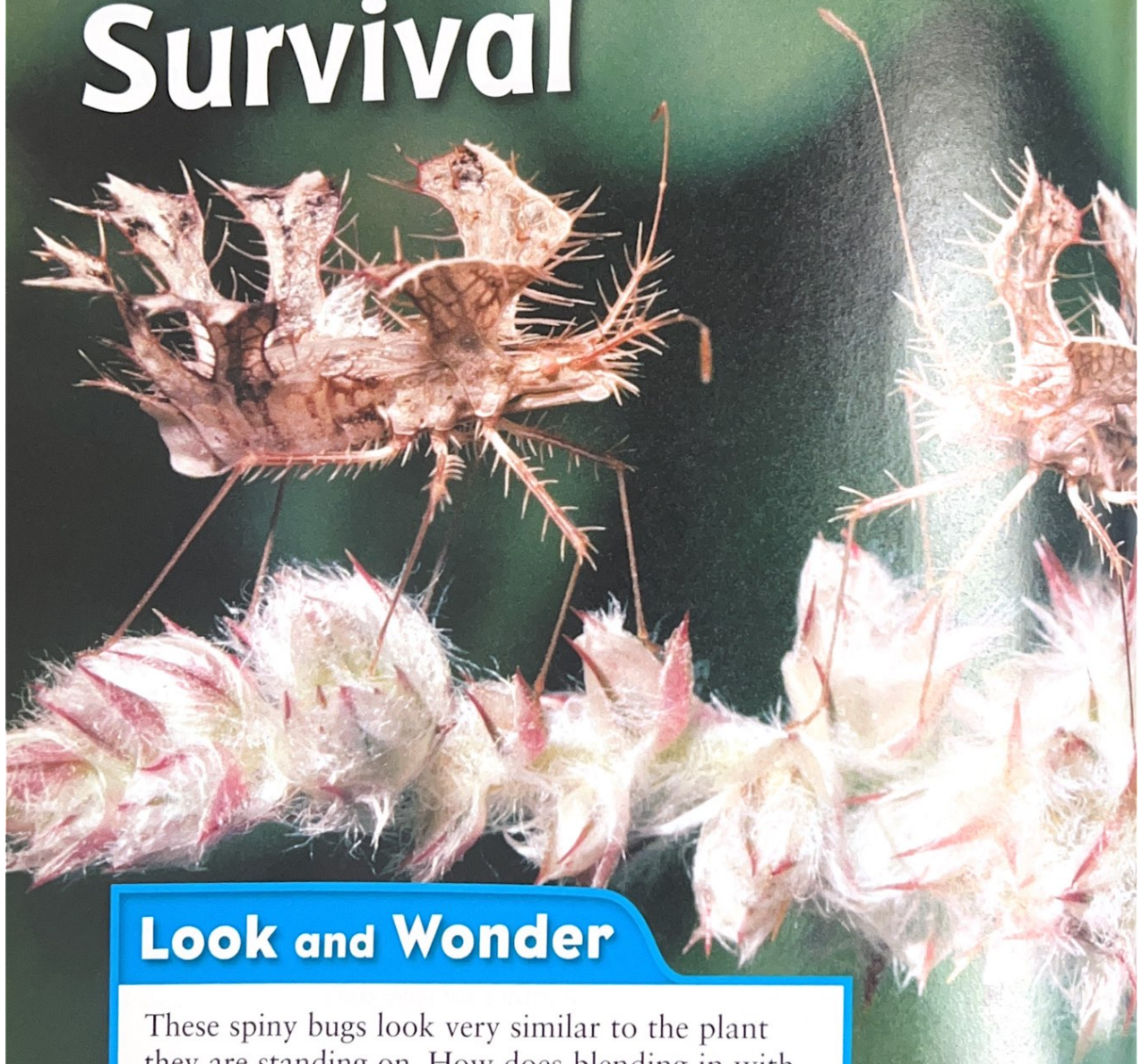


## Lesson 3

# Adaptation and Survival



### Look and Wonder

These spiny bugs look very similar to the plant they are standing on. How does blending in with an environment help an organism?



# Explore

## Inquiry Activity

### How do adaptations help animals survive in their environment?

#### Form a Hypothesis

Sow bugs are animals that live under logs, leaves, and rocks. Are sow bugs adapted to prefer damp or dry environments? Write your answer as a hypothesis in the form "If moisture in the sow bug's environment is increased, then . . ."

#### Test Your Hypothesis

- 1 Observe** Place 15 sow bugs on the tray. Examine the sow bugs with the hand lens. Record your observations.
- 2 Experiment** Tear four paper towels in half. Make sure they are the same size. Dampen two of the halves.
- 3** Move the sow bugs to the center of the tray. Place the moist paper towels in one end of the tray. Place the dry paper towels on the opposite side of the tray.
- 4** Watch the sow bugs for several minutes. Look for changes in their behavior.
- 5** After 10 minutes, count the sow bugs on each side of the tray. Record your results. **▲ Be Careful.** Wash your hands after handling sow bugs.

#### Draw Conclusions

- 6** Based on your observations, what traits help sow bugs survive in their environments?
- 7** What were the independent variable and dependent variable? What variables remained constant?
- 8 Infer** Did your results support your hypothesis? Explain why or why not.

#### Explore More

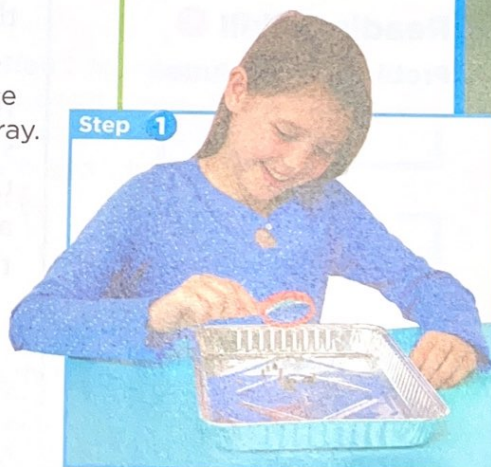
Are sow bugs adapted to prefer dark or light environments? Form a hypothesis and test it. Then analyze and write a report of your results.

#### Materials



- sow bugs
- tray
- hand lens
- paper towels
- water

#### Step 1



#### Step 3





## Read and Learn

### Main Idea

Organisms have adaptations that help them survive in their environments.

### Vocabulary

**adaptation**, p.168

**camouflage**, p.173

**protective coloration**, p.173

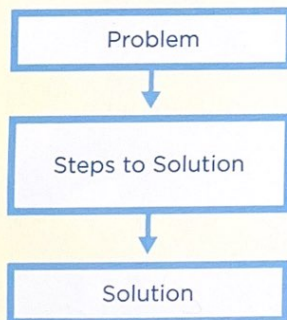
**protective resemblance**,  
p.173

**mimicry**, p.174

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### Reading Skill

#### Problem and Solution



## What is adaptation?

Survival in any ecosystem is a constant struggle. An **adaptation** (ad•uhp•TAY•shuhn) is any characteristic that helps an organism survive in its environment. Over time, organisms with successful adaptations survive more frequently than other organisms. Their offspring inherit these adaptations. Adaptations can be structural or behavioral.

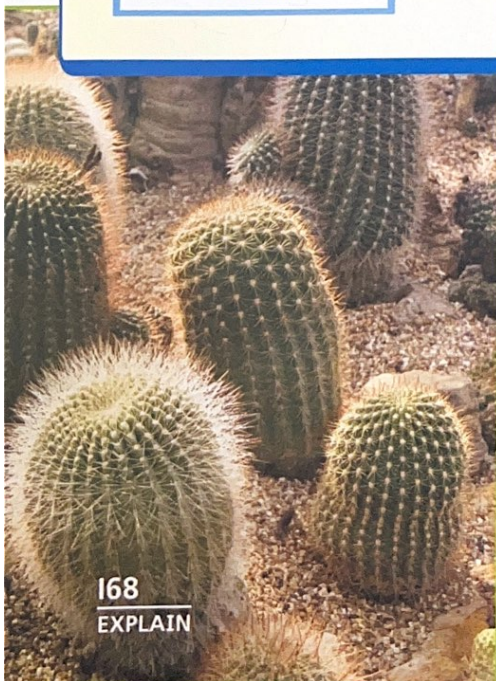
### Structural Adaptations

*Structural adaptations* are adjustments to internal or external physical structures. Fur color, long limbs, strong jaws, and the ability to run fast are structural adaptations. Some structural adaptations help organisms survive in certain environments. For example, ducks have webbed feet that help them survive in water. Cactuses have a thick, waxy cuticle that prevents water loss in their dry environment.

Other structural adaptations protect prey from predators or enable predators to hunt more successfully. Turtles have hard shells that protect them from predators. Predators such as sharks have an excellent sense of smell and sharp teeth. Both of these traits help sharks catch their prey.

**Structural Adaptation** When puffer fish are threatened, they fill their bodies with air or water. As they fill up, their spines are pushed out. Their spines and large size protect them from predators.

**Structural Adaptation** Many plants, such as roses and cactuses, have thorns or spines on their stems. These modified leaves protect the plant from herbivores.





## Behavioral Adaptations

An adjustment in an organism's behavior is a *behavioral adaptation*. For example, wolves traveling in packs is a behavioral adaptation. Wolf packs can hunt large prey that one wolf alone could not capture. Many prey animals also travel in groups. Some fish swim in schools which protects them from predators. Symbiotic relationships are also behavioral adaptations.

Some behavioral adaptations help animals survive seasonal changes in the climate. Many animals such as birds, butterflies, and fish migrate. *Migration* (mye•GRAY•shuhn) is a

seasonal movement of animals to find food, reproduce in better conditions, or find a less severe climate. Other animals such as bats, snakes, turtles, and frogs hibernate to escape the cold. *Hibernation* (hye•ber•NAY•shuhn) is a period of inactivity during cold weather. The animals remain inactive until warmer temperatures return in spring.

### ✓ Quick Check

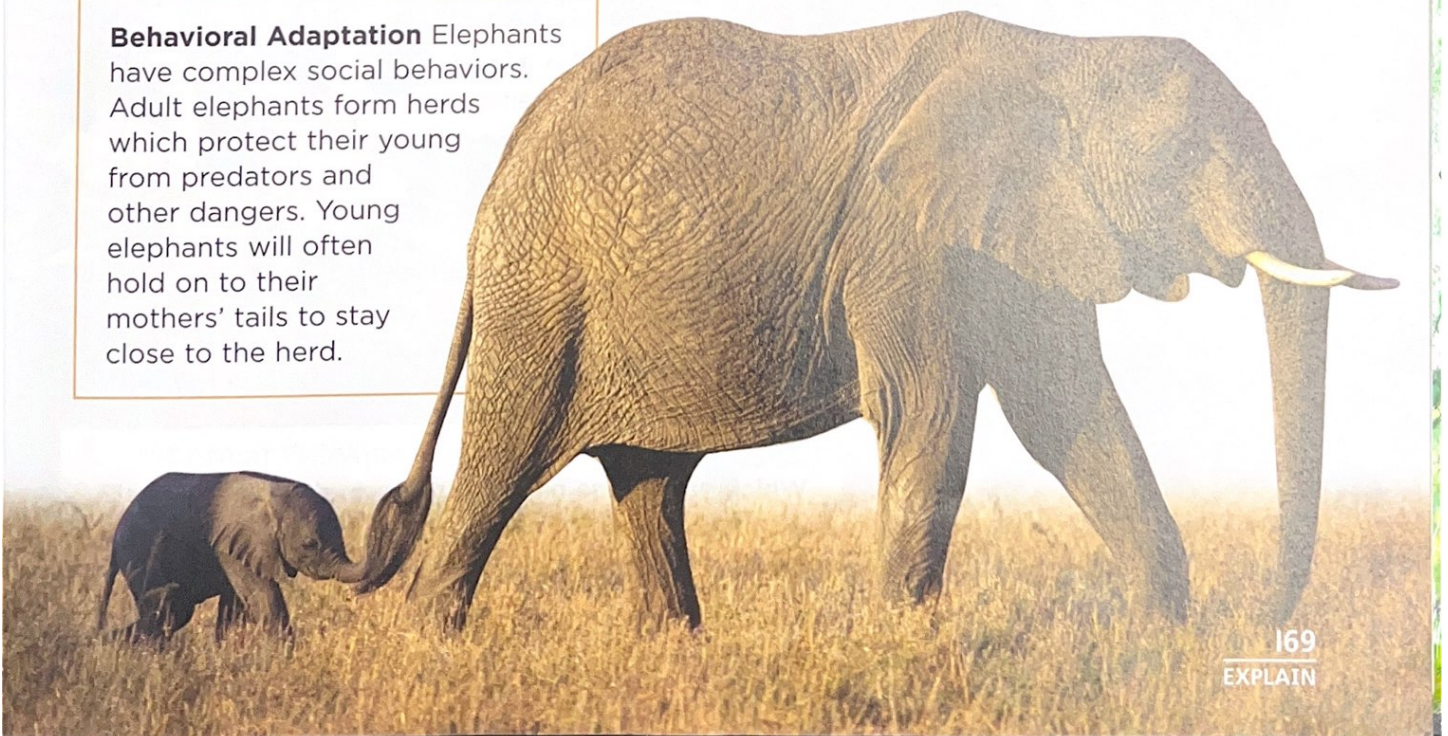
**Problem and Solution** How do sea otters eat animals with shells?

**Critical Thinking** What structural and behavioral adaptations do humans have?



**Behavioral Adaptation** Sea otters eat shelled animals, such as crabs and clams. They crack open the shells using rocks. An otter will hold a rock on its stomach and smash the crab or clam against the rock.

**Behavioral Adaptation** Elephants have complex social behaviors. Adult elephants form herds which protect their young from predators and other dangers. Young elephants will often hold on to their mothers' tails to stay close to the herd.



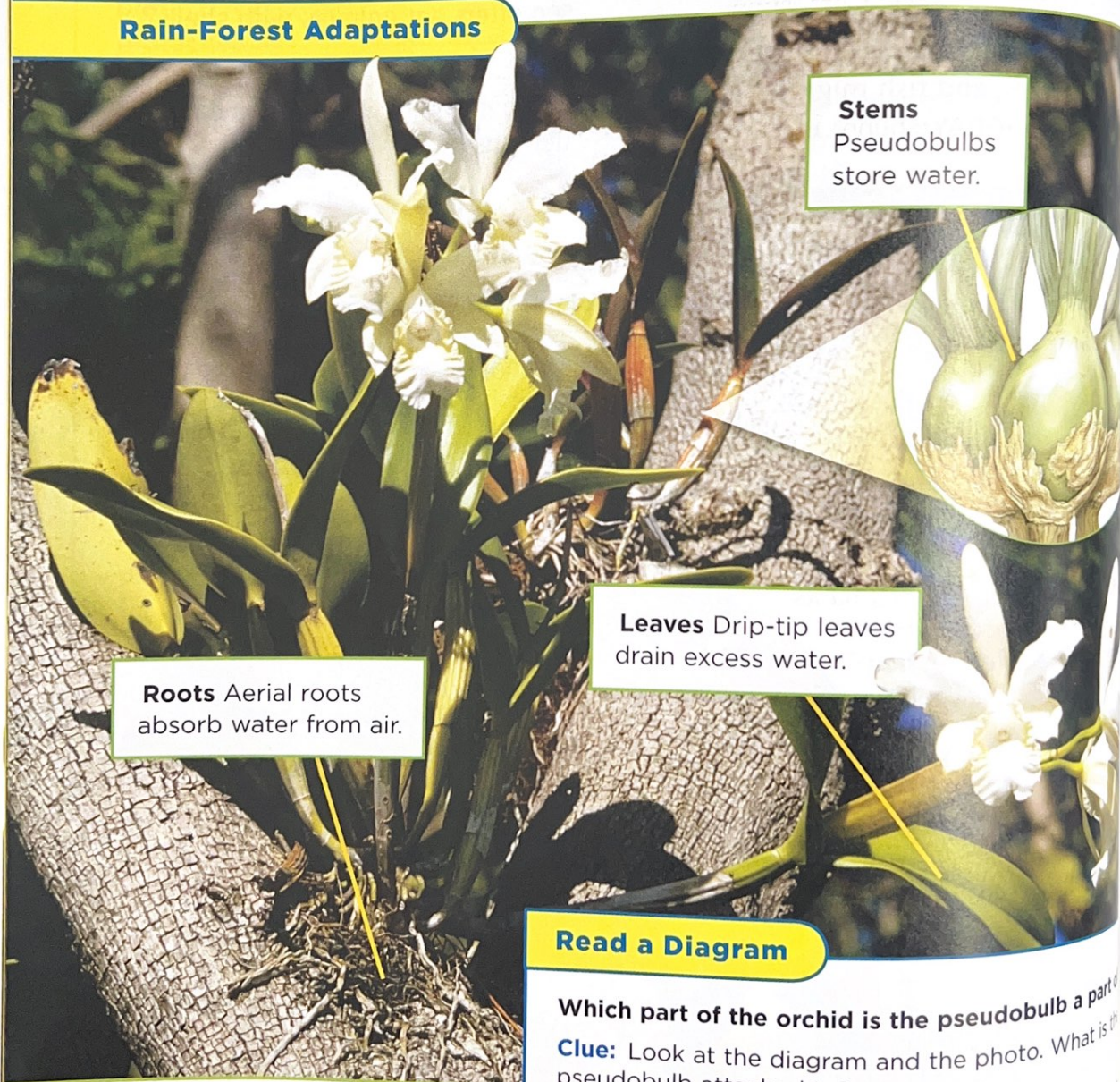


## What are some plant adaptations?

Angiosperms have scented flowers that attract certain pollinators. They have leaves that catch sunlight and roots that soak up water. These and other adaptations help plants survive.

Some plants have specific structural adaptations to different environments. Rain-forest plants, like orchids, have adaptations that help them survive wet, hot temperatures. Orchid stems have storage organs called *pseudobulbs* (SEW•doh•bulbz). They store water for the plant. An orchid's aerial roots help secure it to a tree high in the rain forest. These roots also absorb water

### Rain-Forest Adaptations



#### Stems

Pseudobulbs store water.

**Leaves** Drip-tip leaves drain excess water.

**Roots** Aerial roots absorb water from air.

### Read a Diagram

Which part of the orchid is the pseudobulb a part of?

**Clue:** Look at the diagram and the photo. What is the pseudobulb attached to?



from the moist air. Like many rain-forest plants, orchids have drip-tip leaves. These leaves are adapted to the constant wet conditions in a rain forest. Their tips drain excess water.

Plants, like cactuses, that live in hot and dry environments have thick, waxy stems that prevent water loss. They have very dense, shallow roots that soak up rain quickly. Plants that live in forests, like oak trees, lose their leaves in the winter. This helps them prevent water loss. Cold climate plants, such as moss, are able to complete their life cycle in a shortened growing season. Some aquatic plants, such as water lilies, have stomata on the top surface of the leaf instead of the bottom. This enables the stomata to take in and release carbon dioxide and oxygen.

Many plants have adaptations that defend them from herbivores. For example, some plants produce chemicals that give them a bad taste. When most herbivores eat the leaves, they do not like the taste and stop eating the plant. Other plants, such as milkweeds, produce chemicals that are poisonous to most animals. Both of these adaptations protect the plants from predators.


### **Quick Check**

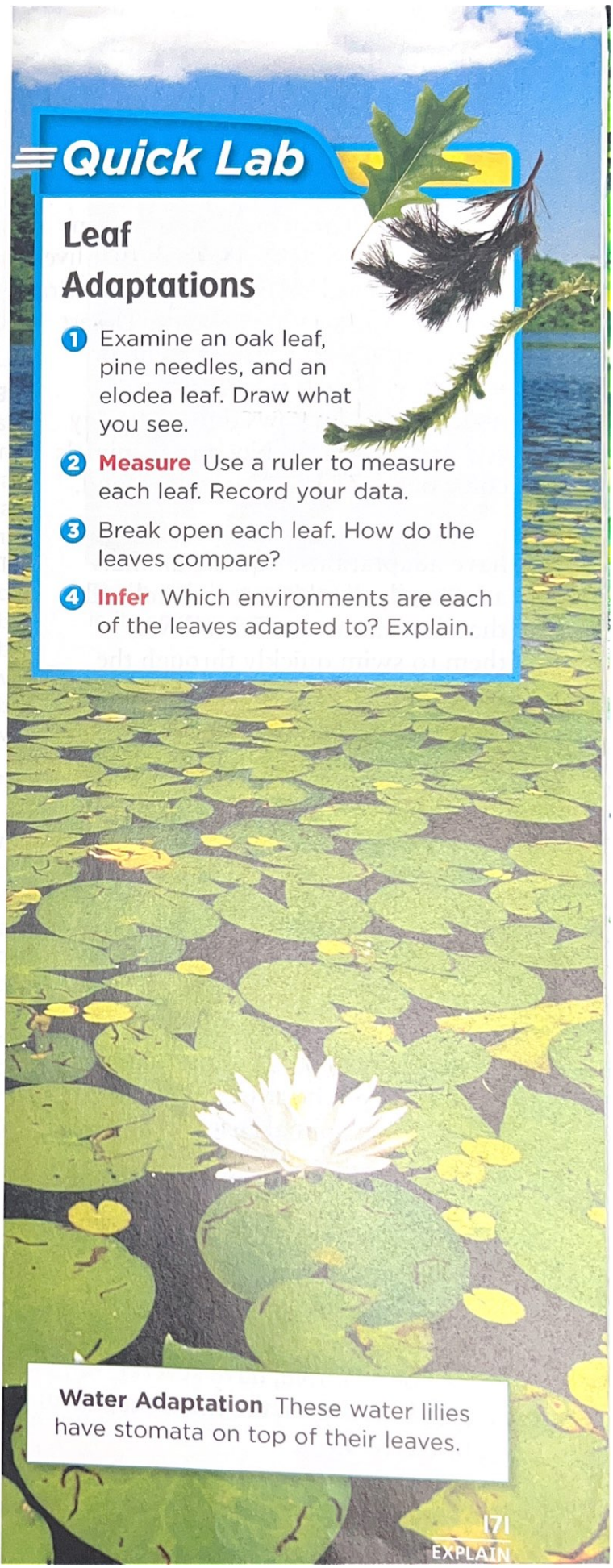
**Problem and Solution** How do water plants release oxygen and take in carbon dioxide?

**Critical Thinking** Why do adaptations always “fit” the environment? For example, why don’t cactuses have drip-tip leaves?

## **Quick Lab**

### **Leaf Adaptations**

- 
- 1 **Examine** an oak leaf, pine needles, and an elodea leaf. Draw what you see.
  - 2 **Measure** Use a ruler to measure each leaf. Record your data.
  - 3 Break open each leaf. How do the leaves compare?
  - 4 **Infer** Which environments are each of the leaves adapted to? Explain.



**Water Adaptation** These water lilies have stomata on top of their leaves.



## What are some animal adaptations?

Like plants, animals have adaptations that help them survive in specific environments. Animals that live in cold climates have thick fur and extra body fat that keep them warm. Desert animals are often active at night, or *nocturnal*. They stay in shelters or underground burrows during the day and avoid the heat. Nocturnal animals come out at night to search for food.

Animals that live in water also have adaptations. Aquatic animals are usually much more streamlined than land animals. This allows them to swim quickly through the water. Aquatic mammals can hold their breath for long periods of time. Other aquatic animals breathe underwater using gills.

Many animal adaptations develop because of predator and prey relationships. Prey have adaptations that enable them to avoid predators. Predators have adaptations that help them hunt and capture prey. Prey animals, such as gazelles, are able to run at speeds of up to 80 kilometers per hour (49.7 miles per hour). Some animals use chemicals to escape predators. When skunks are threatened, they spray a bad-smelling liquid. These adaptations help prey escape predators.

Predators also have adaptations that make them more efficient hunters. Owls, for example, have several adaptations that make them successful night hunters.

**Head** Owls have excellent hearing which helps them hunt. One of their ears is higher than the other. This increases their ability to distinguish where sounds are coming from and how far away a sound is.

**Eyes** Owls have large eyes which help them see tiny prey, such as mice, in the dark. Their eyes are positioned at the front of their head which gives them better vision.

**Wings** An owl's large, muscular wings help it swiftly hunt for prey. Special tips on the wing feathers muffle the sound of air rushing over the wings as the owl flies. This helps the owl fly silently.

**Feet** An owl's feet are also adapted for hunting. They have large talons, or claws, for accurately grabbing prey. This adaptation helps them pick up larger prey animals.





## Camouflage

Some organisms increase their survival in an environment by blending in. Any coloring, shape, or pattern that allows an organism to blend in with its environment is called **camouflage** (KAM•uh•flahzh). Predators with camouflage can sneak up on prey. Camouflage also helps prey animals hide from predators.

**Protective coloration** (pruh•TEK•tiv kul•uh•RAY•shuhn) is a type of camouflage in which the color of an animal helps it blend in with its background. In winter, the arctic fox has a white coat that blends in with the snow. In summer, the fox's coat changes color to help it blend in with the plants that grow in the warm weather. Similarly, a tiger's stripes make it difficult to see in the grass. Stripes help a tiger conceal itself from its prey.

Some organisms go beyond protective coloration. Matching the color, shape, and texture of an environment is called **protective resemblance** (ri•ZEM•bluhns). The walking stick insect, for example, resembles a stick or a small branch.



This pipefish resembles the sea grass in its environment.



### Quick Check

**Problem and Solution** How could you tell whether a rabbit comes from a cold weather or a warm weather environment?

**Critical Thinking** Many flowering plants have brightly colored flowers that are very noticeable. Why don't these plants use camouflage?

Protective coloration helps arctic hares blend in with their snowy environment.





## What is mimicry?

Some animals have adapted to their environment by copying other well-adapted organisms. An adaptation in which an animal is protected against predators by its resemblance to an unpleasant animal is called **mimicry** (MIM•i•kree). The viceroy butterfly, for example, is protected from predators because it looks just like the bad-tasting, poisonous monarch butterfly.

Mimic organisms can look so much like a dangerous or unpleasant animal that their enemies stay away. The harmless robber fly resembles the dangerous bumblebee. The king snake mimics the coloring of the poisonous coral snake.

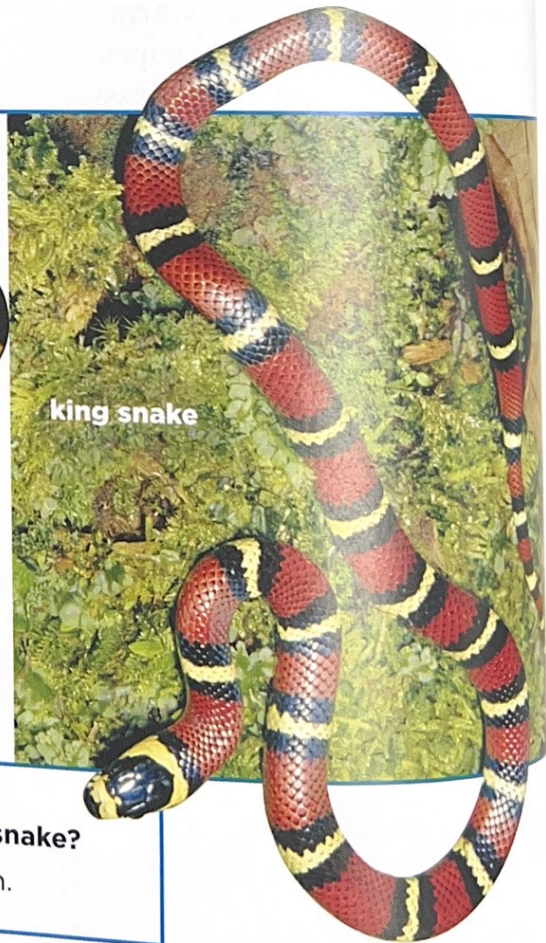
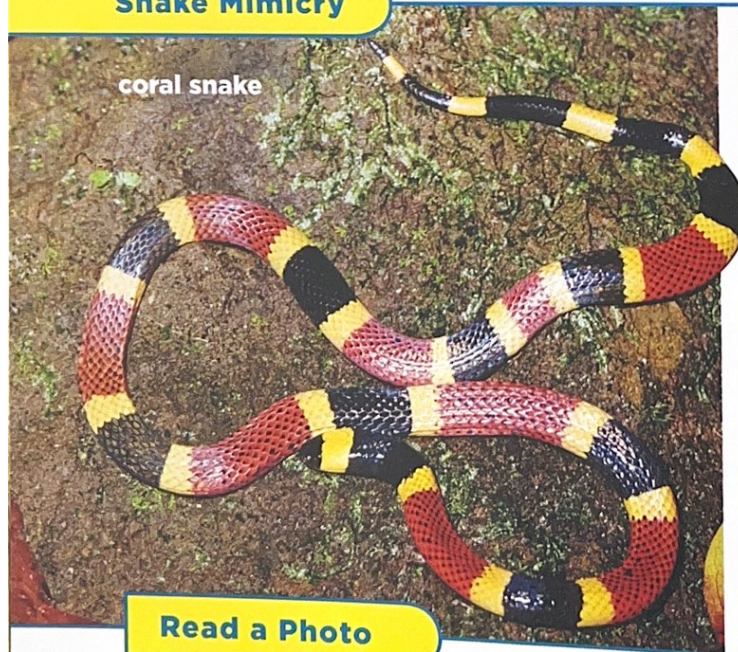
Predators also use mimicry. Instead of warning their prey, they use mimicry to deceive it. Some snapping turtles, for example, have the ability to wag a fleshy “lure” in their mouth. The lure looks like a worm. When fish come closer to try to eat the “worm,” the turtles catch the fish.

### ✓ Quick Check

**Problem and Solution** How do snapping turtles solve the problem of catching fish?

**Critical Thinking** How does mimicry increase an organism's chance of survival?

### Snake Mimicry



### Read a Photo

How can you tell a king snake from a coral snake?

**Clue:** Look for key differences in skin pattern.



# Lesson Review

## Visual Summary



**Adaptations** are traits that help organisms survive in their environments.



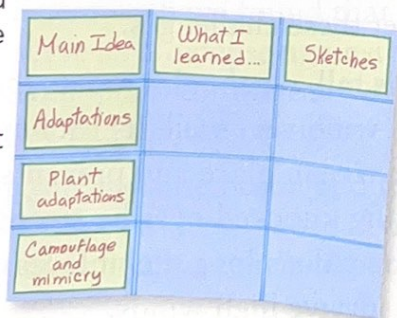
**Plant adaptations** include variations in their leaves, flowers, stems, and roots that help them survive in different environments.



Animal adaptations include **camouflage** and **mimicry**.

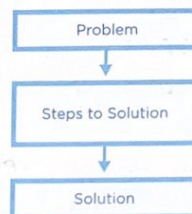
## Make a FOLDABLES™ Study Guide

Make a Trifold Book. Use the titles shown. Tell what you learned about each topic.



## Think, Talk, and Write

- Main Idea** What are structural and behavioral adaptations?
- Vocabulary** An organism imitating a harmful organism is called \_\_\_\_\_.
- Problem and Solution** How are aquatic animals able to survive in water?



- Critical Thinking** Can adaptations be both behavioral and structural? Explain.
- Test Prep** Which of the following are adaptations for cold weather?
  - A thick fur, big ears
  - B thick fur, body fat
  - C body fat, gills
  - D sleek shape, gills
- Test Prep** Which of the following is a behavioral adaptation?
  - A scaly skin
  - B sharp teeth
  - C hibernation
  - D camouflage



## Writing Link

### Fictional Narrative

Why does the giraffe have a long neck? How does its neck help the giraffe survive in its environment? Write a story about how the giraffe might have acquired this adaptation.



## Art Link

### Adaptation Art

Make a painting or drawing that illustrates an animal using camouflage, protective coloration, protective resemblance, or mimicry.





# Meet Caroline Chaboo

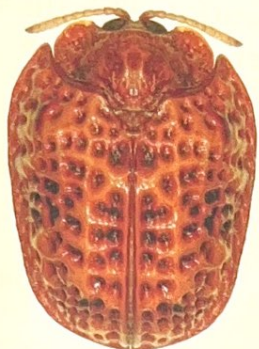


Plants in the tropical forests of the Caribbean face many challenges. They endure pounding rain, drought, and 100-kilometer-per-hour (100-mile-per-hour) hurricane winds. Yet plants like the palm (*Sabal causarium*) have adapted to meet these challenges.

This tall, regal palm resists the power of the wind very well. Its root system anchors the tree in place and prevents it from being knocked over by strong storms. The palm's long, flexible leaves also help it survive high winds.

The tree can live through hurricanes but faces another obstacle—a plant-eating beetle. Caroline Chaboo is a scientist at the American Museum of Natural History. Caroline studies the relationships between plants and insects. She researches the tiny tortoise beetle (*Hemisphaerota palmarum*), which is found in the Dominican





Female tortoise beetles place their eggs within the tissues of the plant.



These scars were caused by tortoise beetles.

Republic. This beetle and its larvae feed on the leaves of the Sabal palm. They scrape the palm's leaves with their mandibles, or jaws. This produces long scars that cause the leaves to dry out and die. Since palm trees have few leaves, losing even one can harm the growth of the entire tree.

While the tortoise beetle weakens the palm, the tree itself does not die. Scientists have found that many plants produce proteins that serve as a defense against insects. Caroline is studying the Sabal palm to find out whether it too produces a natural pesticide against the beetles.

By studying the tortoise beetle and the Sabal palm, Caroline hopes to learn more about how plants and animals adapt to their habitats.



### Write About It

#### Infer

1. How might a natural pesticide produced by the Sabal palm help other organisms?
2. Research tortoise beetles. What other plants do they eat? Write a report that tells how such a pesticide could help other plants.

#### Infer

- ▶ Review the text to make inferences about information not stated explicitly.
- ▶ List the details that support the inferences you make.

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# CHAPTER 3 Review

## Vocabulary

### Visual Summary



**Lesson 1** Food chains, food webs, and energy pyramids show the energy flow between organisms in an ecosystem.



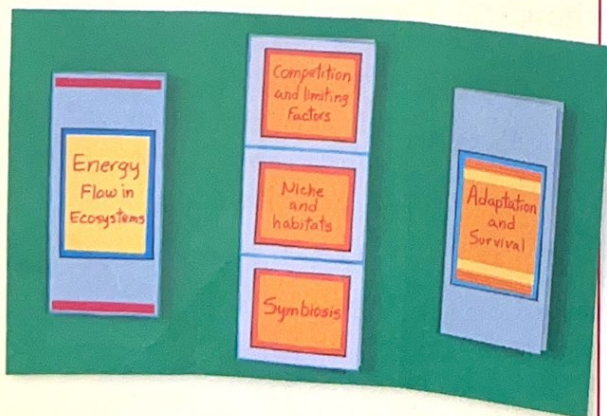
**Lesson 2** Abiotic factors and interactions between organisms control the size of populations in a community.



**Lesson 3** Organisms have adaptations that help them survive in their environments.

### Make a **FOLDABLES™** Study Guide

Assemble your lesson study guides as shown. Use your study guides to review what you have learned in this chapter.



Fill in each blank with the best term from the list.

**adaptation**, p. 168

**habitat**, p. 158

**camouflage**, p. 173

**parasitism**, p. 162

**ecosystem**, p. 142

**prey**, p. 147

**food chain**, p. 144

**symbiosis**, p. 160

1. All living and nonliving things in an environment make up a(n) \_\_\_\_\_.
2. A relationship where one organism benefits and the other is harmed is \_\_\_\_\_.
3. An organism lives and hunts for food in its \_\_\_\_\_.
4. Animals that are eaten by other animals are called \_\_\_\_\_.
5. A characteristic that helps an organism survive in its environment is a(n) \_\_\_\_\_.
6. Some organisms blend in with their environment using \_\_\_\_\_.
7. The path that energy and nutrients follow in an ecosystem is a(n) \_\_\_\_\_.
8. Mutualism and commensalism are different types of \_\_\_\_\_.



## Skills and Concepts

Answer each of the following in complete sentences.

9. **Problem and Solution** Desert ecosystems are dry and often hot. What structural and behavioral adaptations do organisms living in a desert have to solve this problem?
10. **Infer** How do the abiotic characteristics of this pond environment act as limiting factors in this environment?



11. **Predict** A rabbit with brown fur lives in a snowy environment. What do you think will happen to the rabbit?
12. **Critical Thinking** What would happen if an organism at the bottom of a food chain died off?
13. **Fictional Narrative** Write a short story set in the future. Suppose that some people have settled, with their pets, on a new planet. Create an ecosystem for the planet. What adaptations will the humans and animals develop to live in the new planet's ecosystem?



14. How do organisms interact?

## Performance Assessment

### An Ecosystem in Action!

Create a skit about how animals in an ecosystem interact.

#### What to Do

1. Working with a group, choose an ecosystem in which to set your skit. What animals, plants, and other organisms live in this ecosystem?
2. Choose several animals from your ecosystem that interact with each other. They may be predator and prey, or they may compete for food. They may also interact through symbiosis.
3. Write a skit showing how the animals interact. Perform your skit for the class.

## Test Prep

1. Which of the following organisms is a producer in this food chain?



- A blueberry bush  
B robin  
C bobcat  
D earthworm