



## EXHUMING THE PEPPERED MUMMY

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A friend of mine tells me that the only things he remembers about evolution from his high school biology course are photos of black and white peppered moths resting on light and dark tree trunks. They were presented as THE classic case of Darwinian evolution in action, explaining how a trait that enhances survival could be acquired through an unguided material process.

Throughout the second half of the twentieth century, most biology textbooks featured photos of peppered moths (scientific name: *Biston betularia*) on tree trunks.<sup>1</sup> Canadian textbook-writer Bob Ritter explained why in 1999: High school students are “very concrete in the way they learn,” he said. “The advantage of this example of natural selection is that it is extremely visual.”<sup>2</sup>

Soon after 2000, however, the peppered myth succumbed to mounting scientific criticisms. The most embarrassing was that peppered moths in the wild don’t normally rest on tree trunks, and the textbook photos had been staged – as *The New York Times* pointed out in an article on scientific fakery in 2002.<sup>3</sup> Darwinists trying to save the peppered myth turned what should have been a quick and merciful death into a long and painful demise, but it expired anyway. Most biology textbooks have now dropped it entirely.

Then, on August 23, 2007, Cambridge University biologist Michael Majerus disinterred the corpse. In a lecture in Sweden, Majerus announced he had found new evidence that peppered moths are “proof of Darwinian evolution.” The “fact of Darwinian evolution,” in turn, shows that humans invented God and that there will be “no second coming; no helping hand from on high.”<sup>4</sup>

Wow, all that from some moths! What’s going on?

### **Some Background**

Although natural selection is supposed to be the principal mechanism of evolution, Darwin himself had no direct

evidence for it. The best he could do in *The Origin of Species* was “give one or two imaginary illustrations.”<sup>5</sup>

While Darwin was writing, however, industrial pollution was killing the light-colored lichens that covered many tree trunks in the U. K., exposing the dark bark underneath. Before this, populations of peppered moths had consisted almost entirely of a light-colored variety; afterwards, moth populations in urban areas consisted mostly of a dark-colored or “melanic” variety. Nineteenth-century entomologist J. W. Tutt and twentieth-century geneticist E. B. Ford believed that the phenomenon (known as “industrial melanism”) occurred because melanic moths were better camouflaged on pollution-darkened tree trunks and thus able to avoid being eaten by predatory birds – in other words, because of natural selection.

In the 1950s, under Ford’s guidance, British physician and amateur moth-collector Bernard Kettlewell released light and dark peppered moths onto nearby tree trunks and watched as birds ate the more conspicuous ones. Kettlewell also released moths marked with a tiny spot of paint; when he later recaptured some of them, he found that the proportion of moths matching the color of nearby tree trunks had increased. These results were consistent with the camouflage-predation explanation for industrial melanism, and Kettlewell called them “Darwin’s missing evidence” for natural selection.<sup>6</sup>

But the peppered moth story began to unravel in the 1960s, when biologists noticed that the proportions of light and dark moths in some areas didn’t fit the expected pattern. Furthermore, although the proportion of light-colored moths increased after anti-pollution legislation was enacted in the 1970s (as the camouflage-predation hypothesis predicted), the increase occurred before the return of the light-colored lichens that had supposedly provided them with camouflage. Then, in the 1980s, biologists realized that peppered moths in the wild rarely rest on tree trunks.

One researcher reported in 1984 that “the normal resting place of the Peppered Moth is beneath small, more or less horizontal branches (but not on narrow twigs), probably high up in the canopies, and the species probably only exceptionally rests on tree trunks.” Thus “the results of Kettlewell (1955, 1956) fail to demonstrate the qualitative predation of the morphs of the Peppered Moth by birds or other predators in natural conditions.”<sup>7</sup> Other researchers wrote in 1985 that after twenty-five years of field work they had found only one peppered moth on a tree trunk in the wild, and they admitted that they knew primarily “where the moths do not spend the day.”<sup>8</sup> During the same period, another researcher reported that over 8,000 moths had been found in manmade traps.<sup>9</sup> The total number in the wild was probably in the millions.

Majerus himself reported in 1987 that he and a colleague had studied the natural resting sites of peppered moths in various parts of England and concluded: “It seems certain that most *B. betularia* rest where they are hidden.... [and] that exposed areas of tree trunks are not an important resting site for any form of *B. betularia*.”<sup>10</sup> In 1998, Majerus published a book on the subject, listing 47 moths found resting under natural conditions in the wild between 1964 and 1996. Of the 47, 12 were on tree trunks, but only half of these (13% of the total) were in exposed positions. Based on these and other data, Majerus criticized the “artificiality” of work by Kettlewell and others, noting that “in most predation experiments peppered moths have been positioned on vertical tree trunks, despite the fact that they rarely chose such surfaces to rest upon in the wild.” Majerus concluded that “the basic peppered moth story is wrong, inaccurate, or incomplete, with respect to most of the story’s component parts.”<sup>11</sup>

In a 1998 review of Majerus's book in *Nature*, University of Chicago evolutionary biologist Jerry Coyne wrote: "From time to time, evolutionists re-examine a classic experimental study and find, to their horror, that it is flawed or downright wrong." According to Coyne, the fact that peppered moths rarely rest on tree trunks "alone invalidates Kettlewell's release-and-recapture experiments, as moths were released by placing them directly onto tree trunks." Coyne concluded that this "prize horse in our stable of examples" of natural selection "is in bad shape, and, while not yet ready for the glue factory, needs serious attention." Coyne likened his reaction to "the dismay attending my discovery, at the age of six, that it was my father and not Santa who brought the presents on Christmas Eve."<sup>12</sup>

The same year, University of Massachusetts biologist Theodore D. Sargent and two colleagues summarized various problems with the peppered moth story in the journal *Evolutionary Biology*. They concluded that although the camouflage-predation explanation "may be true, in whole or in part," there is "little persuasive evidence, in the form of rigorous and replicated observations and experiments, to support this explanation at the present time."<sup>13</sup> In 2000, I devoted a chapter to peppered moths in my book *Icons of Evolution: Science or Myth?*<sup>14</sup> And in 2002, journalist Judith Hooper published *Of Moths and Men*, in which she described (among other things) how Sargent and other scientific critics of the classic story had been "demonized" by the "industrial melanism establishment."<sup>15</sup>

Darwinists tried desperately to resuscitate the terminally ill story, but it flatlined anyway.<sup>16</sup>

## **So What?**

The peppered moth story died, not because it was proven false, but because the evidence that allegedly supported it was deeply flawed. Nevertheless, natural selection due to camouflage and bird predation camouflage remains a possible explanation, and as Sargent and his colleagues wrote in 1998 it "may be true, in whole or in part."

But it doesn't matter, because the truth or falsity of the peppered moth story is largely irrelevant to Darwinian evolution – at least from a scientific standpoint.

For one thing, we don't need peppered moths to prove that natural selection happens; we have much better examples. One of them (as I pointed out in *Icons of Evolution*) is the oscillating change in average beak size in Galápagos finches documented by Peter and Rosemary Grant in the 1970s (and later described in Jonathan Weiner's book *The Beak of the Finch*).<sup>17</sup> Another much-cited example is the spread of antibiotic resistance in bacteria.<sup>18</sup>

The question is not whether natural selection happens (it obviously does), but how much it can accomplish. The available evidence indicates that natural selection is no more powerful than artificial selection. In centuries of domestic breeding and decades of laboratory experiments, artificial selection has never been observed to produce a new species, much less the new organs and body plans required by Darwin's theory. If Darwin had written a book titled *How Existing Species Change Over Time*, evidence of artificial and natural selection would be relevant – but Darwin's ideas would also be utterly uncontroversial.

Instead, Darwin wrote a book titled *The Origin of Species*, because he thought he had discovered the mechanism whereby unguided natural processes could produce not only new species, but also new organs and body plans. Yet no one has ever documented the origin of a single species by Darwin's mechanism of variation and selection.<sup>19</sup>

University of Bristol (England) bacteriologist Alan H. Linton went looking for direct evidence of speciation and concluded in 2001: "None exists in the literature claiming that one species has been shown to evolve into another. Bacteria, the simplest form of independent life, are ideal for this kind of study, with generation times of twenty to thirty minutes, and populations achieved after eighteen hours. But throughout 150 years of the science of bacteriology, there is no evidence that one species of bacteria has changed into another... Since there is no evidence for species changes between the simplest forms of unicellular life, it is not surprising that there is no evidence for evolution from prokaryotic [e.g., bacterial] to eukaryotic [e.g., plant and animal] cells, let alone throughout the whole array of higher multicellular organisms."<sup>20</sup>

So crucial evidence for Darwin's theory – the origin of species by means of natural selection – is missing. And peppered moths don't provide it.

**Even if the classic peppered moth story were 100% true, it would demonstrate only a reversible shift in the proportions of two varieties in a preexisting species. It would tell us nothing about the origin of those varieties, much less of *Biston betularia*, moths, insects, or animals in the first place.**

So the peppered myth is not only dead, but also irrelevant.

### **Moth-eaten Statistics**

Re-enter Michael Majerus. According to an August 25 story in *The Independent* (London), Majerus has "spent the past seven years collecting data from a series of experiments he has carried out in his own rambling back garden. It has involved him getting up each day before dawn and then spending several hours looking out of his study window armed with a telescope and notepad."<sup>21</sup>

In his August 23 lecture, Majerus summarized his results as follows:

"I have had occasion to spend time carefully scrutinizing the trunks, branches and twigs of a limited set of trees at the experimental site. During this time I have found 135 peppered moths, resting in what I have no reason to presume are not their freely chosen natural resting sites..."

- i) The majority (50.4%) of moths rest on lateral branches.
- ii) Of the moths on lateral branches, the majority (89%) rest on the lower half of the branch.
- iii) A significant proportion of moths (37%) do rest on tree trunks (so Kettlewell wasn't so wrong in releasing his moths onto tree trunks)..."

Majerus concludes: “While the results may be somewhat biased towards lower parts of the tree, due to sampling technique, I believe that they give the best field evidence that we have to date of where peppered moths spend the day.”<sup>22</sup>

What’s wrong with this picture?

In the seven years during which Majerus was peering out his window, far more than 135 peppered moths visited his back yard, but (as previous research showed) he couldn’t see most of them because they were resting high in the upper branches of his trees. Those he could see from the ground represented only a tiny fraction of the total.

In his 1954 classic, *How To Lie With Statistics*, Darrell Huff devoted his first chapter to sampling bias. He wrote: “The test of the random sample is this: Does every name or thing in the whole group have an equal chance to be in the sample?”<sup>23</sup> Obviously, the vast majority of peppered moths were NOT in Majerus’s sample because they were resting where he couldn’t see them. Yet the very question he set out to answer was where they rest! If Huff were writing his book today, he might well use Majerus’s statistic as an egregious example of sampling bias.

It’s because of flawed “evidence” like this that the peppered myth was buried in the first place. R. I. P.

### **Backwards Logic**

The August 25 story in *The Independent* quotes Majerus as saying: “The peppered moth story is easy to understand, because it involves things that we are familiar with: Vision and predation and birds and moths and pollution and camouflage and lunch and death. That is why the anti-evolution lobby attacks the peppered moth story. They are frightened that too many people will be able to understand.”<sup>24</sup>

Frightened? Really?

As we saw above, even if the peppered moth story were 100% true it would demonstrate only what everyone already knows – that natural selection happens, and that (like artificial selection) it can produce minor changes in existing species. Nobody, but nobody, is frightened by that.

Instead, it is the promoters of Darwinism who are frightened, because what seemed to be the most “visual” evidence for their doctrine is gone. It is not the “anti-evolution lobby” that is in a panic to attack the peppered myth, but Darwinists who are in a panic to save it. Witness the giddy zeal with which the perversely misnamed National Center for Science Education is now praising Majerus’s lecture.<sup>25</sup> And witness Majerus’s mind-numbing conclusion: The “fact of Darwinian evolution” shows that humans invented God and that there will be “no second coming; no helping hand from on high.”<sup>26</sup>

Surely, Majerus doesn’t think that by watching a few moths in his back yard he has disproved the existence of God. Nobody could be that irrational, not even a university professor. Most probably, his logic is operating in the other

direction:

God does not exist (or is just a projection of the human mind), so Nature is all there is and everything must have a natural explanation.

Darwinian evolution is the best (some might say the only) natural explanation for the origin of all features of living things.

Since there is no other explanation, all evidence from living things – no matter how flimsy or how flawed – is “proof” of Darwinian evolution.

In other words, the “conclusion” of Majerus’s argument is actually his starting-point. In this Alice-in-Wonderland logic, it’s “conclusion first, evidence later.”

I encountered similar logic a few years ago in a conversation with an old friend, a Darwinist now teaching at a university. He had just returned from the Galápagos, and he told me the standard story of Darwin’s finches. I pointed out that much of what he had just told me was false, and that in any case Darwinian evolution didn’t explain the origin of the finches in the first place. “But it had to be evolution,” he said, “there’s no other possible explanation.” “Sure there is,” I said, “finches could be designed.” He replied: “But if there’s design there must be a Designer, and we know there isn’t. So it had to be evolution.”

Whatever this is, it’s not science.

Majerus ended his August 23 talk with the following: “If the rise and fall of the peppered moth is one of the most visually impacting and easily understood examples of Darwinian evolution in action, it should be taught. It provides after all: The Proof of Evolution.”

Actually, I agree that the rise and fall of the peppered moth should be taught. Students should be encouraged to unwrap this mummy and take a long, hard look at how science decays when it is perverted to justify atheism.

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## Notes

1. Some widely used textbooks from the 1990s that featured staged photographs of peppered moths on tree trunks are: Johnson’s *Biology: Visualizing Life* (1998), p. 182; Guttman’s *Biology* (1999), pp. 35-36; Schraer and Stoltze’s *Biology: The Study of Life* (7th Edition, 1999), pp. 618-619; Miller and Levine’s *Biology* (5th Edition, 2000), pp. 297-298; and Mader’s *Biology* (6th Edition, 1998), pp. 11-12, 306.

2. Ritter was quoted in Carla Yu’s “Moth-eaten Darwinism: A disproven textbook case of natural selection refuses to die,” *Alberta Report Newsmagazine* Vol. 26, No. 15 (April 5, 1999): 38 - 39. Ritter was defending a textbook he co-authored titled *Biology* (Scarborough, ONT: Nelson Canada, 1993), which deals with peppered moths on pp. 109-110.

3. Kenneth Chang, “On Scientific Fakery and the Systems to Catch It,” *The New York Times*, October 15, 2002, D1.

4. Michael E. N. Majerus, "The Peppered Moth: The Proof of Darwinian Evolution," August 23, 2007, available at <http://www.gen.cam.ac.uk/Research/majerus.htm>
5. Darwin's statement about "imaginary illustrations" is from Chapter IV of *The Origin of Species*.
6. H. B. D. Kettlewell, "Darwin's Missing Evidence," *Scientific American* 200 (March, 1959): 48-53; H. B. D. Kettlewell, "Selection experiments on industrial melanism in the Lepidoptera," *Heredity* 9 (1955): 323-342; H. B. D. Kettlewell, "Further selection experiments on industrial melanism in the Lepidoptera," *Heredity* 10 (1956): 287-301; H. B. D. Kettlewell, *The Evolution of Melanism* (Oxford: Clarendon Press, 1973).
7. K. Mikkola, "On the selective forces acting in the industrial melanism of *Biston* and *Oligia* moths (Lepidoptera: Geometridae and Noctuidae)," *Biological Journal of the Linnean Society* 21 (1984): 409-421.
8. C. A. Clarke, G. S. Mani & G. Wynne, "Evolution in reverse: clean air and the peppered moth," *Biological Journal of the Linnean Society* 26 (1985): 189-199.
9. R. C. Steward, "Industrial and non-industrial melanism in the peppered moth, *Biston betularia*," *Ecological Entomology* 2 (1977): 231-243.
10. R. J. Howlett & M. E. N. Majerus, "The understanding of industrial melanism in the peppered moth (*Biston betularia*) (Lepidoptera: Geometridae)," *Biological Journal of the Linnean Society* 30 (1987): 31-44.
11. M. E. N. Majerus, *Melanism: Evolution in Action* (Oxford: Oxford University Press, 1998), especially pp. 116-123. Majerus listed another 203 moths found resting on trees under unnatural conditions (in the vicinity of mercury vapor moth traps).
12. Jerry Coyne, "Not black and white: A Review of Michael Majerus's *Melanism: Evolution in Action*," *Nature* 396 (1998): 35-36.
13. T. D. Sargent, C. D. Millar & D. M. Lambert, "The 'Classical' Explanation of Industrial Melanism: Assessing the Evidence," *Evolutionary Biology* 30 (1998): 299-322. For journalistic accounts published around the same time, see Larry Witham, "Darwinism icons disputed: Biologists discount moth study," *The Washington Times* (January 25-31, 1999): 28; Robert Matthews, "Scientists Pick Holes in Darwin Moth Theory," *The Daily Telegraph* [London] (March 25, 1999); Nigel Hawkes, "Peppered With Flaws," *The Times* [London] (May 26, 1999).
14. Jonathan Wells, *Icons of Evolution: Science or Myth?* (Washington, DC: Regnery Publishing, 2000), available for purchase at <http://www.iconsofevolution.com/>
15. Judith Hooper, *Of Moths and Men* (New York: W. W. Norton, 2002), available for purchase [here](#).

16. At the risk of swatting a dead moth, here is a sampling of the 2002 debate over the peppered myth:

Kevin Padian and Alan Gishlick, "The Talented Mr. Wells," *The Quarterly Review of Biology* 77:1 (March, 2002): 33-37.

Jonathan Wells, "Critics Rave Over Icons of Evolution: A Response to Published Reviews," June 12, 2002, available at <http://www.discovery.org/scripts/viewDB/index.php?command=view&id=1180>

Kenneth R. Miller, "Paying the Price," available at <http://www.millerandlevine.com/km/evol/wells-april-2002.html>

Jonathan Wells, "Moth-eaten Statistics: A Reply to Kenneth R. Miller," April 16, 2002, available at <http://www.discovery.org/scripts/viewDB/index.php?command=view&id=1147>

Bruce S. Grant, "Sour Grapes of Wrath [a review of Judith Hooper's *Of Moths and Men*]," *Science* 297 (2002): 940-941.

Jonathan Wells, "Desperately Defending the Peppered Myth: A Response to Bruce Grant," October 2, 2002, available at <http://www.discovery.org/scripts/viewDB/index.php?command=view&id=1275>

Arthur S. Lodge (editor), "Industrial Melanism," an online exchange of views, available at <http://members.tripod.com/aslodge/id62.htm>

Jonathan Wells, "The Peppered Myth," *Books & Culture*, September/October 2002, p. 7, available at <http://www.discovery.org/scripts/viewDB/index.php?command=view&id=1263>

17. Wells, *Icons of Evolution* (2000), Chapter 8; Peter R. Grant, "Natural Selection and Darwin's Finches," *Scientific American* 265 (October, 1991): 82-87; Jonathan Weiner, *The Beak of the Finch* (New York: Vintage Books, 1994).

18. I have argued that antibiotic resistance in bacteria is not so much an example of natural selection as of artificial selection gone awry (see pp. 76-77 in note 19), but that doesn't affect the argument here.

19. Jonathan Wells, *The Politically Incorrect Guide to Darwinism and Intelligent Design* (Washington, DC: Regnery Publishing, 2006), Chapter 5, available for purchase at <http://www.darwinismandid.com/>

20. Alan Linton, "Scant Search for the Maker," *The Times Higher Education Supplement* (April 20, 2001), Book Section, p. 29.

21. Steve Connor, "Moth study backs classic 'test case' for Darwin's theory," *The Independent* [London], August 25, 2007, available at [http://news.independent.co.uk/sci\\_tech/article2893896.ece](http://news.independent.co.uk/sci_tech/article2893896.ece)

22. Majerus (2007), available at <http://www.gen.cam.ac.uk/Research/majerus.htm>



23. Darrell Huff, *How to Lie With Statistics* (New York: W. W. Norton, 1954), p. 21.
24. Connor (2007), available at [http://news.independent.co.uk/sci\\_tech/article2893896.ece](http://news.independent.co.uk/sci_tech/article2893896.ece)
25. Nick Matzke, “Peppered Moths: We Told You So,” *The Panda’s Thumb*, August 28, 2007, available at [http://www.pandasthumb.org/archives/2007/08/peppered\\_moths.html](http://www.pandasthumb.org/archives/2007/08/peppered_moths.html)
26. Majerus (2007), available at <http://www.gen.cam.ac.uk/Research/majerus.htm>

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