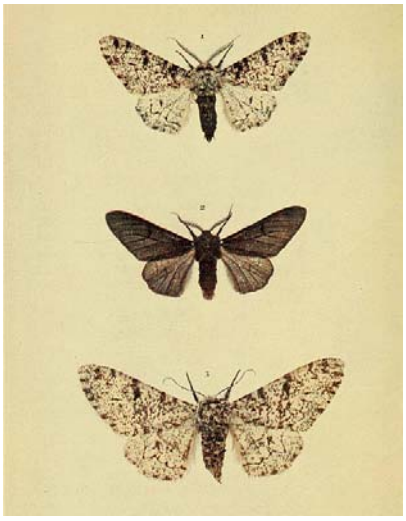
Naturally Selected to Survive

Michael Stahl



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.

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The peppered moth lived in the countryside between the cities of Manchester and London in England. Many years before the 19th century, these 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 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 moths on the trees because the color of the moths blended in with the color of the trees.

In the early 19th century though, England began the first years of its Industrial Revolution. Many cities, like 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 is collected on a surface that comes into contact with smoke. Smoke's dark particles stick onto surfaces like paint. In the English countryside, the trees began to blacken with soot because of all of the smoke in the air from the factories. This made the peppered moths much more vulnerable. Predators could see the moths 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-between the cities of Manchester and London where all of those factories had been constructed. The skin and wings of the peppered moths had changed color and become almost completely black! What caused this change was the fact that predators had eaten a lot of the gray-colored moths because the moths were clearly visible on the black-colored trees. Other darker colored moths in the area survived much more easily and mated with the peppered moths until the population of moths became black.

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.

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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 color 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 many species that have roamed the earth have become extinct

3. Smoke given off by the factories threatened the survival of the peppered moth. What evidence from the text best supports this conclusion?

A Soot is a black substance that is collected 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 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 the peppered moth's coloration?

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 became 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

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6. Read the following sentences: "In the English countryside, the trees began to blacken with soot because of all of the smoke in the air from the factories. This made the peppered moths much more **vulnerable**. Predators could see the moths 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?

_____

_____

_____

_____

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

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_____

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

_____

_____

_____

_____

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Teacher Guide & Answers

Passage Reading Level: Lexile 1090

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 color 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 many species that have roamed the earth have become extinct

3. Smoke given off by the factories threatened the survival of the peppered moth. What evidence from the text best supports this conclusion?

- **A** Soot is a black substance that is collected 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 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 the peppered moth's coloration?

- **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 became 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

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

What does "**vulnerable**" mean?

A quick to change
B **open to attack**
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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?

Suggested answer: Natural selection is the process by which favorable traits are passed down through different generations of a species in order to adapt and likely survive within the changing environment.

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

Suggested answer: The environment changed as the trees became black and covered in soot. This was caused by the appearance of factories that emitted smoke.

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

Suggested answer: As the lighter-colored peppered moths were eaten by predators, the darker moths survived. These dark moths bred with the peppered moths and produced dark offspring that were more likely to survive than light-colored moths. Over time the population became black as the light moths died out.

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