

## Lab: Modeling Evolution MAKEUP ASSIGNMENT

Remember: As per GHHS Policy, you have two days for each day absent to makeup assignments.

(modified from Addison-Wesley Publishing)

**Background:** Ecosystems are constantly changing. Only a certain number of individuals form a given species can live in one habitat because resources such as food, water, space and air are limited. A change in the environment may threaten the life of an individual unless it has a trait that enables it to adapt to the environmental change. Such a trait may give an individual a better chance of survival and reproduce than similar individuals that do not possess that trait. The genes for the trait will be passed to the next generation or organisms and the trait may then become more frequent in the population over time. This process of natural selection, proposed by English naturalists Charles Darwin and Alfred Wallace in 1858, is one process that influences evolution, the change in a population of organisms through time.

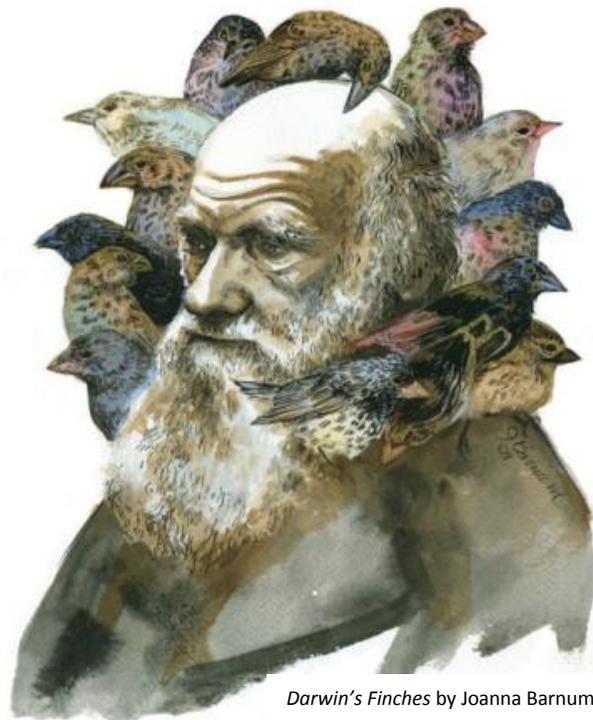
Darwin and Wallace were not the first people to propose an explanation for the changes in species through time. Jean Baptiste de Lamarck (1744-1829)

argues that the earth was very old and had undergone gradual changes over time. Organisms had to change in their lifetime to better cope with their environment. Organisms that acquired these adaptations passed them on to their offspring, and gradually the species as a whole changed. Lamarck's ideas were inaccurate; changes acquired in one's lifetime cannot be passed on to the next generation. Lamarck and Darwin were missing a piece of the puzzle; it was not until the discovery of the principles of inheritance (genetics) and the source of new variants in a population (mutations) that evolution was truly understood.

Mutations are random. They cause changes in proteins that control cellular function and make up cell structures. Mutations are usually harmful or neutral; they very rarely give an individual an advantage over other individuals in a population. In natural selection, certain individuals of a population that possess a unique trait are more successful than the rest of the population in passing on their genes. Natural selection requires variation in a population upon which to operate. One way this variation is provided is by mutations.

### Prelab Questions:

1. Relate genes, traits and environmental change.
2. Explain the difference between the conclusions of Darwin and Lemarck.
3. How do mutations play a role in natural selection?



*Darwin's Finches by Joanna Barnum*

**What We Did in Class:**

Students created a genetic code (represented by coloring boxes on graph paper) by following directions drawn randomly for each table (representing the fact that an individual's genetic code is not chosen). As directions were given at each table, one student was skipped each round (representing a mutation). Once students all had their genetic code, Mr. Rush/Ms. Magee then created a selective pressure for the group. If a student did not have a specific pattern within their genetic code, it was determined that they lacked a particular trait necessary to survive and/or reproduce. Only students who were able to survive and reproduce continued to the next generation where the process repeated.

**Analysis:**

4. How were genetic codes represented in the class activity?
5. How were mutations represented in the class activity?
6. How were selective pressures applied in the class activity?
7. Natural selection is often referred to as "survival of the fittest". Define fitness.
8. Describe one example of how a genetic trait can lead to reproductive success in an individual.
9. How does the reproductive success of an individual contribute to genetic drift?
10. How does genetic drift contribute to the evolution of a species?
11. How does the evolution of a species relate to speciation?
12. Why does speciation occur more rapidly after mass extinction events?

Watch the video <http://www.bozemanscience.com/ap-es-009-ecosystem-diversity> and answer the following

13. What are the three ways we can measure biodiversity on the planet?
14. Why is a branching tree of life not entirely accurate?
15. What is a cladogram?
16. Describe the example of natural selection given in the video.
17. Describe the example of speciation given in the video.
18. How many mass extinctions have occurred in the Earth's past?
19. Name the four area of ecosystem services.
20. What have you learned from this makeup lab?