

Section 33.1

Innate Behavior

North Carolina Objectives Objective 4.05 Analyze the broad patterns of animal behavior as adaptations to the environment: Innate behavior

► Before You Read

You may live in an area where you can observe animals migrating. Have you seen flocks of birds flying overhead in spring or fall? Perhaps you have seen salmon returning upstream. How do animals know when to migrate? Write your thoughts on the lines below.

► Read to Learn

What is behavior?

A peacock displaying his colorful tail, a whale spending the winter months in the ocean off the coast of southern California, and a lizard seeking shade from the hot desert sun are all examples of animal behavior. **Behavior** is anything an animal does in response to a stimulus. A stimulus is an environmental change that directly influences the activity of an organism. The presence of a peahen stimulates the peacock to open its tail feathers. A change in the length of daylight hours may cause the whale to leave its summertime arctic habitat. Heat stimulates the lizard to seek shade.

Inherited Behavior

Inheritance plays an important role in the ways animals behave. You would not expect to see a hummingbird tunnel underground or a mouse fly. Yet, why does a mouse run away when a cat appears? Why does a hummingbird fly south for the winter? These behaviors are genetically programmed. An animal's genetic makeup determines how that animal reacts to certain stimuli.

Does natural selection favor certain behaviors?

Often, a behavior exhibited by an animal species is the result of natural selection. A variety of behaviors among individuals affects their ability to survive and reproduce. Individuals with behavior that makes them more successful at surviving and reproducing usually produce more offspring. These offspring inherit the genetic basis for the successful behavior. Individuals with less successful behavior produce fewer offspring or none at all. ♡

STUDY COACH

Mark the Text

Identify Main

Ideas This section introduces innate behavior. Skim the section and highlight three important facts about innate behavior.

✓ Reading Check

1. How does natural selection favor certain behaviors?

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Innate Behavior, *continued*

Inherited behavior of animals is called **innate** (ih NAYT) **behavior**. A toad captures prey by flipping out its tongue. To capture prey, a toad must first be able to detect and follow the prey's movement. Toads have "insect detector" cells in the retinas of their eyes. As an insect moves across the toad's line of sight, the "insect detector" cells signal the brain, causing an innate response; the toad's tongue flips out. This is an innate behavior known as a fixed-action pattern. A fixed-action pattern is an unchangeable behavior pattern that, once begun, continues until completed.

 **Reading Check**

2. What does innate behavior include?

 **Reading Check**

3. What controls the fight-or-flight response?

What is the basis of innate behavior?

Scientists have found that an animal's hormonal balance and its nervous system affect how sensitive the individual is to certain stimuli. The sense organs responsible for sight, sound, touch, and odor identification are especially important. In fire ant colonies, a single gene influences the acceptance or rejection of the ant queen, thereby controlling the colony's social structure. Innate behavior includes fixed-action response, automatic response, and instincts. ☺

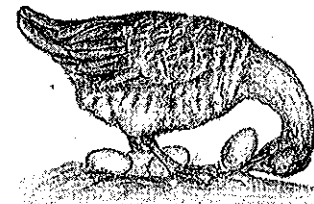
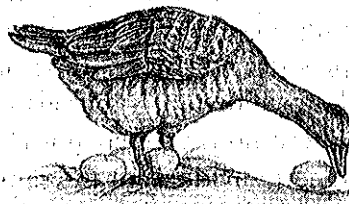
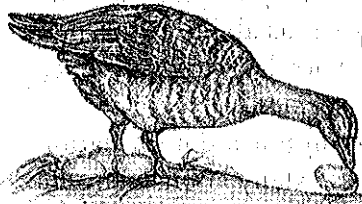
Automatic Responses

What happens if something is thrown at your face? Your first reaction is to blink and jerk back your head. Even if a protective clear shield is placed in front of you, you cannot stop yourself from behaving this way. This reaction is called a reflex, the simplest form of innate behavior. A **reflex** (REE fleks) is a simple, automatic response to a stimulus that involves no conscious control. If you accidentally touch a hot stove, you will automatically jerk your hand away. Before you even have time to think about it, the reflex movement saves your body from serious injury.

Another automatic response, called fight-or-flight response, has adaptive value. Think about a time when you were suddenly scared. Your heart began to beat faster. Your skin got cold and clammy and your breathing rate increased. You were having a fight-or-flight response. A **fight-or-flight response** mobilizes the body for greater activity. Your body is being prepared to either fight or run from the danger. A fight-or-flight response is automatic and controlled by hormones and the nervous system. ☺

Instinctive Behavior

The fixed-action response of the toad capturing prey, the reflex response to a hot stove, and the fight-or-flight response are quick, automatic responses to stimuli. Some behaviors, however, take a longer time because they involve more complex actions. An **instinct** (IHN stingt) is a complex pattern of innate behavior. Instinctive behavior begins when the animal recognizes a stimulus and continues until all parts of the behavior are completed. For example, a female greylag goose instinctively retrieves an egg that she sees has rolled out of the nest.



Much of an animal's courtship behavior is instinctive. **Courtship behavior** is the behavior that males and females of a species carry out before mating. Like other instinctive behaviors, courtship has evolved through natural selection. Courtship behavior helps members recognize other members of the same species. That is important for the survival of the species. In courtship, behavior ensures that members of the same species find each other and mate. Such behavior has adaptive value for the species. For example, different species of fireflies can be seen at dusk flashing distinct light patterns. Female fireflies of one species respond only to those males flashing the species-correct patterns. ♡

Some courtship behaviors prevent females from killing males before they have had the opportunity to mate. For example, in some spider species, the male is smaller than the female and risks being eaten if he gets close to her. Before mating, the male in some species presents the female with an object, such as an insect wrapped in a silk web. While the female is unwrapping and eating the insect, the male is able to mate with her without being attacked. Sometimes, after mating, the female eats the male anyway.

Can instinctive behavior reduce aggression?

A **territory** is a physical space an animal defends against other members of its species. It may contain the animal's breeding area, feeding area, potential mates, or all three. Animals that have territories will defend their space. They will drive away other

✓ Reading Check

4. How has courtship behavior evolved?


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Innate Behavior, *continued* **Reading Check**

5. What are the benefits of territorial behavior?

individuals of the same species. For example, a male sea lion patrols the area of beach where his harem of female sea lions is located. He does not bother a neighboring male that has a harem of his own. Both males have marked their territories and each respects the boundaries. However, if a young, unattached male tries to enter the sea lion's territory, the owner of the territory will attack and drive the intruder away.

Setting up territories reduces conflicts, controls population growth, and provides for efficient use of environmental resources. When animals space themselves out, they don't compete for the same resources within a limited space. This behavior improves survival rates. If the male has selected an appropriate site and the young survive, they may have inherited his ability to select an appropriate territory. Territorial behavior has survival value, not only for individuals, but also for the species. 

Pheromones are chemicals that communicate information among individuals of the same species. Many animals produce pheromones to mark territorial boundaries. For example, wolf urine contains pheromones that warn other wolves to stay away. Pheromones work day and night, and they work whether or not the animals that made the marks are present.

What is the purpose of aggressive behavior?

Animals sometimes act aggressively. **Aggressive behavior** is used to intimidate another animal of the same species. Animals fight or threaten one another in order to defend their young, their territory, or another resource, such as food. Aggressive behavior includes bird calling, teeth baring, or growling. It is a message to "keep away".

Animals of the same species rarely fight to the death. The fights are usually symbolic. Why does aggressive behavior rarely result in serious injury? It may be that the defeated individual shows signs of submission. These signs stop further aggression by the victor.

What is a dominance hierarchy?

Sometimes, aggressive behavior among several individuals results in a grouping in which there are different levels of dominant and submissive animals. A **dominance hierarchy** (DAH muh nunts • HI rar kee) is a form of social ranking in which some individuals are more subordinate than others. Usually one animal is the top-ranking, dominant animal. This animal may lead others to food, water, and shelter. A dominant male often sires most or all

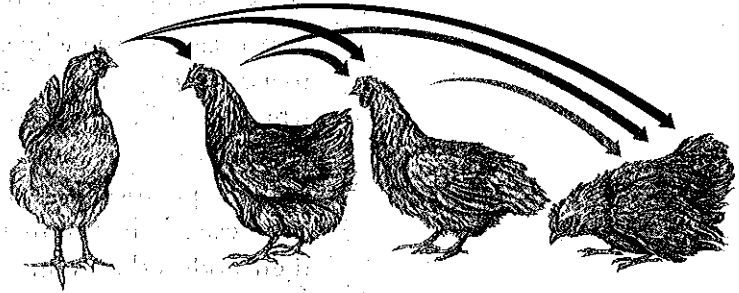
**Think it Over**

6. **Analyze** The formation of a dominance hierarchy is (Circle your choice.)
- a learned behavior.
 - innate behavior.
 - both.

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33.1 Innate Behavior, *continued*

of the offspring. There might be several levels in the hierarchy. Individuals in each level are subordinate to the one above. The ability to form a dominance hierarchy is innate. However, the position each animal assumes may be learned. You may have heard the term *pecking order*. It describes a dominance hierarchy formed by chickens. The top-ranking chicken can peck any other chicken. The chicken lowest in the hierarchy is pecked by all the other chickens in the group.



What are some behavioral cues?

Sometimes behavior is a response to internal biological rhythms. Behavior based on a 24-hour day/night cycle is one example. Many animals, humans included, sleep at night and are awake during the day. Other animals, such as owls, have the opposite pattern. They sleep during the day and are awake at night. A 24-hour, light regulated, sleep/wake cycle of behavior is called a **circadian** (sur KAY dee uhn) **rhythm**. Circadian rhythms keep you alert during the day and help you relax at night. Even if you forget to set your alarm clock, they may wake you. Circadian rhythms are controlled by genes. They are also influenced by factors such as jet lag and shift work.

Rhythms also occur on a yearly or seasonal cycle. Migration, for example, occurs on a seasonal cycle. **Migration** is the instinctive, seasonal movement of animals. In North America about two-thirds of bird species fly south in the fall. There is food available in areas such as South America. The birds fly north in the spring to areas where they breed during the summer. Whales migrate seasonally too. Scientists hypothesize that change in day length stimulates the onset of migration in the same way that it controls the flowering of plants. Butterflies, salmon, and caribou are just a few of the animals that make seasonal migrations. ♡

Migration requires remarkable strength and endurance. The arctic tern migrates between the arctic circle and the Antarctic, a one-way flight of almost 18 000 km.

Animals navigate in a variety of ways including:

- using the positions of the sun and stars
- using geographic clues such as mountain ranges
- using Earth's magnetic field ♡

✓ Reading Check

7. What might stimulate the onset of migration?

✓ Reading Check

8. How do animals navigate during migration?

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Innate Behavior, *continued*

It is possible that some animals migrate in response to colder temperatures and shorter days, as well as hormones. Young animals may learn when and where to migrate by following their parents.

What happens to animals that do not migrate?

It is easy to see why some animals migrate from a colder place to a warmer place, yet most animals do not migrate. The ways in which many animals cope with winter is another example of instinctive behavior.

In preparation for winter, some animals store food in burrows and nests. Other animals survive winter by undergoing changes in their bodies that reduce the need for energy. Many mammals, some birds, and a few other types of animals go into a deep sleep during the cold winter months. This period of inactivity is called hibernation. **Hibernation** (hi bur NAY shun) is a state in which the body temperature drops. Oxygen use decreases and the breathing rate falls to a few breaths per minute. Hibernation conserves energy. Animals that hibernate typically eat large amounts of food to build up body fat before entering hibernation. The fat provides fuel for the animal's body.

What about an animal that lives in a climate that is hot year-round? Some animals respond to heat in a way that is similar to hibernation. **Estivation** (es tuh VAY shun) is a state of reduced metabolism that occurs in animals living in conditions of intense heat. Desert animals appear to estivate in response to lack of food or periods of drought. On the other hand, Australian long-necked turtles will estivate even when they are kept in a laboratory with constant food and water. That means that estivation is an innate behavior that depends on internal and external cues.

✓ Reading Check

9. What is estivation?

► After You Read

Mini Glossary

aggressive behavior: innate behavior used to intimidate another animal of the same species in order to defend young, territory, or resources

behavior: anything an animal does in response to a stimulus in its environment

circadian (sur KAY dee uhn) rhythm: innate behavior based on the 24-hour cycle of the day; light regulated; may determine when an animal sleeps or wakes

courtship behavior: an instinctive behavior that males and females of a species carry out before mating

dominance hierarchy (DAH muh nunts • HI rar kee): innate behavior by which some animals form social ranking within a group in which some individuals are more subordinate than others; usually has one top-ranking individual

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estivation (es tuh VAY shun): state of reduced metabolism that occurs in animals living in conditions of intense heat

fight-or-flight response: automatic response controlled by hormones that prepares the body to either fight or run from danger

hibernation (hi bur NAY shun): state of reduced metabolism occurring in animals that sleep during parts of cold winter months; an animal's temperature drops, oxygen consumption decreases, and breathing rate declines

innate (ih NAYT) behavior: an inherited behavior in animals; includes automatic responses and instinctive behaviors

instinct (IHN stingt): complex innate behavior patterns that begin when an animal recognizes a stimulus and continue until all parts of the behavior have been performed

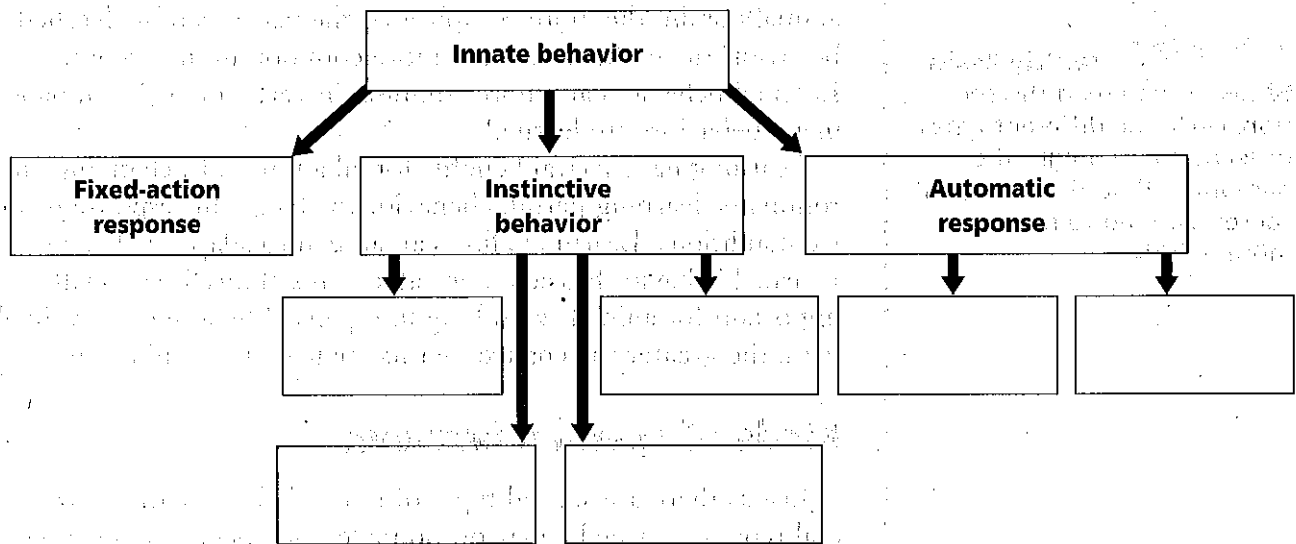
migration: instinctive seasonal movements of animals from place to place

reflex (REE fleks): simple, automatic response in an animal that involves no conscious control; usually acts to protect an animal from serious injury

territory: physical space an animal defends against other members of its species; may contain an animal's breeding area, feeding area, potential mates, or all three

1. Read the terms and their definitions in the Mini Glossary. On the line below explain how a reflex is different from an instinct.

2. Complete the web diagram by using the following concepts in the appropriate box: **reflex, courtship, hibernation, fight-or-flight, territoriality, and migration.**



3. How is innate behavior an advantage in a species where the mother leaves once the young have hatched?

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