

Behavior



Animal Behavior

- Observable coordinated responses to stimuli.
- Originates with genes that direct the formation of tissues and organs of the animal body (nervous & endocrine systems).

Nervous System

- Detects processes and integrates information about stimuli.
- Commands muscles and glands to make suitable responses.

Endocrine System

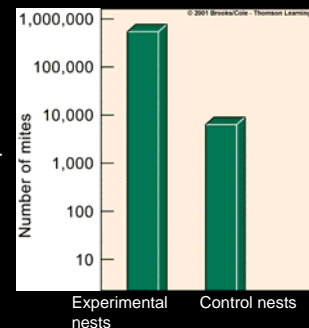
- Produces hormones in response to neural stimuli.
- Hormones influence behavior.

Behavior is adaptive

- Behavior is heritable and has been demonstrated to improve fitness.

Starling Nest Decoration

- Starlings line nest with wild carrot.
- Experiments have shown this behavior is adaptive.



Starling



Genes and Behavior

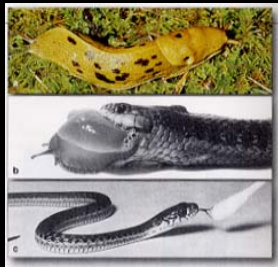
- Some variations in behavior have a genetic basis.
- Arnold showed that garter snakes' taste for slugs has genetic basis.
- Hybrid snakes showed behavior intermediate between parental types.

Garter Snake

Coastal snake eat slugs, inland snake do not.

Captive newborns showed same preferences as wild adults.

Cross breeds had intermediate interest.



Hormones and Bird Song

- Sex hormones produced during development prime male birds to sing.
- As adults, males will sing only when days are long and levels of the hormone melatonin are low.

Prairie Voles Hormones

Prairie voles are monogamous mammals. Pair bonding occurs during a night of mating. They usually become monogamous for life. During their mating they release oxytocin.

If they are together but prevented from mating they will not form a bond. If the female is injected with oxytocin then a bond will form.

If bonded females are injected with an oxytocin blocker, she will run off with the next male she sees.



Types of Behavior

1. Instinctive
2. Learned

Instinctive Behavior

- Performed without having been learned.
- Usually triggered by simple sign stimuli.
- Response is a stereotyped motor program, a fixed-action pattern.

Instinctive Behavior

- For the Garter snakes, the sign stimuli is the scent of a yummy slug
- The fixed action pattern for the Garter is its strike, capture and eating slug.



Instinctive Behavior

European cuckoos lay eggs in nests of other species

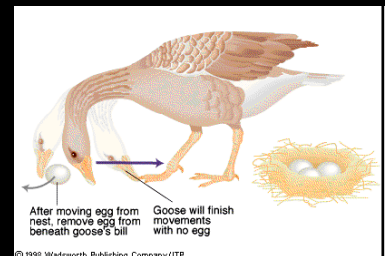
Newly hatched cuckoos toss the competitor's eggs out of the nest



Cuckoos get fed by the mother of the eggs they destroyed

Instinctive Behavior

Graylag goose continues egg-retrieving motion even after egg is removed



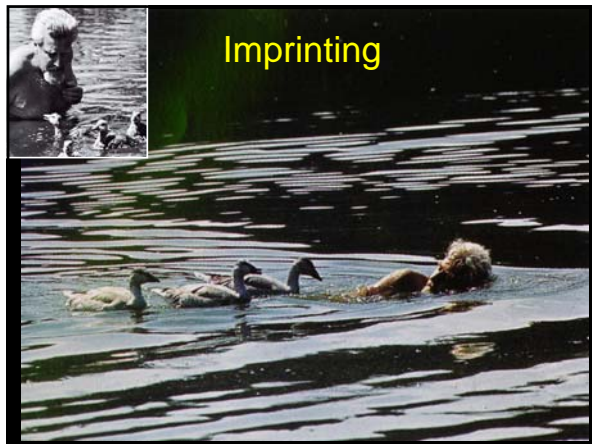
Learned Behavior

- Responses change with experience.
- Some categories of learned behavior
 - Imprinting
 - Insight learning
 - Classical conditioning
 - Operant conditioning
 - Spatial learning
 - Habituation

Imprinting

- Time-dependent learning.
- Triggered by exposure to a sign stimulus during a sensitive period.
- Young geese imprint on a moving object and treat it as "mother".





Classical Conditioning

- First demonstrated by Pavlov.
- An autonomic response becomes associated with a novel stimulus.
- Salivation became associated with sound of bell that accompanied feeding.

Learned Behavior

1. Normal salivation

2. Bell is rung when food is presented

3. Salivation at the sound of ringing bell

Classical Conditioning

Pavlov's experiments with dogs.

Learned Behavior

Classical Conditioning Before Conditioning

UCS automatically produces UCR. Neutral stimulus does not produce salivation.

Classical Conditioning

Pavlov's experiments with dogs.

- Unconditioned Stimulus: a thing that can already elicit a response.
- Unconditioned Response: a thing that is already elicited by a stimulus
- Unconditioned Relationship: an existing stimulus-response connection

Learned Behavior

Classical Conditioning During Conditioning

UCS is paired with neutral stimulus. UCS produces UCR.

Classical Conditioning

During conditioning

- Association of a neutral stimuli with an UCS produces a UCR.

Learned Behavior

Classical Conditioning After Conditioning

Neutral stimulus is now the conditioned stimulus. It produces CR, salivation, which is similar to the UCR produced by the Hot Dog.

Classical Conditioning

After conditioning

- Neutral stimulus now elicits a conditioned response.

Operant Conditioning

- A voluntary action becomes associated with its consequences.
- A toad may attempt to eat a wasp with a black and gold pattern and be stung.
- Thereafter, the toad will be conditioned to avoid eating similar insects.

Operant Conditioning



Habituation

- An individual learns NOT to respond to a stimulus that has neither good nor bad consequences.
- Pigeons in cities learn that people are no threat and do not flee from them.

Spatial Learning

- Through experience with an environment, an organism creates a mental map.
- Some blue jays remember the location of dozens of places where they have stored food.

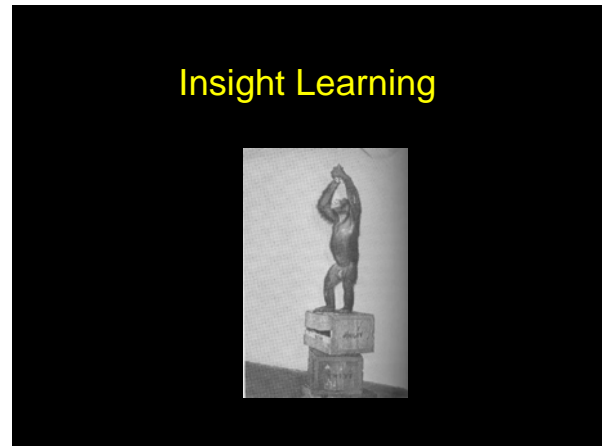
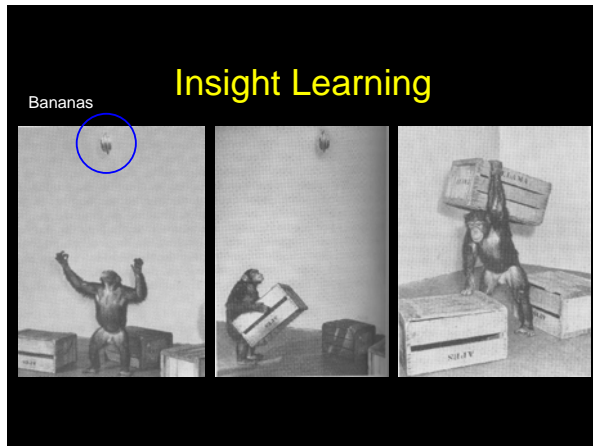
Spatial Learning



Blue Jay (*Cyanocitta cristata*)
knows where it stashed food.

Insight Learning

- An animal solves a problem without trial-and-error attempts at a solution.
- Captive chimpanzees show insight learning when they solve a novel problem, as when they stack boxes to reach food that is out of reach.



Bird Song: Instinct + Learning

- Bird comes prewired to listen to certain acoustical cues; instinctively pays attention to particular sounds.
- Which dialect the bird sings depends on what song it hears; it learns the details of the song from others around it.

Bird Song: Instinct + Learning

- Birds raised in acoustic isolation still sang as adults, but not exactly the same as typical song.
- Birds raised with recordings of its native songs and that of a different species sang the native song.

Selection for Behavior

- Some variation in behavior has a genetic basis.
- Some behavior promotes reproductive success (is adaptive).
- Genes that encode adaptive behavior will increase in population.

Selfish and Altruistic Behavior

- Selfish behavior promotes an individual's genes at the expense of others.
- Altruistic behavior helps others at the expense of the altruist; may be adaptive under certain circumstances.

Selfish Ravens

- Heinrich observed what appeared to be altruistic calling by ravens at carcasses.
- Further observation showed that the callers were behaving selfishly.
- Calls helped callers recruit others and to overwhelm owners of the territory where the food was located.

Communication Signals

- Intraspecific signals will evolve only if they benefit both signaler and receiver.
- Variety of signal modalities
 - Pheromones
 - Visual signals
 - Acoustical signals
 - Tactile signals

Pheromones

- Chemical signals that diffuse through air or water.
- May bring about behavioral change in receiver or cause physiological change (priming pheromones).

Acoustical Signals

- Sounds used in communication.
- Used to attract mates, secure territory, warn off rivals.
- May also be used to communicate danger, keep groups together.

Acoustical Signals




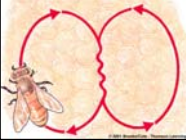
Visual Displays

- Important in courtship and in aggression.
- Baring of teeth by baboon communicates threat.
- Play bow in wolves solicits play behavior.
- Flashing of fireflies attracts mates.



Tactile Display

- Signaler and receiver communicate by touch
- Honeybee dance language

Signal Variation


- Some signals never vary.
- Other signals can be varied to convey information about the signaler.
- Composite signals combine information encoded in more than one cue; more potential for variation and information.

Ritualized Displays

- Common behavior patterns are exaggerated and simplified.
- Body parts may be enhanced or colored in way that enhances the display.
- Ritualization is often important in courtship displays.

Ritualized Displays

Fiddler crab uses oversized and brightly colored claw to lure mates into their dens.



Male Sage Grouse Courtship Display



High-Step in Blue-Footed Boobies



FIGURE 22.4
Courtship ritual as a behavioral barrier between species. These blue-footed boobies, inhabitants of the Galapagos, will mate only after a specific ritual of courtship display. Part of the "high-step" call for the male to high-step, a behavior that advertises the bright blue feet characteristic of the species.



Courtship Displays in Blue-Footed Boobies



Illegitimate Signals

- An illegitimate receiver intercepts a signal meant for individuals of another species.
 - Termite smells pheromone of invading ant and attacks it.
- An illegitimate signaler mimics signals
 - Predatory fireflies mimic females of prey species.

Sexual Selection

- Reproductive success is measured in number of offspring produced.
- Reproductive success can be enhanced by increasing the number of matings or the quality of mates.

Male Reproductive Strategy

- Males produce energetically inexpensive sperm.
- Males often provide no parental care.
- Males maximize reproductive success by mating with as many females as possible.

Female Reproductive Strategy

- Females produce large, energetically expensive eggs.
- Females often provide parental care.
- Females increase reproductive success by increasing the quality of their mates.

Choosy Females

- Female choice can dictate rules of male competition and shape male behavior.
- Selects for males that appeal to females.
- Male sage grouse display in leks.
- Male hangingflies offer nuptial gifts.

Male Contests

- Females of some species cluster in groups.
- Males of such species may fight one another for access to harems.
- Selects for large males that can defeat other males in contests.

Male Northern Elephant Seal with Harem



Northern Elephant Seal
(*Mirounga angustirostris*)

Male-Male Fighting



Northern Elephant Seal
(*Mirounga angustirostris*)

Male-Male Fighting



Northern Elephant Seal
(*Mirounga angustirostris*)

Male-Male Fighting



Northern Elephant Seal
(*Mirounga angustirostris*)

Meanwhile...



Parenting Behavior

- Enhancing the survival of offspring can increase parents' reproductive success.
- Parental behavior comes at a cost; drains time and effort that could be spent producing additional offspring.

Benefits of Social Living

- Improved detection of predators; many eyes.
- Improved repulsion of predators
 - Musk oxen
 - Sawflies

Selfish Herd

- A group held together by self-interest.
- Other members of the group form a living shield against predators.
- Individuals may compete for the safest spots; positions in the center of the group.

Male with Horns



Musk Oxen
(*Ovibos moschatus*)

Dominance Hierarchy

- Some individuals accept subordinate status to others.
- Dominant members have higher reproductive success than subordinates.
- Subordinates may do better over long term than if they were on their own.

Costs of Social Living

- Increased competition for food, mates, and other limiting resources.
- Increased vulnerability to disease and parasitism.
- Risk of exploitation by other group members.

Altruistic Behavior

- Nonbreeding helpers are found in mammals, birds, and insects.
- Altruists apparently sacrifice their reproductive success to help others.
- How are genes for altruism perpetuated?

Altruism

Guardianship: Meerkats are "snack size" for a number of animals, so one always stands guard while the others forage or nap.

Helpfulness: Various adults will baby-sit the youngsters while the mother feeds.



Theory of Indirect Selection

- Proposed by William Hamilton.
- Genes associated with caring for relatives may be favored by selection.
- Altruists pass on genes indirectly, by helping relatives who have copies of those genes to survive and reproduce.

Social Insects

- Workers in colonies of social insects are sterile.
- These colonies are extended families.
- Workers pass on their genes indirectly by helping relatives reproduce.

Termites

- Workers and soldiers are sterile.
- A single queen and one or more kings are the parents of the entire colony.



Honeybees



- Workers are sterile females.
- A single queen is the mother of all members of the colony.
- At certain times of the year, the colony produces drones--fertile males that leave the colony and mate.

Naked Mole-Rats



- Only mammals known to have a sterile worker caste.
- Single queen reproduces with one to three males.
- DNA evidence shows clan members are all closely related.

Considering Human Behavior

- Some human behavior may be adaptive or may have been adaptive in the past.
- Testing hypotheses about human behavior can help us understand how they arose.

Redirected Behavior

- Certain behaviors that are normally directed toward relatives may sometimes be directed toward nonrelatives.
- In this case, the redirected behavior is nonadaptive.

Moral Questions

- A behavior that is adaptive may or may not be desirable or moral.
- Some behaviors that were adaptive in small groups, such as adoption, may no longer be adaptive in large societies.
- A behavior may be nonadaptive but still be socially desirable.