

Name: _____ Date: _____

Student Exploration: Natural Selection

Vocabulary: biological evolution, camouflage, Industrial Revolution, lichen, morph, natural selection, peppered moth

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

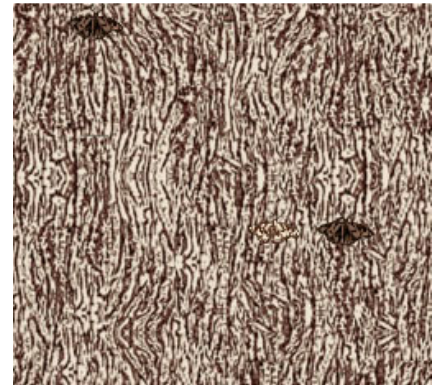


The **peppered moth** (*Biston betularia*) is a common moth found in Europe, Asia, and North America. It is commonly found in two forms, or **morphs**: a dark morph and a light, speckled morph. Birds are a frequent predator of the peppered moth.

1. Which morph do you think would be easier to see on a dark tree trunk? _____
2. Which morph do you think would be easier to see on a light tree trunk? _____


Gizmo Warm-up

The *Natural Selection* Gizmo™ allows you to play the role of a bird feeding on peppered moths. The initial population of 40 moths is scattered over 20 tree trunks. Click on moths to capture them. Click the **Next tree** button or hit the **spacebar** on your keyboard to advance to the next tree.



1. Check that LIGHT TREES is selected. Click **Start** and hunt moths for one year.
 - A. How many dark moths did you capture? _____
 - B. How many light moths did you capture? _____
 - C. **Camouflage** is coloring or patterns that help an organism to blend in with the background. Which type of moth is better camouflaged on light bark? _____
2. If a forest contained mostly light-colored trees, which type of moth would you expect to be most common? _____

How many moths can you find?

Activity A: Light trees	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Click Reset. • Check that the LIGHT TREES tab is selected. 	
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Introduction: Before the 19th century in England, the air was very clean. The bark on trees was usually light in color. Abundant **lichens** growing on tree trunks also lightened their appearance.

Question: How does the color of a peppered moth affect survival?


1. Predict: Over time, what will happen to the populations of light and dark moths on light trees? _____
2. Experiment: Click **Start** and hunt peppered moths on light tree trunks for five years. In each year, try to capture as many moths as you can. (Hint: Use the **spacebar** on your keyboard to advance to the next tree.)

After 5 years, select the TABLE tab and record the percentages of each moth type. (Note: The table shows current populations of each moth, not the number of captured moths.)

Year	Dark moths	Light moths
0		
1		
2		
3		
4		
5		

3. Analyze: What do your results show? _____

4. Apply: Which type of moth do you think was more common before the 19th century, when most trees were light in color? _____
5. Extend your thinking: What strategies did you use to hunt for moths? _____

Activity B: Dark trees	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Click Reset. • Select the DARK TREES tab. 	
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Introduction: The 19th century was the time of the **Industrial Revolution** in England. Most of the new industries used coal for energy, and the air was polluted with black soot. In forests near factories, the soot coated trees and killed lichens. As a result, tree trunks became darker.

Question: How did air pollution affect moth populations?

1. Predict: Over time, what will happen to the populations of light and dark moths on dark trees? _____
2. Experiment: Click **Start** and hunt peppered moths on dark tree trunks for five years. In each year, try to capture as many moths as you can. (Hint: You can use the **spacebar** on your keyboard to advance to the next tree.)

When you are done, select the TABLE tab and record the percentages of each moth type.

Year	Dark moths	Light moths
0		
1		
2		
3		
4		
5		

3. Analyze: What do your results show? _____

4. Apply: Which type of moth do you think was more common during the 19th century? Why?

(Activity B continued on next page)

Activity B (continued from previous page)

5. Draw conclusions: **Natural selection** is the process by which favorable traits tend to increase in frequency over time. How does this experiment illustrate natural selection?

6. Think and discuss: Did the changes you observed in the moth populations result from individual moths changing colors? Or did they occur because the best-hidden moths survived and reproduced, passing on their colors to their offspring? Explain your answer.

7. Extend your thinking: **Biological evolution** is the process by which populations of organisms change over time. How could natural selection lead to evolution? If possible, discuss your answer with your classmates and teacher.
