Research Information for Animals

- Vertebrates/Invertebrates
- Internal Stimuli
- External Stimuli
- Inherited Behaviors
- Learned Behaviors

Vertebrates

Animal Group	Movement	Obtaining Resources	Protection and Defense
Fish	Swim with fins	Filter food from water; use teeth to eat plants or to catch and eat other animals	Scales, some with protective coloring; teeth
Amphibians: frogs, toads, salamanders	Swim in early life; walk or jump in adult life	Use mouth to eat algae and plants or to capture and eat prey	Some have poisonous glands
Reptiles: turtles, snakes, alligators, crocodiles	Swim, slither, or walk	Use teeth to tear grasses, to crush plants and the shells of clams and other mollusks, or to capture and eat other animals	Scales; some snakes are poisonous; turtles have hard shells; crocodiles and other lizards have strong jaws and large teeth
Birds	Use wings to fly or swim; use legs to walk, run, or swim	Use beaks to open and eat seeds, eat fruit, catch and eat fish or other prey; use claws to help hunt	Feathers, some with protective coloring; beaks and claws
Mammals	Walk or run	Use specialized teeth to eat grasses, fruit, other plant foods, or meat; claws to help capture and eat prey; hands to pick up food	Fur or hair; endoskeleton protects brain, heart, lungs, and other organs; teeth and claws

The tables summarize how many animals move, get resources, and protect themselves.

Invertebrates

Animal Group	Movement	Obtaining Resources	Protection and Defense
Sponges	Most cannot move, are attached to a surface	Filter food from water	None
Mollusks: snails, clams, squid, octopus	Swim using their feet, or crawl along ground	Filter food from water	Most have shells for protection; octopus and squid use ink to blind attackers
Segmented worms: earthworms, leeches	Wiggle through soil or water	Use mouth to get bits of food from soil or water as they move	Hide in soil or sand
Echinoderms: sea stars, sea urchins, sea cucumbers, sand dollars	Use tube feet with suction cups	Sea stars open clams with tube feet; brittle stars eat dead matter on seafloor; sea cucumbers filter food from the sand	Sea urchins have spines; sea stars have hard exoskeletons
Arthropods: lobsters, spiders, mites, insects	Walk with jointed appendages or fly	Use jaws to tear leaves, bite fruit; use appendages to capture prey and put it into mouth	Exoskeleton; some have poisonous bites or stingers

Chapter 3 • Lesson 20

Indicators: 6-3.4, 6-3.5, 6-3.6

How Animals Respond to Change

Key Words • internal stimulus • external stimulus • hibernation • migration • camouflage • courtship

Getting the Idea

In Lesson 19, you learned about some of the ways animals respond to heat and cold. Anything in the environment that causes a reaction is a stimulus, and the way an organism reacts is a response. Animals respond to many stimuli in their environments. Different animals react differently to the same stimuli.

Internal Stimuli

Animals respond to signals from inside their bodies. They sleep when they are tired, eat when they are hungry, and drink when they are thirsty. Signals from inside an animal's body are called **internal stimuli**.

Animals need food for energy and heat. Hunger is a stimulus. Animals respond to hunger by looking for food and eating it. Eating gives them the energy they need to stay alive. Animals also need water. Thirst is a stimulus that tells animals to drink. Animals also need sleep. As they sleep, important things, such as digestion and rest, happen within their bodies. Sleepiness tells the animals to sleep so they can stay alive.

External Stimuli

In Lesson 19, you learned about shedding, sweating, panting, and shivering. These are responses to an animal's environment. Stimuli that come from the environment outside the organism are called **external stimuli**. Sunlight, heat, cold, seeing another animal, and noise are examples of external stimuli.

Blinking is an automatic response to external stimuli such as dust, sunshine, heat, and wind. Blinking helps protect the eye by covering it with a layer of tears. This film of tears keeps the eye from drying out. The liquid also keeps out organisms that could cause an infection. Blinking also protects the eye from dust and insects by closing the eyelid if anything comes too close.

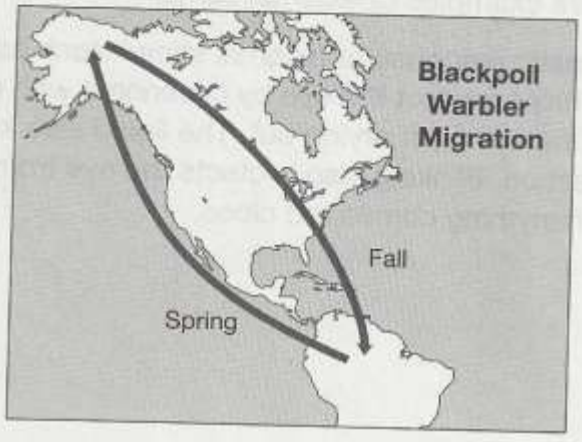
Food gathering is a response to external stimuli. For example, some animals gather food when the seasons change. They may be responding to shorter days or to changes in temperature. At other times, the stimulus is the presence of the food. When food is plentiful, animals store it for times when food is scarce. Squirrels, mice, and beavers gather and store nuts and tree bark to eat later. Some other animals, such as bears, ants, walruses, chipmunks, and penguins, gather lots of food and eat it right away. They turn the food into body fat that they can use for energy later. The fat can also keep them warm.

Some animals hibernate when it gets cold and food supplies are low. During **hibernation**, the animal's breathing and heart rate slow down. The animal goes into a period of deep sleep. Its body temperature falls so it is close to that of the environment. Hibernating animals use very little energy. Some mammals and many amphibians and reptiles hibernate during the winter. They may hibernate for all or part of the winter. When the environment warms up again, the animal's body temperature also rises. The animal wakes up and becomes active again. Snakes, groundhogs, beavers, and ground squirrels all hibernate.

Most bears do not hibernate. They do enter a sleeplike state, but they wake up from time to time. Their body temperature does not drop as low as that of true hibernators.

Migration is an animal's movement to a new location when the seasons change. In winter, many animals migrate to warmer places where more food is available. They return to the cooler areas in the spring. Animals that migrate usually go to the same place year after year, using the same route. They start their trips in response to the weather or to changes in the amount of daylight.

Some mammals and many birds migrate in the fall and spring. The arctic tern travels from the Arctic to the Antarctic and back every year. It flies about 35,000 kilometers a year. The monarch butterfly flies from the northeastern United States to Mexico every year. The blackpoll warbler flies nonstop for 90 hours to get from North America to South America. The gray whale swims from the Arctic to the waters off northern Mexico. Other animals that migrate include caribou, ducks, and orcas.



Recall that some animals use camouflage to protect themselves from predators or to hide from their prey. **Camouflage** is the ability of an animal to blend into its environment. Some animals camouflage themselves in response to external stimuli. For example, arctic foxes have white fur in winter, which blends in with the snow. In summer, they grow gray or brown fur, which makes them harder to see against the rocks, soil, and plants. Chameleons and other lizards change colors to match the environment and hide from predators.

Some animals react to predators by squirting fluids. An octopus squirts out a black, inky fluid that forms a cloud. The cloud hides the octopus, giving it time to swim away from the predator. The horned lizard shoots blood out of its eyes so it has time to escape. A skunk squirts an oily, foul-smelling liquid that can cause pain, nausea, and burning eyes. This slows the predator and gives the skunk time to escape. Predators that have been sprayed once usually do not attack skunks again.

Some animals, including bees and wasps, have stingers to protect themselves. If a predator grabs one of these insects, the insect may react by stinging. The pain causes the predator to let go of the insect.

Some animals travel together for protection against the environment and predators. Each animal is protected by the others in the group. A group of musk oxen may stand with all their horns facing outward for defense. Sometimes a group of animals may look like one large animal, and confuse a predator. A school of small fish can arrange themselves to look like one large fish. When zebras stand together, telling them apart is difficult. If a lion attacks the zebras, it may become confused. It will chase one zebra for a few seconds, then start after another. The lion usually gets tired before catching any of the zebras.

Courtship is the process of finding a mate. Courtship includes behaviors that help males and females of the same species recognize each other. Stimuli in the environment signal that it is time for courtship. Many animals court in spring, responding to warmth and longer days. Smells, sounds, and color may all play a part in courtship. Male peacocks show their colorful tail feathers to attract females. Male deer rub against trees, leaving a scent that will attract a female deer.

Responses to Stimuli

Animal	Stimulus	Response
Earthworm	Sunlight	Move toward shade
Moth	Candle or porch light	Fly toward light
Fish	Food	Swim toward it
Dog	Heat	Pant, sweat through foot pads
	Food	Drool
	Owner walking into the room	Wag tail
Cat	Heat	Pant
	Fear	Hiss and arch back
Horse	Fly landing on skin	Twitch muscle
Human	Particle in eye	Blink
	Cold	Shiver
	Heat	Sweat
	Tiredness	Yawn
	Dust in breathing passages	Sneeze

Indicator: 6-3.7

Learned and Inherited Behaviors

Key Words • behavior • learned behavior • imprinting • conditioning • inherited behavior • instinct

Getting the Idea

Why do robins build nests out of twigs? How do animals know how to find food or cooperate with each other? Animals are born knowing how to do some things. They learn other behaviors through experience. All these behaviors help animals survive.

Learned Behaviors

A **behavior** is anything an organism does in response to changes in its environment. These actions help an animal survive.

A **learned behavior** is a behavior that an animal is taught by its parents or learns through experience. Learned behaviors include skills and responses an animal learns during its lifetime. These are not traits that the animals have from birth. For example, you know fire is too hot to touch from your experience or because someone told you. You were not born knowing this.

If an animal spends time living with its parents, it can learn by watching them. Many animal behaviors are learned by observation. For example, lion cubs learn to hunt by watching their mothers hunt. Chimpanzees learn from their parents to use small sticks to dig for insects. Some animals are taught by trainers. People teach dogs to play ball, sit, stay, and roll over. Animals also learn from experience. A pet cat might hear the sound of the can opener and run for its food bowl. The cat has learned that food appears in its bowl after it hears the can opener. Animals learn from each other and from experience.

Imprinting is a behavior in which newborn animals recognize and follow the first moving thing they see. This is usually their mother. However, it can be any other animal, or even a nonliving object. Scientists have studied imprinting mostly with chickens, ducks, and geese. The imprinted behavior cannot be changed. If a duckling first sees and follows a male duck or a scientist, it will never follow any other animal, not even its mother.

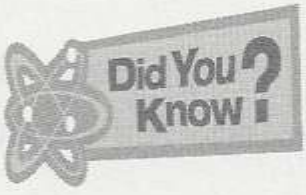
Conditioning is another form of learned behavior. An animal learns to respond in a specific way to a certain stimulus. The animal learns this because the response keeps having the same result. For instance, a child learns that touching a hot pan on the stove will cause pain. The child learns not to touch hot pans. A chimpanzee learns that using a stick to dig will get it termites to eat. A dog that sees its owner and wags its tail has learned that this behavior will earn it a pat on the head. Some behaviors are learned by trial and error. The dog may not have wagged its tail the first few times it saw its owner. It may have tried jumping up instead. If the person pets the dog whenever the dog wags its tail, and not when it jumps up, the dog will learn to wag its tail when its owner gets home.

Inherited Behavior

Inherited behaviors are behaviors that an animal does not have to learn. Animals know most of these behaviors at birth. Inherited behaviors are also called **instincts**. These behaviors are passed from parents to their offspring.

Swimming is an inherited behavior for whales and fish. The babies do not need to be taught to swim, and they do not learn to swim by observation. They know as soon as they are born. Humans have to be taught to swim. Swimming is a learned behavior for humans.

Crying is an inherited behavior. Babies know how to cry as soon as they are born. This crying lets the parent know that the baby is hungry, thirsty, or sleepy. Many other mammals also inherit this behavior. The sucking motion is also an inherited behavior. This behavior allows newborns to eat and gain strength right away. A newborn may start sucking before it has found its mother and the source of food. Turtles are born with the instinct to run to the ocean, even though they have never seen the ocean before. Newborn sparrows bob their heads so their parents will give them food. Bobbing their heads is an instinct. Feeding baby birds when the babies bob their heads is an inherited behavior of the parents.



The South Carolina state reptile is the loggerhead turtle. Loggerhead turtles make their nests on the beach. It is against the law to use a light on a beach in South Carolina from May to October. If a baby loggerhead turtle sees a light, it may get confused and move toward the light instead of toward the ocean.

Animals show inherited behavior in other ways, too. Loggerhead turtles know to come to the beach to make nests, even though they have not been there since they were born. Snails know to dig small holes to lay their eggs. Different birds build different kinds of nests. Some birds nest in trees, and some nest on the ground. Some birds build nests out of twigs, and others use mud. Each bird instinctively knows how and where to build a nest. Courtship behaviors are also inherited. A male fiddler crab does not need to be taught to show off its large claw to attract females. It does this instinctively.

The Venn diagram below shows some inherited and learned behaviors. Notice that some behaviors are learned in some species and instinctive in others. For example, a fish is born knowing how to swim. Humans have to be taught.