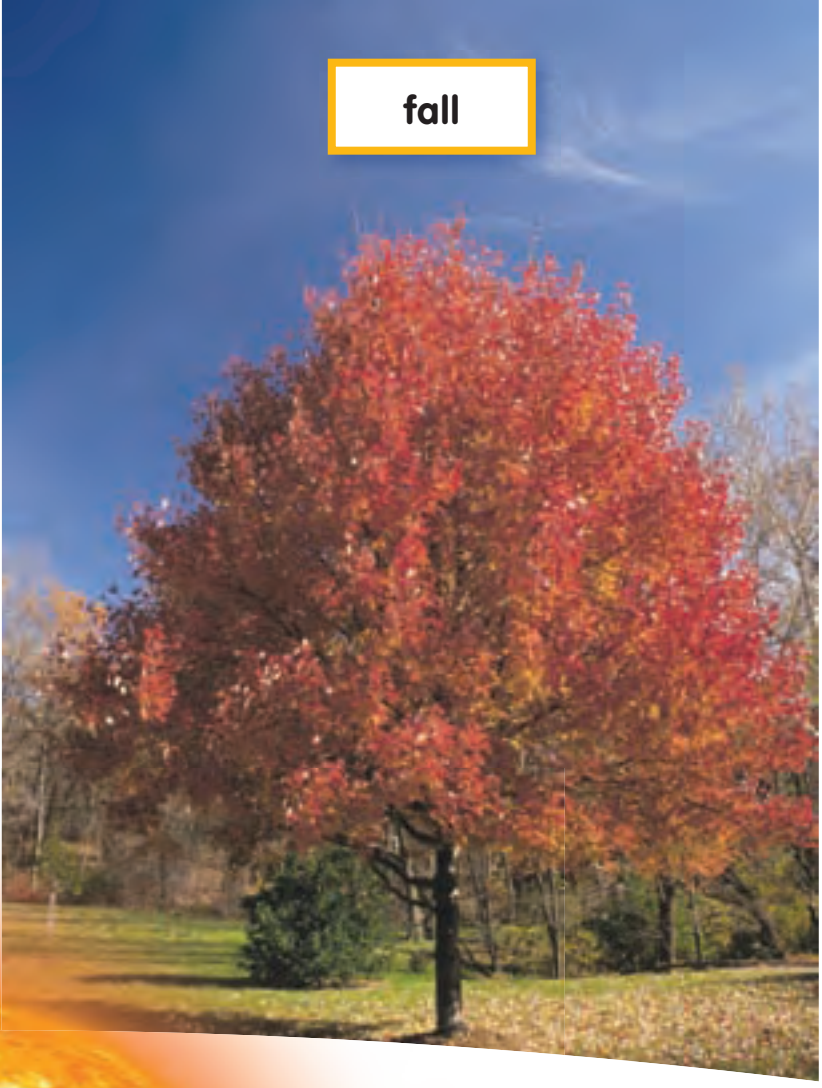
I Read to Review

Our Moving Earth

Our planet Earth is always moving. Every day it spins. It takes all day and all night for Earth to make one full turn.

When Earth has turned part of the way around, we no longer see the Sun. Now we see the Moon and stars shining in the night sky.

Every day Earth also moves farther on its trip around the Sun. The whole trip around the Sun takes a year.



Along the way Earth has four seasons. When the year is over, the trip around the Sun begins again!

CHAPTER 4 Review

Vocabulary

Use each word once for items 1–6.

- axis
- orbit
- phases
- rotates
- star
- summer

1. The hottest of the four seasons is _____.
ESS-4

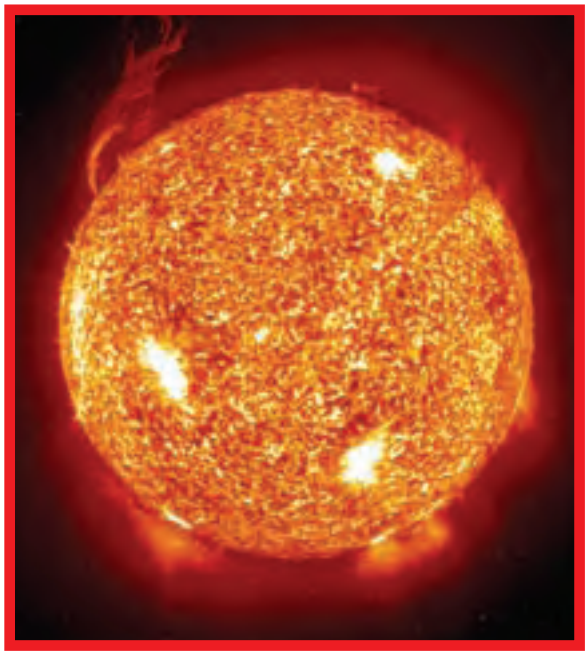
2. The Moon's changing shapes are called _____.
ESS-3

3. We have day and night because Earth _____ once every 24 hours.
ESS-A

4. A center line that an object spins around is a/an _____.
ESS-A

5. Every year Earth makes one _____ around the Sun.
ESS-A

6. This bright, hot _____ is also known as our Sun.
ESS-A



Answer the questions below.

7. What season do you think this photo shows? Why?
ESS-4

8. **Draw Conclusions.** Describe how Earth and the Moon travel around the Sun. Use balls and a flashlight to help describe what happens.
ESS-A

9. **Compare and Contrast.** What makes day and night?
ESS-A

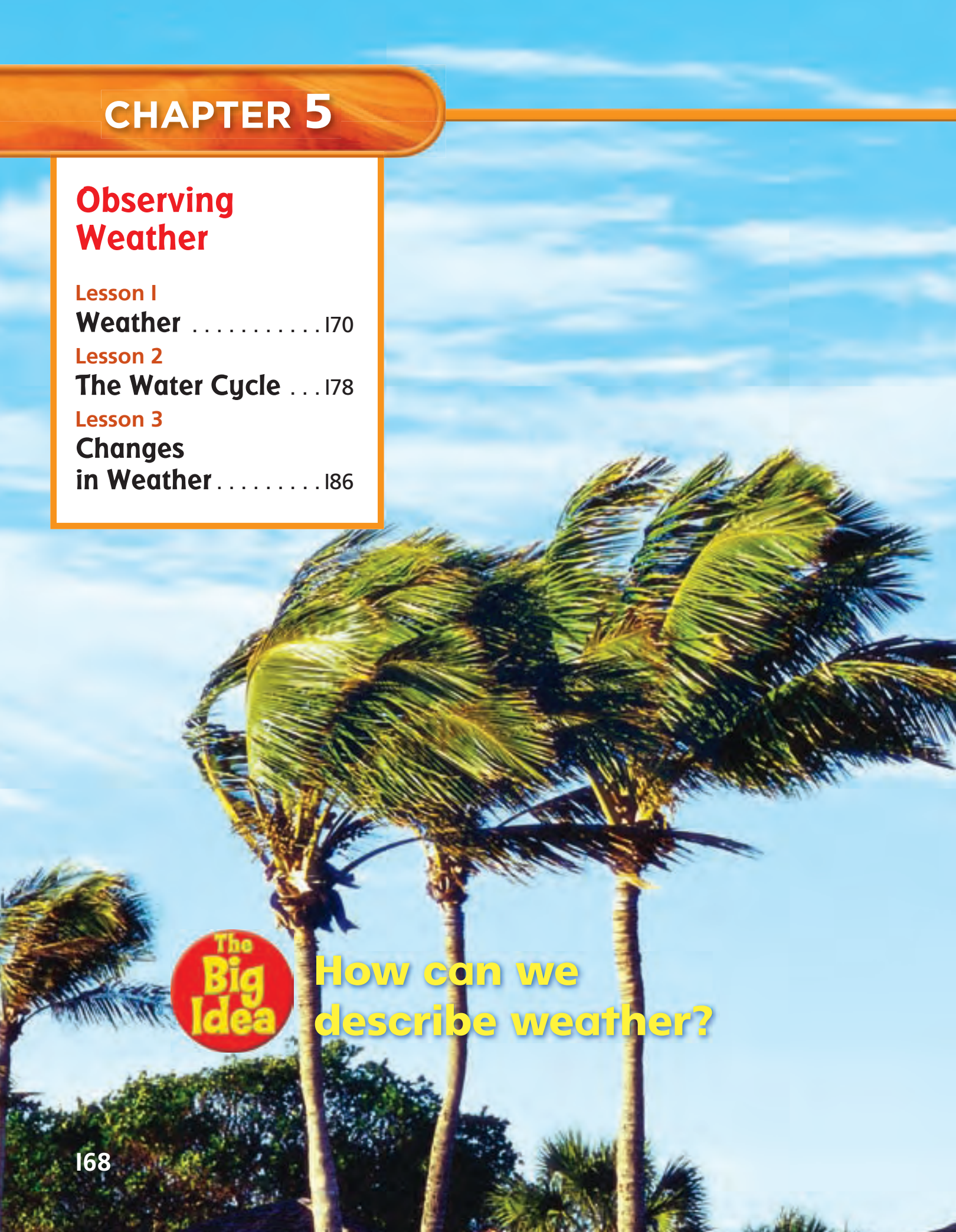
10. Where does the Moon's light come from?
ESS-A

The Big Idea

11. What can we see in the night sky?
ESS-1

CHAPTER 5

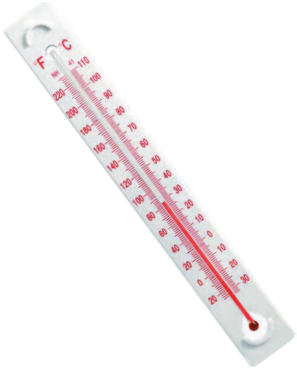
Observing Weather



The Big Idea

How can we describe weather?

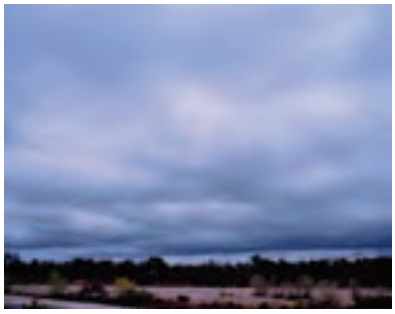
Key Vocabulary



temperature a measurement of how hot or cold something is (page 172)

precipitation water falling from the sky as rain, snow, or hail (page 173)

cumulus large, white, puffy clouds (page 188)



stratus thin clouds that form into layers like sheets (page 189)

More Vocabulary

anemometer, page 175

evaporate, page 180

condense, page 181

cirrus, page 189

ESS-C. Observe, describe, and measure changes in the weather, both long term and short term.

Lesson 1

Weather

Look and Wonder

Weather changes from day to day. How can you describe this kind of weather?

ESS-4. Observe and describe that some weather changes occur throughout the day and some changes occur in a repeating seasonal pattern. **ESS-5.** Describe weather by measurable quantities such as temperature and precipitation.

Explore

Inquiry Activity

How does the weather change each day?

What to Do

1. Make a chart with these columns at the top: Date, Temperature, Weather.
2. **Record Data.** Observe the weather each day. Record on the chart what you see. Draw any clouds you see.
3. **Compare.** After several days, compare how the weather changed from day to day.

Explore More

4. Add a column to your chart called Wind. Record how wind changes from day to day.

You need

thermometer

construction paper

Step 2

SI-8. Measure properties of objects using tools such as rulers, balances and thermometers.

Read Together and Learn

Vocabulary

temperature
precipitation
anemometer

What is weather?

When you get dressed in the morning, you might think about the weather. How hot or cold will it be outside? Is it a sunny day, or is it raining or snowing?

One way that people describe weather is by the temperature. **Temperature** describes how hot or cold something is.

This thermometer shows 70 degrees Fahrenheit (70°F) or 21 degrees Celsius (21°C).

This thermometer shows 40°F or 5°C. It is cooler, so you must dress warmly.

Another way people describe weather is by telling if it is raining. Rain, snow, sleet, and hail are all kinds of precipitation. **Precipitation** is water that falls to Earth from clouds. Each kind of precipitation can be measured in a different way.

How can you talk about weather?

Hail is chunks of ice that fall from thunderclouds.

A ruler is used to measure the depth of snow.

A rain gauge is used to measure the amount of rain that falls in one spot.

What is wind?

All around Earth there is hot and cold air. Differences between hot and cold air cause the air to move, making wind.

Wind can be strong or light. One way to measure how the wind is blowing is with a wind sock. Wind blows into the open end of a wind sock and makes it point in the direction the wind is blowing.

If the wind sock moves gently, the wind is light. If it blows out straight, the wind is strong. ▶

Quick Lab

Make a wind sock. **Observe** how strong the wind is.

Wind Sock

Read a Photo

How strong is the wind in this photograph?

People also measure the wind's speed with an **anemometer**. The cups on the anemometer catch the wind and spin. The stronger the wind is, the faster the cups spin. The anemometer keeps track of how many times the cups spin.

This scientist is using an anemometer. ▶

How can we measure wind?

Think, Talk, and Write

1. **Summarize.** How do anemometers and wind socks measure wind?
2. What are some different kinds of weather?
3. Write about and draw the different kinds of precipitation.

Social Studies Link

Research what the weather is like in another country. How is it like your weather? How is it different?

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A Snowy Day

What are these people doing on this snowy day?

Write About It

Write a story about what you might do on a snowy day. Use the photograph to help you think about what a snowy day might be like.

Remember

A story has a beginning, middle, and end. A story uses describing words.

LOG ON e –Journal Write about it online at www.macmillanmh.com

SI-6. Recognize that explanations are generated in response to observations, events and phenomena. **ELA WA 2.I.** Write stories that convey a clear message, include details, use vivid language and move though a logical sequence of steps and events.

A Sunny Day

Look carefully at the thermometer. What is the temperature in degrees Fahrenheit (°F)?

Write a Number Sentence

The weatherman predicted that the temperature will rise to 55 degrees Fahrenheit (55°F). Write a number sentence to show how many degrees Fahrenheit it will rise.

Remember

The left side of the thermometer shows Fahrenheit.

SI-9. Use whole numbers to order, count, identify, measure and describe things and experiences. **M DAP 2.4.** Write a few sentences to describe and compare categories of data represented in a chart or graph, and make statements about the data as a whole.

Lesson 2

The Water Cycle

Torres del Paine National Park, Chile

Look and Wonder

Where do you see water in this picture?

ESS-5. Describe weather by measurable quantities such as temperature and precipitation.

Explore

Inquiry Activity

Where did the water go?

What to Do

1. Fill both cups halfway with water. Mark the water levels.
2. Cover one cup with plastic wrap. Tape it to the cup. Place both cups in a sunny place.
3. **Predict.** How will the levels of water change in each cup over several days?
4. **Record Data.** Write what you see in each cup every day.
5. **Draw Conclusions.** What happened to the water levels after several days? Why?

Explore More

6. What would happen if you used twice as much water? Try it.

You need

2 cups

plastic wrap

water

tape

marker

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

Read Together and Learn

Vocabulary

evaporate

condense

How does water disappear?

When you jump into a swimming pool you feel the water on your body. This water is liquid.

But water is not always liquid. When water heats up, some of it changes into a gas we cannot see. Water can **evaporate**, or change from a liquid to a gas. The gas travels in the air as water vapor.

Liquid water from the pond evaporates into water vapor in the air.

FACT Clouds form everywhere, not just over water.

These clouds are made of droplets of water.

water vapor

Water vapor rises in warm air. As the air cools, it can no longer hold the water vapor. So the water changes again!

This time, the water vapor will **condense**, or turn back into liquid. The water forms into tiny droplets. Sometimes these droplets form clouds.

How can water change forms?

What is the water cycle?

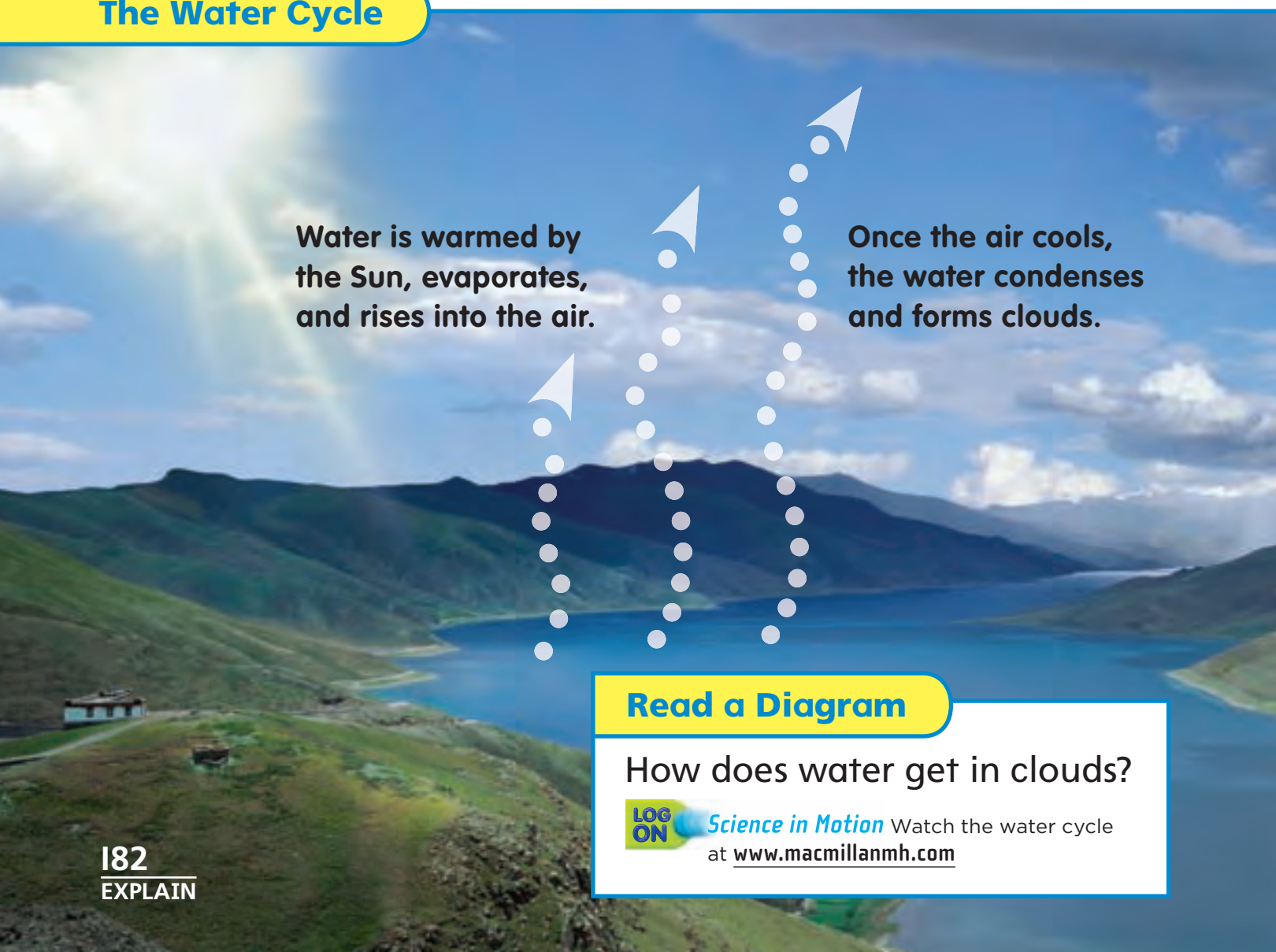
Water evaporates from oceans, rivers, and lakes. Then the water condenses into clouds and falls as precipitation. We call these changes the water cycle. All over Earth, water is always moving through the water cycle.

Quick Lab

Make a model of the water cycle. Observe how hot water changes in a closed container.

How does water vapor move back down to Earth?

The Water Cycle



Read a Diagram

How does water get in clouds?

LOG ON *Science in Motion* Watch the water cycle at www.macmillanmh.com

Think, Talk, and Write

1. **Cause and Effect.** What happens in the water cycle?
2. What happens when water evaporates?
3. Write about how water changes when it evaporates and condenses.

Music Link

Write a song about water vapor and clouds.

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Inquiry Skill: Predict

When you **predict**, you use what you know to tell what you think will happen.

▶ Learn It

Kendra needs to decide which footwear she should wear outside. What do you think she will choose?

What I Know

I know it's raining outside.

What I Predict

I predict that Kendra will wear her rain boots.

Try It

1. Look through this window and at the thermometer. What type of weather do you think is coming?

2. What information did you use to help you predict?

3. **Write About It.** What do you need to wear to keep warm on a cold day? Write a story about it.

SI-2. Ask "how do you know" questions (not "why" questions) in appropriate situations and attempt to give reasonable answers when others ask questions.

Lesson 3

Changes in Weather

Owens Valley, California

Look and Wonder

Look at the sky. Did you know that clouds can help predict weather?

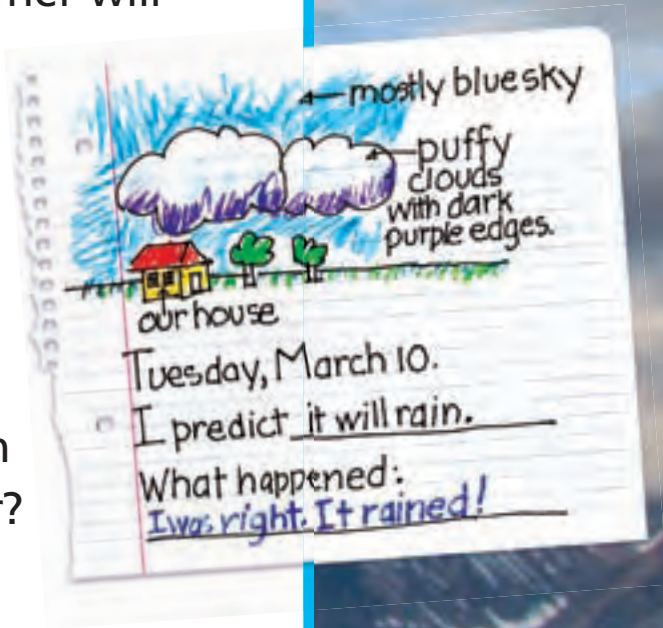
ESS-4. Observe and describe that some weather changes occur throughout the day and some changes occur in a repeating seasonal pattern. **ESS-5.** Describe weather by measurable quantities such as temperature and precipitation.

Explore Inquiry Activity

How can clouds help predict the weather?

What to Do

1. **Observe.** Look carefully at the sky every day this week.
2. **Record Data.** Draw the kinds of clouds you see each day for a week. Write the date next to each picture. Then predict what the weather will be like tomorrow.
3. The next day, record what the weather is like. Draw the clouds and the date. Was your prediction from the day before correct?
4. **Draw Conclusions.** How can clouds help predict weather?



Explore More

5. **Predict.** Write a weather report for the next week. Why is tomorrow's weather the easiest day to predict?

SI-6. Recognize that explanations are generated in response to observations, events and phenomena.

Read Together and Learn

Vocabulary

cumulus
cirrus
stratus

What are different kinds of clouds?

Not all clouds look the same. There are different kinds of clouds. Each means a different type of weather may be coming.

Cumulus clouds are small, white puffs. Cumulus clouds may appear in long, rippled rows.

▼ **Cumulus clouds are often seen in spring and summer. Small, puffy cumulus clouds mean good weather.**

FACT Not all clouds are rain clouds.

▲ **When you see cirrus clouds, it usually means that the weather will change within the next day.**

Cirrus clouds are thin clouds very high in the sky. They are made of ice. The wind blows cirrus clouds into wispy streams.

Stratus clouds are often low in the sky. They come in sheets and cover the entire sky. Stratus clouds can be thick or thin.

Which cloud type is best for the day of a picnic?

▲ **When you see stratus clouds, it usually means that a storm with rain or snow is coming.**

How can we stay safe from weather?

When different types of air come together, the weather changes. Storm clouds can grow thick and lightning can form in them.

Stay safe in dangerous weather. Pay attention to weather reports. During storms, do not go outside near tall objects where lightning may strike.

Quick Lab

Use a paper bag to **make a model** of a thunder sound.

Lightning Safety

Avoid open spaces.

Stay out of water.

Do not stand under trees.

Stay indoors.

Read a Chart

Where should you go in a storm?

Sometimes storms become very strong. They can turn into hurricanes and cause disasters. Strong thunderstorms can make spinning columns of air called tornadoes.

Tornadoes can pick up large objects from the ground and damage property.

How can weather change?

Think, Talk, and Write

1. **Main Idea and Details.** How can clouds help people predict the weather?
2. What kinds of clouds predict a storm is coming?
3. Draw and write about a storm you have seen.

Social Studies Link

Make a short skit or commercial showing how to prepare for severe weather.

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Real World Reading in Science

Predicting Storms

weather balloon

Even on a sunny day, dangerous thunderstorms can happen quickly. Knowing that a storm is coming is very useful. If there is lightning, you would know to stay inside and not use electricity.

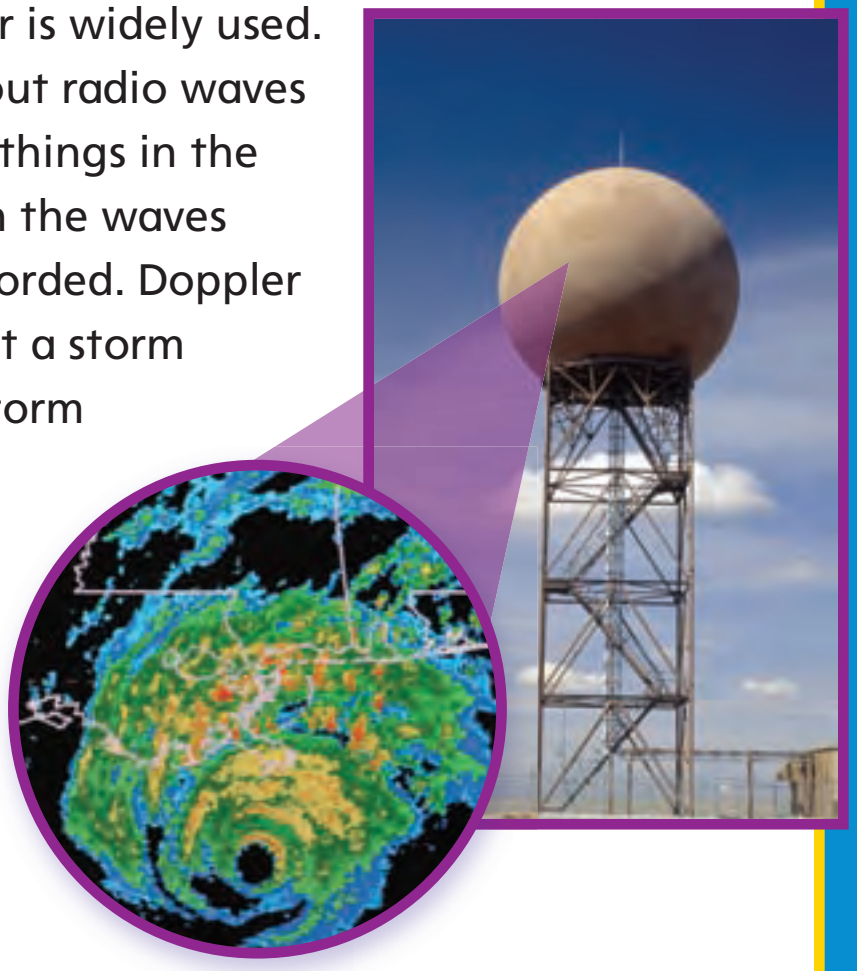
If there is a flood, you would know what to do. You can go to a higher floor in your home. How do scientists predict storms?

ESS-5. Describe weather by measurable quantities such as temperature and precipitation. **ELA RP 2.4.** Summarize text by recalling main ideas and some supporting details.

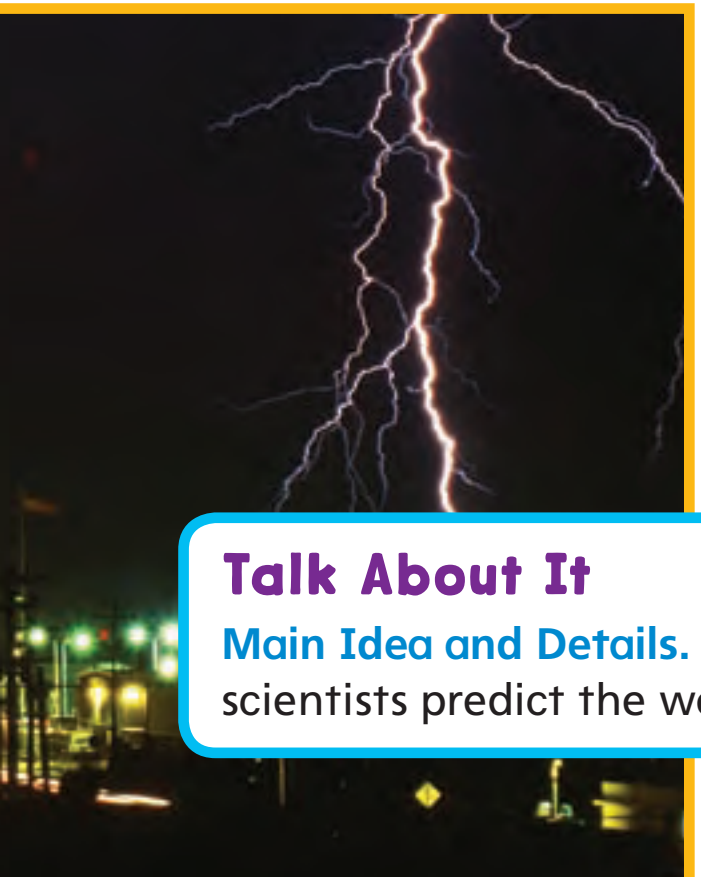
1892: Weather balloons are first used. Weather balloons can float high above Earth. As the balloons travel, they collect data about wind and weather conditions that might lead to storms.

▼ **Doppler radar**

Mid-1990's: Doppler radar is widely used. Radar is a tool that sends out radio waves into the air. The waves hit things in the air, such as raindrops. Then the waves come back. The data is recorded. Doppler radar can measure how fast a storm is moving and where the storm is going.



▲ **Doppler radar recorded this image of a hurricane.**



Talk About It

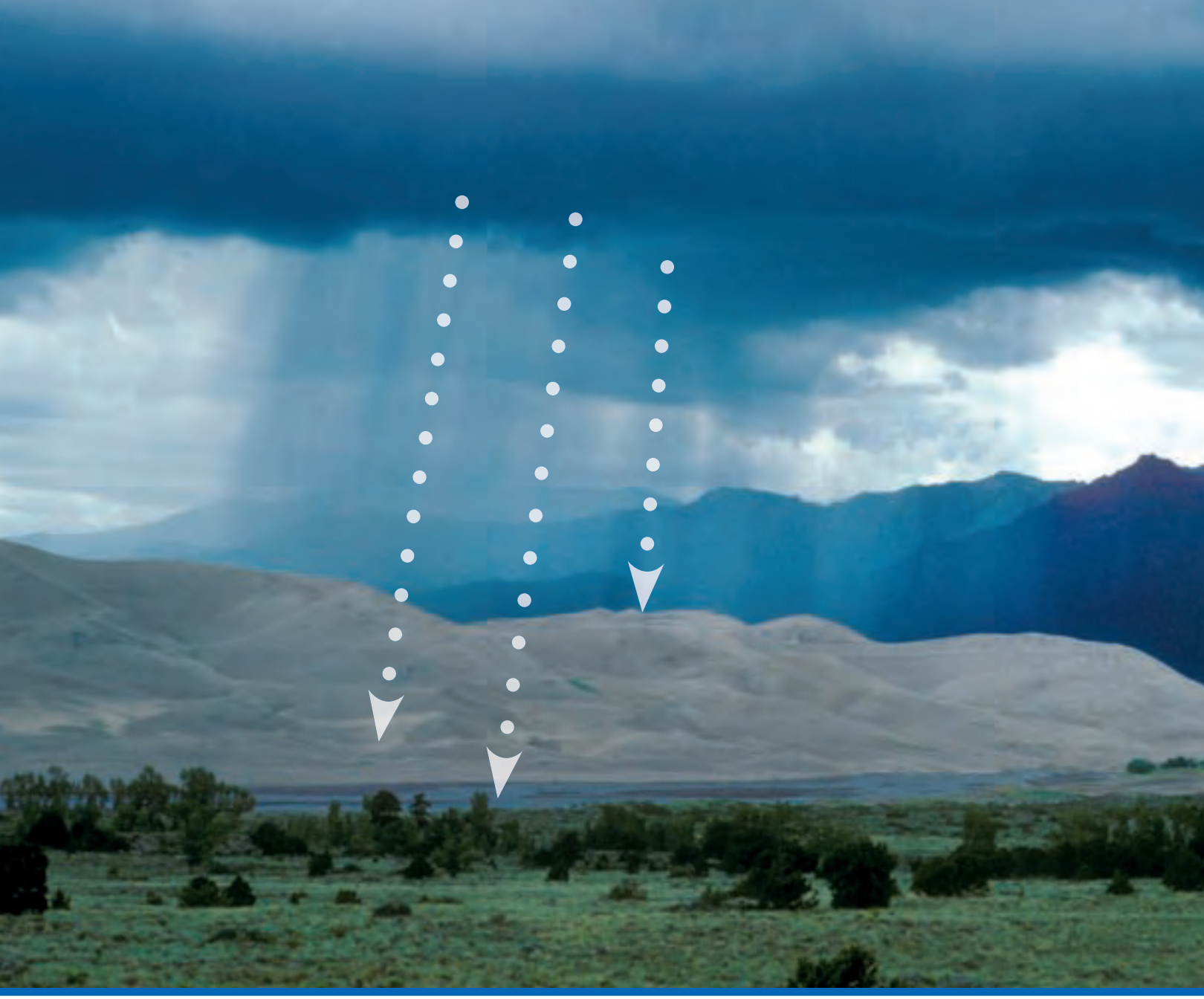
Main Idea and Details. How do scientists predict the weather?

I Read to Review

Earth's Water Cycle

There is a lot of water on Earth! There is water in oceans, rivers, and ponds. When water on Earth warms, some evaporates, or turns into water vapor. Water vapor rises in the air.

When water vapor cools, it forms clouds. There are many types of clouds. Some are thick and some are thin. Some are high in the sky and some are low.



When clouds get heavy, precipitation falls to Earth. Precipitation can be rain, hail, sleet, or snow. There can be storms with lightning and thunder. Look out, a storm is coming!

The storm is over now. The rain has stopped falling. The ground is still wet, but the Sun is coming out. The Sun will warm Earth's water and start the cycle again.

CHAPTER 5 Review

Vocabulary

Use each word once for items 1–6.

condense
cumulus
evaporate
precipitation
stratus
temperature

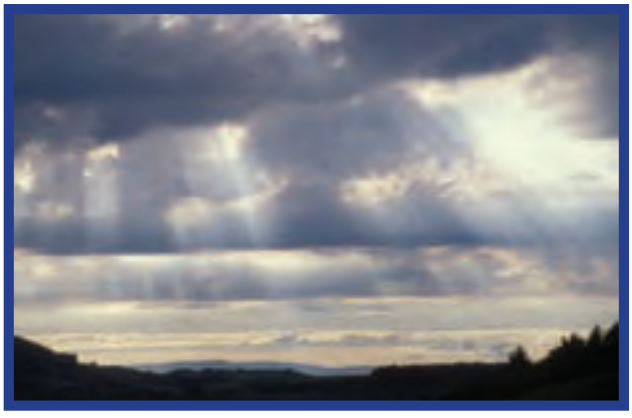
1. When water vapor starts to _____ it turns into a liquid.

2. The _____ tells how hot or cold it is.
ESS-5

3. Rain and snow are kinds of _____.
ESS-4

4. Small, white puffy clouds are called _____ clouds.
ESS-4

5. You can see the Sun through these _____ clouds.
ESS-4



6. Water can _____. It becomes water vapor and goes into the air.
ESS-4

Answer the questions below.

7. **Predict.** Look at the photo. What kind of weather is coming?
ESS-4

8. **Summarize.** Describe the water cycle.

9. What do clouds tell us about weather?
ESS-4

10. What tools can we use to measure weather?
ESS-5

The Big Idea

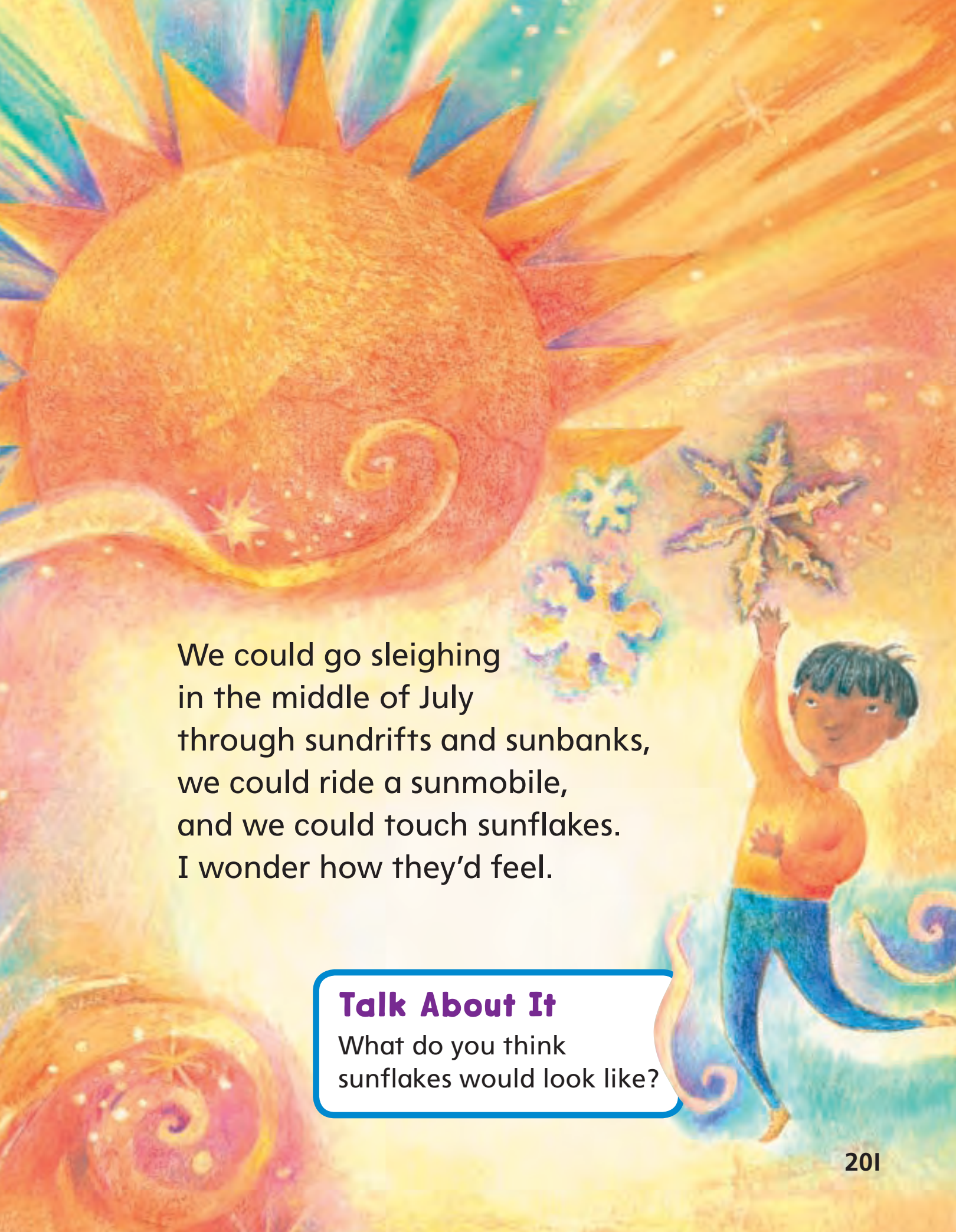
11. How can we describe weather?
ESS-5

Literature
Poem

Sunflakes

by Frank Asch

If sunlight fell like snowflakes,
gleaming yellow and so bright,
we could build a sunman,
we could have a sunball fight,
we could watch the sunflakes
drifting in the sky.



We could go sleighing
in the middle of July
through sundrifts and sunbanks,
we could ride a sunmobile,
and we could touch sunflakes.
I wonder how they'd feel.

Talk About It

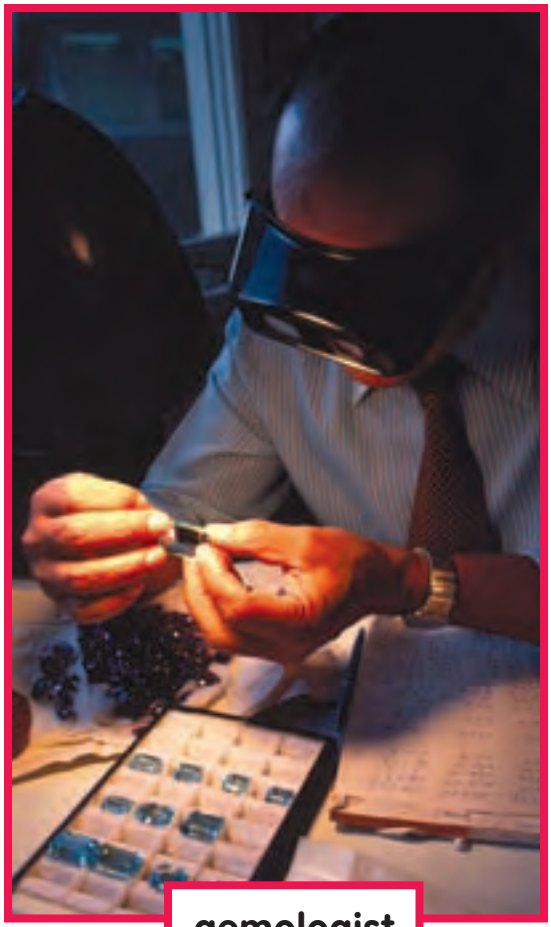
What do you think
sunflakes would look like?

Gemologist

Have you seen people wearing rings or earrings with colorful stones in them? Many of these stones are called gems. Gemologists are scientists who study gems.

Gems are hard and rare minerals that are known for their beauty. Sapphires, emeralds, and diamonds are some gems.

The job of a gemologist is to identify a gem and to find out its quality and value. Gemologists use special tools to identify gems and see if they have cracks in them.



gemologist

More Careers to Think About

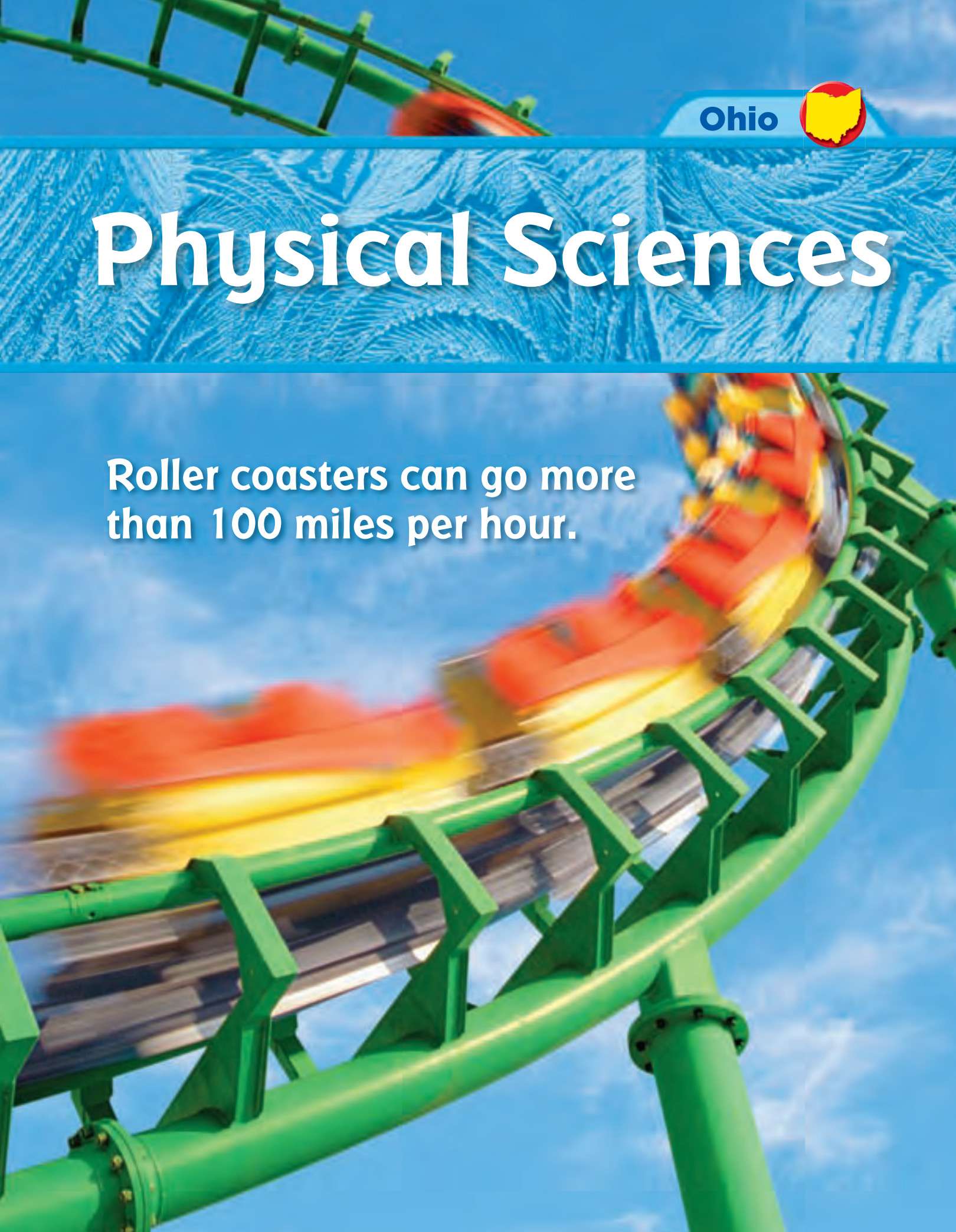
jewelry designer

volcanologist

LOG ON e-Careers at www.macmillanmh.com

Ohio

Physical Sciences



Roller coasters can go more than 100 miles per hour.

MARBLEHEAD LIGHTHOUSE

light beams from a lighthouse

A Lake Lighthouse

Marblehead Lighthouse in Marblehead, Ohio is one of the oldest lighthouses on the Great Lakes. It has been working since I822. Its light can be seen up to 20 kilometers (II miles) away.

Lighthouses are used as guides for boats and small planes. They help keep ships safe from dangerous coastlines and shallow water.

Source of Light

The earliest lighthouses used fire or candles for light. Next came lamps that burned oil. These lamps were placed in a reflector. Reflectors made the light brighter. Now many lighthouses use electric lights.

Think, Talk, and Write

Critical Thinking What are some other sources of light?

Ohio

A CLOSER LOOK

Main Idea

You see objects because light reflects off of them. Lighthouses help guide ships and planes.

Activity

Compare Look at a lighthouse and a street lamp.

- How are these sources of light alike? Different?
- Share your answers with your classmates.

PS–3. Explore with flashlights and shadows that light travels in a straight line until it strikes an object.

Dayton Philharmonic Orchestra

cello

timpani drum

The Orchestra Stage

The Dayton Philharmonic Orchestra plays in the Mead Theater at the Schuster Center. The sounds they make travel through the air. People in the theater hear the sounds. The sounds from different instruments combine to make music.

Good Vibrations

The sounds in music come from things that vibrate. High sounds come from things that vibrate quickly. Low sounds come from things that vibrate slowly.

The mouth piece on an oboe vibrates when you blow air through it. A viola string vibrates when you pluck it. You use a mallet to hit the timpani drums. The drums make a very loud sound!

Think, Talk, and Write

Critical Thinking What makes a sound high or low? Loud or soft?

Ohio

A CLOSER LOOK

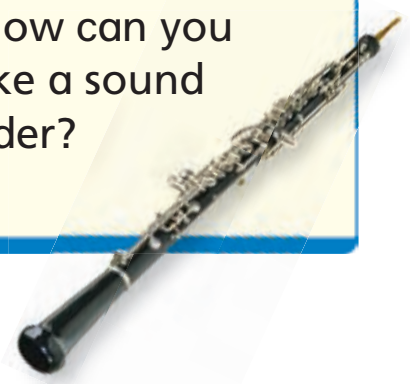
Main Idea

The sounds of an orchestra are made by vibrating instruments.

Activity

Predict What are some ways that you can make music?

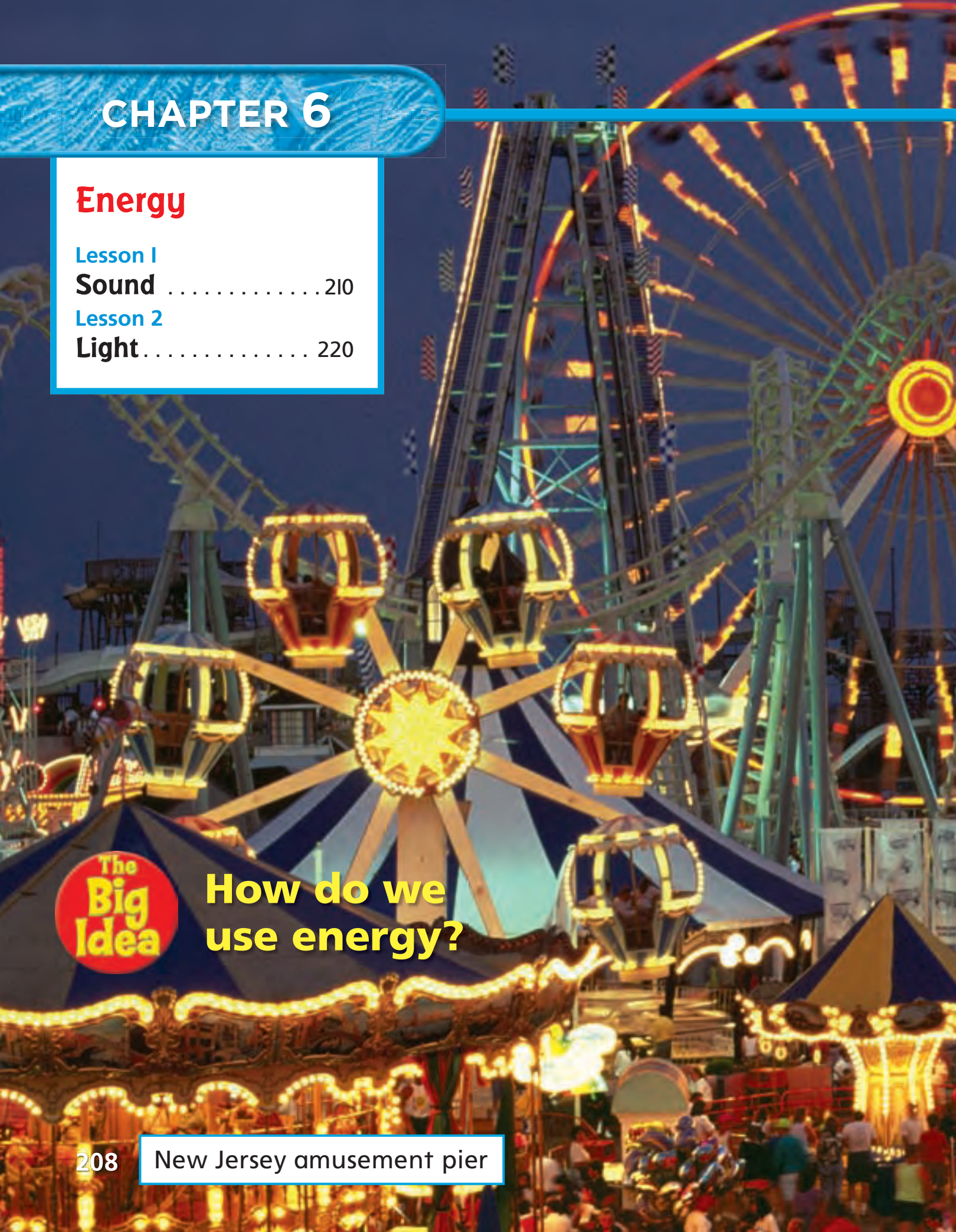
- Make your own musical instrument.
- How can you make its pitch higher or lower?
- How can you make a sound louder?



PS-1. Explore how things make sound . . . **PS-2.** Explore and describe sounds . . . produced by vibrating objects.

CHAPTER 6

Energy



The Big Idea

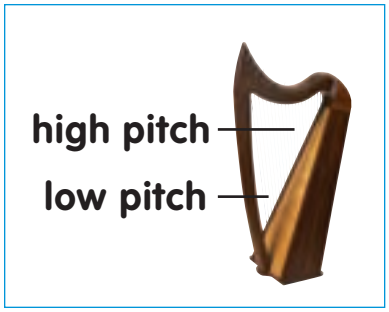
How do we use energy?

New Jersey amusement pier

Key Vocabulary

sound A type of energy that is heard when objects vibrate. (page 212)

vibrate to move back and forth quickly (page 213)



pitch How high or low a sound is. (page 215)

light A kind of energy that lets us see. (page 222)

More Vocabulary

reflect, page 222

PS-B. Recognize that light, sound and objects move in different ways.
PS-C. Recognize sources of energy and their uses.

Lesson 1

Sound

Look and Wonder

Keep the noise down! How are sounds made? How can some sounds be different from others?

PS-1. Explore how things make sound (e.g., rubber bands, tuning fork and strings). **PS-2.** Explore and describe sounds (e.g., high, low, soft and loud) produced by vibrating objects.

Explore

Inquiry Activity

How is sound made?

What to Do

1. Tie the string to the paper clip. Make a hole in the bottom of the cup.
2. Pull the string through the hole. The clip keeps the string from pulling through the cup.
3. Wear goggles. Hold the cup and string with a partner. The third partner snaps the string.
4. **Observe.** What happens? How did you make sound?

Explore More

5. **Predict.** How will the sound be different if you change the length of the string? Try it.

You need


string


paper cup


goggles


paper clip

SI-4. Use appropriate safety procedures when completing scientific investigations.

Read Together and Learn

Vocabulary

sound
vibrate
pitch

SCIENCE QUEST Explore sound with the Treasure Hunters.

What makes sound?

Ring! A loud alarm clock wakes you up each morning. How do you hear it? **Sound** is a kind of energy that we can hear.

▲ **When the bells on the alarm clock are hit, they move back and forth quickly.**

How We Hear Sound

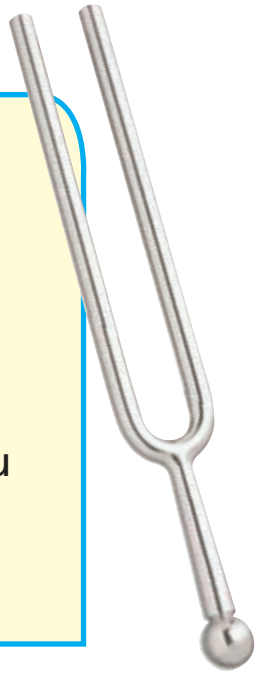
▶ **The guitar strings vibrate and make the air around them vibrate.**

Sound energy is made when objects **vibrate**. When an object vibrates, it moves back and forth quickly. When something vibrates, air around the object vibrates also.

The eardrum is the part of our body we use to hear sounds. Messages sent from your ear to your brain tell you what sound you heard.

Quick Lab

Use a tool called a tuning fork. **Observe** what happens when you strike it and place it in water.



How do you hear sounds?

Read a Diagram

How did the sound travel from the guitar to the boy's ear?

LOG ON *Science in Motion* Watch how sound travels at **www.macmillanmh.com**

These vibrations move to your eardrum so you can hear the sound of the guitar.

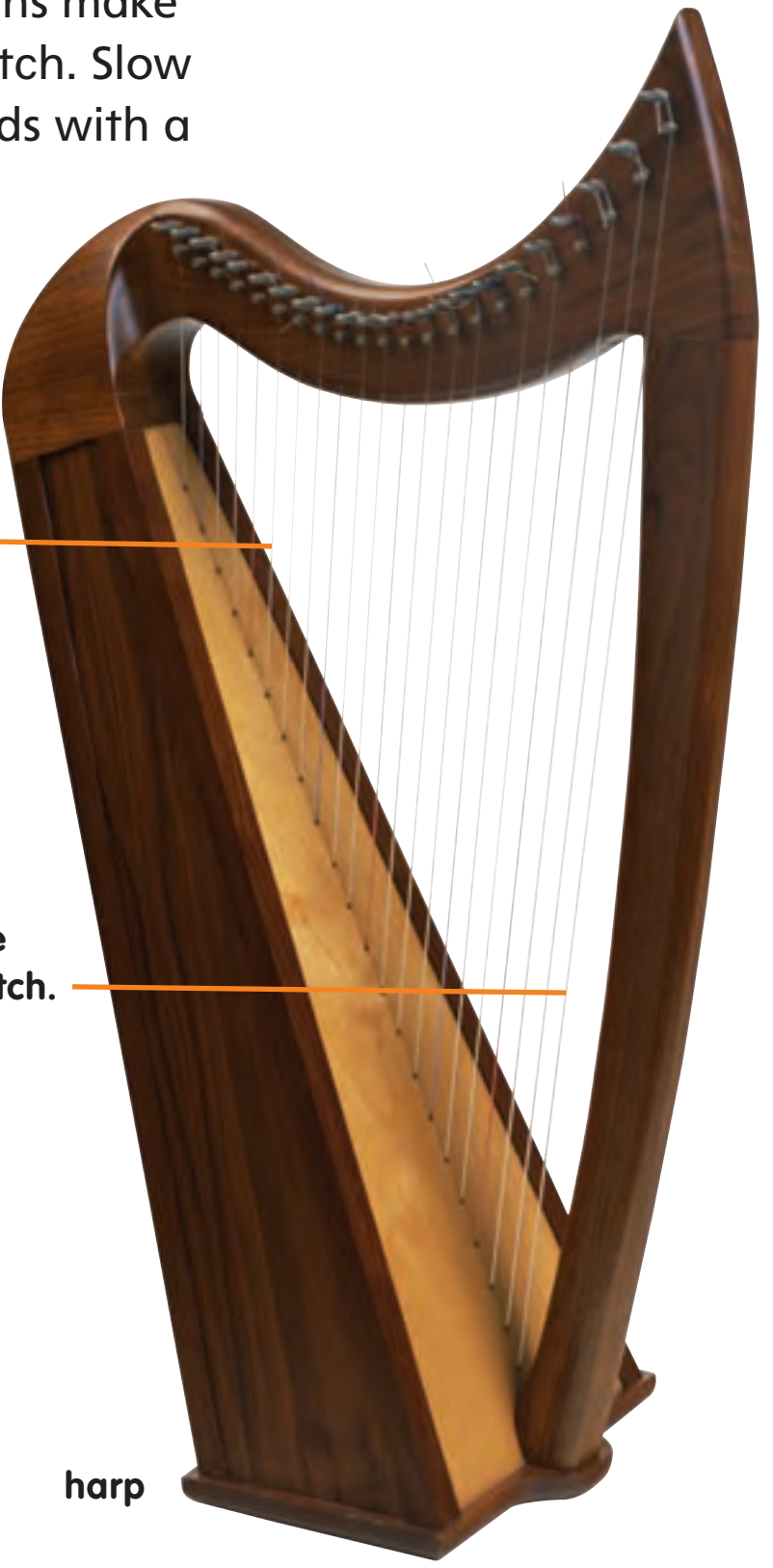
How are sounds different?

Not all sounds are the same. You hear loud and soft sounds every day. You can make your voice loud or soft. A whisper has less energy than a shout. Try making loud and soft sounds.

▲ **Small vibrations make soft sounds. The meow of a cat sounds soft.**

▼ **Big vibrations make loud sounds. The roar of a lion sounds loud.**

Pitch is how high or low a sound is. Fast vibrations make sounds with a high pitch. Slow vibrations make sounds with a low pitch.



- **If you snap a short, tight string, it makes a high pitch.**
- **If you snap a long, loose string, it makes a low pitch.**

How is a high pitch made?

harp

FACT Some sounds cannot be heard by humans.

What do sounds move through?

Place your ear against your desk. Now gently tap the desk with your pencil. You hear vibrations through the wood of the desk. Sound moves through solids, such as wood or plastic.

Sound moves through liquids also. Have you ever heard sound under water? The water vibrates and you hear sound.

▼ **Dolphins and other animals make sounds under water to communicate with each other.**

Most sounds you hear move through air. Air is made of gases. The closer you are to a sound, the louder it sounds. The farther you are from a sound, the softer it sounds.

▲ **How can you tell when a fire engine is close by or far away?**

What can sounds move through?

Think, Talk, and Write

1. **Problem and Solution.** How would you get a guitar string to make a sound with a high pitch?
2. Why do your hands make a sound when you clap them together?
3. Write about how you would make a sound louder.

Music Link

Make your own musical instruments. Stretch rubber bands around a plastic cup. Vibrate the rubber bands to make different pitches.

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Sound Off!

Think about the sounds you hear every day. Some sounds are loud and others are soft. Some sounds are high and others are low.

Write About It

Describe the pitch and volume of a sound you hear every day. How do we use sounds? Why are sounds important?

Remember

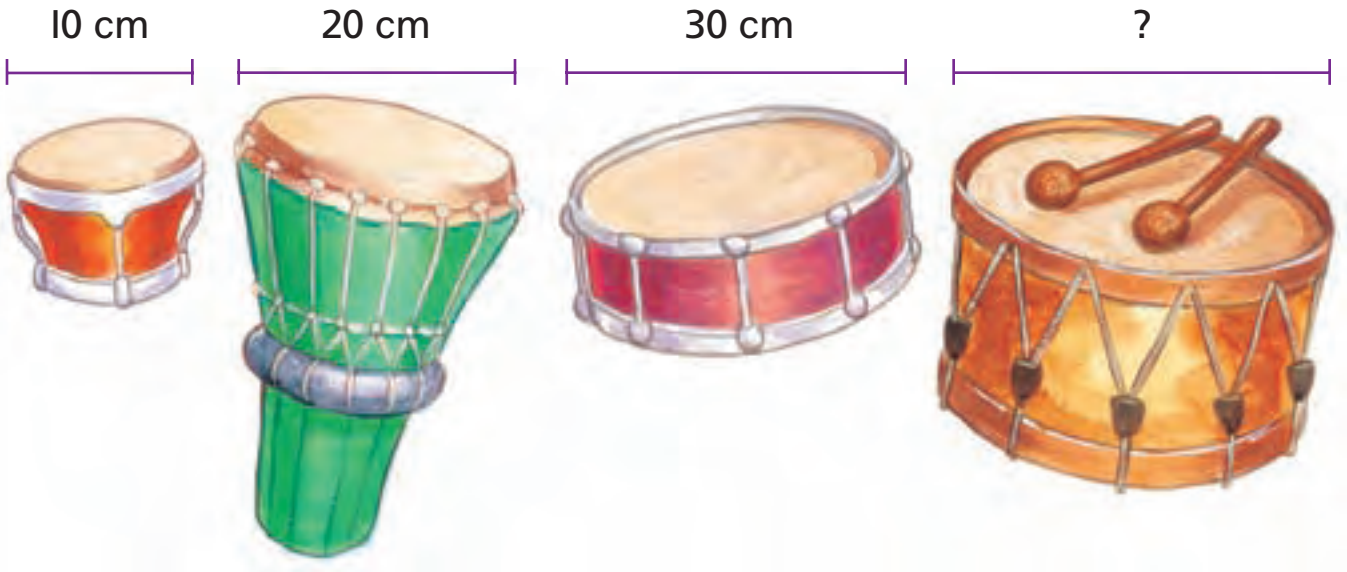
When you describe something, you give details.

LOG ON e –Journal Write about it online at www.macmillanmh.com

PS-2. Explore and describe sounds (e.g., high, low, soft and loud) produced by vibrating objects. **ELA WA 2.4.** Produce informal writings (e.g., messages, journals, notes and poems) for various purposes.

Drum Fun

Miss Lee sells four different drums in her store. The first drum is 10 centimeters wide. The second drum is 20 centimeters wide. The third drum is 30 centimeters wide.



Follow the Pattern

How wide is the fourth drum?
Follow this number pattern:
10 + 10 = 20
20 + 10 = 30
30 + ? = ?

Miss Lee knows that the smallest drum has the highest pitch. Which drum has the lowest pitch?

Remember

You can use a pattern to help you solve problems.

M PFA 2.2. Use patterns to make generalizations and predictions; e.g., determine a missing element in a pattern **SI-9.** Use whole numbers to order, count, identify, measure and describe things and experiences.

Lesson 2

Light

Look and Wonder

Where is this light coming from?
What is blocking some of the light?

PS-3. Explore with flashlights and shadows that light travels in a straight line until it strikes an object.

Explore

Inquiry Activity

What does light pass through?

What to Do

1. **Predict.** Which materials will light pass through? Which will block the light?
2. Work with a partner. Hold up the cardboard. Hold plastic wrap three inches in front of the board. Your partner shines the flashlight on the object.
3. **Observe.** Did the plastic wrap block the light or did the light pass through it?
4. **Compare.** Which objects block the light and which let light pass through?

Explore More

5. **Predict.** What might happen with other classroom items? Try it.

You need

flashlight

cardboard

plastic wrap

various items

Step 2

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

Read Together and Learn

Vocabulary
light
reflect

What is light?

You need light to see things. **Light** is a kind of energy. You see things because light will **reflect**, or bounce off things around you. Light that reflects off objects enters your eyes. Then you can see the objects.

Some sources of light are the Sun, lightbulbs, and flashlights. Most light on Earth comes from the Sun.

Smooth, shiny objects such as mirrors reflect a lot of light.

Have you ever made a shadow on a wall? A shadow is a dark area where light does not reach.

Different objects let different amounts of light through. A book is a solid object. It can block light and make a shadow. Glass is clear. It does not make a shadow because light passes through it.

Shadows

Read a Photo

How is this shadow made?

What are some sources of light?

How do we see color?

Did you know light can bend? Light is a mix of all colors. When white light bends, it separates into different colors. Then we can see the colors of the rainbow.

A prism is an object that can make light bend.

Quick Lab

Use a prism and sunlight to see the colors of the rainbow. **Observe** and draw what you see.

prism

Raindrops can act like prisms and separate light to make rainbows.

Have you ever seen colored lights? A filter is a tool that lets only certain colors of light pass through it.

Some filters let only one color pass through. A red filter blocks all colors except red. You see only red light with a red filter.

Colored glass makes a white light look red, green, or yellow.

What color is most light we see?

Think, Talk, and Write

1. **Sequence.** What happens when we see objects?
2. What kind of objects make shadows?
3. Write a list of things that light can not pass through.

Art Link

Make a filter. Cover a flashlight with colored plastic wrap. Then make shadow puppets!

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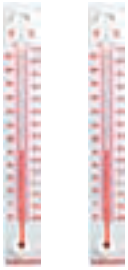
You need

black cloth

white cloth



2 thermometers

clock

How does sunlight affect the temperature of light and dark objects?

What to Do

1. Record the temperature of each thermometer on a chart. Wrap one thermometer in black cloth as shown. Wrap the other in white cloth.

2. Place the wrapped thermometers on a sunny windowsill. Wait 15 minutes.

3 **Compare.** Feel each cloth with your hands after 15 minutes. Which color cloth feels warmer?

4 **Predict.** Which color will have the higher temperature? Why do you think so?

5 **Record Data.** Unwrap each cloth and record each temperature on the chart.

6 Compare the temperatures. What happened to the temperature of each cloth? Was your prediction correct?

Investigate More

Compare. What other dark colors and light colors can you test? Make a plan and test it.

SI-3. Explore and pursue student-generated "how" questions.
SI-8. Measure properties of objects using tools . . .

I Read to Review

Energy Poem

Some energy can be seen.
Some energy can be felt.
Heat is a kind of energy that
can make solids melt.

Sound is a kind of energy.
I hear pitches high and low.
I hear because of vibrations,
small, big, fast, and slow.

Light is a kind of energy.
Light can bounce and bend.
I block light to make shadows.
I see white when all colors blend.

Electricity is a kind of energy.
It makes many things run.
Without electricity, my toy
would be no fun!

CHAPTER 6 Review

Vocabulary

Use each word once for items 1–5.

light
pitch
reflect
sound
vibrate

1. Sound is made when objects _____.
PS-2

2. _____ is how high or low a sound is.
PS-2

3. Energy that can be heard is called _____.
PS-1

4. When light bounces off objects, the light will _____.
PS-3

5. Energy that we can see is called _____.
PS-3

Answer the questions below.

6. What happens to a sound when it moves away from you?
PS-B

7. **Compare.** How does sound move through different materials?
PS-B

8. What can light do?
PS-B

9. **Main Idea and Details.** Why can you see a rainbow with a prism?
PS-3

The Big Idea

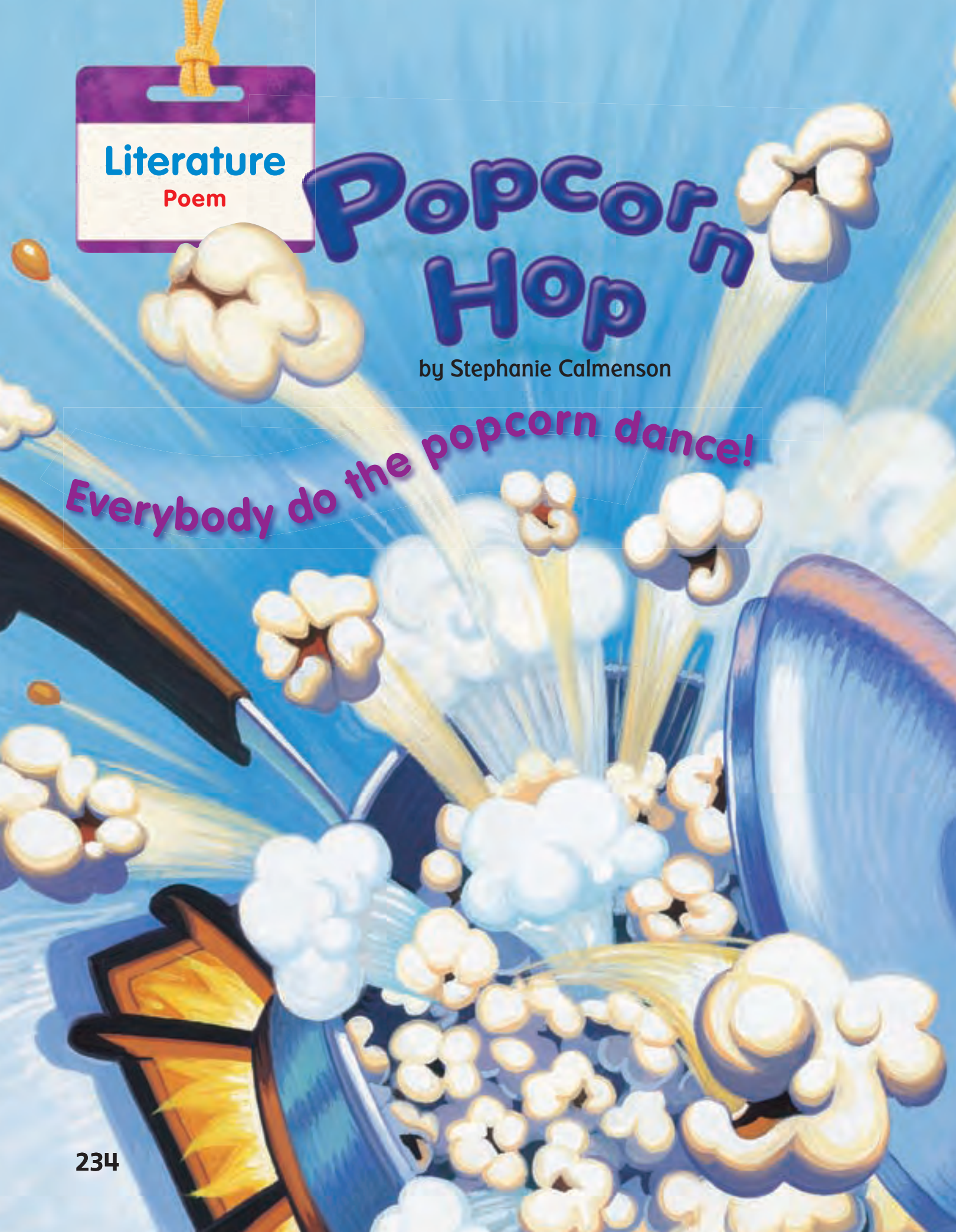
10. How do we use energy?
PS-B, PS-C

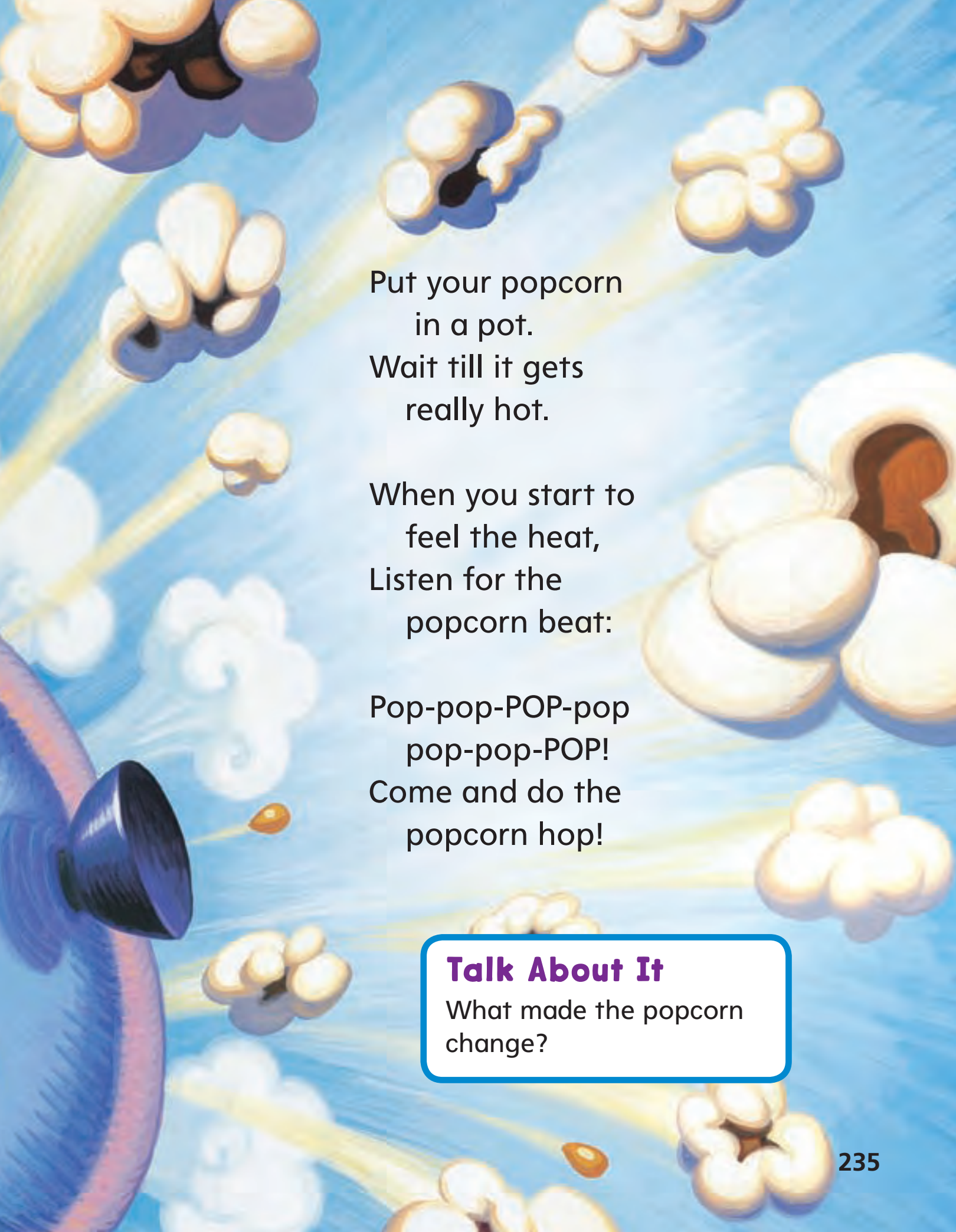
Literature
Poem

Popcorn Hop

by Stephanie Calmenson

Everybody do the popcorn dance!





Put your popcorn
in a pot.
Wait till it gets
really hot.

When you start to
feel the heat,
Listen for the
popcorn beat:

Pop-pop-POP-pop
pop-pop-POP!
Come and do the
popcorn hop!

Talk About It

What made the popcorn change?

Food Chemist

Would you like to make your own cereal or flavor of juice? You could become a food chemist. Food chemists explore ways to make new and more delicious foods.

Food chemists learn how to make yogurt smooth. They find out how to keep cereal crunchy. They might find a way to freeze vegetables so they taste fresher. Food chemists have to understand the science of how food products are made.

food chemist

More Careers to Think About

nutritionist

chef

LOG ON e-Careers at www.macmillanmh.com

Reference

Science Handbook

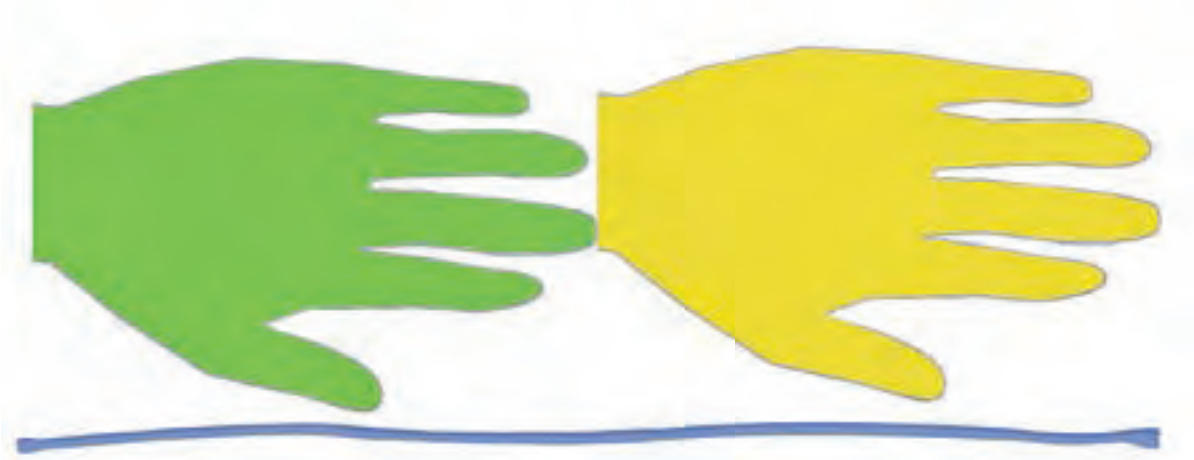
Health Handbook

Measurements

Nonstandard

You can use objects to measure the length of some solids. Line up objects and count them. Use objects that are alike. They must be the same size.

▲ **This string is about 8 paper clips long.**



▲ **This string is about 2 hands long.**

Try It

Measure a solid in your classroom. Tell how you did it.

Standard

You can also use a ruler to measure the length of some solids. You can measure in a unit called **centimeters**.

This toy is about 8 centimeters long. This is written as 8 cm.

You can also use a ruler to measure in a unit called **inches**. One inch is longer than I centimeter.

This toy is about 3 inches long. This is written as 3 in.

Try It

Estimate the length of this toy car. Then find its exact length.

Measurements

Volume

You can measure the volume of a liquid with a **measuring cup**. Volume is the amount of space a liquid takes up.

▲ **This measuring cup has 1 cup of liquid.**

Mass

You can measure mass with a **balance**. The side that has the object with more mass will go down.

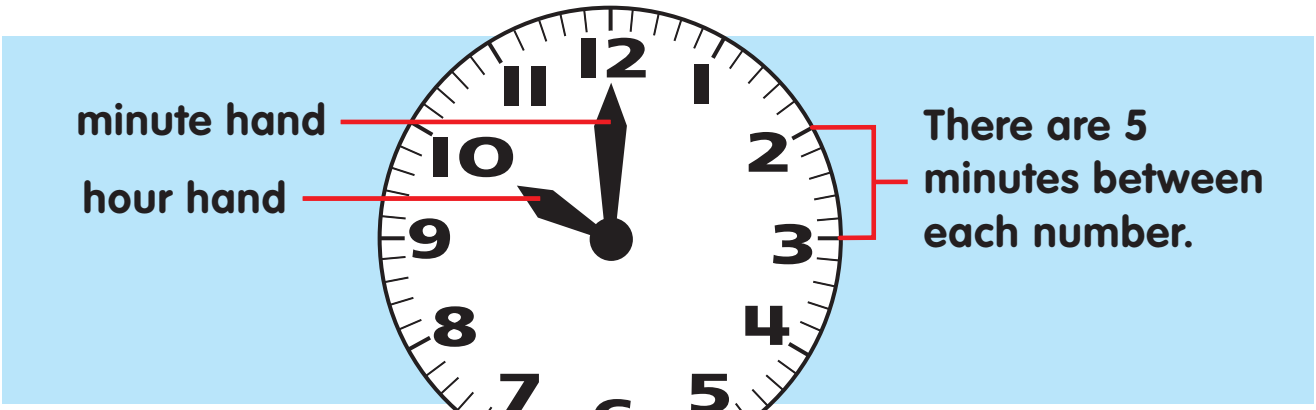
▲ **Before you compare the mass of two objects, be sure the arrow points to the line.**

Try It

Place two objects on a balance. Which has more mass?

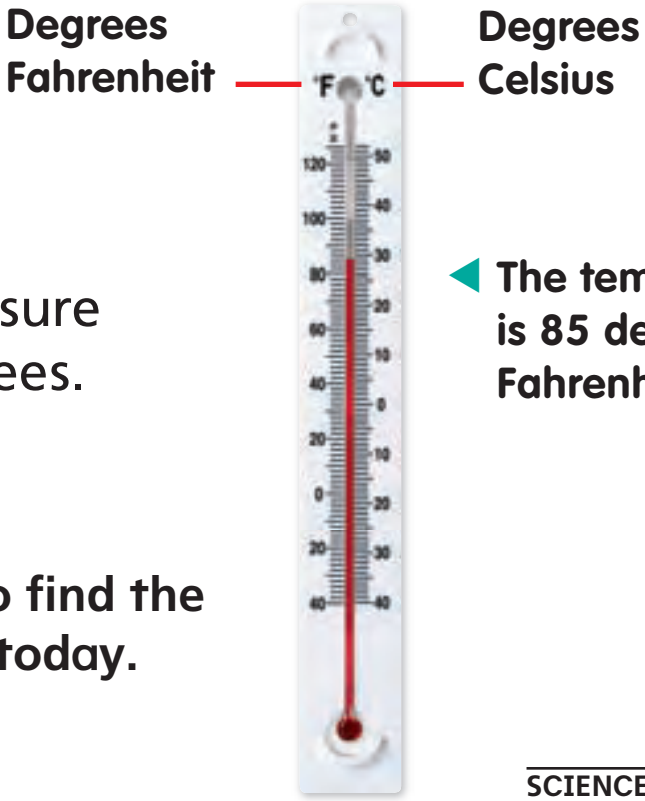
Time

You can measure time with a **clock**. A clock measures in units called hours, minutes, and seconds. There are 60 minutes in I hour.



Temperature

You can measure temperature with a **thermometer**. Thermometers measure in units called degrees.



The temperature is 85 degrees Fahrenheit.

Try It

Use a thermometer to find the temperature outside today.

Science Tools

Computer

A computer is a tool that can help you get information. You can use the Internet to connect to other computers around the world.

When you use a computer, make sure an adult knows what you are working on.

Hand Lens

A hand lens is another tool that can help you get information. A hand lens makes objects seem larger.

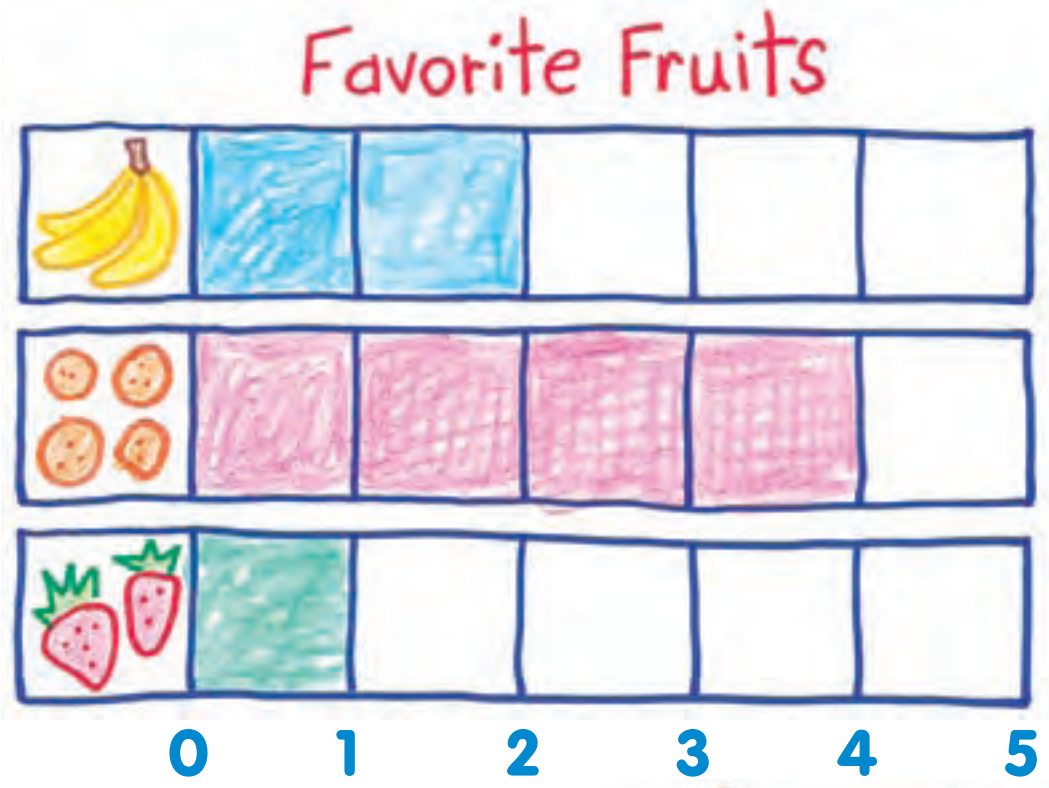
Try It

Use a hand lens to look at an object. Draw what you see.

Graphs

Bar Graphs

Bar graphs organize data. The title of the graph tells you what the data is about. The shaded bars tell you how much of each thing there is.



Try It

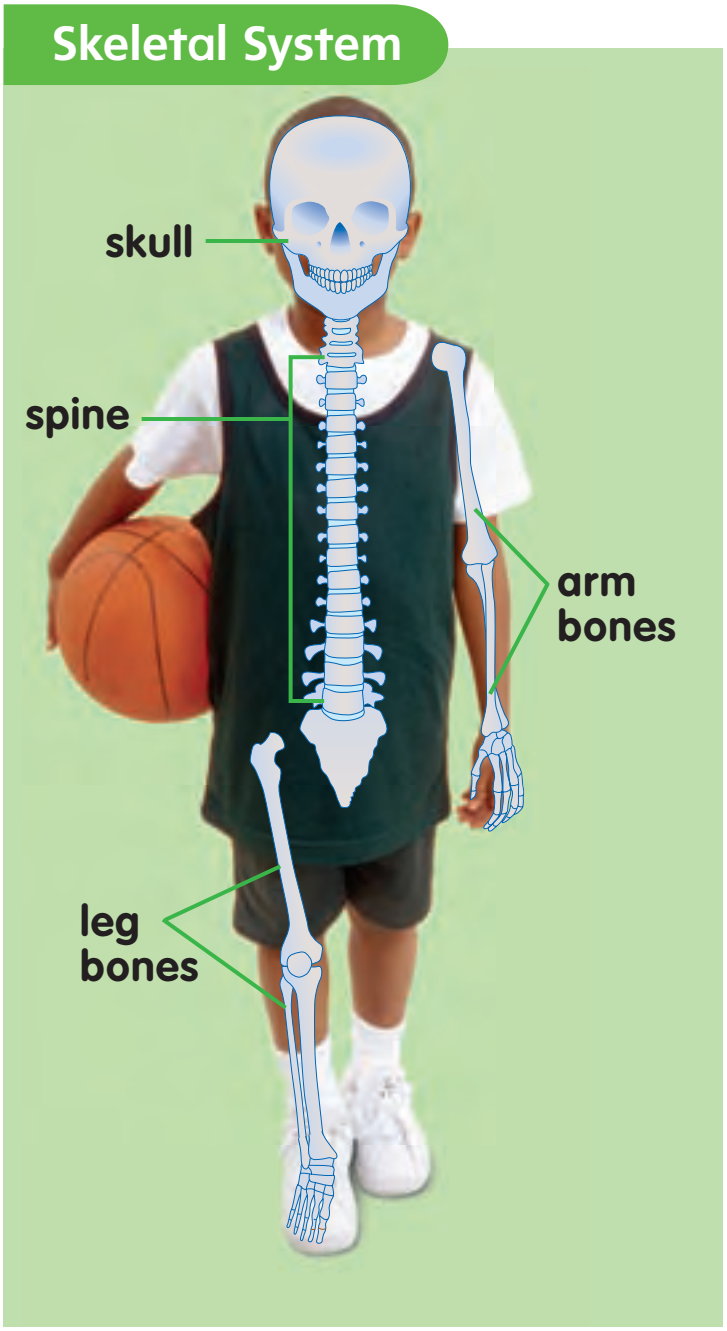
Make a bar graph that shows your classmates' favorite fruits.

Your Body

Skeletal System

Your body has many parts. All your parts work together to help you live.

Bones are hard body parts inside your body. They help you stand straight. Your bones give your body its shape.



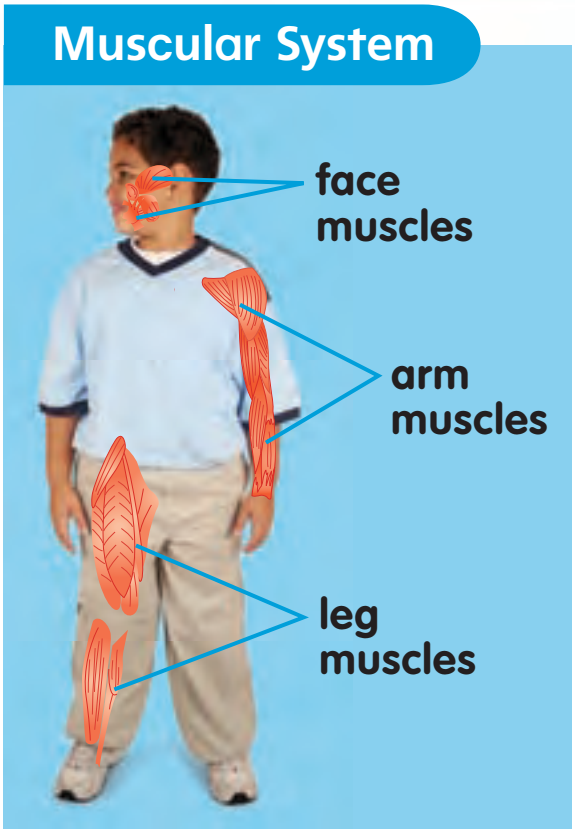
Try It

How many bones do you think there are in your arms? Count them.

Muscular System

Muscles are body parts that help you move. They are inside your body.

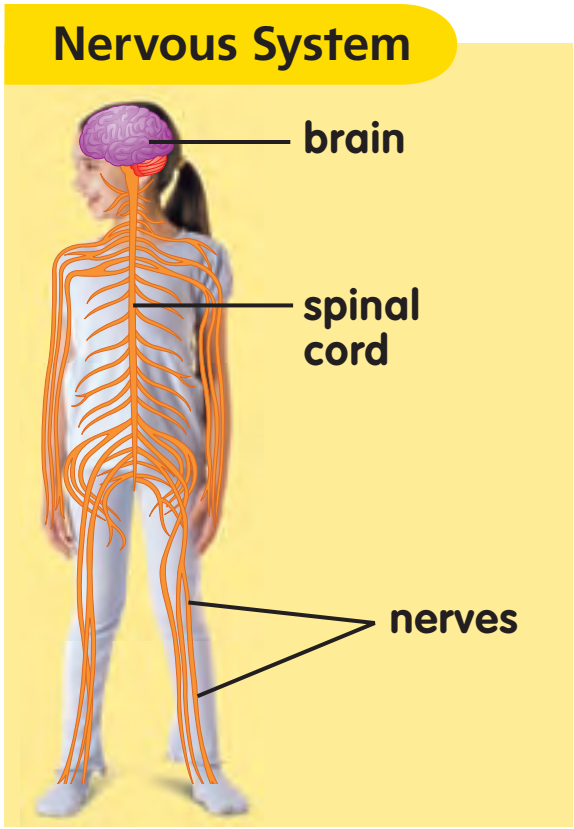
Muscles get stronger when you exercise them.



Nervous System

Your brain sends messages all around your body. The messages travel along tiny body parts called nerves.

These messages tell your body parts to move. They can also alert you of danger.



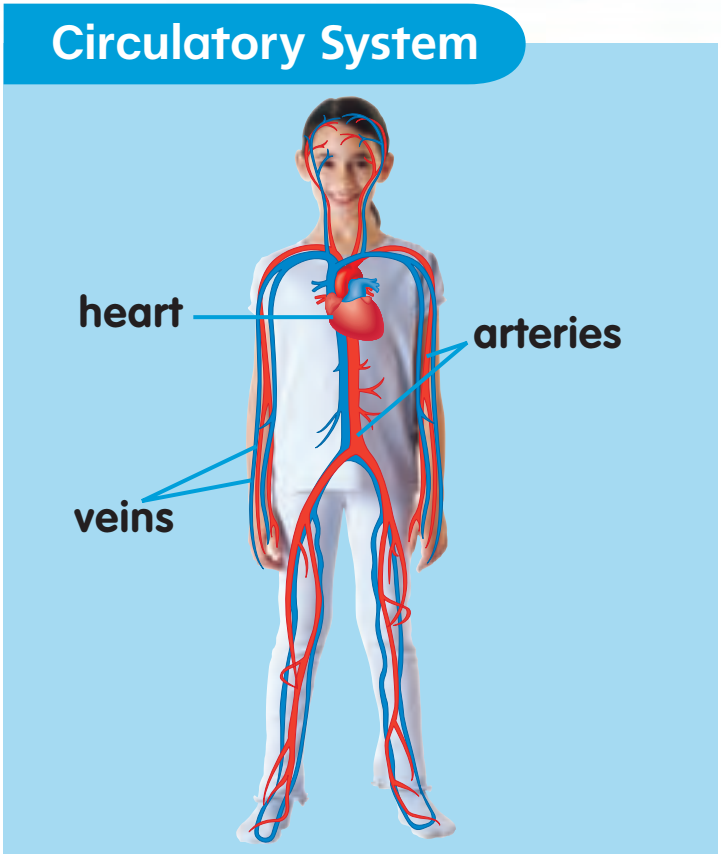
Try It

Jump up and down in place. Which muscles did you use?

Circulatory System

Blood travels through your body. Your heart pumps this blood through blood vessels.

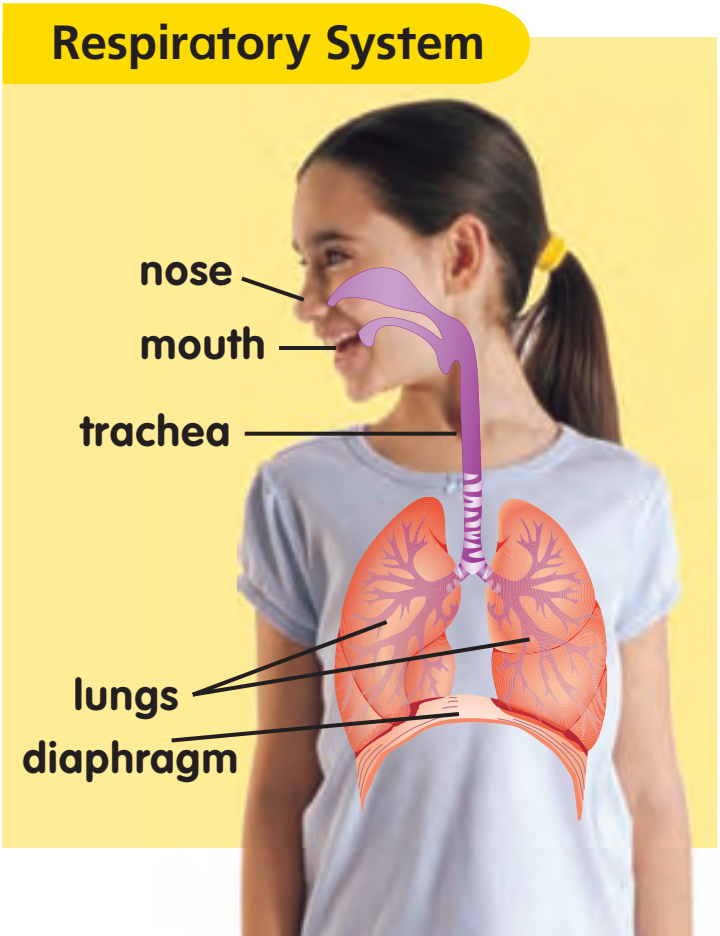
Blood vessels are tubes that carry blood inside your body. Arteries and veins are blood vessels.



Respiratory System

Your mouth and nose take in the oxygen you need from the air.

The oxygen goes into your lungs and travels through your blood.

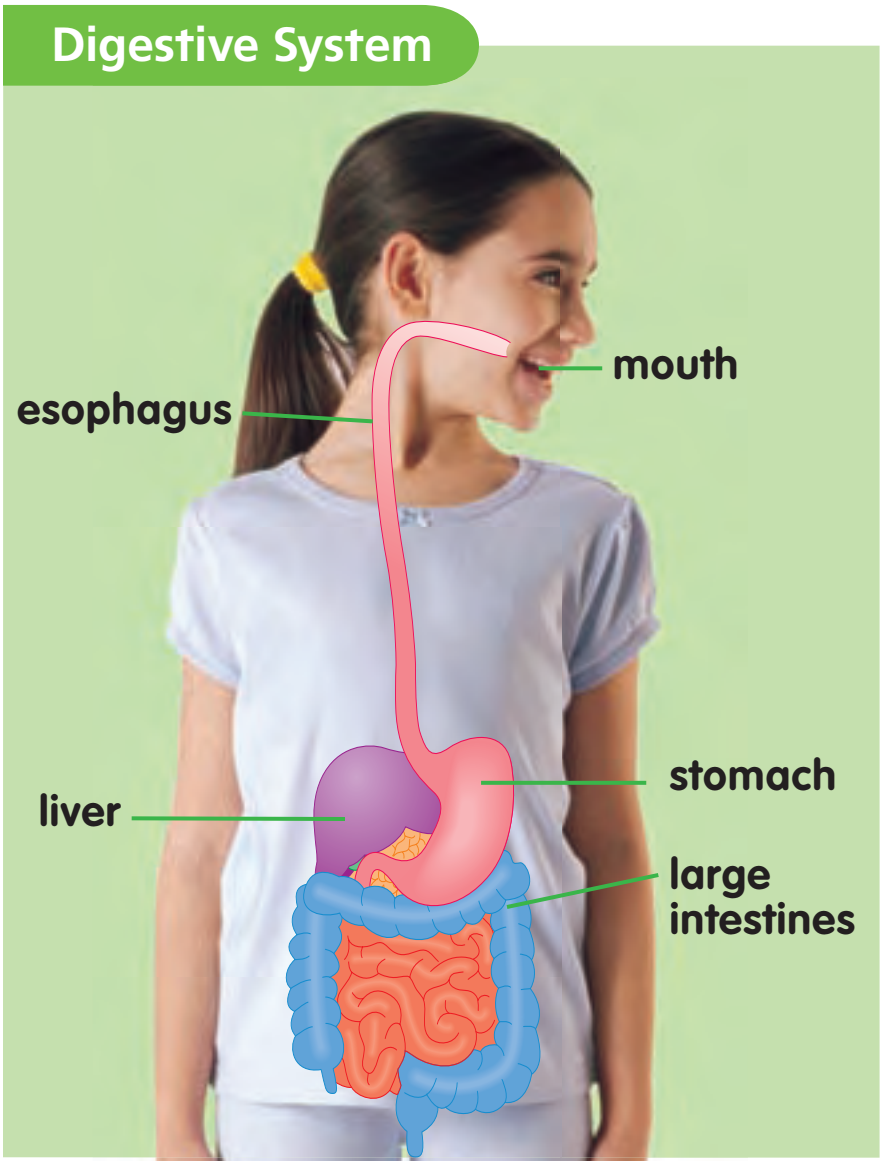


Try It

Count how many breaths you take in 1 minute. Do ten jumping jacks. Count again.

Digestive System

When you eat, your body uses food for energy. Food enters your body through your mouth. Your stomach and intestines help you get nutrients from the food in your body.



Try It

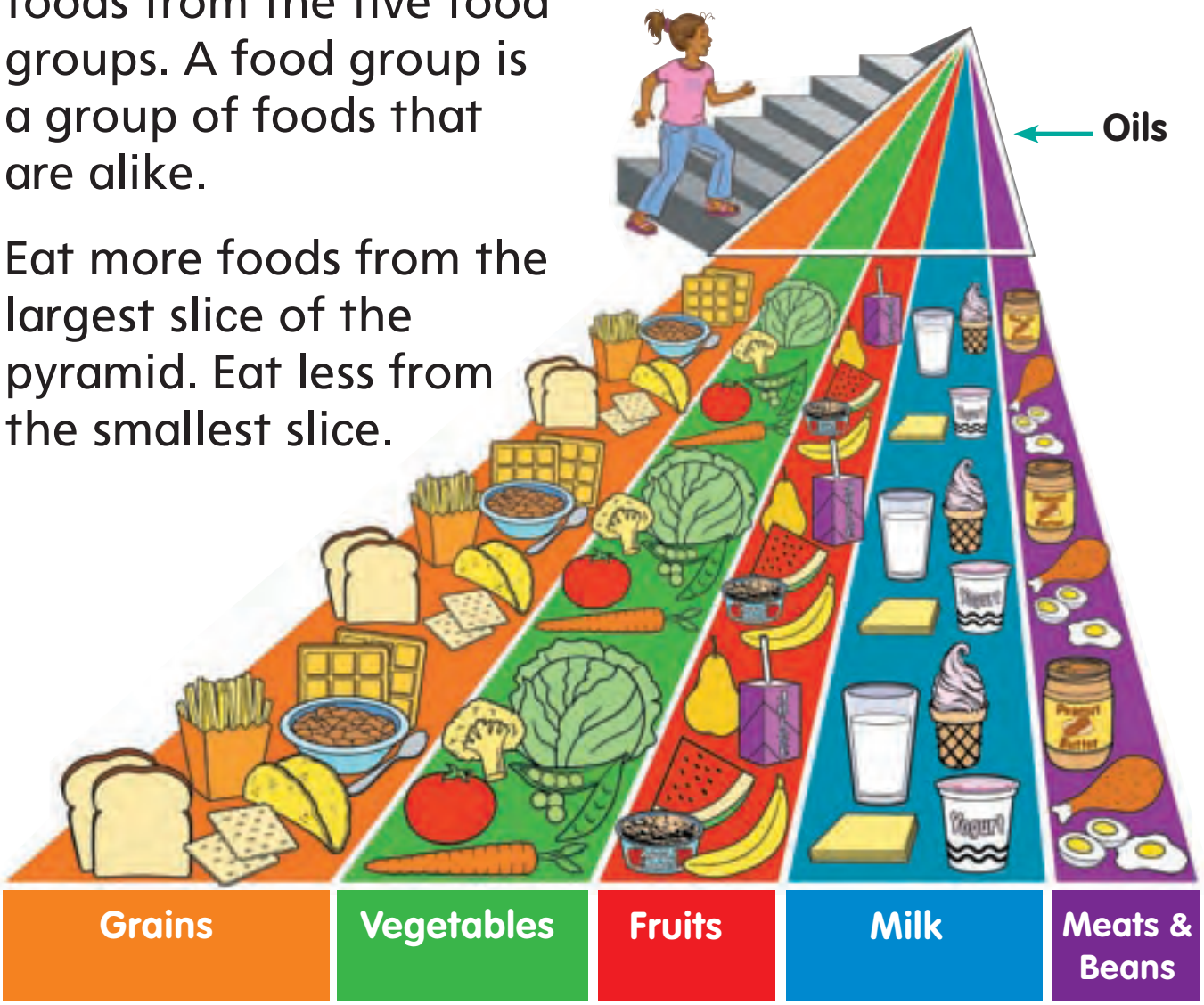
Write a story about why your body needs food.

Healthful Foods

MyPyramid

MyPyramid is a guide for healthful eating. A healthful meal contains foods from the five food groups. A food group is a group of foods that are alike.

Eat more foods from the largest slice of the pyramid. Eat less from the smallest slice.



Try It

Plan a healthful meal. Include one food from each group.

Healthful Foods

Nutrients are materials in foods that make you healthy. Nutrients called carbohydrates store energy in your body. Proteins help your body grow.

People around the world get nutrients from different foods.

chickpeas

Foods Around the World		
Food	Parts of the world	Nutrient
Rice	Asia	carbohydrate
Tortilla	Central America	carbohydrate
Millet	Africa	carbohydrate
chickpeas	Middle East	protein
olives	Europe	oils

olives

rice

Try It

List your favorite foods. Find out what nutrients are in the food.

Healthy Living

Stay Healthy

Be active every day. Exercise keeps your heart and lungs healthy.

Doctors and dentists can help you stay healthy as you grow.

▲ Exercise is important for a healthy body.

▲ Get a checkup from a doctor and dentist every year.

Try It

Record how many times you exercise in one week.

Take Care of Your Body

Tobacco and alcohol harm you. Tobacco smoke can make it hard to breathe. Alcohol slows down your mind and body.

Here are some ways to take care of your body. ▼

▲ **Only take medicines that your parent or doctor gives you.**

Try It

Make a poster about being drug free. Share it with your school.

Safety

Safety Indoors

To stay safe indoors, do not touch dangerous things. Tell an adult about them right away. Never taste anything without permission.

In case of a fire, get out fast. If your clothes catch fire, remember to stop, drop, and roll.

▲ Do not touch these things.

Try It

Practice stop, drop, and roll. Teach it to a friend.

stop

drop

roll

Safety Outdoors

Be safe outdoors. Follow these rules.

▲ Wear a helmet.

▲ Cross at a crosswalk.

▲ Wear your seat belt.

▲ Follow game rules.

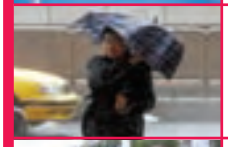
Try It

Choose one of the rules. Make a poster showing the safety rule.

Wind Scale

Very windy weather can be dangerous. Do not play outdoors before a storm. Scientists use a scale like this one to tell how hard the wind is blowing.

▼ **This is a Beaufort scale.**

Wind Scale			
Number		**What You Can See**	**Wind Speeds**
	0	**calm**	less than 1 mile per hour
	3	**gentle breeze**	8–12 miles per hour
	6	**strong breeze**	25–30 miles per hour
	9	**very strong wind**	47–54 miles per hour
	12	**hurricane**	more than 73 miles per hour

Try It

Look out a window. What kind of wind do you see? Use the wind scale to help.

Glossary

A

adaptation Body part or a way an animal acts that helps it stay alive. (page 78) **The anteater's long snout is an adaptation.**

amphibian Animal that lives part of its life in water and part on land. (page 63) **A salamander is an amphibian.**

anemometer A tool that measures the speed of wind. (page 175) **The stronger the wind is, the faster the anemometer spins.**

axis A center line that an object spins around. (page 139) **Earth spins on its axis.**

C

camouflage A way that animals blend into their surroundings. (page 79) **Animals use camouflage to stay safe.**

cirrus Thin, wispy clouds high in the sky. (page 189) **The wind blows cirrus clouds into wispy streams.**

condense To change from a gas to a liquid. (page 181) **Water vapor can condense on a cold glass.**

cumulus White, puffy clouds. (page 188) **Small cumulus clouds appear in good weather.**

D

drought A long period of time with little or no rain. (page 110) **Plants can die in a drought.**

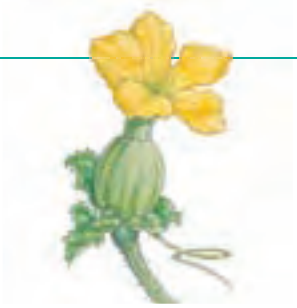
E

endangered When many of one kind of animal die and only a few are left. (page 114) **These tigers are endangered.**

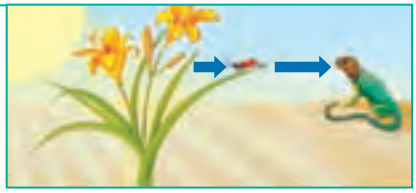
evaporate To change from a liquid to a gas. (page 180) **Water can evaporate from oceans, rivers, lakes, or land.**

extinct When a living thing dies out and no more of its kind live on Earth. (page 117) **Dinosaurs are extinct.**

F



flower Plant part that makes seeds. (page 36) **Some flowers can grow into fruit.**



food chain A model of the order in which living things get the food they need. (page 102) **A food chain begins with the Sun.**

food web Two or more food chains that are connected. (page 105) **This picture shows a desert food web.**

fossil What is left of a living thing from the past. (page 116) **This fish fossil was found in the desert.**

H

habitat A place where plants and animals live. (page 94) **A habitat can be wet, dry, windy, or cold.**

I

insect Animal with six legs, antennae, and a hard outer shell. (page 64) **An ant is an insect.**

L

larva Stage in the life cycle of some animals after they hatch from an egg. (page 72) **A caterpillar is a larva.**

life cycle How a living thing grows, lives, has young, and dies. (pages 40, 70) **The pictures show the life cycle of a chicken.**

light A kind of energy that lets us see. (page 222) **We get light from the Sun.**

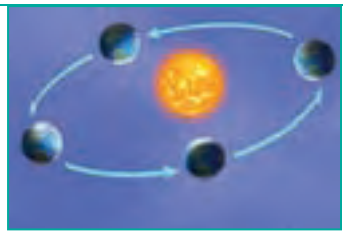
M

mammal Animal with hair or fur that feeds milk to its young. (page 62) **A lion is a mammal.**

minerals Bits of rock and soil that help plants and animals grow. (page 30) **Plants use minerals in the ground to grow.**

O

orbit The path Earth takes around the Sun. (page 148) **Earth orbits the Sun each year.**

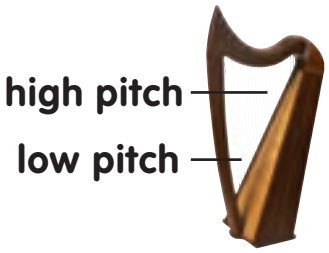


oxygen A gas found in the air we breathe. (page 31) **Living things need oxygen.**

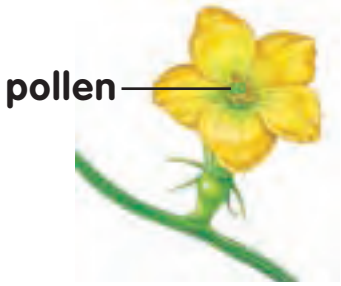
P

phase The Moon's shape as we see it from Earth. (page 157) **The Moon's phase will change each night.**

pitch How high or low a sound is. (page 215) **Short, tight strings make a high pitch.**



pollen Sticky powder inside a flower that helps make seeds. (page 36) **Pollen can move from flower to flower.**



precipitation Water falling from the sky as rain, snow, or hail. (page 173) **Rain is one kind of precipitation.**

predator An animal that hunts other animals for food. (page 103) **A predator must be fast to catch its food.**

prey Animals that are eaten by predators. (page 103) **The bird catches prey with its beak.**

pupa Stage in a butterfly life cycle when a caterpillar makes a hard case around itself. (page 72) **The pupa hangs from a branch.**

R

reflect To bounce off something. (page 222) **Light can reflect better off shiny objects.**

reptile Animal with rough, scaly skin. (page 63) **An alligator is a reptile.**

rotation A turn or spin. (page 138) **Earth makes one rotation in 24 hours.**

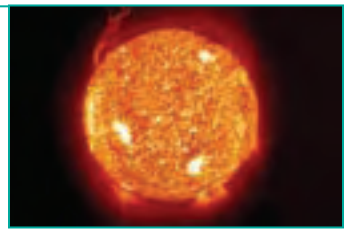
S

seed Plant part that can grow into a new plant. (page 36) **A seed can grow with water, warmth, and air.**

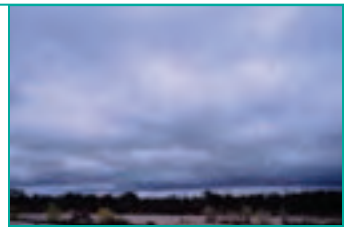
seedling A young plant. (page 40) **A seedling will grow into an adult plant.**

sound A type of energy that is heard when objects vibrate. (page 212) **An alarm clock makes a loud sound.**

star An object in space made of hot, glowing gases. (page 158) **The Sun is a star that we see during the day.**



stratus Thin clouds that form into layers like sheets. (page 189) **Stratus clouds can cover the whole sky.**



T

temperature A measurement of how hot or cold something is. (page 172) **A low temperature means something is cold.**

trait The way a living thing looks or acts. (page 47) **The color of a flower is a trait.**

V

vibrate To move back and forth quickly. (page 213) **Strings vibrate to make sound.**

Science Skills

classify To group things by how they are alike. (page 5) **You can classify animals by how many legs they have.**

communicate To write, draw, or tell your ideas. (page 9) **You can communicate the ways you can change a piece of clay.**

compare To observe how things are alike or different. (page 5) **You can compare how a cat and a dog are alike and different.**

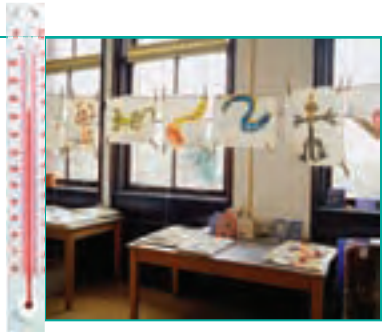
draw conclusions To use what you observe to explain what happens. (page 9) **You can draw conclusions about why the stick will make a shadow.**

infer To use what you know to figure something out. (page 7) **From these tracks, you can infer which animal was here.**

investigate To make a plan and try it out. (page 8) **You can investigate how long it takes the car to stop rolling.**

make a model To make something to show how something looks. (page 4) **You can make a model of a mountain in the ocean.**

measure To find out how far something moves, or how long, how much, or how warm something is. (page 6) **You can measure temperature with a thermometer.**

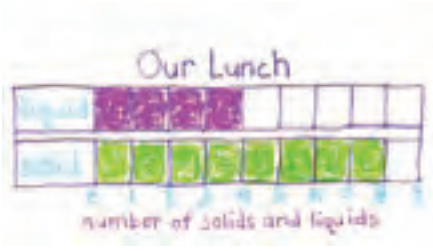


observe To see, hear, taste, touch, or smell. (page 4) **You can observe how the flower looks, smells, and feels.**

predict To use what you know to tell what you think will happen. (page 8) **You can predict what the weather will be like today.**

put things in order To tell or show what happens first, next, or last. (page 7) **You can put things in order to show the life cycle of a plant.**

record data To write down what you observe. (page 6) **You can record data about what your class had for lunch.**



Science Content Standards

Ohio Science Indicators

Life Sciences

LS-1. Explain that animals, including people, need air, water, food, living space and shelter; plants need air, water, nutrients (e.g., minerals), living space and light to survive.

LS-2. Identify that there are many distinct environments that support different kinds of organisms.

LS-3. Explain why organisms can survive only in environments that meet their needs (e.g., organisms that once lived on Earth have disappeared for different reasons such as natural forces or human-caused effects).

LS-4. Compare similarities and differences among individuals of the same kind of plants and animals, including people.

LS-5. Explain that food is a basic need of plants and animals (e.g., plants need sunlight to make food and to grow, animals eat plants and/or other animals for food, food chain) and is important because it is a source of energy (e.g., energy used to play, ride bicycles, read, etc.).

LS-6. Investigate the different structures of plants and animals that help them live in different environments (e.g., lungs, gills, leaves and roots).

LS-7. Compare the habitats of many different kinds of Ohio plants and animals and some of the ways animals depend on plants and each other.

LS-8. Compare the activities of Ohio's common animals (e.g., squirrels, chipmunks, deer, butterflies, bees, ants, bats and frogs) during the different seasons by describing changes in their behaviors and body covering.

LS-9. Compare Ohio plants during the different seasons by describing changes in their appearance.

Earth and Space Sciences

ESS-1. Recognize that there are more stars in the sky than anyone can easily count.

ESS-2. Observe and describe how the sun, moon and stars all appear to move slowly across the sky.

ESS-3. Observe and describe how the moon appears a little different every day but looks nearly the same again about every four weeks.

ESS-4. Observe and describe that some weather changes occur throughout the day and some changes occur in a repeating seasonal pattern.

ESS-5. Describe weather by measurable quantities such as temperature and precipitation.

Physical Sciences

PS-1. Explore how things make sound (e.g., rubber bands, tuning fork and strings).

PS-2. Explore and describe sounds (e.g., high, low, soft and loud) produced by vibrating objects.

PS-3. Explore with flashlights and shadows that light travels in a straight line until it strikes an object.

Science and Technology

ST-1. Explain that developing and using technology involves benefits and risks.

ST-2. Investigate why people make new products or invent new ways to meet their individual wants and needs.

ST-3. Predict how building or trying something new might affect other people and the environment.

ST-4. Communicate orally, pictorially, or in written form the design process used to make something.

Scientific Inquiry

SI-1. Ask "how can I/we" questions.

SI-2. Ask "how do you know" questions (not "why" questions) in appropriate situations and attempt to give reasonable answers when others ask questions.

SI-3. Explore and pursue student-generated "how" questions.

SI-4. Use appropriate safety procedures when completing scientific investigations.

SI-5. Use evidence to develop explanations of scientific investigations. (What do you think? How do you know?)

SI-6. Recognize that explanations are generated in response to observations, events and phenomena.

SI-7. Use appropriate tools and simple equipment/instruments to safely gather scientific data (e.g., magnifiers, non-breakable thermometers, timers, rulers, balances and calculators and other appropriate tools).

SI-8. Measure properties of objects using tools such as rulers, balances and thermometers.

SI-9. Use whole numbers to order, count, identify, measure and describe things and experiences.

SI-I0. Share explanations with others to provide opportunities to ask questions, examine evidence and suggest alternative explanations.

Scientific Ways of Knowing

SWK-I. Describe that scientific investigations generally work the same way under the same conditions.

SWK-2. Explain why scientists review and ask questions about the results of other scientists' work.

SWK-3. Describe ways in which using the solution to a problem might affect other people and the environment.

SWK-4. Demonstrate that in science it is helpful to work with a team and share findings with others.

Science Content Standards

Ohio Science Benchmarks – Grades K-2

Life Sciences

A. Discover that there are living things, non-living things and pretend things, and describe the basic needs of living things (organisms).

B. Explain how organisms function and interact with their physical environment.

C. Describe similarities and differences that exist among individuals of the same kind of plants and animals.

Earth and Space Sciences

A. Observe constant and changing patterns of objects in the day and night sky.

B. Explain that living things cause changes on Earth.

C. Observe, describe and measure changes in the weather, both long term and short term.

D. Describe what resources are and recognize some are limited but can be extended through recycling or decreased use.

Physical Sciences

A. Discover that many objects are made of parts that have different characteristics. Describe these characteristics and recognize ways an object may change.

B. Recognize that light, sound and objects move in different ways.

C. Recognize sources of energy and their uses.

Science and Technology

A. Explain why people, when building or making something, need to determine what it will be made of, how it will affect other people and the environment.

B. Explain that to construct something requires planning, communication, problem solving and tools.

Scientific Inquiry

A. Ask a testable question.

B. Design and conduct a simple investigation to explore a question.

C. Gather and communicate information from careful observations and simple investigation through a variety of methods.

Scientific Ways of Knowing

A. Recognize that there are different ways to carry out scientific investigations. Realize that investigations can be repeated under the same conditions with similar results and may have different explanations.

B. Recognize the importance of respect for all living things.

C. Recognize that diverse groups of people contribute to our understanding of the natural world.

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