Peppered moth comeback described in an article in *New Scientist*, 8 Dec 2007, p46. For many years the peppered moth *Bist on betularia* has been used as the prime example of evolution occurring before our eyes. This moth comes in two colour forms, one pale and speckled, the other solid black. Before the early 1800's the black forms were fairly rare but over the next century they gradually increased in numbers, especially in regions where industrial pollution had blackened the tree trunks in the woodlands where the moths lived. This change was believed to be caused by birds eating the moths that could not blend in with the tree trunks on which they rested during the day. In the polluted regions black moths would be well camouflaged on the black trees, but pale moths would be easily spotted and eaten.

In the 1950s Earnest Kettelwell carried out a series of experiments where he released light and dark moths onto tree trunks in two different regions in England, one where the trees were blackened by industrial pollution, and one in an unpolluted area whose trees were covered in lichens. Kettelwell later recaptured moths from both regions and recorded the numbers of each form that had survived. As he expected more black moths survived in the region with black tree trunks and more light moths survived in the region with lichen covered tree trunks. The increase in black moths was called "industrial melanism" and was presented to generations of biology students as a classic example of Natural Selection, and according to Darwin, Natural Selection was the driving force for evolution. This story is in most high school biology textbooks, often accompanied by a photo of moths on tree trunks with a caption such as "Evolution in Action."

Kettelwell's results were often used a proof of evolution, but people who studied moths recognised there were serious flaws in Kettlewell's method, the main ones being that moths did not normally rest on tree trunks, and he released far more moths than were found in the natural environment. Because of these flaws some scientists suggested the peppered moth should not be used as an example of evolution, especially as creationists and Intelligent Design advocates have used the flaws to criticise evolutionary theory.

In order to reclaim the moth for evolution, Michael Majerus of Cambridge University, has carried out a new series of release and recapture experiments. He observed that the moths normally took up resting places on the undersides of tree branches, so he enclosed tree branches with nets and released one moth into each net at night and then removed the nets the next day, after the moths had taken up their resting positions. Later in the day he checked the tree trunks to see if the moths were still there. As the moths normally do not move during the day, any missing moths were assumed to have eaten. Majerus also observed birds eating the moths, and he noted they were better at finding dark moths on the light coloured tree trunks where he carried

out his study.

Majerus' study overcomes all the flaws in Kettelwell's experiment, so he claims "It provides the proof of evolution." The *New Scientist* article goes on the explain: "There is no doubt that the peppered moth's colour is genetically determined, so changes in the frequencies of light and dark forms demonstrate changes in gene frequencies - and that is evolution. What's more, the direction and speed at which this evolution occurred can only be explained by natural selection. The agent of selection remains contentious, but bird predation is the only hypothesis with any experimental backing."

Editorial Comment: It is easy to argue that if evolution is true, then change in gene frequency would have to be true - but the reverse is not so. A change in gene frequency is not evolution. Evolution requires new genes, not changes in the numbers of already existing genes. Since all genes involved in Majerus' observations of the peppered moth pre-date even Kettlewell's experiment, then nothing has evolved at all - the only valid conclusion is that black and white moths turn into black and white moths. Majerus' experiments have shown that variations in the numbers of light and dark forms of this moth are genuine examples of natural selection and valid examples of a change in gene frequency, but he has not provided any kind of proof for evolution. Natural selection is not evolution. It is a process where some individuals are removed from a population, leaving the others to breed. It does not create any changes to living organisms, and therefore cannot produce new species. Whatever has happened to this species of moth over the past two centuries, it has not evolved, and we will continue to take every opportunity we have to teach students this fact, and that the data supports the Biblical claim that God made maths to produce their own Moth Kind. (Ref. insects, education, controversy)

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