What Is Evolution By Natural Selection? U-9 L-8

Exploring Science / Historical Steps

Now You See It, Now You Don't. Imagine that you are a moth. You like to rest on tree trunks. How do you protect yourself from hungry birds? You can hold still and keep quiet. Or, you can be the same color as the tree. In other words, you can look like part of the tree. If birds cannot see you, you are safe.

In the mid 1800s, light-colored peppered moths were common in London, England. The moths were a perfect match for the light-colored trees on which they lived. Once in a while, a change in a moth's genes caused a dark moth to be born. When the dark moth rested on a light tree, it was easily seen. A bird quickly ate it. The few dark moths that were born did not live long enough to reproduce. They could not pass the dark genes to offspring. So almost all of the peppered moths were light.

Then many factories were built in London. As soot from the factories filled the air, the tree trunks turned dark. The light moths became the ones easily seen and eaten. They became the ones that did not live long enough to reproduce. The few dark moths were now protected. They survived, reproduced, and passed their dark genes to their offspring. More and more dark moths - and fewer and fewer light ones - were born.

By 1900, most of the peppered moths in London were dark. Few light moths were left.

➢ Hares are relatives of the rabbit. In a very cold, snowy climate, which hare is more likely to live long enough to reproduce - a white hare or a brown hare? Explain.

(Left)
Light-colored peppered moths could not be seen easily by birds. They survived and reproduced.

(Right)
When soot darkened trees, light-colored moths could be seen easily by birds, and were often eaten. Dark-colored moths survived and reproduced.

Natural Selection

The London population of peppered moths changed from one of mostly light moths into one of mostly dark moths. The evidence is overwhelming that the living things on Earth have changed over time. This change is called **evolution**.

A theory to explain how new forms of living things come to be, and how old forms die out, was first proposed by **Charles Darwin**. In 1831, a ship called the *Beagle* set sail from England. Darwin was aboard as the ship's naturalist. For five years, the *Beagle* traveled around the world. It stopped in South America, in Australia, and at many islands.

During the voyage, Darwin studied many forms of life. He collected many fossils and living things. He took these back to England for further study. He was struck by the great variety of species of both the present and the past. In 1859, Darwin put forth the idea that present species evolved from species of the past. He felt that he knew how this happened. He called the method **natural selection**. Darwin's theory has five parts:

(1) Most living things produce more young than can grow to adulthood. A fish may lay millions of eggs. A plant may produce thousands of seeds.

(2) Such large numbers of young must compete for food, space, mates, and hiding places. Only some of the young survive. The rest lose the struggle and die.

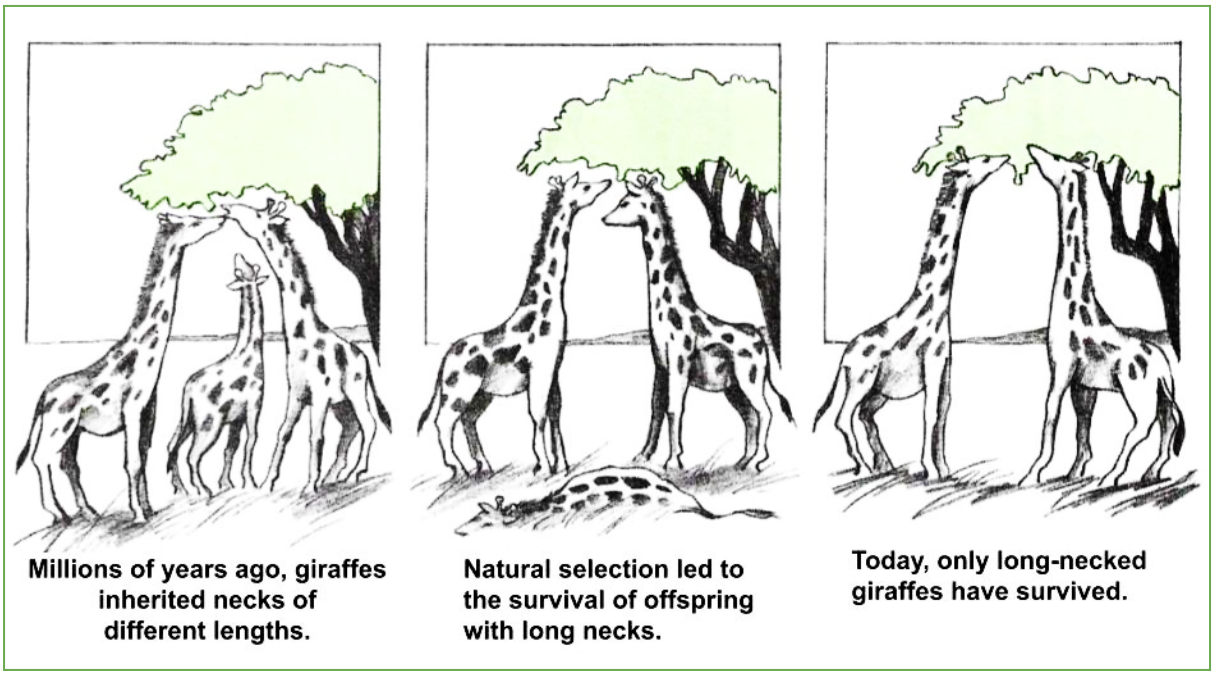
(3) No two living things are exactly alike. Traits differ, or vary, even within the same species. Look at the people around you. Each has some different traits. Likewise, peppered moth individuals vary in color.

(4) The traits of some organisms make them better fitted, or **adapted**, to their environment. Well-adapted individuals are better able to survive. This is now often called the "survival of the fittest."

(5) Organisms that survive may live long enough to reproduce. The traits that helped them to survive are passed to their offspring.

Darwin knew that offspring could inherit traits from parents. But no one knew about genes at that time. In the 1900s, genes were found to be the carriers of traits. Sometimes, a gene goes through a change; we call such a change a **mutation** (myoo-TAY-shun). When this organism reproduces, the changed gene passes to its offspring. For example, an original dark moth was the result of a mutation; its offspring inherited this gene for dark color.

Study the pictures that illustrate how giraffes likely evolved. Do you see how natural selection accounts for the long necks of today's giraffes?



Millions of years ago, giraffes inherited necks of different lengths.

Natural selection led to the survival of offspring with long necks.

Today, only long-necked giraffes have survived.

➢ To Do Yourself

What is the survival rate of some organisms?

You will need: Seeds (pea, bean, or radish), soil, cut-off juice carton, water, plastic spoon

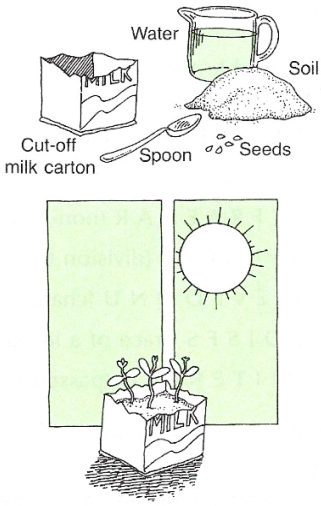
1. Plant 9 seeds in some soil in the bottom half of a juice carton. Label with the date and the number of seeds planted.

2. Water to moisten the soil, but do not soak. Place the carton in sunlight and keep the soil moist.

3. After one week, count how many of the seeds sprouted. Record your results.

4. Let the seedlings grow for another week and count the plants that survive. Again record your results. Keep the soil moist as the seedlings grow.

5. Compare your results with the class's results.



Questions

1. Did the plants compete with each other as Darwin suggested?_____

2. How does producing many seeds help a plant species to survive?_____

REVIEW U-9 L-8

I. In each blank, write the word that fits best. Choose from the words below.

vary	**selection**	**struggle**	**mutations**
adapted	**evolution**	**reproduce**	**heredity**

Darwin's famous book is On the Origin of Species by Natural Selection. Obviously, his idea of *how* species evolve is called natural _____. A _____ for existence occurs because large numbers of young compete. Among individuals of a species, traits _____ ; that is, they differ. Some traits make an organism better fitted, or _____, to its environment. Those organisms better fitted to survive are more likely to live long enough to _____. Changes, or_____, in genes can adapt a species to a changed environment.

II. Suppose that a thousand tadpoles (young frogs) hatch at the same time in a small pond.

A. Can all of them survive? Explain. _____

_____

B. Which ones do you think are more likely to grow to become adult frogs?

_____