

Lab: Peppered Moth Simulation

BIOLOGY: CHAPTER 10-PRINCIPLES OF EVOLUTION

Objectives:

- Describe the importance of coloration in avoiding predation
- Relate environmental change to changes in organisms
- Explain how natural selection causes populations to change

Materials

- 8½" x 11" sheet dark background
- 8½" x 11" sheet light background
- Forceps
- Clock with second hand
- 30 light circles (made with hole punch)
- 30 dark circles (made with hole punch)



Purpose: In this lab, you will simulate how predators locate prey in different environments. You will analyze how color affects and organism's ability to survive in certain environments.

Background: The usual form of the peppered moth *Biston betularia* in northern Europe has a light "peppered" pattern of coloration. The moth rests on tree branches and its color pattern **camouflages** it against predatory attack. The camouflage only works against the right background: birds are more likely to eat poorly camouflaged moths, which therefore have a lower **fitness**.

The light coloration of tree branches is mainly caused by lichens that grow there. Smoke pollution in the industrial revolution in the UK killed these lichens near to industrial areas, leaving tree branches black. At about this time, around 1830, a '**melanic**' form of the peppered moth becomes increasingly common in contemporary moth collections. The melanic form is camouflaged on dark tree branches. Through the 19th century, the melanic form increased in frequency until, near industrial regions, it was the normal type of the moth. The increase was almost certainly driven by natural selection.

The moths satisfy all four conditions for natural selection:

- they reproduce;
- their color pattern is inherited;
- there is variation in their color patterns;
- the different forms have different fitnesses.

Before you begin the lab, complete the hypothesis below:

Hypothesis: If the color of the prey matches the background color then

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RC Schank

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the RC Schank text.

Peppered Moth Virtual Lab:

Observing Evolution Bruce S. Grant, 2021-08-10 The author presents a firsthand narrative about discovering the parallel evolution of melanism in American and British peppered moths *Biston betularia* A Simulation Model of the Gene Frequency Cline of the Peppered Moth Anne DONNELLY, 1966 Of Moths and Men Judith Hooper, 2002 The tale of a flagrant scientific fraud its cover up and the scientific incompetence behind the most important paradigm in evolutionary biology Charles Darwin's theory of evolution The fraud began in 1953 with H B D Kettlewell an amateur but charismatic lepidopterist attached to Oxford University Using studies of the peppered moth *Biston betularia* he showed the process of natural selection at work over a period of months rather than millennia The naturally light coloured moth was found in Kettlewell's experiments to have mutated to a darker variety *Biston carbonaria* in industrial areas where the darker colour would prove a more effective camouflage against predator birds The conclusive evidence was drawn from the rate at which light and dark moths appeared on the trunks of an industrially influenced forest and the rate at which the lighter poorly camouflaged moths were consumed by birds There were only two problems no one was sure that birds naturally ate the pepper moth and the reason they were consumed in such apparently conclusive numbers was that they had been glued to the trees by Kettlewell **Natural Selection** John Hewitson, 1978 The Peppered Moth , 1968 **Of Moths and Men** Judith Hooper, 2006-09 **Taking the Peppered Moth with a Grain of Salt** David Wÿss Rudge, 1999 **Mechanisms of Colour Change in Larval and Adult Peppered Moths, *Biston Betularia*** Nicola Edmonds, 2010 **Of Moths and Men** Judith Hooper, 2002

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