

Naturally Selected to Survive

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The earth has changed, over and over again, throughout the course of its history. Some of these changes have happened quickly. Others have occurred over long stretches of time. For example, the planet has experienced ice ages that took place over *thousands* of years. During those eras, huge sheets of ice covered much of the surface of the globe. Then for a few thousand years between the ice ages, the earth warmed up. Scientists believe that this cycle has actually occurred a few times, and it might be one of the many reasons behind the recent global warming we have experienced.

As the planet goes through this cycle, environments may go through changes. In order to survive in changing environments, species oftentimes must undergo a process of adaptation. Adaptation refers to a mutation or genetic change that enables an organism such as an animal or plant to survive in its environment. This trait is passed down from one generation to the next, becoming an inherited trait of the species. A species may have to adapt to warmer temperatures, increased precipitation, or even developing air pollution. If the organisms of a species cannot change along with the area in which they live, they risk dying out. Though an uncountable number of species that have roamed the earth have become extinct, the planet has seen many others adapt as well. These select organisms have been able to go on living in their environment.

A species adapts to a changing environment as organisms with favorable traits reproduce and survive. These favorable traits, which help the species survive, are passed down through different generations of the species. This process is called “natural selection.” Recent history has given us an important example of how organisms are able to survive once their environments change.

Light gray peppered moths and dark-colored peppered moths lived in the countryside between the cities of Manchester and London in England. Many years before the 19th century, more of the light gray peppered moths had been able to survive in their environment mostly because of their color. Their thin layer of skin, as well as their large wings, was mostly gray with a little bit of black “peppered” all around. This color was advantageous because the light gray peppered moths were camouflaged when they stayed on gray-colored areas on the sides of trees in their habitat. Predators, which were mostly birds, could not see the light-colored moths on the trees because the color of the moths blended in with the color of the trees. Instead, the predators were able to see the dark-colored peppered moths more easily.

In the early 19th century, though, England began the first years of its Industrial Revolution. Many areas, especially in and between the cities of Manchester and London, became populated by a growing number of factories. This was because companies began to use a lot of new machinery that had been invented in the decades before. These machines made work a lot easier in many ways. The companies could build more products faster than ever before. However, many of these factories needed coal to provide energy for the machines. When coal burns, it gives off a lot of dark-colored smoke. Soot is a black substance that collects on a surface that comes into contact with smoke. Smoke’s dark particles stick onto surfaces like paint. In the English countryside near industrialized areas, the trees began to blacken with soot because of all of the smoke in the air from the factories. This made the light gray peppered moths much more vulnerable. Predators could see them on the trees more clearly and easily hunt them down.

Sometime in the next hundred years, scientists began to notice a huge change in the moth population living in and between the cities of Manchester and London near where many of those factories had been constructed. Most of the peppered moths were the dark-colored kind! What caused this change was the fact that predators had eaten a lot of the light gray peppered moths because the moths were clearly visible on the black-colored trees. The dark-colored peppered moths in the area survived much more easily and mated with other dark-colored peppered moths until most of the population of peppered moths became dark-colored.

Many scientists feel that this example of evolution in a species supports Charles Darwin’s theory of natural selection. An author named J.W. Tutt published a report about the moths a few years after Darwin’s death, writing that the change in the peppered moth population seemed to support Darwin’s ideas. Though Darwin was not alive to read the Tutt report, his teachings about nature live on.

Name: _____ **Date:** _____

1. According to the passage, what happens when organisms cannot adapt to changes in their environment?
 - A) They move to another environment.
 - B) They risk dying out.
 - C) Nothing happens.
 - D) They wait for the environment to change again.

2. What does the author mainly describe in the passage?
 - A) how natural selection changed the population of peppered moths
 - B) how the Industrial Revolution improved the lives of workers
 - C) how Charles Darwin devised his theory of natural selection
 - D) how humans influence organisms via artificial selection

3. Smoke given off by the factories threatened the survival of the light gray peppered moths. What evidence from the text best supports this conclusion?
 - A) Soot is a black substance that collects on a surface that comes into contact with smoke.
 - B) When coal burns, it gives off a lot of dark-colored smoke.
 - C) Predators could see the light gray peppered moths on the black trees covered by soot and easily hunt them down.
 - D) The trees began to blacken with soot because of all of the smoke in the air from the factories.

4. What conclusion can be drawn from the change in population of light gray peppered moths and dark-colored peppered moths?
 - A) The color change had nothing to do with the change in environment.
 - B) There were previously no dark-colored peppered moths.
 - C) The lighter peppered moths migrated to a new environment.
 - D) Darker coloring is currently better for the peppered moth's survival.

5. What is this passage mostly about?

- A) Charles Darwin
- B) The Industrial Revolution
- C) natural selection
- D) global warming

6. Read the following sentences: "In the English countryside near industrialized areas, the trees began to blacken with soot because of all of the smoke in the air from the factories. This made the light gray peppered moths much more **vulnerable**. Predators could see them on the trees more clearly and easily hunt them down."

What does "**vulnerable**" mean?

- A) quick to change
- B) open to attack
- C) easily defended
- D) in a strong position

7. Choose the answer that best completes the sentence below.

_____ of the smoke given off by coal burned in the factories, the nearby trees became blackened with soot.

- A) On the other hand
- B) Primarily
- C) As an illustration
- D) As a result

8. What is natural selection?

9. How did the peppered moth's environment change, and what caused this change?

10. How did the peppered moth population become mostly dark-colored?
