The Ignoble Fate of the Peppered Moth

The reasons why men and women enter the profession of medicine are almost as numerous as the numbers of medical school entrants. And it is said with some statistical justification that once these students have completed their formal education, passed their licensure examinations and finally entered the health-care arena, few ever leave medicine for alternative careers. The average graduating physician today is so deeply in debt that the fleeting thought of becoming an itinerant poet or a Zen theologian causes little more than vertiginous panic.

Yet some do leave; and while most in this small group merge into a sea of anonymity precious solely to their kith and kin, there are nonetheless a handful who have left an enduring impression upon the larger society by their non-medical accomplishments. Indeed, some are so famous that their earlier medical careers are obscured or forgotten. Certainly the names of Nostradamus, Rabelais, Marat or Clemenceau elicit no thoughts of medicine except amongst their zealous biographers. And considering Marat's lethal role in France's Reign of Terror - and his well-publicized murder by Charlotte Corday - it is hard to think of him as having once been a healer.

Then there are those physicians who, after decades of diligent medical practice, have ventured beyond medicine to pursue a hobby, and, in doing so, have left an indelible mark upon what we know about the world around us.

Such a person was Henry Bernard Davis Kettlewell (1907 – 1979). Few today remember his name but for a single series of biological experiments appearing in virtually all textbooks on evolutionary biology. And so, in the tranquility of academic circles, Kettlewell has achieved a small measure of well-deserved immortality.

Kettlewell was born in Yorkshire, England, attended Cambridge University and received his medical doctorate from St. Bartholomew's Hospital (Barts), London, in 1929. Until the onset of World War II he practiced medicine in the Surrey district. During the war, he worked fulltime in emergency medical services. In 1949 Kettlewell emigrated to South Africa, leaving the practice of clinical medicine to pursue a lifelong interest in insects, particularly butterflies and moths (lepidopterology).

Following a series of successful investigations regarding suppression of predatory locusts in the southern tier of Africa, particularly Congo and Mozambique, Kettlewell returned to Oxford as the recipient of a research grant to explore the genetics of peppered moths (*Biston betularia*). Somehow, investigations into the ecological influences upon the peppered moth do not stir the souls or the passions of many humans, particularly those who write science stories for daily newspapers. So for the next few years Kettlewell pursued his inquiries on the lives of the English peppered moth unmolested or distracted by journalistic scrutiny.

Kettlewell chose the Deanend forest neighboring upon the industrial city of Birmingham, England, as the base for his investigations. In consecutive censuses of the resident moth population undertaken in the three decades beginning in 1952, he noticed a region-based concentration for the dark-colored pepper moths. Thus, in the moth populations in forest groves closest to the city (and thus closest to its air-polluting factories) the dominant body coloring of the moths was dark gray or black (a phenomenon he called melanism.) In samplings of moths living on groves more distantly situated from the urban factories, the dominant body color was a pale tan. Kettlewell was aware, too, that the resident moths of the Birmingham region, prior to the 18th Century (and the onset of major industrialization), had been largely pale. He verified the relationship between survival of peppered moths and the color of their wings by releasing large numbers of peppered moths into aviary cages filled with insectivorous birds. The birds ignored dark-colored moths alighting upon dark surfaces and light-colored moths alighting upon light-colored surfaces; but if a dark-colored moth alighted upon a light-colored surface (or vice versa) the birds promptly consumed them.

Kettlewell speculated that the gradually darkening of the moths (melanism) coincided with the effects of the 18th Century Industrial Revolution upon the atmospheric pollution surrounding Birmingham and, concurrently, the gradual darkening of the buildings and tree trunks neighboring upon the coal-burning factories. Thus moths inheriting dark-colored wings had a greater survival likelihood nearer the factories while those inheriting light-colored wings had a greater chance of surviving (and hence producing more moths with light-colored wings in the next generation) in forests remote from the coal-burning factories.

Kettlewell's observations and experimental verification provided yet another example of Darwin's theory that those biological variants best capable of adapting to a changing ecological environment would be better represented in the next generation - the survival of the fittest, the core premise of his theory of evolution. Of course, if by some ecological magic the Birmingham factories should all revert to energy-generation free of any air pollution, then within a generation or two the surfaces of Birmingham's trees and buildings would become lighter; and shortly thereafter the light-colored moths would again predominate.

Kettlewell died in 1957, to his final days an unduly modest man. He cleaved to his anonymity with the tenacity of a barnacle determined, to the end, to have a private rendezvous with obscurity.

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Stanley M. Aronson, MD, has no financial interests to disclose.

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