Calculating your grade
1. Each Test Grade * 0.25
2. Quiz average * 0.25
3. Add everything up!

Example

Scaled Scores
Quiz average: 88 Quiz average: 22
Sum: 57.5
Maximum grade:
57.5 + 25 = 82.5

Goals:
1. Understand what Behavior is.
2. Be able to identify types of movement and orientation
3. Understand various types of Learning
4. Be familiar with examples of various behavioral strategies

Read Chapter 41 (big book) or 28 (little book)

Websites:
- http://www.ex.ac.uk/bugclub/raiders.html
- http://www.nature.com/nsu/011101/011101-6.html
- http://bees.ucr.edu
- http://koning.ecsu.ctstateu.edu/Plants_Human/bees/bees.html
- http://insects.ummz.lsa.umich.edu/michodo/test/home.htm
- http://powell.colgate.edu/wda/Beginners_Guide.htm
- http://fly.to/dragonflies

Review of Communication Terms & Concepts
Pheromones
Chemical released by an individual of a species to elicit a response from another (usually of the opposite sex) of the same species: benefits both sender and receiver.

Kairomones:
Chemicals Released by one species that elicit a response in individuals of another species which favors the receiver

Allomones (All/o = other)
Chemicals released by one species that elicit response in an individual of another species which favors the sender

Pheromones
- Poisonous
- Non-poisonous

Mullerian mimics: Imitate other poisonous individuals, creating a recognizable “distasteful type”

Batesian mimics: Look like distasteful organisms, even though they, themselves are harmless
Tactile Communication:
Use of touch to elicit behavioral response

Advantages
- Little risk of noise (misinterpretation) or interception
- Sender has high confidence that message was received

Disadvantages
- Have to be in contact!
- Risk: Remember... You’re in striking distance

Combination Communication: Using all of the media
- Visual
- Acoustic
- Chemical
- Tactile

What is Behavior?
1) What organisms do... the ways in which an organism adjusts to and interacts with its environment
2) Regulation of bodily status using movement

Does Behavior Have a Common Denominator?

- Genetics: The Blueprint of the ship and all of its components
- Anatomy, Biochemistry, Physiology: The finished battleship, complete with all moving parts
- Behavior: The Captain / decision making personnel and how they chose to use the ship
- Ecology & Evolution: The Battleship environment and whether the ship is a winner or is sunk.

Anthropomorphism:
- Ascribing human purposes or qualities to other animals

Nerves
Photoreception

Human Visual Spectrum

Mechanoreceptors

Photoreceptors

What is Movement?
Physical transport through nervous coordination

Types of movement:
1. Postural: Maintaining a spacial relationship without displacement/distance
2. Manipulative: Moving something in the environment
3. Locomotory: Displacement and/or distance under own power

What Behaviors do insects use when foraging for resources?

Taxis (Directed Search): Headings are selected with a left/right bias
1. Phonotaxis- Orienting toward sound
2. Chemo taxis- Orienting toward a smell
3. Phototaxis- Orienting in relationship to a light source
4. Anemotaxis- Orienting in relationship to wind

Kinesis (Indirect Search): New headings are selected at random
- Arrestment is important

Rhythms of behavior

Nocturnal – Night time activity
Diurnal- Daytime Activity
Crepuscular- Evening activity
Circadian – Circa (about), dies (day). A rhythm that lasts approximately 24 hours
Circannual – Yearly rhythm

Types of Behavior

- Innate (Instinct): Genetically inherited disposition
- Learned: Behavioral response is altered as a result of experience.
- Mechanistic: Nervous fixed-action pattern. Once started, difficult (or even impossible) to stop
What is Learning?
Changes of behavior mediated by experience

Types of Learning
- Imprinting: Time dependent
- Classical Conditioning: Pavlov’s dog
- Operant Conditioning: Trial and Error
- Cognition: Organism creates an internal understanding of world or past experience

Can insects learn?
- Fruit flies learn new hosts
- Bees and Wasps return to their homes
- Most insects avoid toxic foods

Behavior is functional and evolutionary
The individual
- Genetic
- Developmental
- Physiological

Behavior is functional and evolutionary
Sexual Selection: Evolution of traits that give an individual an edge when competing for mates

Ways humans can manipulate animal behaviors
Types of tools
1. Attractants
2. Arrestants
3. Repellents
4. Noise
5. Combinations

Coordination: Killer Bees
- Correct name: Africanized Honey Bee, *Apis mellifera scutellata*
- African bees were imported to Brazil in 1956 to breed hybrid bees better-adapted to tropical climate
- Escaped quarantine in 1957 and bred with “native” species -- honeybees are not native to the New World. They were originally brought by European colonists
**Killer bees**

New hybrid bees--Africanized Honey Bees--are slightly smaller than the European bees

3/8-1/2 inch long...but only an expert can tell them apart

Which is which?

Killer bees  
European bees

**FABIS - Fast Africanized Bee Identification System**

- Bee sample taken
- Wings measured
- Probable positive? DNA analysis

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**Killer bees**

- Earned the name “killer” due to the fact that they, unlike native bees, will attack in a swarm, and will attack under less provocation
- Doesn’t have to be a physical disturbance to “set them off”: vibrations from vehicles, pedestrians, and noise may cause attacks
- Bees may remain agitated for 24 hours after the disturbance, attacking people and animals up to 1/4 mile from the hive

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**Killer bees**

- They do NOT have stronger venom, and can only sting once, like native bees
  - However, they are 10 times more likely to sting, when disturbed, and react faster (0.3 seconds vs. 0.2 seconds for the European Honeybee).
  - When foraging for pollen, however, they are no more likely to sting than native bees.

**Why do Killer bees proliferate?**

- Africanized bees (AHB) are less choosy about hive placement
- They swarm more often (move to a new hive)
- They develop faster, and produce more larvae

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**First US swarm: October 1990, Hidalgo, Texas**

Jesus Diaz was the first subject of a bee attack while mowing his lawn, in May 1991. He suffered 18 stings and was hospitalized

82 year old Lino Lopez was the first US casualty of killer bee attacks on July 15, 1993, with more than 40 stings.

Between Sept. 1986-Sept. 1991, there were over 1,000 stingings, resulting in 58 human deaths in Mexico

Some victims received over 1,000 stings.

**Killer bees**

- AHB have caused over 300 deaths in Venezuela, 176 deaths in Mexico, 191 attacks on Texans (2 deaths), multiple attacks in Arizona (2 deaths) and 2 attacks in California

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**Killer bees**

- The biggest danger is to beekeepers, as AHB may enter European colonies and hybridize, causing a normal colony to suddenly become aggressive
- Additionally, they may produce less honey, as their comb structure results in smaller cells. A row of 10 European bee cells is over 5cm in length. 10 AHB cells are less than 4.9 cm in length
- They target the head, so duck and run for shelter. Bees can follow odors, and will wait above water for you to come up for air
- If you are stung in excess of 15 times or have symptoms other than local pain and swelling, seek medical help, immediately
- Remove stingers immediately, by scraping with a blunt instrument - tweezers will empty the venom into the skin

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**Killer bees**

- On average, honeybees add $10 billion to crop values each year, and produce about $150 million worth of honey
- Bees should be treated with caution: beware of refuse piles and optimal hive locations: cracks and crevices in walls, holes in trees, etc.
- Bees should be treated with caution: beware of refuse piles and optimal hive locations: cracks and crevices in walls, holes in trees, etc.

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**Killer bees**

- Currently, AHB inhabit only areas of New Mexico, Texas, Arizona and California. They move northward at about 100-300 miles per year
- Bees should be treated with caution: beware of refuse piles and optimal hive locations: cracks and crevices in walls, holes in trees, etc.
Coordination: Fast food

- Dragonflies belong to one of the most “primitive” (oldest) insect orders: Odonata
- Dragonflies are the “cheetahs” of the insect world
- Bats and sparrowhawks are the only other animals fast enough to maneuver in flight to catch insect prey.
- Austrophlebia costalis has been clocked at speeds up to 98 km/h (downhill) 57.9 km/h = max on a level plane. Cheetahs = max 60 km/hr
- As fast as we perceive raptors to be, most only land on their prey, rather than scooping it from the air.

One of the simplest types of learning is termed habituation. It is defined as ignoring a continued stimulus that is not is seen in its purest form in churches and college stimulus in these cases is the human voice.

Henry David Thoreau (1817-1862) from Walden
American writer