So... how does evolution really work?

Four Mechanisms of Evolutionary Change

- Mutation
- Migration (Gene Flow)
- Genetic Drift
- Natural Selection
Mechanisms of evolution

• Evolution does not occur in individuals but in populations.

A population evolves because the population contains the collection of genes called the **gene pool**.

• As changes in the gene pool occur, a population evolves.
Any change in an organism's sequence of DNA

A mutation could cause parents with genes for bright green coloration to have offspring with a gene for brown coloration. That would make the genes for brown beetles more frequent in the population.
The mutation in the color of the coat of the leopard (panther) increases camouflage at night.

Some mutations are beneficial and increase an organism's fitness.
Mutations increase the size of a population's *gene pool*:

- Mutations slowly become part of an organism's genes.
- *All the genes* of a population: the total number of genes in a population at any one time is called the population's *gene pool*.

- **What is the gene pool for the color allele in this illustration?**
- **What type of gene pool would be best?** large or small?
BW: 1. What is a gene pool?
2. Explain how mutations can cause a population to evolve

Standard: 4.4 PO1

Objective: determine how a change in genotype frequency results in a change of phenotype frequency that could affect the organism's success in an environment

Activity: Mechanisms of Evolution
- Gene Flow & Genetic Drift
- Angry Beans Will Drift Lab
Gene Flow...also increases the variation in a population.
Some individuals from a population of brown beetles might have joined a population of green beetles. That would make the genes for brown beetles more frequent in the green beetle population.
Genetic Drift

Occurs when a small group of individuals leaves a population and establish a new one in a geographically isolated region, usually due to some type of traumatic event.
Imagine that in one generation, two brown beetles happened to have four offspring survive to reproduce. Several green beetles were killed when someone stepped on them and had no offspring. The next generation would have a few more brown beetles than the previous generation—but just by chance. These chance changes from generation to generation are known as genetic drift.
BW: 1. What is gene flow?
2. Explain how migration can cause a population to evolve

Standard: 4.4 PO1

Objective: - explain how finite resources can lead to speciation or extinction of a species
- explain how an environmental effect could affect the amount of biodiversity

Activity: Mechanisms of Evolution
- Natural Selection
- "Survival of the Sneakiest"
The final mechanism for evolutionary change: **Natural Selection**

**Struggle for Existence**

In nature, there is a struggle for existence because of limited food supply and predation by other organisms.
Because of this, many organisms produce more offspring than can survive to adulthood.
Therefore, differences in our traits is what makes some organisms live longer and survive in their environment, and contribute their genes to future generations.

*This is known as*

“*Survival of the fittest*”
Imagine that green beetles are easier for birds to spot (and hence, eat). Brown beetles are a little more likely to survive to produce offspring. They pass their genes for brown coloration on to their offspring. So in the next generation, brown beetles are more common than in the previous generation.
Darwin called these characteristics *adaptations*: Physical or behavioral traits that allow organisms to survive.

- Bearers of traits (white fur genes) adapt to the new environment survive and reproduce.

Natural selection selects for specific adaptations such as CAMOUFLAGE.
How well an organism survives and is able to pass on its genes to its offspring is called **FITNESS**.

Which organism is more "fit" in each of these examples?
What does that mean?

- Organisms that are better able to survive in their environment produce more offspring.

- Organisms that are not well adapted to their environment do not produce any or as many offspring.
Scientists have worked out many examples of natural selection that have led to new species.
What is a species?

A *species* is: A group of potentially interbreeding organisms that produce fertile offspring and share similar characteristics.
Those organisms who are able to survive these factors pass on those traits to their offspring…

*Survival of the fittest leads to speciation (formation of a new species).*
Samples of Sexual Selection: When certain characteristics are preferred by mates for reproduction.

**Peacock Feathers**

**Orchids and Wasps**
Behavior can also be shaped by natural selection.

How might this be so?
Blue-footed booby Birds

Big Horn Sheep

Tropical Bird Mating Dance

Bee's Waggle Dance
In other cases, human activity has led to environmental changes that have caused populations to evolve through natural selection.
A striking example is that of the population of dark moths in the 19th century in England,
Which rose and fell in parallel to industrial pollution. These changes can often be observed and documented.
BW: 1. How was your Spring Break? What did you do?

2. When is the History & Mechanisms of Evolution test?

**Please TAKE OUT your Cricket Cartoon questions & answers**

Standard: 4.4 PO3

Objective: demonstrate & describe the mechanisms that allow species to increase their fitness

Activity: Mechanisms of Evolution -> Natural Selection
- Cricket Cartoon
**Wednesday, March 24th, 2010**

**B&W:**

1. What is the x-axis going to be labeled in your peppered moth lab graph?
2. What is the y-axis going to be labeled in your peppered moth lab graph?

*REMEMBER: "Y be dependent when you can be X-tremely independent”*

**Standard:** 4.4 PO3

**Objective:** demonstrate & describe the mechanisms that allow species to increase their fitness

**Activity:** Mechanisms of Evolution -> Natural Selection  
- Peppered Moth Lab
1. How does natural selection cause a population to evolve?

2. Give 1 example of a physical adaptation and 1 example of a behavioral adaptation

Standard: 4.4 PO3

Objective: demonstrate & describe the mechanisms that allow species to increase their fitness

Activity: Mechanisms of Evolution -> Natural Selection
- Peppered Moth Lab