

What is Behavior?

- ☑ Behavior is a ***combination*** of an organisms genetic make-up (genes) and environmental stimuli... “Nature” ***and*** “Nurture”
- ☑ Behaviors evolve because they increase fitness

What causes Behavior?

- Behavior has both proximate and ultimate causes
- ***Proximate*** questions are mechanistic:
 - concerned with the ***environmental stimuli*** that trigger a behavior
 - concerned with the ***genetic and physiological mechanisms*** underlying a behavioral act.
- ***Ultimate*** questions address the ***evolutionary significance*** for a behavior and why natural selection favors this behavior.
- These two levels of causation are related.
 - For example, many animals breed during the spring and summer because of the warmth of the seasons (***proximate***).
 - The abundant food supply may increase the chances of offspring surviving (***ultimate***).

“Pre-programmed” Animal Behavior

Innate Behavior

- Innate behavior is developmentally fixed (instinctive).
- These behaviors are due to genetic programming.
- The range of environmental differences among individuals does not appear to alter the behavior.
- An example of innate behavior is **fixed action pattern (FAP)**
- FAP is a sequence of behavioral acts that is essentially unchangeable and usually carried to completion once initiated.
 - The FAP is triggered by an external sensory stimulus known as a **sign stimulus** (stimuli are usually obvious).
 - The FAP usually occurs in a series of actions the same way every time.
 - Many animals tend to use a relatively small subset of the sensory information available to them and behave stereotypically.

How do Animals Learn?

- Learning is the modification of behavior resulting from specific experiences.
 - The alarm calls of Vervet monkeys provide an example of how animals improve their performance of behavior.
 - These monkeys give distinct alarm calls when they see leopards, eagles, or snakes.
 - Leopards: loud, barking sound – response is to run up into a tree
 - Eagles: short double-syllabled cough – response is to look up
 - Snake: “chutter” – response is to look down
- Learning versus maturation.
- **Maturation** is the situation in which a behavior may improve because of ongoing developmental changes in neuromuscular systems, for example, flight in birds.
 - As a bird continues to develop its muscles and nervous system, it is able to fly.
 - It is not true learning.
- **Habituation.**
- This involves a loss of responsiveness to unimportant stimuli or stimuli that do not provide appropriate feedback.
 - For example, some animals stop responding to warning signals if signals are ***not*** followed by a predator attack (the “cry-wolf” effect).

Imprinting is learning limited to a sensitive period

- **Imprinting** is the recognition, response, and attachment of young to a particular adult or object.
- Imprinting is generally irreversible.
- The **sensitive period** is a limited phase in an individual animal’s development when learning particular behaviors can take place.
- Konrad Lorenz experimented with geese that spent the first hours of their life with him and after time responded to him as their “parent.”
- What is innate in these birds is the ability to respond to a parent figure; while the outside world provides the *imprinting stimulus*.

Many animals can learn to associate one stimulus with another

- **Associative learning** is the ability of many animals to learn to associate one stimulus with another.
- **Classical conditioning** is a type of associative learning.
 - Pavlov’s dog is a good example.
 - Ivan Pavlov exposed dogs to a bell ringing and at the same time sprayed their mouths with powdered meat, causing them to salivate.
 - Soon, the dogs would salivate after hearing the bell but not getting any powdered meat.

- **Operant conditioning** is a type of associative learning.
 - This is called trial-and-error learning: an animal learns to associate one of its own behaviors with a reward or a punishment.
 - For example, predators learn to associate certain kinds of potential prey with painful experiences and modify their behavior accordingly.
 - This type of learning is the basis for most of the animal training done by humans.

Why do Animals Play?

- Practice and exercise may explain the ultimate basis of play.
- **Play** as a behavior has no apparent external goal, but may facilitate social development or practice of certain behaviors and provide exercise.

Animal Cognition: The connection of nervous system function with behavior

- Animal cognition is an animal's ability to be aware of and make judgments about its environment.
- **Cognition** is the ability of an animal's nervous system to perceive, store, process, and use information gathered by sensory receptors.

Animals use various cognitive mechanisms during movement through space

- Kinesis and taxis.
 - These are the simplest mechanisms of movement.
 - **Kinesis** is a change in activity rate in response to a stimulus.
 - For example, sow bugs are more active in dry areas and less active in humid areas.
 - **Taxis** is an automatic, oriented movement to or away from a stimulus.
 - For example, phototaxis and chemotaxis.
- Use of landmarks within a familiar area.
 - Some organisms move in response to a recognized object or environmental cue, the object is the landmark.
- Cognitive maps.
 - Some animals form **cognitive maps** (internal codes of spatial relationships of objects in the environment).
- Migration Behavior.
 - **Migration** is the regular movement of animals over relatively long distances.
 - *Piloting*: an animal moves from one familiar landmark to another until it reaches its destination.
- *Orientation*: animals can detect directions and travel in particular paths until reaching a destination.
 - *Navigation* is the most complex, and involves determining one's present location relative to other locations in addition to detecting compass directions.
 - Cues for these behaviors include the earth's magnetic field, the sun, and the stars.

Social Behaviors and Interactions

- **Social behavior** is any kind of interaction between two or more animals, usually of the same species.
- **Agonistic behavior** is a contest involving threats.
 - Submissive behavior.
 - Rituals: the use of symbolic activity
 - usually limits injuries
- **Reconciliation behavior** often happens between conflicting individuals.
- **Dominance hierarchies** involve a ranking of individuals in a group (a “pecking order”).
 - Alpha, beta rankings exist.
 - The alpha organisms control the behavior of others.
- Territoriality is behavior where an individual defends a particular area, called the **territory**.
 - Territories are typically used for feeding, mating, and rearing young and are fixed in location.
 - Drawbacks are that territoriality uses a great deal of an individual’s energy.
 - In addition, an individual might be defending a territory and die or miss a reproductive opportunity.
 - Spraying behavior is where an individual marks its territory.

Natural selection favors mating behavior that maximizes the quantity or quality of mating partners

- **Courtship** behavior consists of patterns that lead to mating and consists of a series of displays and movements by the male or female.
- **Parental investment** refers to the time and resources expended for raising of offspring.
 - Generally lower in males because they are capable of producing more gametes (which are also smaller), therefore making each one less valuable.
 - Females usually invest more time into parenting because they make fewer, larger gametes, a process which is energetically more expensive, thus making each gamete more valuable.
 - In terms of mate choice, females are usually more discriminating in terms of the males with whom they choose to mate.
 - Females look for more fit males (i.e., better genes), the ultimate cause of the choice.

Social interactions depend on diverse modes of communication

- A **signal** is a behavior that causes a change in the behavior of another animal.
- The transmission of, reception of, and response to signals make up **communication**.
 - Auditory – Displays such as singing, and howling.
 - Visual – aggression, courtship
 - Touch - grooming
 - Chemical - **Pheromones** are chemicals released by an individual that bring about mating and other behaviors.
 - Examples include bees and ants.

The concept of inclusive fitness can account for most altruistic behavior

- **Altruism** is defined as behavior that might decrease individual fitness, but increase the fitness of others.
- Altruistic behavior in the Belding ground squirrel – sounding an alarm call to warn others of danger
- **Inclusive fitness** is defined as the affect an individual has on proliferating its own genes by reproducing and helping relatives raise offspring.
 - Kin selection is the mechanism of inclusive fitness, where individuals help relatives raise young.
 - Reciprocal altruism, where an individual aids other unrelated individuals without any benefit, is rare, but sometimes seen in primates (often in humans).