



Animal Behavior



What is behavior?

- Behavior
 - everything an animal does & how it does it
 - response to stimuli in its environment
 - Innate (instinct)
 - inherited
 - automatic & consistent
 - learned
 - ability to learn is inherited, but the behavior develops during animal's lifetime
 - variable & flexible
 - change with experience & environment



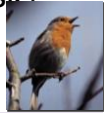
Why study behavior?

- Evolutionary perspective...
 - part of phenotype
 - acted upon by natural selection
 - lead to greater fitness?
 - lead to greater survival?
 - lead to greater reproductive success?



What questions can we ask?

- Proximate causes
 - immediate stimulus & mechanism
 - “how” & “what” questions
- Ultimate causes
 - evolutionary significance
 - how does behavior contribute to survival & reproduction
 - adaptive value
 - “why” questions



male songbird
 → what triggers singing?
 → how does he sing?
 → why does he sing?



Courtship behavior in cranes
 → what...how... & why questions

→ how does daylength influence breeding?
 → why do cranes breed in spring?

Evolutionary perspective

- Adaptive advantage?
 - innate behaviors
 - automatic, fixed, “built-in”, no “learning curve”
 - despite different environments, all individuals exhibit the behavior
 - ex. early survival, reproduction, kinesis, taxis
 - learned behaviors
 - modified by experience
 - variable, changeable
 - flexible with a complex & changing environment

Innate behaviors

- Fixed action patterns (FAP)
 - sequence of behaviors essentially unchangeable & usually conducted to completion once started
 - sign stimulus
 - triggers a FAP

egg rolling in geese

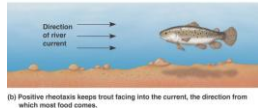


Innate: Directed movements

- **Taxis**

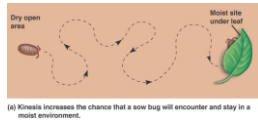
- change in direction
- automatic movement toward (positive taxis) or away from (negative taxis) a stimulus

- phototaxis
- chemotaxis



- **Kinesis**

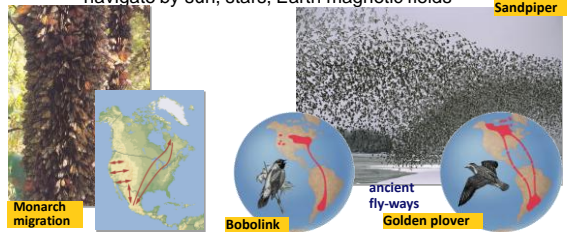
- change in **rate** of movement in response to a stimulus



Complex Innate behaviors

- Migration

- "migratory restlessness" seen in birds bred & raised in captivity
- navigate by sun, stars, Earth magnetic fields



Innate & Learning: Imprinting



- Learning to form social attachments at a specific critical period
- both learning & innate components



Konrad Lorenz



PROXIMATE CAUSE: During an early, critical developmental stage, the young gander observe their mother moving away from them, and calling.

ULTIMATE CAUSE: On average, ganders that follow and imprint on their mother receive more care and learn necessary skills, and thus have a greater chance of surviving than those that do not follow their mother.

Critical period

- Sensitive phase for optimal imprinting

- some behavior must be learned during a receptive time period



As a brood parasite, the Cuckoo never learn the song of their species as a nestling. Song development is totally innate.



Learned behavior

- Associative learning

- learning to associate a stimulus with a consequence

- operant conditioning

- trial & error learning
- associate behavior with reward or punishment

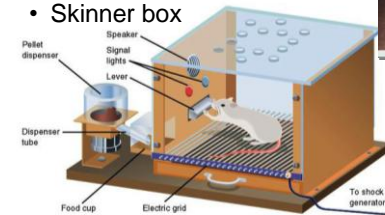
- classical conditioning

- Pavlovian conditioning
- associate a "neutral stimulus" with a "significant stimulus"



Operant conditioning

- Skinner box



mouse learns to associate behavior (pressing lever) with reward (food pellet)

Classical conditioning

- Ivan Pavlov's dogs
 - connect reflex behavior (salivating at sight of food) to associated stimulus (ringing bell)



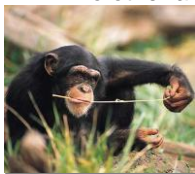
Learning: Habituation

- Loss of response to stimulus
 - “cry-wolf” effect
 - decrease in response to repeated occurrences of stimulus
 - enables animals to disregard unimportant stimuli
 - ex: falling leaves not triggering fear response in baby birds



Learning: Problem-solving

- Do other animals reason?



chimpanzee

problem-solving

tool use

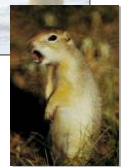


sea otter



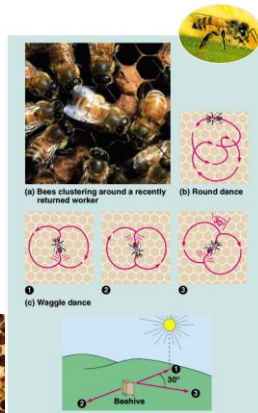
Social behaviors

- Interactions between individuals
 - develop as evolutionary adaptations
 - communication / language
 - agonistic behaviors
 - dominance hierarchy
 - cooperation
 - altruistic behavior



Language

- Honey bee communication
 - dance to communicate location of food source
 - waggle dance



Communication by song

- Bird song
 - species identification & mating ritual
 - mixed learned & innate
 - critical learning period
- Insect song
 - mating ritual & song
 - innate, genetically controlled



Social behaviors



- Agonistic behaviors
 - threatening & submissive rituals
 - symbolic, usually no harm done
 - ex: territoriality, competitor aggression



Social behaviors

- Dominance hierarchy
 - social ranking within a group
 - pecking order



Social behaviors

- Cooperation
 - working together in coordination

Pack of African dogs hunting wildebeest cooperatively

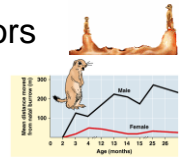


White pelicans "herding" school of fish



Social behaviors

- Altruistic behavior
 - reduces individual fitness but increases fitness of recipient
 - kin selection
 - increasing survival of close relatives passes these genes on to the next generation



How can this be of adaptive value?

Social interaction requires communication

- Pheromones
 - chemical signal that stimulates a response from other individuals
 - alarm pheromones
 - sex pheromones

marking territory



The female lion lures male by spreading sex pheromones, but also by posture & movements



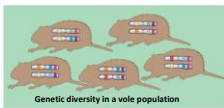
Conservation Biology and Restoration Ecology

Conservation vs. Restoration

- **Conservation biology**, which seeks to preserve life, integrates several fields:
- **Restoration ecology** applies ecological principles to return degraded ecosystems to conditions as similar as possible to their natural state

Three Levels of Biodiversity

- Biodiversity has three main components:
 - Genetic diversity
 - Species diversity
 - Ecosystem diversity



Genetic diversity comprises genetic variation within a population and between populations



Species diversity is the variety of species in an ecosystem or throughout the biosphere



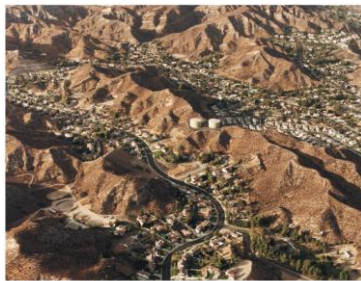
the variety of ecosystems in the biosphere

Three Threats to Biodiversity

- Most species loss can be traced to three major threats:
 - Habitat destruction
 - Introduced species
 - Overexploitation
 - Global Change

Habitat Loss

- Human alteration of habitat is the greatest threat to biodiversity throughout the biosphere
- In almost all cases, habitat fragmentation and destruction lead to loss of biodiversity



Introduced Species

- Introduced species are those that humans move from native locations to new geographic regions
- Without their native predators, parasites, and pathogens, introduced species may spread rapidly

Overexploitation

- Overexploitation is human harvesting of wild plants or animals at rates exceeding the ability of populations of those species to rebound
- Overexploitation by the fishing industry has greatly reduced populations of some game fish, such as bluefin tuna

Global Change

- Acid precipitation
 - pH less than 5.2, due to the burning of wood and fossil fuels
- Global warming
 - Increase in atmospheric CO₂ levels, and other greenhouse gases, lead to increased global temperatures
- Ozone depletion
 - CFCs cause thinning of the ozone layer, increasing UV rays reaching Earth