Mothbusters

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Of Moths And Men: An Evolutionary Tale
by Judith Hooper
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"We are complete nutcases." So confesses Michael Majerus, one of a small band of contemporary British naturalists, referring to his profession and, in particular, to an earlier generation of moth-hunters who had a disproportionate effect on the course of evolutionary genetics. This earlier group had succeeded in convincing itself, and the academic world at large, that their manipulations of the peppered moth in industrial and non-industrial environments, had finally and permanently nailed Darwin's theory of natural selection to the mast of the good ship *Beagle*.

How the mighty have fallen! The soft underbelly of flawed science, dubious methodology and wishful thinking in what became a classic textbook account of evolution in action has since been exposed by several refutations published in professional (*Nature*) and non-professional (*The New York Times*; *New Scientist*) media. From our schooldays, most of us are familiar with the photos of black and white moths that 'proved' the adaptive changes at work, favouring the survival of melanic moths in industrially polluted England, and the increased predation by birds suffered by their lighter-hued brethren. The story has now met its nemesis in Judith Hooper's exhilarating account of the public and private lives of an opinionated and powerful group of evolutionists, who contributed to this shameful episode in the study of evolution.

This is not a 'Piltdown Man' exposure: a deception by one misguided, fraudulent hoaxer. It is a story embracing a generation of Oxfordian pan-selectionists from the 1940s

onwards, with Henry Ford and Bernard Kettlewell at their epicentre, egged on by the grand mathematical geneticist Sir Ronald Fisher, and cheered from the sidelines by Sir Cyril Clarke, Philip Sheppard and Arthur Cain, who were working on similar 'adaptive' problems in other wild species. Ford, in particular, was not above simplifying the peppered-moth observations to the point of distortion to satisfy his own conceptual needs. He and his well-wishers were also not above ostracizing and marginalizing anyone who disagreed with them. Most subsequent, and unnecessarily disparaging, debates on evolution between British Darwinists and holders of more complex views of evolution—Sewall Wright, Motoo Kimura, Richard Lewontin and Stephen J. Gould, to name but four—have their roots deep in the mire of arrogant discourse that emanated from the Oxford School of Ecological Genetics.

"Oh, dear boy, reality is so boring" was the riposte of Henry Ford to Bryan Clarke, who had dared to suggest that the dons might usefully leave Oxford for a taste of reality outside its walls. Sadly, reality did not overly intrude during this half-century of blinkered interpretation that industrial melanism had evolved from the supposedly selective predation of birds on the supposedly poorly camouflaged moths, while resting on their supposedly natural habitats of tree trunks.

I will not give the game away. If you enjoyed the inter-generational story of decay in Gabriel Garcia Marquez's *One Hundred Years Of Solitude* or the clannish intrigues in Zadie Smith's *White Teeth*, you will love every line of this thumping good read, thoroughly researched and sufficiently detailed to satisfy scientific taste, but written with a bravado and psychological insight that would have appalled the misogynist world of Henry Ford and his friends.

But we should avoid applying twenty-first century standards to mid-twentieth century methodology, in particular for the study of genes in their natural milieu. Despite the subjective naivety of Kettlewell, the heroically creative experimentalist, there is an honesty of admission in his early papers that more than compensates for the blunders he made in the field. If he had not

been so overtly pressurized by his abrasive boss, Henry Ford back in Oxford, maybe he would not have changed his experimental design mid-stream, thus annulling the validity of his results. Ted Sargent, the self-effacing moth expert, battled for years against the Oxford conclusion that bird predators are the proximal cause of the ups and downs of melanic moths, but to no avail. It was his misfortune to be an undemonstrative loner, quietly but persistently pointing out the experimental errors, from the perceived intellectual backwater of Amherst, Massachusetts.

Have things changed today? Yes, but for the worse. Ecological geneticists of the old school have been replaced by mathematical geneticists and genome pushers who rely more on narrowly conceived assumptions and simulations than on observation and experiment. They too are convinced, with little direct evidence, of the ubiquity and efficacy of natural selection alone acting on all that moves. Such conviction stems from the statistically naive assumption that if the level of DNA sequence diversity within a species is different from that between species, then natural selection is at work, in all its theoretical modes. Scant attention is paid to the ubiquitous mechanisms of genomic turnover (gene conversion, slippage, transposition and so on) that greatly affect such distributive patterns of genotypes and, importantly, of phenotypes. Sadly, our backroom maths boys have eliminated the genotype-phenotype dichotomy and subsumed the latter in the former. As such, nobody other than the stalwarts, such as Bryan Clarke, much cares about the experimental investigation of selection in the wild operating on real, complex and unitary phenotypes. In their own inimical ways, the early ecological geneticists, although opinionated to unacceptable levels, at least tried to understand the evolved natural world of blood and guts.

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