

**Essential Question****What Are Some Animal Adaptations?****Preview Lesson Content**

**Objectives** Read the objectives with students. Refer to them throughout the lesson.

**Vocabulary** Have students write each word on an index card. Then have them write what they think the term means, using the format *I think (vocabulary term) means* and completing the sentence. As students learn about each word, have them write the definition on the back of the index card.

**Engage**

Use this page and the Try This! activity to engage students, determine students' background knowledge, and create excitement about the lesson content.

**Get Ready to Learn**

How did God make animals different? Can you think of animals that have special adaptations that help them survive? Ask students to share how animals' body parts, colors, sizes, and shapes help them survive in their environment. Review the meaning of *adaptations* with students. Adaptations result from God's design of the DNA that enables plants and animals to adapt to changing conditions. This is evidence for how much God cares about His Creation because He anticipated its needs.

**Try This!**

**What is your favorite animal?** Have students work individually. Their lists should include all the characteristics they know about this animal. After students have completed their lists, have them work in pairs to discuss the adaptations they listed and how they think these help the animal meet its needs. Allow students to research their animals as necessary.

**Objectives**

- Describe physical adaptations of animals.
- Identify behavioral adaptations of animals.
- Describe some animal behaviors that are learned.

**Vocabulary**

camouflage . . . . .	p. 70
mimicry . . . . .	p. 71
behavioral adaptation . . . . .	p. 73
instinct . . . . .	p. 73
migration . . . . .	p. 74
learned behavior . . . . .	p. 76

Find out what these words mean as you study this lesson.

**Essential Question****What Are Some Animal Adaptations?****Engage**

**Get Ready to Learn** How did God make animals different? Can you think of animals that have special adaptations that help them survive? Each adaptation an animal has helps it survive. Some of these adaptations serve more than one purpose. A rhinoceros, for example, has horns that it uses for several purposes. If a predator such as a lion attacks, a rhino will use its horn to protect itself and its young. Rhinos also use their horns to fight with other rhinos over territory, or for a mate.

**Try This!** What is your favorite animal? List what you know about the adaptations of this animal. How does the animal use these adaptations to meet its needs? Describe the adaptations of your animal to a partner and ask how the animal uses the adaptations to survive. If you are unsure about the adaptations of an animal, research it.



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**Science Background**

The meaning of *rhinoceros* is "horn-nosed." Rhinoceros horns grow from the skin. They are made of keratin, the same material human hair and nails are made of. Rhinoceros horns are not attached to the skull and they are always growing. If the horn is broken, it grows back.

Two species of rhinoceros live in Africa, the black rhinoceros and the white rhinoceros. These rhinoceros have large, well-developed horns. Three species of rhinoceros, the Sumatran, Indian, and Javan, live in Asia. Unlike the other two-horned rhinoceros, the Javan and Indian are one-horned rhinoceros. The Asian species do not use their horns as weapons because they are small. The horns are mainly used for courting, digging, and other activities.



## Structured Inquiry

Discover

Record your work for this inquiry. Your teacher may also assign the related Guided Inquiry.



# The Beaks Have It!

How is the shape of a bird's beak related to what it eats?



**SAFETY:** Never eat or drink anything in science class.

### Materials

- beaks: straws, tweezers, nutcrackers, chopsticks, toothpicks, spoon
- food: gummy worms, sunflower seeds, plastic foam pieces, marshmallows, rice, colored water in a cup
- paper plates      • plastic cup
- stopwatch or clock with second hand

**Step 1** Place each food on a different paper plate. Keep the water in the cup.

**Step 2** **Develop a hypothesis** that has to do with the tools. Which beak will work best for eating the food or drinking the water?

**Step 3** **Investigate.** Choose a "beak" to test first. Use the stopwatch to time how much of each type of food you can pick up and place in an empty cup in 30 seconds with your chosen beak.

**Step 4** **Record your data** in a chart. Repeat Steps 3 and 4 for the next "beak."

### Create Explanations

1. How is the shape of a bird's beak related to what it eats?
2. How did using models help you conduct an investigation about bird beaks?



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## Discover

Use the inquiry activities as an opportunity for students to perform hands-on investigations and think like a scientist.



## Structured Inquiry

# The Beaks Have It!

How is the shape of a bird's beak related to what it eats?



Remind students never to eat or drink anything in science class.

### Preparation and Tips

Demonstrate how to use each tool. Be sure students understand these models of bird beaks. Display pictures of actual bird beaks and relate them to the tools. For example, the straw is like the long, tubular beak of a hummingbird and the toothpick is a model for the sharp bill of an eagle. Likewise, the different foods are models for bird food. For example, the colored water is similar to flower nectar that hummingbirds eat.

**Predict** Which model "beak" will work best for eating each food?



Have students use their *Science Journals* to record their work for this inquiry.

### Inquiry Practice Tip

**Conduct Investigations** Explain to students that when they investigate, they make a plan and then try their ideas.

### Expected Results

Students should realize that birds' beaks come in many sizes and shapes and are suited to the food they eat.

### Create Explanations

1. Different beak shapes allow birds to eat different types of food.
2. Sample answer: I cannot directly observe birds in class, so I can use a model beak to see how beak shape affects the type of food a bird eats.

## Inquiry Extension

### Design a Beak

How can you make a model of a beak?

Extend the Structured Inquiry by having students design and build a working model of a beak for eating one kind of food.

**Teaching Tip** Students should decide what food the bird will eat, which should be realistic. Provide a variety of materials such as paper, foil, glue, paperclips, small nails, and so on for models. Then have students demonstrate their models and orally explain the adaptations.

Students may record their work in their *Science Journals*. A scoring rubric can be found as an *Online Teacher Resource*.



## Guided Inquiry

## Explain

### Physical Adaptations

#### Objective

- Describe physical adaptations of animals.

#### Set Goals

As students study this lesson, have them identify each physical adaptation and its purpose.

#### Develop Key Vocabulary

**camouflage** Write *camouflage* on the board. Ask students how many syllables are in the word and what they are. (cam-ou-flage) Then explain that *camouflage* comes from a French word meaning “to disguise.” Ask how this matches the definition.

#### Teach Science Concepts

For many animals that are both predators and prey, being able to blend in with their surroundings is important for their survival. Students should understand that camouflage helps prey hide from predators, and helps predators sneak up on prey unseen.

**What camouflage does a fawn have?** Its spotted fur color blends in with the vegetation and the ground in dappled sunlight.

**How might camouflage help a tiger?** The tiger can sneak up and surprise its prey without being seen.



#### Think About It

**What advantage does camouflage give to the animal?** Sample answer: A tiger's stripes help it hide in the jungle and sneak up on its prey without being seen.

## Physical Adaptations Explain



#### Think About It

Think of another example of an animal that uses camouflage. What advantage does camouflage give to the animal?



This insect looks like a leaf.

When you dress, you may choose colors, patterns, and shapes that attract attention. But suppose you did not want anyone to notice you. What colors, patterns, or shapes would you wear then?

Animals cannot choose their color, pattern, or shape. These are physical, or structural, adaptations. Many animals have physical adaptations that serve as a disguise. They can hide out in the open because they blend into their environment. The adaptation that allows some animals to blend into their surroundings is **camouflage**.

Color, patterns, and body shape are adaptations that help camouflage both predators and prey. Because a polar bear's fur looks white, for example, it can blend in with the snow. The polar bear can watch its prey without being seen, and attack when the time is right. The spots on a fawn camouflage it from predators in the light of the forest. An insect shaped like a twig is camouflaged by its shape.

#### Lesson Activity

Work with a partner. Cut an index card into four equal pieces. These pieces will be “insects.” Keep two pieces and give two to your partner. Color your cards so they will be hard to see when placed on a surface somewhere in the classroom. Ask your partner to close his or her eyes while you tape your “insects” to the places you have chosen. Have your partner open his or her eyes and look for your “insects.” Time how long it takes your partner to find the “insects.” Then switch roles and have your partner hide his or her “insects.” Talk with your partner about what made the “insects” easy or hard to find.



**How did you color your “insects” to try to hide them?**

**How could you change your “insects” to hide them better?**

## Scaffolded Questions

**Approaching Level** What would happen if a duck did not have webbed feet? The duck would not be able to swim very well since webbed feet are an adaptation for swimming. Webbed feet push more water back.

**On Level** Katydid look like leaves. If a katydid was on a bush, and a predator came by, what might happen? If the predator doesn't eat leaves, it most likely will not eat the katydid since it looks like a leaf.

**Above Level** Why might an animal not survive if it moved out of its natural environment? Sample answer: Animals develop adaptations for specific environments and may not be suited to other places. In the case of invasive species, when the animal/plant is moved from its home environment to elsewhere, the natural controls that keep species in check are gone. The species becomes a pest.



red-spotted purple butterfly



pipevine swallowtail

The red-spotted purple butterfly is a mimic of the poisonous pipevine swallowtail butterfly. A bird can't tell them apart, so it will not eat either one.

God designed some animals to look, sound, or behave like other animals. These other animals may have warning signals to protect them. Their colors or patterns may inform predators they are poisonous or taste horrible. The animals that imitate them are neither poisonous nor terrible-tasting. However, predators stay away anyway, because they think both are the same kind of animal. When an animal imitates another animal or object to avoid predators, it is called **mimicry**.

An animal's body covering is a physical adaptation too. A fish's scales keep water out of its body. Scales keep a reptile's body from drying out. The moist skin of amphibians is adapted for water. Birds' feathers provide warmth, help birds fly or swim, and keep them dry. Fur or hair protects animals from extreme cold or heat and protects skin from scrapes and scratches and too much Sun. Fur may be colored or patterned to provide camouflage.

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## Science Background

Mimicry involves one animal, the mimic, another animal, the model, and a third animal, the one confused by the other two.

**Batesian Mimicry:** An edible mimic looks like a poisonous or inedible model. For example, the scarlet king snake is not poisonous. However, it mimics the coral snake, which is very poisonous.

**Mullerian Mimicry:** Two or more bad-tasting or poisonous animals look like each other. Each animal benefits since predators that learn to stay away from one will most likely stay away from the other. An example involves the look-alike monarch and viceroy butterflies. Recently, scientists have found that birds find both distasteful. Previously they were thought to be examples of Batesian mimicry.

## Develop Key Vocabulary

**mimicry** Ask students what it means to mimic someone. (to copy or imitate closely) Then explain that *mimicry* comes from the Greek word *mimos*, which means "imitator." Discuss how this fits with the definition.

## Teach Science Concepts

Stress that mimicry uses shape, color, and patterns to look like another plant or animal—usually one that is dangerous, tastes bad, or looks like an inedible plant part such as a leaf or twig.

**Why do predators stay away from animals that imitate certain other animals?** Predators stay away from mimics because they confuse them with animal look-alikes that are dangerous or bad-tasting.

**Some flies look like bees. Is this camouflage or mimicry? Why?** This is mimicry because the flies are harmless, but they resemble bees, which sting. Ask students to explain the difference between camouflage and mimicry. Emphasize that both are adaptations.

## Lesson Activity

Tell students to decide where they want to hide their "insects" before they color them, since they want the "insects" to blend in with their surroundings. Provide students with colored markers or crayons to color their insects. Remind students that their "insects" cannot be hidden under, inside, or behind any object. They must be on a surface. You may wish to be the timekeeper for each group and have groups take turns.

**How did you color your "insects" to try to hide them?** Sample answer: I made their color as close as possible to the color of the place I put them. **How could you change your "insects" to hide them better?** Sample answer: I could put them on something with a pattern and color them to match the pattern.

## Explain (cont.)

### Incorporate Inquiry Practice

**Practice: Infer** When you infer, you use your observations and what you already know to make a careful guess.

Find photos of willow ptarmigan or rock ptarmigan in both their winter and summer (breeding) plumage. Show students the photos and explain that both photos show the same kind of bird in two different seasons. Ask students what they think winter and summer are like in the birds' environment. (cool summers and cold, snowy winters). Explain that these birds live in northern Canada and Alaska. **Infer how this adaptation helps these birds thrive in their environment.** In summer, their dark color helps them hide from predators because they blend in with the ground and the plants. In winter, their white color helps them blend in with the snow and makes it hard for predators to see them. This adaptation helps them live and thrive in their environment. Students may also notice that ptarmigan have feathers on their feet. Have students infer the benefit of this adaptation. The feathers help keep their feet warm in the winter.

### Explore-a-Lab Structured Inquiry

**Practice: Models** Remind students that scientists create models to observe things that they cannot observe directly. Point out that pictures and role-plays, as well as physical objects, can be models. Models can help us predict how real living things might adapt to changes in their environment.

**What adaptations will help an animal survive in a new environment?** Answers will vary, but students should consider the demands of the environment (cold, hot, dry, wet), and adapt the animal appropriately.

### Woodpecker Adaptations

- strong, sharp beak for drilling holes
- stiff tail for support on the tree
- two toes point backward to help with climbing trees
- very long tongue has a barb to skewer insects



You already know that a bird's beak is adapted to its foods. Did you know that other animals have adaptations for specific purposes too? Some animals have sharp, pointed teeth for eating meat. For animals that swim, webbed feet are an adaptation. They help the animal swim faster and easier.

### Explore-a-Lab

#### Structured Inquiry

**What adaptations will help an animal survive in a new environment?**

Working in a group, write a list of your favorite animals on small slips of paper. Place them in a cup or hat. Then write a list of environments, such as tundra, rain forest, and desert, on slips of paper and place them in another cup or hat. Make sure you have an equal number of environments and animals.

Without looking, choose one animal. Then choose an environment. Consider what adaptations the chosen animal might need to survive in the chosen environment. Draw the animal and label its adaptation. Communicate and explain why you changed the features of the model animal as you did.

Choose another animal and environment. Continue until all animals and environments have been chosen.

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## Science and Society

In the United States, it is illegal to sell, trade, or possess eagle feathers, hawk feathers, or feathers from any other wild bird protected by the Migratory Bird Treaty Act of 1918 and Bald Eagle Protection Act. A person found with an eagle or its parts can be fined up to \$25,000.

However, eagle feathers have great cultural and spiritual significance to Native Americans in the United States and First Nations peoples in Canada. In the United States, the religious use of eagle and hawk feathers is governed by a federal law limiting the possession of eagle feathers to certified and enrolled members of federally recognized Native American tribes.

## Behaviors That Are Instincts Explain

Camouflage, mimicry, and animals' body parts and coverings are physical adaptations. The way in which an animal behaves is an adaptation, too—a **behavioral adaptation**. Behaviors that animals are born knowing how to do are **instincts**. A lion preying upon a zebra and a bird building a nest are examples of instincts. When animals flee from danger, they are following their instincts.

Why do some animals like to live in groups? Some animals are safer in a group. It's harder for predators to choose one from a moving herd. Zebras' stripes confuse predators when zebras travel in large groups. Although fully grown male bison are safe from most predators, they live in groups and form a circle to protect their females and young.



### Think About It

Prey animals often live in groups. Predators also sometimes live in groups. What advantages might predators gain from living in groups?

### Behavioral Adaptations

**Puffer Fish** Puffer fish can inflate to several times their normal size.

**Fish** Fish and other animals travel in groups for protection and to find food.

**Opossum** Opossums can roll onto their backs, slow their breathing, and become stiff, as if dead.



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## Science Background

The puffer fish can inflate its body in a just a few seconds by swallowing great gulps of water or air. It is able to accomplish this because of a sac attached to its intestines. It uses a muscular valve to shut off its esophagus and stomach. Then it uses its specialized gills, which behave like a suction pump, to fill up the sac. Because the puffer fish does not have any pelvic bones or ribs, it can expand itself to a great extent. However, in order to not blow itself up too much, there are controls in the muscles of its skin, which help in regulating the expansion. Once the body of the puffer fish is fully extended, its predators can neither grip its body nor bite through the skin. The puffer deflates itself by releasing the muscular valves, allowing the water to be ejected through the gills and mouth.

## Behaviors That Are Instincts

### Objective

- Identify behavioral adaptations of animals.

### Develop Key Vocabulary

**behavioral adaptation** Remind students that if they look at the two words separately, they can infer that *behavioral* refers to how an animal responds to its environment, and an *adaptation* is any body part, behavior, or physical feature that increases its ability to survive in its environment.

**instinct** Tell students that an instinct is a way of behaving that God created in the animal.

### Teach Science Concepts

Ask students whether they have ever seen a dog chase a squirrel, or mark its territory. Explain that these behaviors are instincts and no one taught the dog to do these things. God created animals with instincts. Point out that not all behavior is instinctual. Explain that instincts do not change when an animal's environment changes. Instincts are forever.

**How are behavioral adaptations and instincts different?** God created animals with instincts, a set of behaviors that animals are born with. God also created animals with the ability to change their behaviors in order to adapt to their environment and survive.

**What are two ways animals protect themselves from predators?** Sample answer: They run, fly, or swim. They travel in groups or make themselves look larger. They are poisonous.

**Why does a puffer fish inflate itself?** So it will look larger to predators and be difficult for predators to swallow.



### Think About It

**What advantages might predators gain from living in groups?** Predators can learn to hunt cooperatively.

## Explain (cont.)

### Develop Key Vocabulary

**migration** Ask students to name the root word of *migration*. (migrate) Explain that *migrate* is a verb that means “to move from place to place.” Tell students that the suffix *-tion* means “the act of.”

### Teach Science Concepts

**Why do you think animals are able to migrate?** Sample answer: God created certain animals with the ability to travel long distances.

**Why do you think some animals hibernate rather than migrate?** Sample answer: Some animals that hibernate may not be able to travel distances to find food.

### Explore-a-Lab **Structured Inquiry**

**Practice: Observe** Remind students that when we observe, we carefully watch without interference.

**How will earthworms respond to light?** Earthworms will move away from bright light.

### A Good Place to Live

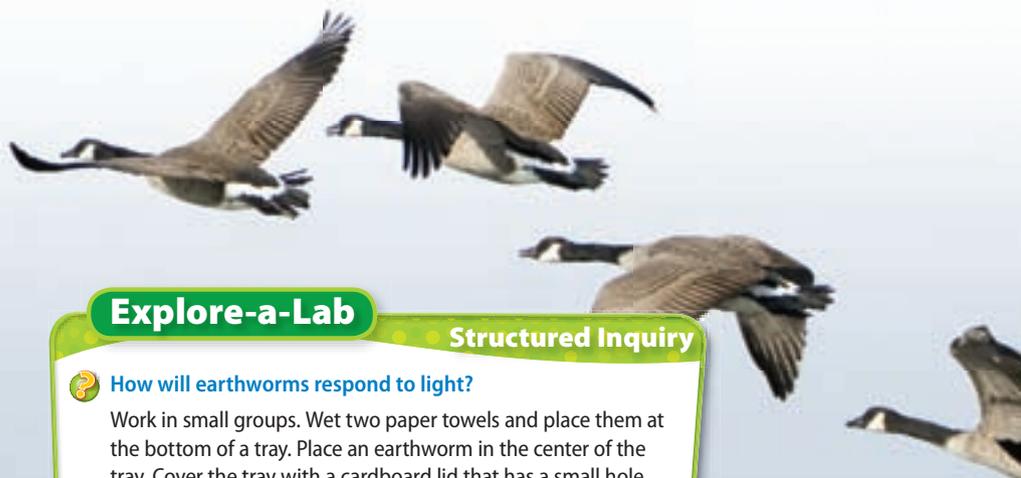
Encourage students to complete the analysis of the data gathered in the Open Inquiry activity. Remind them that they should think like scientists and use the scientific process when creating explanations.



**Reminder**

You may know that some animals travel south in the fall and return home in the spring. These animals are migrating. **Migration** is the act of traveling from one place to another, and back again. It is an instinctual behavior. For example, many birds that breed and raise their young in North America migrate in autumn. The areas where they spend winters are South and Central America, the Caribbean Islands, and the far southern United States.

Why do animals migrate? When it gets cold and the ground is covered with snow and ice, it's hard for many animals to find food and stay warm. However, some animals migrate during times other than fall. Wildebeests in Africa, for example, migrate throughout the year, always looking for grass and water.



### Explore-a-Lab

#### Structured Inquiry



**How will earthworms respond to light?**

Work in small groups. Wet two paper towels and place them at the bottom of a tray. Place an earthworm in the center of the tray. Cover the tray with a cardboard lid that has a small hole about 5 cm (2 in.) from one side of the piece of cardboard. Set up a light so it shines through the hole in the lid. Wait for ten minutes. Then remove the lid and observe the location of the earthworm.

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### Science Background

Wildebeests migrate throughout the year, always looking for fresh grazing and better water supplies. Short rains begin around early November. In late November and December, the herds migrate south to the short-grass plains of the Serengeti. They stay there through January, February, and March. Most wildebeest calves are born around February. Gradually the herds spread west across the plains. Then around April they start their great migration north. By May, all the wildebeests begin moving north, migrating to seek fresh grazing and water. During June, July, and August, their migration continues northward. In September, the herds reach and cross the Mara River, full of dangerous crocodiles. By October the herds begin heading south, and they reach the Serengeti National Park's Lobo area. They stay there until late November, when the whole wildebeest migration begins again.

Female loggerhead turtles leave feeding areas and travel hundreds of miles to nesting grounds, where they lay their eggs. Then they swim back to their feeding area. Salmon spend most of their lives in the ocean even though they were hatched from eggs in rivers or streams. When they are ready to reproduce, they return to where they were hatched. Dall sheep in Alaska migrate up and down mountains. They spend summers near the top of mountains and then spend winter at lower elevations where there is less snow and where food is easier to find.

Rather than migrate when it gets cold, some animals stay in the same place and hibernate, or go into a deep sleep. Because they do not need a lot of energy while hibernating, they survive the winter without much food. Animals that hibernate include woodchucks, ground squirrels, and bats. Snakes, turtles, and frogs also hibernate.



### Scripture Spotlight

Read **Proverbs 6:6–8** and explain what animal adaptations you read about.

### Lesson Activity

Find out about an animal that migrates to, from, or through the area where you live. Draw its migration route on a map.

**What can you infer about the migration of the animal you chose?**

Canada geese migrate north in spring, and south in autumn.



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## English Language Learners

**Language Development** Write the following words on the board: *migration, migrate, hibernation, hibernate, instinct, instinctive, behavior, behavioral*. Then, one at a time, point to each word, say it, and ask students to repeat it. Review nouns, verbs, and adjectives with students. Ask them to name the part of speech for each word and use it correctly in a sentence. (*migration*—noun, *migrate*—verb, *hibernation*—noun, *hibernate*—verb, *instinct*—noun, *instinctive*—adjective, *behavior*—noun, *behavioral*—adjective).

### Lesson Activity

Have students use the Internet or other references to gather data. Provide students with the information below and a world outline map. Have them record the migration routes of their birds or other animals.

Animal	Route
Pronghorn	moves north in spring from its winter range in the Upper Green River Valley of Wyoming following along the Green River, travels down the Gros Ventre valley to its summer range in Jackson Hole and Grand Teton National Park, where it gives birth and spends the summer, then in fall it begins its return trek to its winter range
Ruby-throated hummingbird	from southern Canada flies across the Gulf of Mexico to Central America and as far south as Panama

**What can you infer about the migration of the animal you chose?** Answers will vary depending on which animals students select.



### Scripture Spotlight

Read **Proverbs 6:6–8**, and explain what animal adaptations you read about. Explain that the passage describes how ants work hard to gather what they need to survive during times when food is plentiful. Ask students if they think the work the ants do is from instinct or if it is a learned behavior. Share with students that ants have been observed teaching new ants to find food sources. In experiments, some ants were rewarded with finding food while other foraging ants found nothing. Eventually, the unsuccessful ants started to perform a different job within the ant nest. This would suggest that ants exhibit some learned behaviors.

## Explain (cont.)

### Learned Behaviors

#### Objective

- Describe some animal behaviors that are learned.

#### Develop Key Vocabulary

**learned behavior** Have students tell the meaning of *learned* and *behavior*. Connect their definitions to the meaning of *learned behavior*.

#### Teach Science Concepts

Ask students to explain how they learn things. Explain that animals learn things in the same way. Point out that learned behaviors develop as an animal interacts with its environment.

#### What are examples of learned behaviors?

Sample answers: a cat running to be fed when it hears a can opener, a deer returning to a yard to get food, a dog avoiding skunks after being sprayed **Which is an example of a learned behavior, a spider spinning a web or a bird getting food from a bird feeder? Explain.** A bird getting food from a bird feeder is a learned behavior because bird feeders do not occur in nature. Spinning a web is an instinct because God created in spiders the ability to adapt in this way.



#### Think About It

**Which are instinctive and which are learned behaviors? How do you know?** Sample answer: Brushing my teeth is a learned behavior that my parents taught me. When I jumped out of the way when my sister dropped her orange juice, that was instinctive. I didn't think, I just did it.



#### Focus on Health

**What are some healthy behaviors you have learned? What are some unhealthy learned behaviors?** Sample answer: Learning to brush your teeth and eating healthful foods are healthy learned behaviors. Unhealthy learned behaviors include drinking too much soda, drinking alcohol, and smoking.

## Learned Behaviors Explain



#### Think About It

Humans have both instinctive and learned behaviors. Make a list of what you do each morning before school. Which are instinctive and which are learned behaviors? How do you know?



#### Focus on Health

What are some healthy behaviors you have learned? What are some unhealthy learned behaviors?

A cat races into the kitchen when it hears a can opener. A deer returns every night to a backyard where people leave food. A dog avoids skunks after being sprayed. After eating a bad-tasting insect, a bird stays away from other insects of the same kind. These animals have learned these behaviors just as you have learned to speak, read, ride a bicycle, or play a sport. A behavior that is taught is a **learned behavior**.

Learned behaviors are similar to adaptations because they help animals survive. But they are not adaptations because they will not be inherited by offspring from their parents. Young animals, however, can learn many behaviors from watching their parents.

Animals learn behaviors through experience and practice. A raccoon searches for food in a garbage can because it has found food there before. If the garbage can is no longer available, the raccoon's behavior will no longer get it food. The raccoon will be forced to change its behavior.

Many animals learn behaviors from their parents or others of their own kind. Lions, for example, teach their cubs how to stalk and attack prey. Monkeys teach their young which leaves they can safely eat.



Some raccoons open garbage cans. This behavior is not natural. It is a learned behavior.

## Assessment Options

**Informal Assessment** Use the questions and features provided at point-of-use in the teacher wrap.

**Formal Assessment** Consider assigning the lesson review in the *Student Edition* or the lesson support page found as an *Online Teacher Resource*. The chapter test in the *Teacher Edition* may be used for formal assessment.

**Performance Assessment** Ask students to perform the task described below. Use the rubric on the next page to assess students.

**Task:** Think about an animal you would like to create. Make a list of adaptations your animal has. Draw your animal and name it. Then choose three of the animal's adaptations. Write a paragraph that explains how these adaptations help your animal survive. Share your animal drawing and paragraph.

## Make a Connection Extend

Make a list of ten adaptations that you have learned about in this chapter. Choose one form of communication that is your adaptation to learning. Write a poem or story, draw a picture, or make a cartoon that describes or shows the adaptations you listed. Share your work. When you adapt to learning, what is the benefit?

### Lesson Review Assess/Reflect

**Summary:** What are some animal adaptations? Animals rely on physical adaptations, instincts, and learned behaviors to survive in their environments.

- 1. Graphic Organizer** Make a cause-and-effect chart to tell what adaptations animals have and why they have them.
- 2. Vocabulary** How is an **instinct** different from a **learned behavior**?
- 3. Test Prep** The nonpoisonous scarlet king snake looks and acts like the dangerous coral snake. What is this an example of?
  - A. migration
  - B. instinct
  - C. mimicry
  - D. camouflage
- 4. Inquiry Practice** Some animals' fur turns white at some times of the year. What can you **infer** is the reason this occurs?
5. What are two ways that animals deal with changing weather?
6. Some female sea turtles return to the beach where they were born to lay their eggs. What is this an example of? How do you know this?
- 7. Review Proverbs 6:6–8.** What lessons do you think God wants you to learn from the ants?



**Family Link** With a family member, visit a zoo or a park, or observe animals in your own backyard. Observe their physical adaptations and record them in a chart. Then, use the Internet or other reference sources to find out some of each animal's instincts and learned behaviors. Add the information to your chart. Share it with classmates.

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**Rubric:** Use the following rubric to evaluate student performance.

- 3—Drawing clearly identifies adaptations. Written explanation is complete and shows understanding of science concepts.
- 2—Drawing identifies adaptations. Written explanation is partially complete and shows reasonable understanding of science concepts.
- 1—Drawing somewhat identifies adaptations. Written explanation is somewhat complete and shows limited understanding of science concepts.
- 0—Drawing does not identify adaptations. Written explanation is incomplete and shows no understanding of science concepts. Ideas are communicated poorly.

## Extend

### Make a Connection

Tell students to pick the form of communication that they feel most successful and comfortable with. After all students have shared their work, discuss the benefits of adapting to learning.

## Assess/Reflect

### Lesson Review

Read the essential question and lesson summary with students. Ask students if they have any questions about the summary. Then ask students what additional details they would add to it.

Assign the lesson review. Evaluate students' responses, and review concepts as needed. Sample responses are shown below.

1. Graphic organizers will vary. Sample answers: Cause: camouflage, mimicry, run fast, travel in groups; Effect: stay safe from predators/startle prey; Cause: migration, hibernation, fur or hair; Effect: stay warm
2. Instincts are behaviors animals are born knowing. Learned behaviors are taught.
3. C
4. Sample answer: I can infer that the fur turns white in winter to camouflage the animal in the snow.
5. Two ways animals deal with changing weather are by migrating or hibernating.
6. This is an example of an instinct. Female sea turtles are born knowing to do this. It is not something they learn from others of their own kind.
7. God wants you to take the initiative to prepare for what you need in life and work hard to achieve it.

**Family Link** Suggest students and family members take photographs of the animals they observe, if possible. Invite students to share their charts with the class.

## Extend

## Extend

### Set Goals

As students study this page, ask them to think about how each device takes the place of a natural adaptation to help organisms live in inhospitable areas.

### Bioshelter

#### Teach Science Concepts

Bioshelters differ from traditional greenhouses in the complex interactions between the many elements of the bioshelter. The building protects the organisms within, controls the air, and absorbs solar energy. The solar energy is used by plants and stored as heat energy in water, soil, and stone inside the bioshelter. Gases are exchanged through the many organisms and through the soil in the bioshelter. Nutrients are exchanged between the organisms and the soil. Waste is recycled in the soil.

**Tilapia is a popular fish used for food. Tilapia can only live in warm water. How can a bioshelter be helpful in raising tilapia in a cooler climate?** The bioshelter can keep the water warm using solar energy.

### Clay Pot Irrigation

#### Teach Science Concepts

Clay pot irrigation helps plants, specifically trees, survive in areas with insufficient water.

**What adaptation might a species of tree develop if it were going to survive without the help of a clay pot irrigation system?**

Over time, the species might develop faster-growing roots or it might develop a lesser need for water.

#### Concept Check

1. Bioshelters protect living things from the natural environment that may not be suitable for certain plants and animals to grow.
2. Sample answer: Water leaks out of the pots slowly, providing continuous water in an area where it doesn't rain very often.

### Bioshelter

Bioshelters are a way to raise plants and animals where people need them. Bioshelters allow plants and animals to live where they could not live in nature. A bioshelter is a solar greenhouse. It protects the plants and animals inside. Bioshelters are used to grow crops for food. They have ponds with fish. They also include insects and other animals. That helps keep the shelter habitat in natural balance.

The greenhouse protects the life inside of it. Solar energy heats it. The ponds help keep the temperature inside from getting too hot or too cold. Insects are used to naturally control harmful pests. Someday, people may live inside bioshelters.



#### Concept Check

1. How do bioshelters help living things survive in environments where they do not naturally live?
2. How would clay pot irrigation be useful to people who live in the desert?

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### Clay Pot Irrigation

The buried clay pot irrigation system, invented in China, has been used for over 2,000 years. It is an efficient way to water plants that grow in dry areas.

Clay pots are buried in a garden or small field. Then the pots are filled with water. The water slowly leaks out through the clay walls of the pots. The plants pull only as much water as they need from the pots.

Most irrigation systems water plants at regular times. The clay pot irrigation system provides continuous moisture at the plants' roots where it is needed. Water is added to the buried clay pots only once or twice a week. No water is wasted.

This irrigation system has been used successfully by farmers in parts of Latin America, Asia, and Africa. Tomatoes, corn, beans, onions, and garlic are grown using this system. Farmers in Mexico and India can now grow enough to feed themselves and sell extras at the market.

## History of Science

Harriet Russell Strong was born in the state of New York in 1844. Her family moved west to California when she was a child. When she grew up, she and her husband purchased 320 acres of land in California. It was very dry land, so she began searching for better ways to irrigate the crops. She invented a flood control/storage dam system. She used the system to irrigate their crops of walnuts, citrus fruits, pampas grass, and pomegranates. Her irrigation system became widely used and is primarily responsible for the growth of the Southern California produce industry.

All her adult life, Strong was an advocate for water conservation. She was one of the first people to propose using the Colorado River to supply water for Los Angeles. She even spoke before Congress about the need for water conservation practices.

### Herpetologist

A herpetologist studies amphibians and reptiles. Amphibians and reptiles are vertebrates (animals with backbones). They are ectotherms. That means they use behavior to control body temperature. They depend on heat from the environment to keep them warm.

Amphibians hatch from eggs in water. As they grow, they develop lungs and legs that



allow them to live on land. Some amphibians are frogs, toads, salamanders, and newts.

Reptiles hatch from eggs on land. Reptiles have lungs to breathe air when they hatch. Some reptiles are alligators, crocodiles, turtles, snakes, and lizards.

Some herpetologists study amphibians to see what affect humans have on their habitat. Some herpetologists study ways to use venom from amphibians and reptiles to help people. Other herpetologists work to teach people about this diverse group of animals. There are almost 8,500 species of amphibians and reptiles. Since there are so many, herpetologists usually pick a specialty.

### Animal Behaviorist

Animal behaviorists study how animals act in their natural habitats. They help protect animals whose natural habitats are endangered. They also study ways to help people and animals live together.

Animal behaviorists study how animals take care of their young. They study how animals find food, water, and shelter. They also study how animals protect themselves from predators.

Some animal behaviorists design healthy living areas for animals in zoos or aquariums. They train service animals for disabled people. They also help pets that behave badly. Animal behaviorists use what they learn to better understand how humans behave and learn.



#### Concept Check

1. Is the herpetologist holding an amphibian or a reptile? How do you know?
2. How can studying animal behavior help animals that belong to an endangered species?

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### Set Goals

As students study this page, ask them to think about how both herpetologists and animal behaviorists help animals survive and be comfortable in their environments.

### Herpetologist Teach Science Concepts

It is not unusual to see snakes or lizards lying on a rock in the sunlight. They are absorbing the heat from the rock and from the sunlight to warm their bodies. People who keep a cold-blooded animal as a pet must provide a heat source so the pet can stay warm.

### Animal Behaviorist Teach Science Concepts

There are many types of jobs for people who work with animal behavior. Some people work with pets to improve their behavior. These animal behaviorists work to help pets get along better with human families. They first look to make sure the pet is not sick. Then, they try to find out why the pet is behaving in an inappropriate manner. Finally, they come up with strategies for the family to use to help stop the unwanted behavior. Pets often encounter other people and their pets, so the need for good behavior is important for everyone's safety and well-being.

**Why do you think many people are interested in what an animal behaviorist can do for their pets?** Many people have pets. They want their pets to get along with people and with other animals.



#### Concept Check

1. It is a reptile. It appears to have scaly skin and claws.
2. By studying endangered species, scientists may find ways to help them survive.

### Science and Society

One of the jobs an animal behaviorist might hold is that of designing the habitats for animals in zoos. Although zoos have existed for a long time (since about 3500 B.C.), in the 1970s zoos took on a more active role in conservation. Many modern zoos embrace this philosophy. Animals often live in open areas that try to mimic their natural habitat in appearance, climate, and lighting. Zoos may participate in breeding programs for endangered species.

All zoos in the United States must have a license and be inspected. They also must follow laws established to protect animals. The Association of Zoos and Aquariums (AZA) requires zoos accredited by it to meet very strict standards for both animal care and conservation. Many popular zoos in the United States are accredited by the AZA.