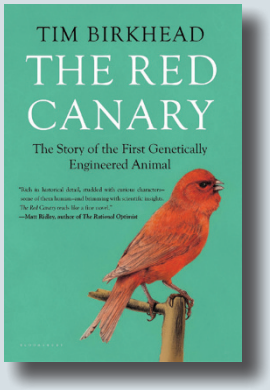
An unsung pioneer in genetics

Reviewed by Kara Rosania



THE RED CANARY: THE STORY OF THE FIRST GENETICALLY ENGINEERED ANIMAL

By Tim Birkhead

Bloomsbury USA, New York, NY
Price: $11.99
Paperback, 268 pages
ISBN: 9781620407578

There was a time when all canaries were green. As they became popular cage birds in the 15th century, however, 'bird fanciers' or hobbyists interested in the rearing of birds began adjusting various traits through selective breeding to produce birds with yellow or white plumage and songs that improved upon those of their progenitors. But none of these endeavors was more ambitious than that of Hans Duncker, who in the 1920s decided to turn the canary red.

Duncker's story is told in Tim Birkhead's book, *The Red Canary*, which was published in a new paperback edition in May 2014. Birkhead's account not only provides an early history of genetic manipulation but also highlights the incompatibility of single-mindedness with scientific discovery.

Duncker, a German high school teacher, began his obsession with canaries when he became transfixed by the beauty of a canary's song. The canary belonged to a young shop owner and bird fancier named Karl Reich, who had being breeding canaries with nightingales specifically to improve their sound. Duncker, a devout Darwinian, immediately understood the genetic implications of what Reich had done. He and Reich proceeded to team up on a more ambitious project—the production of a red canary. Duncker was sure that he could introduce an inherited red color to the species by hybridizing white canaries with the naturally red siskin, the canary's close relative. Undaunted by the limited genetic knowledge and the primitive technology of the time, Duncker developed an elaborate breeding program, adhering to strict Mendelian principles, to transfer the red gene from the siskin to the canary.

The book is perhaps inaccurately subtitled, as the red canary that was eventually produced was not in fact "genetically engineered" according to the modern definition of the term. It also was not really the "first" such attempt to breed a missing trait of interest into a variety by interspecies hybridization, as this was already widely done in horticulture. Furthermore, the eventual success of the endeavor to turn canaries bright red ultimately came through environmental, not genetic, manipulations. That canaries' colors could be influenced by their diet had been well known ever since the debut of orange canaries at the British National Cagebird Show of 1873; their bright colors were the result of feeding red peppers to the birds during their molting period. Yet Duncker refused to consider that any kind of environmental factor, including diet, could have any degree of influence on plumage color. As a result, his breeding program only succeeded as far as creating canaries with a dull copper hue.

Thirty years later, Anthony Gill and Charles Bennett built on Duncker's work to succeed where he had not by recognizing that a truly red canary would need to be a product of both nature and nurture. They discovered that, even in the red siskin, a combination of genes for the red trait and carotenoids in the bird's diet to activate these genes was required to make a bird red in color. Birkhead writes, "Duncker was so obsessed by genetic effects he never entertained the possibility that red genes even in their rightful owner might require something from the environment (like carotenoids) to make them work."

Birkhead also details how Duncker's belief in the absolute primacy of genes over environment inspired his eugenic views on human breeding, which regrettably led him into collusion with the Nazis. Birkhead briefly interrupts his historical narrative to detail his shock at making this discovery, and it comes as somewhat of a shock to the reader as well. Yet, after reading several chapters about Duncker's unwavering approach to scientific thinking, and considering the context of the political climate of 1930s Germany, it perhaps should not be so surprising. Ultimately, his failures in both areas of research forced Duncker to acknowledge one of the ultimate lessons of biology: that genes and environment work together in a complex interplay to determine biological outcomes, and both must be considered equally when studying the characteristics of living organisms, human or otherwise.

Birkhead's book is an engaging read for anyone interested in scientific discovery, and many aspects will be familiar to those whose research revealed truths they had not anticipated, necessitating a reconsideration of previously held notions. As Birkhead writes of Duncker, "He failed because his belief in genetics was so strong, so all-embracing and, ultimately, so naïve."