



Chapter 35: Behavioral Adaptations

Honors Biology 2013

1

Behavior

- * Wide range of activities
 - * Both observable actions and chemical communication
- * Response to internal and external environmental stimuli (environmental cue that causes a response)
- * Behavioral ecologist - studies behavior in an evolutionary context
- * Learning is also a behavioral process
 - * Learning has genetic and environmental components

2

What causes behavior?

- * Proximate causes - the answers to questions about the immediate mechanism for a behavior
 - * Proximate questions answer “how”
 - * ex. “How do penguins choose their mates?”
- * Ultimate causes - evolutionary explanations for behavior
 - * Ultimate questions answer “why”
 - * ex. “Why does a penguin form a monogamous mating pair?”

3

Fixed Action Patterns

- * Innate behaviors - behavior under strong genetic control and is performed virtually the same by all members of a species
- * Fixed Action Patterns (FAPs) - unchangeable series of actions triggered by a specific stimulus
- * Once initiated, it is performed completely regardless of changing circumstances.

4

Behavior is Genetic and Environmental

- * Some behaviors are more dominated by genetics
 - * Fruit fly male courtship
 - * Male flies have a vigorous courtship ritual
 - * Scientists discovered the protein responsible for this.
 - * If male flies make the protein, they court females. If they do not make the protein, they do not court females.
 - * If females are genetically engineered to produce the protein, they will court other female flies.

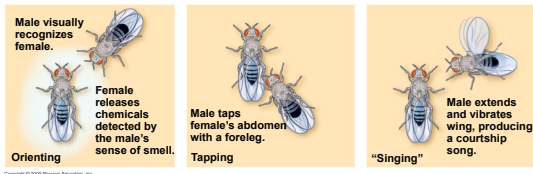


Fig. 35.3A

5

Behavior is Genetic and Environmental

- * Some behaviors are more dominated by environment
- * Norway rats
 - * Mothers that are highly interactive with their pups produce pups that become relaxed adults.
 - * Mothers that do not interact with their pups much produce pups that become fearful adults.
 - * Cross-fostering experiments found the environment was the determining factor.

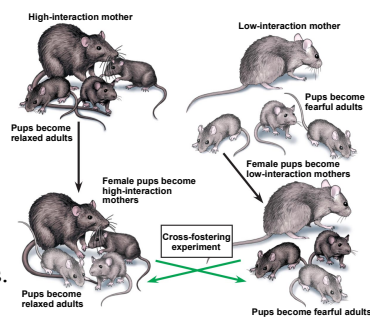


Fig. 35.3B

6

Learning

- * Learning - modification of behavior as a result of specific experiences
- * Allows animals to change their behaviors in response to changing environmental conditions

TABLE 35.4 TYPES OF LEARNING	
Learning Type	Defining Characteristic
Habituation	Loss of response to a stimulus after repeated exposure
Imprinting	Learning that is irreversible and limited to a sensitive time period in an animal's life
Spatial learning	Use of landmarks to learn the spatial structure of the environment
Cognitive mapping	An internal representation of the spatial relationships among objects in the environment
Associative learning	Behavioral change based on linking a stimulus or behavior with a reward or punishment; includes trial-and-error learning
Social learning	Learning by observing and mimicking others
Problem solving	Inventive behavior that arises in response to a new situation

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7

Habituation

- * learn not to respond to a repeated stimulus that conveys little or no information
 - * ex. Hydras contract at the slightest touch, but will stop responding if disturbed repeatedly.
- * Proximate cause
- * Ultimate cause

8

Imprinting

- * Imprinting - learning that is limited to a specific time period in an animal's life and is generally irreversible
- * Sensitive period - limited phase when the animal can learn the behavior
- * Konrad Lorenz
 - * If goslings (baby geese) spent their first few hours with Lorenz, they would follow him like he was their mother.
 - * Even as adults the geese would prefer Lorenz or other humans to spending time with geese.
 - * He discovered that the stimulus was movement of an object away from the hatchling.



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Fig. 35.5

9

Animal Movement

- * Kinesis - random movement in response to a stimulus
 - * ex. starting, stopping, changing speed, turning
- * Taxis - a response directed toward (positive taxis) or away from (negative taxis) a stimulus
 - * ex. stream fish (trout) have a positive taxis related to current

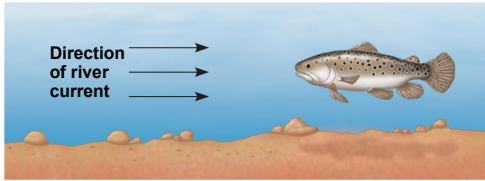


Fig. 35.7B

10

Spatial Learning

- * Spatial learning - animals establish memories of landmarks in their environment that indicate the locations of food, nest sites, prospective mates, and potential hazards
 - * ex. Digger wasps

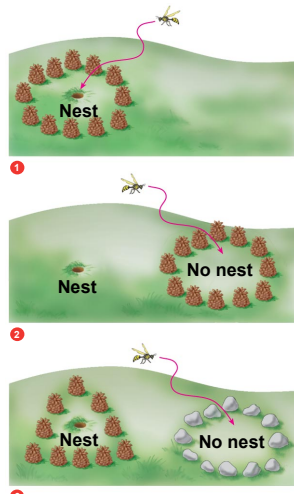


Fig. 35.7C

11

Cognitive Maps

- * Cognitive map - internal representation of the spatial relationships among objects in an animal's surroundings
- * Migration - regular back-and-forth movement of animals between two geographic areas
 - * Individuals must have complex maps that guide them
 - * Birds placed in funnel shaped cages fly in the direction of their migration.

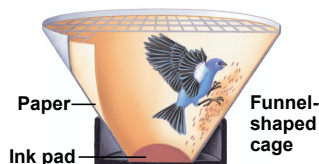


Fig. 35.8

12

Associative Learning

- * Associative learning - ability to associate one environmental feature with another
- * Trial-and-Error learning - an animal associates its own behavior with a positive or negative effect
- * Memory is key to associative learning
- * Thought that this is a result of neurochemical events



Fig. 35.9

13

Social Learning

- * Social Learning - learning by observing the behavior of others
- * Vervet monkeys
 - * Alarm calls are distinct (leopards, eagles, snakes)
 - * Infants give alarm calls but in general ways (any bird = eagle alarm call)
 - * Adults will also give the alarm call when the infant correctly identifies the predator



Fig. 35.10

14

Cognition

- * Cognition - process carried out by an animal's nervous system to perceive, store, integrate, and use information gathered by the senses
 - * ex. many animals can categorize things as same and different
- * Problem solving - process of applying past experience to overcome obstacles in new situations



Fig. 35.11 A & B

15

Foraging

- * Foraging - food obtaining behavior that includes eating and any mechanism used for searching, recognizing, and capturing food
 - * generalists - eat just about anything that is available
 - * specialist - eats very specific items (ex. koala)
- * Optimal foraging theory - an animal's behavior should provide maximum energy gain with minimal energy expense and minimal risk

16

Communication

- * Signal - stimulus transmitted by one animal to another
- * Communication - sending of, reception of, and response to signals
 - * Nocturnal animals use odor and sound signals
 - * Diurnal animals use visual and sound signals
 - * Aquatic animals use visual, electrical, and chemical signals

17

Communication: Honeybees

- * Have a complex social organization with division of labor
- * Adult workers leave the hive to forage
- * When the adult worker finds flowers, she regurgitates nectar (so the others can taste and smell it) and then communicates the location through a "dance"

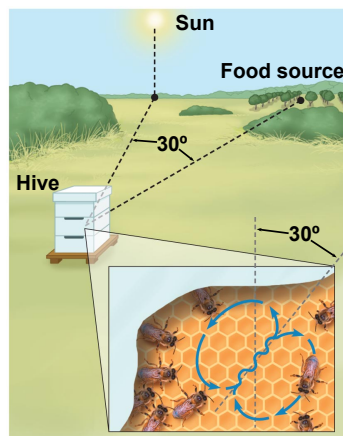


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18

Mating Behaviors

- * Promiscuous - mate with multiple partners and form no lasting bonds
- * Polygamous - individual of one sex mates with several of the other
 - * polygyny
 - * polyandry
- * Monogamous - form bond with a single partner and both parents care for offspring

19

Courtship Rituals

* Loons:

- * Courting male and female swim side by side
- * They frequently turn their heads away from each other
- * Dip beaks in the water and submerge heads
- * Male invites female onto land by turning his head backwards



20

Mating Behaviors and Parental Care

- * Mammals take care of their young because the females are the source of food.
- * Certainty of paternity - difficult for males to know which offspring are his
 - * If the male is certain (in the case of monogamous or polygynous species) he is likely to help the offspring to survive to maturity to ensure his genes are passed on to the next generation.

21

Chemical Pollutants

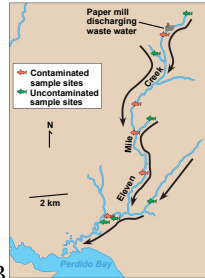
- * Endocrine disrupting chemicals
- * Can cause changes in territorial defense, mating cues, sloppy nest building, risk taking



- * Ex. PCBs and DDT

- * Stickleback fish - pollutants mimic female hormones and impair males ability to perform courtship rituals

- * Mosquitofish - females started to develop male traits when exposed to chemicals from a paper plant



Figs. 35.16A-B

22

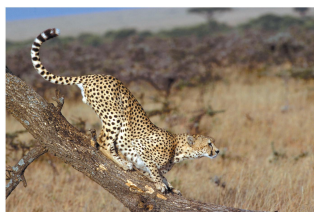
Sociobiology

- * Social behavior - any kind of interaction between two or more animals (usually of the same species)
 - * ex. courtship, migration (in large groups), pack hunting
- * Sociobiology - uses evolution to explain and interpret social behavior (now are they influenced by natural selection)

23

Territorial Behavior

- * Territory - an area which individuals defend and from which members of the same species are excluded
- * Animals usually identify their territories through auditory signals (sea lions and squirrels) or through scent (cheetah)



24

Agonistic Behavior

- * Agonistic behavior - threats, rituals, and sometimes combat to determine which competitor gains the resource
 - * Resources could be territory, mates, food, etc.
- * Usually not violent
 - * Tests of strength, symbolic displays
- * Violence is not favored by natural selection because it is too big of a risk to take



Fig. 35.19

25

Dominance Hierarchies

- * Dominance hierarchy - ranking of individuals based on social interactions
 - * Often determined by agonistic behavior
- * Female wolves have a hierarchy that determines mating.
 - * If resources are abundant, all the females will mate.
 - * If resources are scarce, only the alpha female will mate.



Fig. 35.20

26

Altruism

- * Most behaviors are selfish because animals try to maximize their ability to survive (fitness)
- * Altruism - behavior that reduces an individual's fitness while increasing the fitness of others in the population
 - * Ex. Ground Squirrels give off alarm call when predators are present.
 - * This puts the squirrel in danger but keeps the rest of the population safe.

27

Why are species altruistic if it hurts the individual?

- * Inclusive fitness - an individual's success at perpetuating its genes by producing its own offspring and by helping close relatives (who will share many of the same genes) to produce offspring
- * Kin selection - natural selection favoring altruistic behavior that benefits relatives
- * Reciprocal altruism - an altruistic act that may be repaid at a later time by the beneficiary