

Behavioral Animal Adaptations

Survival of organisms

ANIMAL BEHAVIOR

- ▶ **BEHAVIOR** = anything an animal does in response to a stimulus in its environment
- ▶ What is a **stimulus** for bears beginning to hibernate?
- ▶ What is a **stimulus** for a dog beginning to bark?



ANIMAL BEHAVIOR

INNATE

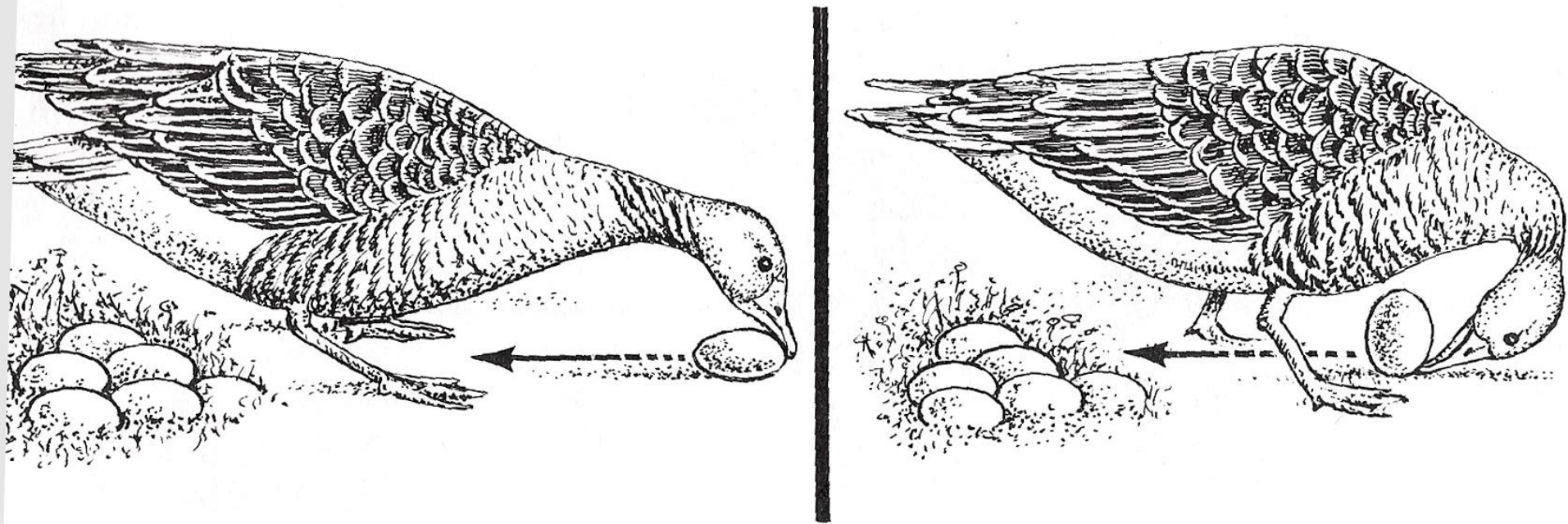
- ▶ **INNATE BEHAVIOR** = behaviors that animals inherit from parents
- ▶ These behaviors are typically genetic
- ▶ Example: toad using tongue to catch prey
 - ▶ Fight or flight response
 - ▶ Herding behavior for protection



ANIMAL BEHAVIOR

INNATE

- ▶ Another example: graylag goose retrieving eggs that roll out of the nest



^ ANIMAL BEHAVIOR

INNATE

- ▶ Suckling behavior – newborns are able to suckle at nipple to obtain nourishment
- ▶ This is an innate behavior



^ ANIMAL BEHAVIOR

INNATE

- ▶ Also includes:
 - ▶ Courtship behavior
 - ▶ Territoriality
 - ▶ Migration/hibernation/estivation
 - ▶ Pheromones/chemical messages



Courtship Behavior

- ▶ Birds of Paradise are among the many examples of bird species that have elaborate dance/courtship behavior in an effort to attract a mate. They will clean the “performance area” off, and then practice their display
- ▶ Male peacocks will strut and display plummage as a way to attract a mate



Territorial Defense

- ▶ A territory is a physical space an animal defends against other members of its species. It may contain the animal's breeding area, potential mates, feeding area, or all three.
- ▶ Setting up territories reduces conflict, controls population growth, and provides for efficient use of resources. This means animals don't compete for the same resources within a small space, and improves chances of survival of the young, and therefore, the species.
- ▶ EX: Betta fighting fish, three-spined stickleback displays red belly to warn off other males



Territorial Defense



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Migration

- ▶ Cues/stimulus from external environment causes animals to migrate/move to different locations
- ▶ EX: birds and butterflies migrate south for the winter



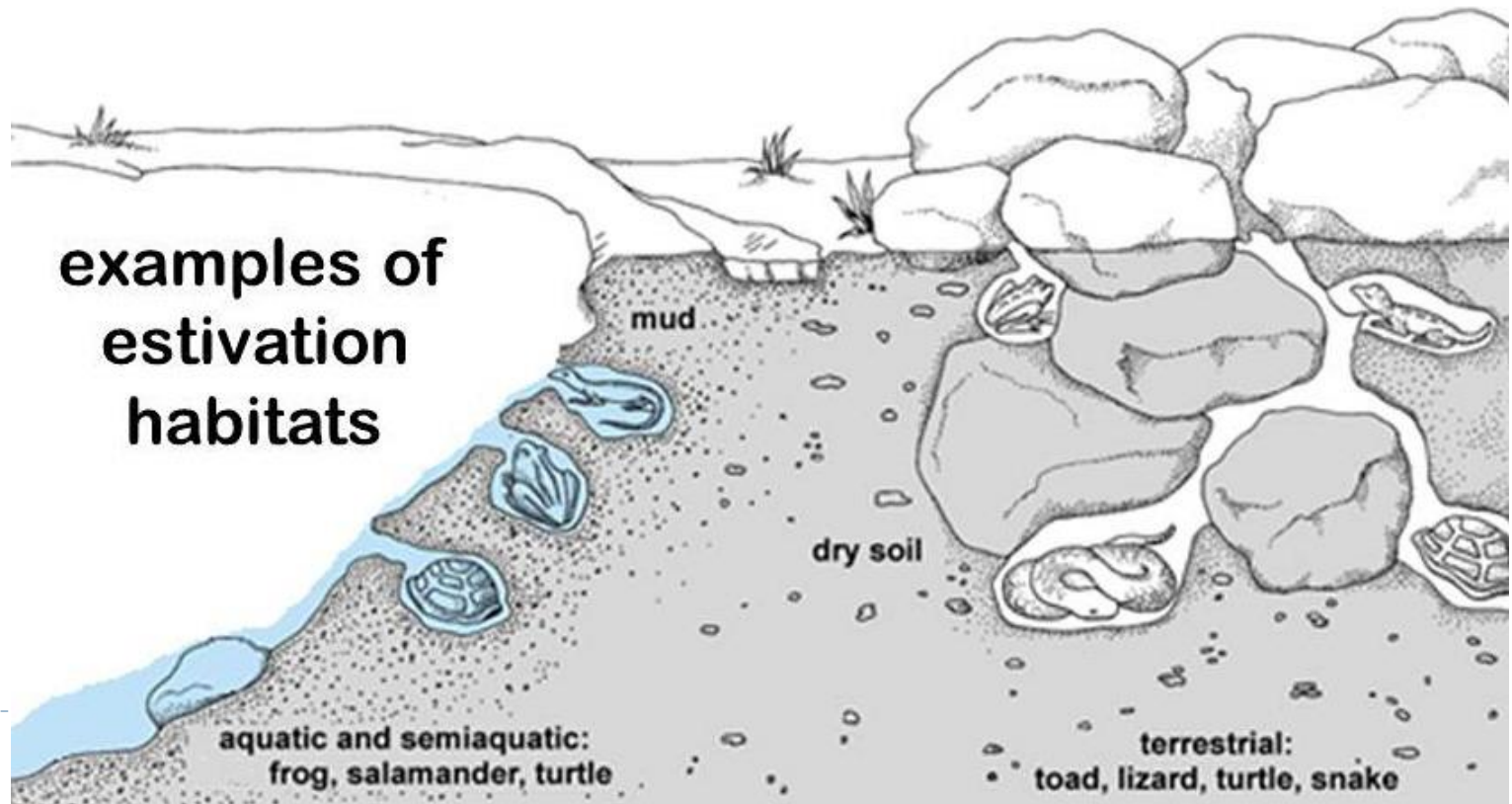
Hibernation

- ▶ **Hibernation** is a state where the body temperature drops substantially, oxygen consumption decreases, and breathing rates decline to a few breaths per minute. (Conserve energy)
- ▶ Animals that go into hibernation to survive the cold winter months when food is scarce usually eat vast amounts of food to build up body fat before entering hibernation.
- ▶ EX: bears, squirrels, bats



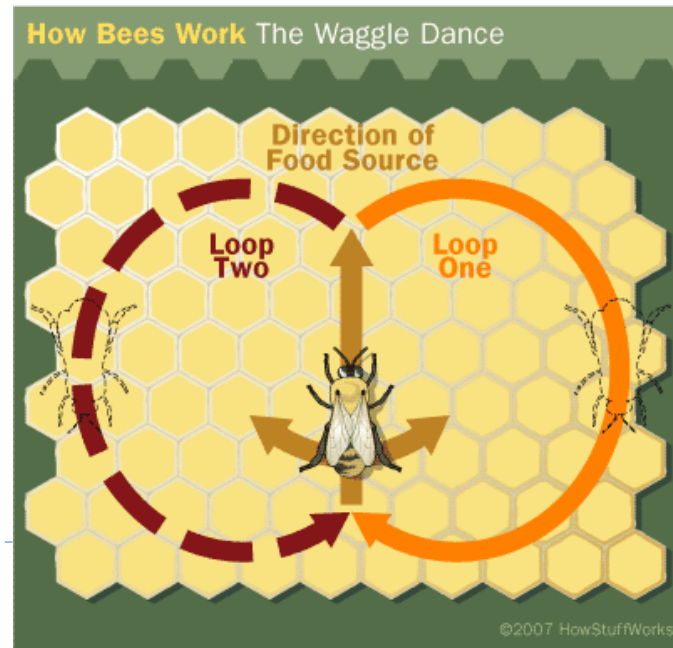
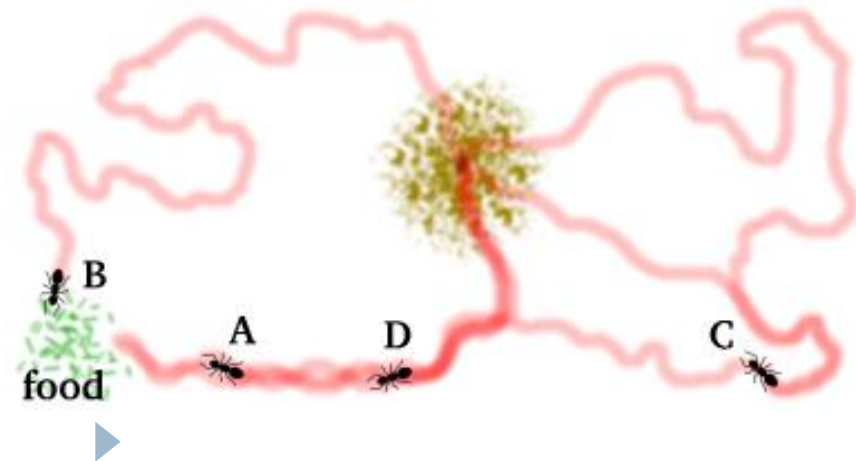
Estivation

- ▶ Estivation is a state of reduced metabolism that occurs in animals living in conditions of extreme heat.
- ▶ EX: desert animals may estivate due to lack of food or during periods of drought



Phermones / Chemical Messaging

- ▶ Insects such as ants, bees, and termites can communicate with each other by leaving phermones behind
- ▶ Ants leave chemical trails that are followed by other members of their nest
- ▶ A honey bee performs a carefully choreographed "waggle" dance that instructs the rest of the hive where to find a food source.



Circadian Rhythm

= 24 hour, sleep/wake cycle of behavior in animals

- ▶ Controlled by genes, but influenced by environment
- ▶ Most sleep during night, awake during day
- ▶ Some sleep during day, awake at night



ANIMAL BEHAVIOR

LEARNED

- ▶ **LEARNED BEHAVIOR** = takes place when behavior changes through practice or experience
- ▶ More common in vertebrates than invertebrates
- ▶ Learning allows an animal to adjust to change (thus, live longer)



ANIMAL BEHAVIOR

LEARNED

- ▶ Habituation: getting used to a stimulus (sensory adaptation)
 - ▶ Horses are usually skittish, but horses in a busy city eventually disregard noisy cars and horns. This adaptation is called habituation.



ANIMAL BEHAVIOR

LEARNED

- ▶ Imprinting: forming an attachment to another object
 - ▶ Ducklings following mother
 - ▶ Happens at a specific time in life
 - ▶ Usually irreversible



ANIMAL BEHAVIOR

LEARNED

- ▶ Trial-and-error: learn by mistakes
 - ▶ Birds building nests (coarse vs soft trash)
 - ▶ Animals must have motivation in order to learn!



ANIMAL BEHAVIOR

LEARNED

- ▶ Classical conditioning is learning by association.
- ▶ EX: new kitten meows when it smells aroma of food in the can you open. After a few weeks, the sound of the can opener alone attracts the kitten, causing it to meow.
- ▶ EX: Pavlov's dogs and salivation



ANIMAL BEHAVIOR

LEARNED

1. Before conditioning



→
response



Food

Salivation

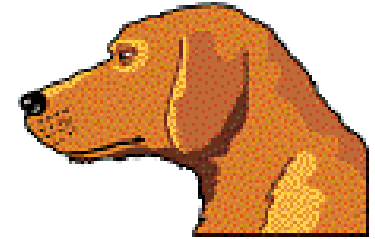
Unconditioned stimulus

Unconditioned response

2. Before conditioning



→
response



Tuning fork

No salivation

Neutral stimulus

No conditioned response

3. During conditioning



+



→
response



Tuning fork

Food

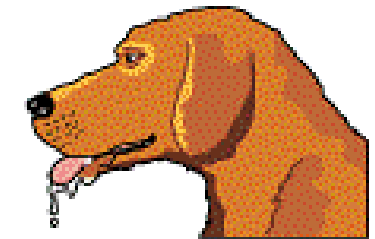
Salivation

Unconditioned response

4. After conditioning



→
response



Tuning fork

Salivation

Conditioned stimulus

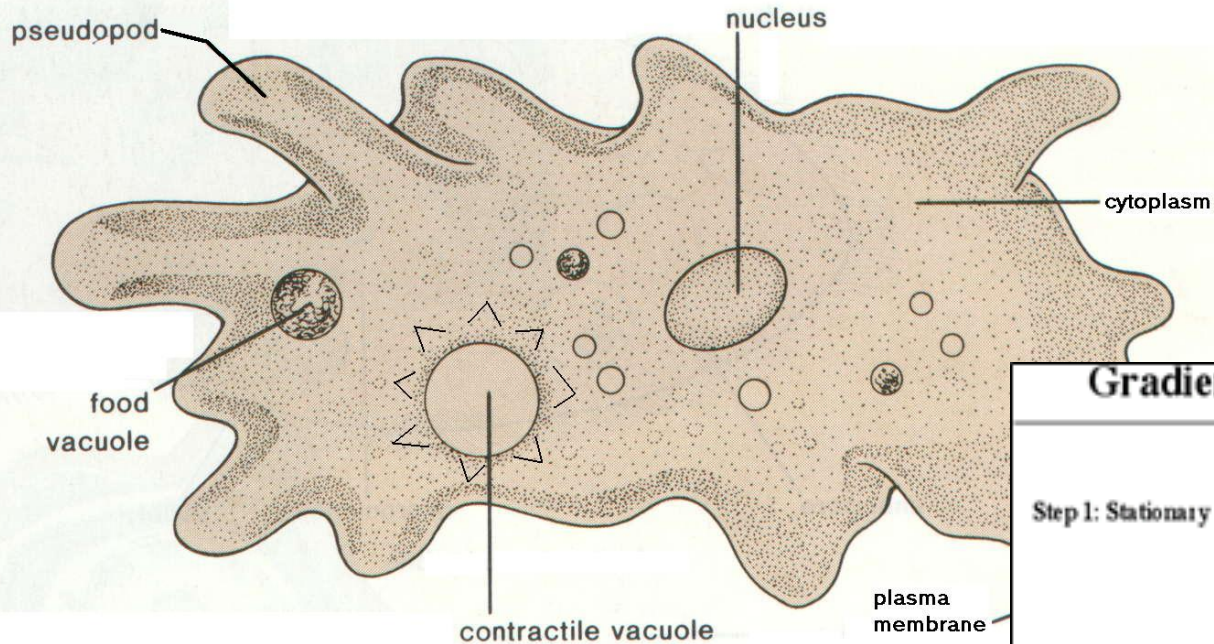
Conditioned response

Animal Behavior: Taxes / taxis

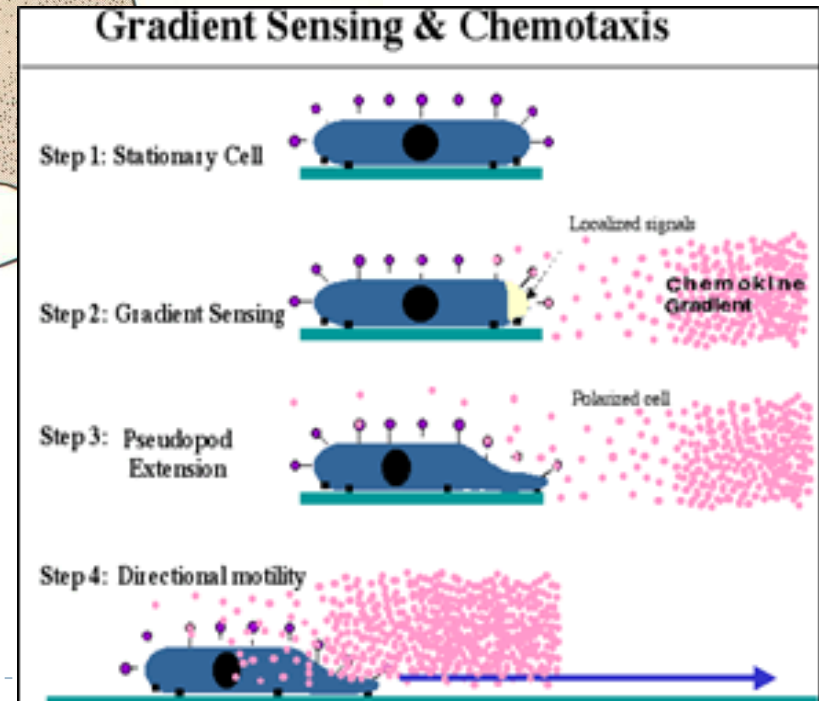
- ▶ **Chemotaxis** is the phenomenon whereby bacteria, and other single-cell or multicellular organisms direct their movements according to certain chemicals in their environment. This is important for bacteria to find food (move to the greatest concentration of particles) or to move away from toxins.



Animal Behavior: Taxes/taxis

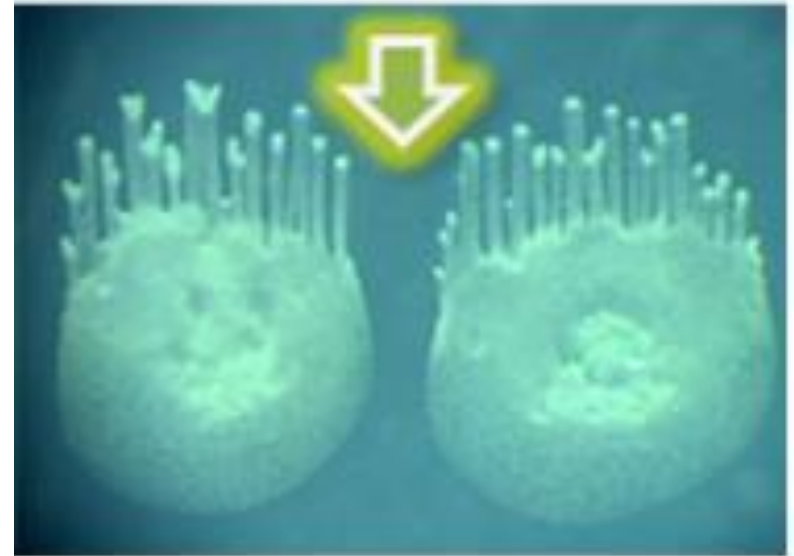


Amoebas use a pseudopod (fake foot) to move toward/away from chemicals



Animal Behavior: Phototaxis

- ▶ **Phototaxis** is a kind of taxis, or locomotory movement, that occurs when a whole organism moves in response to the stimulus of light. This is advantageous for phototrophic organisms as they can orient themselves most efficiently to receive light for photosynthesis. Phototaxis is called positive if the movement is in the direction of increasing light intensity and negative if the direction is opposite.



Synechocystis cells spotted on motility plates exhibit phototaxis as shown by the regular finger-like projections one day after growth in directional light (arrow).

Reproduction, Growth, and Development

- ▶ Sexual versus asexual
- ▶ Eggs
- ▶ Seeds
- ▶ Spores
- ▶ Placental
- ▶ Marsupial
- ▶ Amniotic Egg VS Shelled Egg



Sexual VS Asexual Reproduction

Sexual Reproduction

- ▶ Requires two individuals – male and female
- ▶ Gametes (sex cells) are formed; sperm – males, egg – female
- ▶ Meiosis results in half (23) number of chromosomes
- ▶ Fertilization fuses gametes to make a zygote
- ▶ Great variation – broad differences

Asexual Reproduction

- ▶ Requires one individual
- ▶ No gametes formed
- ▶ Mitosis results in exact copy of parent cell
- ▶ No fertilization occurs
- ▶ No variation, offspring exact copy (clone) of parent – no differences/variation



Sexual VS Asexual Reproduction

Sexual Reproduction

Asexual Reproduction

Advantages

- High Genetic Variability
- Facilitates adaptation
- “Speeds” up evolution

- Saves energy
- Courtship is a non-issue
- Greatest increase in fitness for each individual

Disadvantages

- Energy Costly
- Courtship is time/resource consuming
- Usually sacrifices the fitness of one sex to the other.

- Low Genetic Variability
- Adaptation to environment is difficult
- “Retards” evolution

Types of Fertilization

- ▶ (1) **External fertilization** - an egg is released into the environment by a female and is fertilized by a male. A moist habitat is essential for this type of fertilization so the gametes don't dry out. Aquatic invertebrates and most fish practice external fertilization.
- ▶ Organisms clustered in the same area release their eggs and sperm in the water at the same time in a process called spawning.



Types of Fertilization

- ▶ (2) Internal fertilization – egg and sperm fuse during internal fertilization inside the animal
- ▶ EX: humans, placental mammals

