A feather in the cap for bird breeders

The Red Canary: The Story of the First Genetically Engineered Animal

by Tim Birkhead

Weidenfeld & Nicolson: 2003. 284 pp. £16.99

(Published in the United States as A Brand-New Bird. Basic Books, \$26)

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Plucking *The Red Canary* off the shelf in a bookshop, you'd assume that you'd found a book about biotechnology. The subtitle touts the eponymous bird as "the first genetically engineered animal", and the dust jacket promises a narrative of "huge contemporary relevance" to "the exciting but controversial developments in genetic manipulation". But it's not about biotechnology at all. It is in fact a book about animal breeding of the traditional sort — there's not a restriction enzyme, plasmid vector or polymerase chain reaction (PCR) machine in sight. Presumably the publicists' attempt to drum up interest in the book explains the strange disconnect between its outside and its inside: they've given *The Red Canary* showy but artificial plumage.

A more appropriate but less attractive title would be *A History of Canary Breeding*. For the story of the red canary occupies only half of an account that begins in the fifteenth century when wild canaries were first snatched from — where else? — the Canary Islands. At first the preserve of aristocracy, pet canaries were soon a staple of European life, beloved for their colour and beguiling song. Canary breeding became a cottage industry in Germany, which pumped out thousands of 'Harzer rollers' (named for their rumbling call) for the European market. Birkhead notes that in 1742 there were roughly 200,000 canaries in London alone.

It's an absorbing if not riveting tale, and Birkhead brings illumination and ornithological insight to a dark and neglected corner of animal breeding. We learn, for example, that for practical reasons, breeders and bird-catchers pioneered the study of bird migration and behaviour, inadvertently fledging a new science — ornithology — in the process. And there are plenty of interesting tidbits, such as the peculiar origin of a musical instrument: the recorder was invented to train songbirds. Nor does Birkhead neglect the role for which canaries are proverbial: they were used as an early-warning system in coalmines because their rapid respiration made them especially susceptible to toxic gas, while their song brightened the gloom underground.

The core of the book is the unlikely collaboration between two Germans: Hans Dunker, an academic ornithologist, and Karl Reich, a shopkeeper and fanatical canary hobbyist. With Reich's expertise, Dunker worked out the genetics of canary song and colour, gaining modest fame in the process. Around 1925, they set out to create the avian equivalent of the blue rose: a red canary. They 'genetically engineered' the bird by crossing it with a close relative, the South American red siskin, and then repeatedly crossing the reddest hybrids back to canaries. But despite years of effort, their project failed. Their canaries became no redder than an unattractive, blotchy orange. When National Socialism intervened, the enterprise was forgotten as Dunker abandoned canaries for a new role as an enthusiastic propagandist for Nazi eugenics.

The fabled red bird was not produced until 1964, and then only through chicanery. Jack Swift, a British breeder, discovered that dark orange birds would become red prize-winners when fed carotenoids — the same substance that turns flamingos pink. And so the Holy Grail of canarydom was reached by manipulating both genetics and diet.

To convince us of his tale's significance, Birkhead plays up two themes: genetic engineering and the connection between genes and environment — nature and nurture. But the effect is the opposite of what Birkhead intended: his digressions remind us that, for all of their charm, canaries have little to offer on either theme.

Birkhead shows that genetic engineering — at least, when defined as the transfer of genes between species — is not new, but has been around for at least 75 years. In fact, it is

older than that: orchid breeders were crossing species in the 1850s, and bread wheat is the product of several ancient interspecific hybridizations. But the genetic engineering of Dunker and Reich is not the genetic engineering of Monsanto. Though they both yield transgenic organisms, the issues surrounding the production of genetically modified food and of red canaries are worlds

apart. Canaries are irrelevant even when we ignore the technical issues and envisage the worst-case scenarios — the escape of bacterial-toxin genes from genetically engineered corn is far more worrisome than the escape of colour genes from canaries. To imply that Reich and Dunker's experiments offer insight into modern transgenics is to turn the red canary into a red herring.

The interaction between genes and environment is also overblown. It is true that such interactions are important in many areas of genetics, as shown in Matt Ridley's recent book *Nature Via Nurture* (Fourth Estate, 2003). And it is true that it takes carotene as well as genes to make a red canary, just as it takes both pulchritude and peroxide to make a Marilyn Monroe. But Birkhead goes too far when claiming that the gene-environment interaction is "one of the most fundamental phenomena in biology because it recognizes that the nature versus nurture debate is erroneous and meaningless". The debate is not meaningless, because specific environments are not critical for much of animal breeding. A fertilized dachshund egg becomes an adult dachshund regardless of where gestation occurs or what one feeds the puppy.

As a biologist, my enthusiasm for *The Red Canary* — admittedly a book for the layman — was further eroded by scientific gaffes that too often mar the discussion of genetics. Birkhead, for example, explains that species hybrids are especially vigorous because only one gene of each pair is expressed, and that the "genes that are turned on are those that best complement the rest of that individual's genetic make-up". But even if hybrids were generally more vigorous than pure species, which they aren't, this explanation is dead wrong, literally: hybrids expressing only half their alleles would not survive.

While *The Red Canary* tells a good tale, it suffers from its need to place the story in a broader context. It provides little insight into controversies about genetic engineering, nor does it illuminate the nature-nurture debate. Burdened with these expectations, *The Red Canary* flutters gamely but fails to soar. ■

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