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# Mechanisms and Speciation 2: Evolution on the Web Questions

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## Evolution on the Web

The website below, sponsored by UC Berkeley, is a reliable source for information about evolution. This will give you the introductory information about the mechanisms of Evolution.

[http://evolution.berkeley.edu/evolibrary/article/0\\_0\\_0/evo\\_14](http://evolution.berkeley.edu/evolibrary/article/0_0_0/evo_14)

### Mechanisms of Change

#### [Mechanisms: the processes of evolution](#)

1. What is evolution? Why are genetic variation and heritability (ability for a trait or gene to be passed on to the next generation) essential for Evolution as a process?

#### [Descent with modification](#)

1. Explain what we mean by "descent with modification" Use the two beetle examples to explain. What kind of timeline are we examining in terms of descent? What kinds of modifications?

#### [Mechanisms of change](#)

This website lists 4 mechanisms of evolution: mutation, migration (gene flow), genetic drift, and natural selection. Describe each of the 4 mechanisms and their limitations (if applicable):

#### [Genetic variation](#)

1. This page lists the 3 main sources of genetic variation. What are they?
2. Sexual reproduction (specifically recombination in meiosis) is very limited in a source of genetic variability. Can you explain why? (i.e. are you getting a change in **types** of traits present?)

#### [Mutations](#)

1. A common misconception is that mutations are "bad" or "good". Explain why this is not true.
2. Take a side trip to "Mutations are Random". Explain what random means.
3. At what stage of development do mutations matter to Evolution? For example, why isn't a mutation in your skin from sun exposure considered important in this regard.

### Gene flow (aka migration)

We will divide "migration" into 2- gene flow within populations (meaning genes are moving into one population), and gene flow across populations (looking at flow between more populations).

1. Migrations, also called gene flow, can either increase or decrease genetic variation in a population. Take a side trip to "the details of gene flow" to describe the difference.
2. How is variability influenced by gene flow within a population (i.e. where organisms are migrating in)? Between populations? (Do the two populations become more similar (decrease variation) or different?)

### Development

1. Many students wonder why organisms are like they are. For example, why don't organisms have more toes? Take a side trip to "developmental constraints on evolution" and explain why turtles can't be ninjas and men can't 'flame on'.
2. How does development help us understand large scale modifications to morphology (structures, etc)?

### Genetic drift

1. Explain genetic drift (warning: it isn't like gene flow!)
2. Take a side trip to "sampling error and evolution" and explain why genetic drift reduces genetic variation in a population.
3. The example of genetic drift has a large shoe and different colored bugs, but why is an outside source (i.e. big shoe in the sky) not necessary for drift to occur?

### Natural selection

1. Natural selection is often simplistically described as "survival of the fittest". How does natural selection work? What does fitness REALLY mean? (It's not pumping iron 3 days a week!)
2. Choose one example from the page "Natural Selection at Work" and explain.

### What about fitness?

1. Explain how fitness was involved in your example from "Natural Selection at Work".
3. Natural selection can often lead to new traits increasing in prevalence over time, but can also contribute to conservation of traits, or traits that remain unchanged over long periods, and are shared by diverse organisms. Explain how/why this is important, and how it relates to fitness.

### Sexual selection

1. Why is sexual selection considered a "special case" of natural selection? How does this support your definition of fitness?

### Artificial selection

1. Why do we consider this type of selection artificial? Give another example of artificial selection besides the one shown.
- Look through the following sections and describe what you learn :

### Adaptation

1. Explain what an adaptation is.
2. Why is saying an organism has an adaptation different and more accurate than saying an organism ADAPTED if we don't further clarify our explanation?

In other words, why would it be better to say "white fur is an adaptation that polar bears have developed which allows them to remain camouflaged in their environment" than "Polar bears adapted to have white fur so they were camouflaged" . What's wrong with the second statement? (follow the link below and come back to this question if you need some hints!)

Misconceptions about natural selection: ***Why are "need," "try," and "want" are not rarely appropriate to use when it comes to explaining evolution?***

## **Speciation**

[http://evolution.berkeley.edu/evolibrary/article/0\\_0\\_0/evo\\_40](http://evolution.berkeley.edu/evolibrary/article/0_0_0/evo_40)

**Go through the tutorial at the link above. When you are done, you should be able to answer the questions below.**

1. How are species usually defined? Why is it sometimes difficult to make a distinction between species?
2. Explain how each of the following contribute to speciation:
  - a. Geographic Isolation
  - b. Reduction of Gene Flow
  - c. Reproductive Isolation (location, time, rituals, and parts)
3. What is the evidence of speciation currently occurring? Geographically? In the lab?
4. Describe the process of co-speciation.
5. Relate speciation to the Evolutionary mechanisms. Which mechanism(s) are restricted? Which continue to occur? How does this contribute to the development of new species?