Animal Behavior

CHAPTER 18

- Introduction
- Fixed action pattern
- Learning
- Social behavior

Behavior is defined as the way an organism responds to changes in its internal or external environment. A **behavior** can be **innate** (inborn), such as running for shelter upon hearing a loud noise. It can also be **learned**, such as one child sharing her toys with another child. Usually behaviors are carried out in response to a **stimulus**, a change in the environment. A monkey eats a banana (behavior) in **response** to hunger (stimulus).

An organism's behavior is important for its survival and for the successful production of offspring. The study of behavior and its relationship to its evolutionary origins is called ethology. Foremost in the field of ethology are three scientists who shared the Nobel Prize in 1973: Karl **von Frisch**, Konrad **Lorenz**, and Niko **Tinbergen**. Von Frisch is known for his extensive studies of honeybee communication and his famous description of the bee waggle dance. Niko Tinbergen is known for his elucidation of the **fixed action pattern**, and Konrad Lorenz is famous for his work with **imprinting.** Here are some basic concepts in the field of animal behavior.

FIXED ACTION PATTERN

A fixed action pattern (FAP) is an innate, *highly stereotypical behavior* that, once begun, is continued to completion no matter how useless or silly looking. FAPs are initiated by external stimuli called **sign stimuli**. When these stimuli are exchanged between members of the same species, they are known as **releasers**. An example of a FAP studied by Tinbergen involves the stickleback fish, which attacks other males that invade its territory. The releaser for the attack is the red belly of the intruder. The stickleback will not attack an invading male stickleback lacking a red underbelly, but it will readily attack a nonfishlike wooden model as long as a splash of red is visible.

LEARNING

Learning is a sophisticated process in which the responses of the organism are modified as a result of experience. The capacity to learn can be tied to length of life and complexity of the brain. If the animal has a very short life span, like a fruit fly, it has no time to learn, even if it has the ability. It must therefore rely on fixed action patterns. In contrast, if the animal lives a long time and has a complex brain, then a large part of its behavior is dependent on prior experience and learning.

TIP

The most commonly asked questions on this topic concern:

- imprinting
- fixed action pattern
- sign stimuli
- releasers

Habituation

Habituation is one of the simplest forms of learning in which an animal comes to ignore a persistent stimulus so it can go about its business. If you tap the dish containing a hydra, it will quickly shrink and become immobile. If you keep tapping, after a while the hydra will begin to ignore the tapping, elongate, and continue moving about. It has become habituated or used to the stimulus.

Associative Learning

Associative learning is one type of learning in which one stimulus becomes linked to another through experience. Examples of associative learning are **classical conditioning** and **operant conditioning.**

CLASSICAL CONDITIONING

Classical conditioning, a type of associative learning, is widely accepted because of the ingenious work of Ivan Pavlov in the 1920s. Normally, dogs salivate when exposed to food. Pavlov trained dogs to associate the sound of a bell with food. The result of this conditioning was that dogs would salivate, an automatic response, upon merely hearing the sound of the bell even though no food was present.

OPERANT CONDITIONING

Operant conditioning, also called **trial and error learning,** is another type of associative learning. An animal learns to associate one of its own behaviors with a reward or punishment and then repeats or avoids that behavior. The best-known studies involving operant conditioning were done by B. F. Skinner in the 1930s. In one study, a rat was placed into a cage containing a lever that released a pellet of food. At first, the rat would depress the lever only by accident and would receive food as a reward. The rat soon learned to associate the lever with the food and would depress the lever at will. Similarly, an animal can learn to carry out a behavior to avoid punishment. Such systems of rewards and punishment are the basis of most animal training.

Imprinting

Imprinting is learning that occurs during a sensitive or critical period in the early life of an individual and is irreversible for the length of that period. When you see ducklings following closely behind their mother, you are seeing the result of successful imprinting. Mother-offspring bonding in animals that depend on parental care is critical to the safety and development of the offspring. If the pair does not bond, the parent will not care for the offspring and the offspring will die. At the end of the juvenile period, when the offspring can survive without the parent, the response disappears.

Classic imprinting experiments were carried out by Konrad **Lorenz** with geese. Geese hatchlings will follow the first thing they see that moves. Although the object is usually the mother goose, it can be a box tied to a string or in the case of the classic experiment, it was Konrad Lorenz himself. Lorenz was the first thing the hatchlings saw and they became imprinted on the scientist. Wherever he went, they followed.

SOCIAL BEHAVIOR

Social behavior is any kind of interaction between two or more animals, usually of the same species. It is a relatively new field of study, only developed in the 1960s. Types of social behaviors are cooperation, agonistic, dominance hierarchies, territoriality, and altruism.

Cooperation

Cooperation enables the individuals to carry out a behavior, such as hunting, which they can do as a group more successfully than they can do separately. Lions or wild dogs will hunt in a pack, enabling them to bring down an animal larger than an individual could ever bring down alone.

Agonistic Behavior

Agonistic behavior is aggressive behavior. It involves a variety of threats or actual combat to settle disputes between individuals. These disputes are commonly over access to food, mates, or shelter. It involves both real aggressive behavior as well as ritualistic or symbolic behavior. One combatant does not have to kill the other. The use of symbolic behavior often prevents serious harm. A dog shows aggression by baring its teeth and erecting its ears and hair. It stands upright to appear taller and looks directly at its opponent. If the aggressor succeeds in scaring the opponent, the loser engages in submissive behavior that says, "You win, I give up." Examples of submissive behaviors are looking down or away from the winner. Submissive dogs or wolves put their tail between their legs and run off. Once two individuals have settled a dispute and established their relationship by agonistic behavior, future encounters between them usually do not involve combat or posturing.

Dominance Hierarchies

Dominance hierarchies are pecking order behaviors that dictate the social position of an animal in a culture. This is commonly seen in hens where the alpha animal (top-ranked) controls the behaviors of all the others. The next in line, the beta animal, controls all others except the alpha animal. Each animal threatens all animals beneath it in the **pecking order**. The top-ranked animal is assured of first choice of any resource, including food after a kill, the best territory, or the most-fit mate.

Territoriality

A **territory** is an area an organism defends and from which other members of the community are excluded. Territories are established and defended by agonistic behaviors. They are used for capturing food, mating, and rearing young. The size of the territory varies with its function and the amount of resources available.

Altruism

Altruism is a behavior that reduces an individual's reproductive fitness (the animal may die) while increasing the fitness of the group or family. When a worker honeybee stings an intruder in defense of the hive, the worker bee usually dies. However, it increases the fitness of the queen bee that lays all the eggs. How can altruism

evolve if the altruistic individual dies? The answer is called **kin selection.** When an individual sacrifices itself for the family, it is sacrificing itself for relatives (the kin), which share similar genes. The kin are selected as the recipients of the altruistic behavior. They are saved and can pass on their genes. Altruism evolved because it increases the number of copies of a gene common to a related group.

MULTIPLE-CHOICE QUESTIONS

Questions 1–7

Choose from the list of scientists below.

(A) Niko Tinbergen
(B) Karl von Frisch
(C) B. F. Skinner
(D) Konrad Lorenz
(E) Ivan Pavlov

1. Described the waggle dance in honeybees

2. Imprinting

3. Trained dogs to salivate at the sound of a bell

4. Classical conditioning

5. Taught rats in cages to depress a lever to release food

6. Baby geese followed him everywhere

7. Explained fixed action pattern

Questions 8–12

Choose from the terms below.

(A) Fixed action pattern
(B) Habituation
(C) Classical conditioning
(D) Imprinting
(E) Operant conditioning

8. Innate, highly stereotypical behavior that must continue until it is completed

9. Trial and error learning

10. Sequence of behaviors that is unchangeable and carried to completion once initiated

11. Initially, the amoeba moved away from the strong light; but after a while, it resumed its normal movement pattern

12. This is the way dogs are trained

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13. A sophisticated process in which the responses of the organism are modified as a result of experience is called

    (A) fixed action pattern
    (B) habituation
    (C) imprinting
    (D) classical conditioning
    (E) learning

14. This behavior reduces an individual's reproductive fitness while increasing the fitness of the family.

    (A) Altruism
    (B) Agonistic behavior
    (C) Territoriality
    (D) Cooperation
    (E) Imprinting

15. You want to train your puppy to wait at the curb until you tell him to cross the road. Your friend advises you to give your dog a treat every time he does as you ask. Your friend is advising that you train the dog using

    (A) operant conditioning
    (B) classical conditioning
    (C) imprinting
    (D) fixed action pattern
    (E) habituation

16. _____ is learning that occurs during a sensitive or critical period in early life and is irreversible for the length of the period.

    (A) Habituation
    (B) Operant conditioning
    (C) Trial and error learning
    (D) Imprinting
    (E) Classical conditioning

17. "Mary had a little lamb; its fleece was white as snow. And everywhere that Mary went, the lamb was sure to go." The behavior of the lamb is best described as

    (A) habituation
    (B) imprinting
    (C) operant conditioning
    (D) classical conditioning
    (E) fixed action pattern

18. Fixed action patterns are initiated by external stimuli called

    (A) fixed action pattern
    (B) sign stimuli
    (C) agonistic behavior
    (D) dominance hierarchies
    (E) sensitive periods

19. Animals that help other animals are expected to be

    (A) stronger than other animals
    (B) related to the animals they help
    (C) male
    (D) female
    (E) disabled in some way

20. An animal that sacrifices itself for its relatives is exhibiting

    (A) operant conditioning
    (B) kin selection
    (C) classical conditioning
    (D) imprinting
    (E) habituation

EXPLANATION OF ANSWERS

1. (B) Karl von Frisch is known for his extensive studies of honeybee communication and his famous description of the waggle dance in bees.
2. (D) Konrad Lorenz carried out imprinting experiments. When you see ducklings following closely behind their mother, you are seeing the result of successful imprinting.
3. (E) In the 1920s, Ivan Pavlov conditioned dogs to salivate at the sound of a bell. This is known as classical conditioning.
4. (E) An example of classical conditioning is the training of dogs to salivate at the sound of a bell.
5. (C) B. F. Skinner is the scientist whose name is linked with operant conditioning.

6. (D) A goose hatchling follows the first thing it sees moving after it hatches. In the famous case, goose hatchlings saw and imprinted on Lorenz, not the mother goose.
7. (A) Tinbergen worked with stickleback fish, demonstrating highly stereotypical behavior known as fixed action pattern.
8. (A) This is the definition of fixed action pattern
9. (E) Learning by trial and error is also called operant conditioning. B. F. Skinner carried out the famous studies in operant conditioning.
10. (A) Fixed action pattern is highly stereotypical.
11. (B) Habituation is one of the simplest forms of learning. An animal comes to ignore a persistent stimulus so it can go about its business.
12. (E) A system of rewards and punishment, as described in operant conditioning, is the way most animals are trained.
13. (E) The capacity to learn is tied to the length of an animal's life and the complexity of the brain. If the animal has a short life span, like an insect, it has no time to learn and must rely on fixed action patterns.
14. (A) Altruism enhances the fitness of the family group although it may mean sacrificing the individual.
15. (A) Operant conditioning is trial and error conditioning. This is how we train animals.
16. (D) Konrad Lorenz made this theory of imprinting and himself famous.
17. (B) This describes the geese that followed Konrad Lorenz around everywhere. He was the first moving object they saw after hatching, so they imprinted on him.
18. (B) Sign stimuli are external stimuli that trigger fixed action patterns. Those exchanged between members of the same species are known as releasers.
19. (B) Social behavior is any kind of interaction among two or more animals, usually of the same species. Altruism is a behavior that will help the other members of the family group, who have many genes in common.
20. (B) Altruism is a behavior that ultimately increases the success of the related group. In kin selection, an individual sacrifices itself for the family, a group that shares its genes. Perhaps the individual that sacrificed itself will not get to pass on its genes, but its relatives will.