Animal Behavior Reading (Pg 1)

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 a peacock to open its tail feathers and strut. Environmental cues, such as a change in day length, might be the stimulus that causes the whale to leave its summertime arctic habitat. Heat stimulates the lizard to seek shade. *Figure 33.1* shows two examples of stimuli that affect animal behavior.

Animals carry on many activities—such as getting food, avoiding predators, caring for young, finding shelter, and attracting mates—that enable them to survive and reproduce. These behavior patterns, therefore, have adaptive value. For example, a parent gull that is not incubating eggs or caring for chicks joins a noisy flock of gulls to dive for fishes. If the parent cannot catch a lot of fishes, not only will it die, but its chicks will not survive either. Therefore, this feeding behavior has adaptive value for the gull.

Inherited Behavior

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

Natural selection favors certain behaviors

Often, a behavior exhibited by an animal species is the result of natural selection. The variability of behavior among individuals affects their ability to survive and reproduce. Individuals with behavior that makes them more successful at surviving and reproducing tend to produce more offspring than individuals without the behavior. These offspring will inherit the genetic basis for the successful behavior. You can observe the behavior of isopods in the *MiniLab* on this page.

Inherited behavior of animals is called **innate** (ih NAYT) **behavior**. A toad captures prey by flipping out its sticky tongue. To capture prey, a toad must first be able to detect and follow its movement. Toads have "insect detector" cells in the retinas of their eyes. As an insect moves across a toad's line of sight, the "insect detector" cells signal the brain of the prey's changing position, thus initiating an innate response; the toad's tongue flips out. *Figure 33.2* shows a toad that captured its prey using an innate behavior known as a fixed-action pattern. A fixed-action pattern is an unchangeable behavior pattern that, once initiated, continues until completed.

Genes form the basis of innate behavior

Through experiments, scientists have found that an animal's hormonal balance and its nervous system—especially the sense organs responsible for sight, touch, sound, or odor identification—affect how sensitive the individual is to certain stimuli. 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 patterns, automatic responses, and instincts. You can observe the response of animals to certain stimuli in the *BioLab* at the end of this chapter.

Automatic Responses

What happens if something quickly passes in front of your eyes or 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 can't stop yourself from behaving this way when the object is thrown. This reaction is an example of the simplest form of innate behavior, called a reflex. A **reflex** (REE fleks) is a simple, automatic response to a stimulus that involves no conscious control. *Figure 33.3* shows an example of a reflex.

The adaptive value of another automatic response is obvious. Think about a time when you were suddenly scared. Immediately, your heart began to beat faster. Your skin got cold and clammy, your respiration increased, and maybe you trembled. 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

Compare the fixed-action pattern of a toad capturing prey with a fight-or-flight response. Both are quick, automatic responses to stimuli. But some behaviors 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 have been performed.

As shown in *Figure 33.4*, greylag geese instinctively retrieve eggs that have rolled from the nest. They will go through the motions of egg retrieval even if the eggs roll or are taken away until they are comfortably back on their nest. If they see the egg has not been retrieved they begin the process again.

Courtship behavior ensures reproduction

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. Imagine what would happen to the survival of a species if members were unable to recognize other members of that same species. Individuals often can recognize one another by the behavior patterns each performs. In courtship, behavior ensures that members of the same species find each other and mate. Obviously, such behavior has an adaptive value for the species. Different species of fireflies, for example, can be seen at dusk flashing distinct light patterns. However, female fireflies of one species respond only to those males exhibiting the species-correct flashing pattern.

Some courtship behaviors help prevent females from killing males before they have had the opportunity to mate. For example, in some spiders, the male is smaller than the female and risks the chance of being eaten if he approaches 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. After mating, however, the male may be eaten by the female anyway.

In some species, such objects play an important role in allowing the female to exercise a choice as to which male to choose for a mating partner.

Territoriality reduces competition

You may have seen a chipmunk chase another chipmunk away from seeds on the ground under a bird feeder. The chipmunk was defending its territory. 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, and potential mates, or all three.

Animals that have territories will defend their space by driving away other individuals of the same species. For example, a male sea lion patrols the area of beach where his harem of female sea lions rests. He does not bother a neighboring male that has a harem of his own because both have marked their territories, and each respects the common boundaries. But if an unattached, young male tries to enter the sea lion's territory, the owner of the territory will attack and drive the intruder away from his harem.

Although it may not appear so, setting up territories actually 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 the chances of survival of the young, and, therefore, survival of the species. If the male has selected an appropriate site and the young survive, they may inherit his ability to select an appropriate territory. Therefore, territorial behavior has survival value, not only for individuals, but also for the species. The male stickleback shown in *Figure 33.6* is another animal that exhibits territoriality, especially during breeding season.

Recall that 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. The male pronghorn antelope uses a pheromone secreted from facial glands. One advantage of using pheromones is that they work both day and night, and whether or not the animal that made the mark is present.

What is learned behavior?

Learning, or learned behavior, takes place when behavior changes through practice or experience. The more complex an animal's brain, the more elaborate the patterns of its learned behavior. As you can see in *Figure 33.11*, innate behaviors are more common in invertebrates, and learned behaviors are more common in vertebrates. In humans, many behaviors are learned.

Learning has survival value for all animals in changing environments because it permits behavior to change in response to varied conditions. Learning allows an animal to adapt to change, an ability that is especially important for animals with long life spans. The longer that an animal lives, the greater the chance that its environment will change.

Kinds of Learned Behavior

Just as there are several types of innate behavior, there are several types of learned behavior. Some learned behavior is simple and some is complex. Which group of animals do you think carries out the most complex type of learned behavior?

Habituation: A simple form of learning

Horses normally shy away from an object that suddenly appears from the trees or bushes, yet after a while they disregard noisy cars that speed by the pasture honking their horns. This lack of response is called habituation. **Habituation** (huh bit choo AY shun) illustrated in *Figure 33.12*, occurs when an animal is repeatedly given a stimulus that is not associated with any punishment or reward. An animal has become habituated to a stimulus when it finally ceases to respond to the stimulus.

Imprinting: A permanent attachment

Have you ever seen young ducklings following their mother? This behavior is the result of imprinting. **Imprinting** is a form of learning in which an animal, at a specific critical time of its life, forms a social attachment to another object. Many kinds of birds and mammals do not innately know how to recognize members of their own species. Instead, they learn to make this distinction early in life. Imprinting takes place only during a specific period of time in the animal's life and is usually irreversible. For example, birds that leave the nest immediately after hatching, such as geese, imprint on their mother. They learn to recognize and follow her within a day of hatching.

In birds such as ducks, imprinting takes place during the first day or two after hatching. A duckling rapidly learns to recognize and follow the first conspicuous moving object it sees. Normally, that object is the duckling's mother. Learning to recognize their mother and follow her ensures that food and protection will always be nearby.

Learning by trial and error

Do you remember when you first learned how to ride a bicycle? You probably tried many times before being able to successfully complete the task. Nest building, like riding a bicycle, may be a learning experience. The first time a jackdaw builds a nest, it uses grass, bits of glass, stones, empty cans, old lightbulbs, and anything else it can find. With experience, the bird finds that grasses and twigs make a better nest than do lightbulbs. The jackdaw has used **trial-and-error learning** in which an animal receives a reward for making a particular response. When an animal tries one solution and then another in the course of obtaining a reward, in this case a suitable nest, it is learning by trial and error. Find out for yourself how trial and error learning works in the *MiniLab* on this page.

Learning happens more quickly if there is a reason to learn or be successful. **Motivation** is an internal need that causes an animal to act, and it is necessary for learning to take place. In most animals, motivation often involves satisfying a physical need, such as hunger or thirst. If an animal isn't motivated, it won't learn. Animals that aren't hungry won't respond to a food reward. Mice living in a barn, shown in *Figure 33.13*, discover that they can eat all the grain they like if they first chew through the container in which the grain is stored.

Classical conditioning: Learning by association

Suppose that when you first got a new kitten, it would meow as soon as it smelled the aroma of cat food in the can you were opening. After a few weeks, the sound of the can opener alone attracted your kitten, causing it to meow. Your kitten had become conditioned to respond to a stimulus other than the smell of food. **Classical conditioning** is learning by association.

Insight: The most complex type of learning

In a classic study of animal behavior, a chimpanzee was given two bamboo poles, neither of which was long enough to reach some fruit placed outside its cage. By connecting the two tapering short pieces to make one longer pole, the chimpanzee learned to solve the problem of how to reach the fruit. This type of learning is called insight. **Insight** is learning in which an animal uses previous experience to respond to a new situation.

Much of human learning is based on insight. When you were a baby, you learned a great deal by trial and error. As you grew older, you relied more on insight. Solving math problems is a daily instance of using insight. Probably your first experience with mathematics was when you learned to count. Based on your concept of numbers, you then learned to add, subtract, multiply, and divide. Years later, you continue to solve problems in mathematics based on your past experiences. When you encounter a problem you have never experienced before, you solve the problem through insight.

The Role of Communication

When you think about interactions among animals as a result of their behavior, you realize that some sort of communication has taken place. **Communication** is an exchange of information that results in a change of behavior. Black-headed gulls visually communicate their availability for mating with instinctive courtship behavior. The pat on the head from a dog's owner after the dog retrieves a stick signals a job well done.

Most animals communicate

Animals have several channels of communication open to them. They signal each other by sounds, sights, touches, or smells. Sounds vibrate in all directions and can be heard a long way from their sources. Sounds such as songs, roars, and calls communicate a lot of information quickly. For example, the song of a male cricket tells his sex, his location, his social status, and, because communication by sound is usually species specific, his species.

Signals that involve odors may be broadcast widely and carry a general message. Ants, shown in *Figure 33.15*, leave odor trails that are followed by other members of their nest. These odors are species specific. As you know, pheromones, such as those of moths, may be used to attract mates. Because only small amounts of pheromones are needed, other animals, especially predators, may be unable to detect the odor.

Using both innate and learned behavior

Some communication is a combination of both innate and learned behavior. In some species of songbirds, such as the one shown in *Figure 33.16*, males automatically sing when they reach sexual maturity. Their songs are specific to their species, and singing is innate behavior. Yet members of the same species that live in different regions learn different variations of the song. They learn to sing with a regional dialect. In other species, birds raised in isolation never learn to sing their species song.

Some animals use language

Language, the use of symbols to represent ideas, is present primarily in animals with complex nervous systems, memory, and insight. Humans, with the help of spoken and written language, can benefit from what other people and cultures have learned and don't have to experience everything for themselves. People can use the accumulated knowledge in the books shown in *Figure 33.17* to build new knowledge.