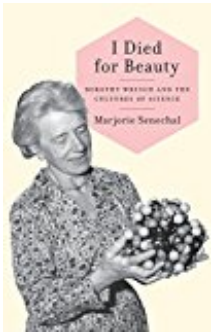
## Jenny McPhee

### I Died for Beauty: Dorothy Wrinch and the Cultures of Science




What is it that drives a human being to pursue an idea to death? To make order out of chaos, to please, impress, defy, or outdo a parent, to win a Nobel Prize, to attain immortality, to find truth, to know beauty? Whatever the motivation, such inexorable determination has led to our greatest scientific breakthroughs. In *I Died for Beauty*, her fascinating book about Dorothy Wrinch, one of the twentieth century's most important and controversial mathematicians, now all but forgotten, Marjorie Senechal considers how Wrinch was driven, until her death in 1976, to pursue her scientific vision by the sheer beauty of her idea.

Born in 1894, Dorothy Wrinch grew up near London, entered Girton College, Cambridge University in 1913, graduating with first-class honors in mathematics in 1916. She stayed on at Cambridge to study symbolic logic with Bertrand Russell, and remained part of his inner coterie. In 1929, she became the first woman to receive a doctor of science degree from Oxford University and soon thereafter the first woman in Cambridge's 800-year history to teach mathematics to men.

Wrinch's extraordinary mind and formidable powers of synthesis spurred her to seek connections between disciplines. She became obsessed with the idea that mathematics could be the ultimate means of describing life forms. At the time, "no other mathematician," writes Senechal, "was so interested in biological form." Wrinch fashioned herself into a "mathematical biologist" years before the term was even coined. Today it is the fastest growing field in mathematics. She contributed significantly to the fields of mathematical physics, philosophy, seismology, genetics, protein structure, probability theory, scientific methodology, crystallography, x-ray diffraction theory, and was nominated for a Nobel Prize in chemistry. Senechal, herself a distinguished mathematician and professor emerita in mathematics and history of science and technology at Smith College, worked with Wrinch at Smith. *I Died for Beauty* is Senechal's quest to understand why the scientific community so drastically marginalized this brilliant woman, then relegated to obscurity. In a clear, multi-faceted narrative, Senechal combines genres -- memoir, biography, history of science, women's studies, art, fiction, even opera. The result is a kaleidoscopic vision of Dorothy Wrinch's life and the cultures that both formed her and that she helped form.

Wrinch was a founding member of The Theoretical Biology Club, a group of interdisciplinary scientists in the early '30s whose ambition was to solve The Great Problem: "What is the relation between those large particles which we call elephants, trees, or men, and those extremely small ones which we call molecules or electrons?" The philosopher Karl Popper, who attended the club in the late '30s, called it "one of the most interesting study circles in the field of the philosophy of science."

In a presentation to the club, Wrinch expressed the view that "the specificity of genes resides in the specificity of their amino acid sequences." Her follow-up published papers on her sequence hypothesis were subsequently ignored, and she turned to other things. By the time Francis Crick formulated the modern sequence hypothesis in the late 1950s, Wrinch, due to a fierce public disagreement with the famous chemist Linus Pauling over the structure of proteins, was no longer taken seriously and her papers on the subject were forgotten. Only in Robert Olby's 1974 comprehensive history of the discovery of the structure of DNA, *The Path to the Double Helix*, does Wrinch finally receive credit for her contribution.

While on an academic exchange in 2002, Senechal discovered that Russian scientists at the Shubnikov Institute for Crystallography in Moscow revered Wrinch as "the greatest American crystallographer of all time" because of her algorithm showing the way to solve inverse problems. Today inverse problems have a wide range of uses, from mapping the structures of earthquake waves traveling through the earth to CAT scans. (I'm reminded of Hedy Lamarr's pioneering invention that led to the technology for WiFi, Bluetooth, 3G cell phones, and GPS systems, for which she also received little credit.)

What Wrinch is most (not) famous for is her proposed structure of protein molecules. In the 1930s, she shot to fame for applying mathematical ideas to the interpretation of life phenomena by using mathematical principles -- probability, geometry, and symmetry -- to deduce the protein structure. By 1938, she was "an international superstar of modern protein science." Her model "catalyzed the scientific imagination," and if correct, "would turn science upside down." A conference on protein structure was convened in Cold Spring Harbor and seventy-two scientists, including Wrinch, attended. By then Wrinch had been teaching math at Oxford for fourteen years. She was the author of fifty papers, all published in top journals. Her work was supported by such scientific luminaries as Nobel laureates Niels Bohr and Irving Langmuir, who nominated Wrinch for a Nobel Prize in Chemistry the following year. She was British, beautiful, athletic, witty, highly opinionated, and as likeable to some as she was off-putting to others. Linus Pauling thought her idea ridiculous and that his folding linear protein model was the answer. Their ensuing high-profile feud, begun at Cold Spring Harbor, would permanently damage Wrinch's reputation as a scientist, with Pauling successfully hounding her out of the field.

Pauling's Christmas tree lights structure of the protein molecule is now long accepted as the correct one. In 1952, a key element of Wrinch's structure, the one Pauling had "proved" couldn't exist, was finally discovered, but in ergots, not proteins. By then, Wrinch's star was so dim no one even thought to tell her about it. As Senechal notes, Pauling would spend the latter half of his career championing high doses of Vitamin C as a cure for cancer. A scientist has a

right to be wrong. But apparently not Dorothy Wrinch.

So, what happened? Pauling was surely to blame but not exclusively. Entrenched institutional misogyny, Wrinch's abrasive personality, an inability to accept defeat, a quest for beauty over truth? Some insight was offered by Dorothy Hodgkin, another British protein crystallographer, a friend and contemporary of Wrinch's, with whom she'd also had a famous disagreement over the structure of the insulin crystal. (Hodgkin won the Nobel Prize in 1964 for discovering the structure of vitamin B12, and five years later finally deciphered the structure of insulin.) Her personality was directly opposed to Wrinch's: she was quiet, self-effacing, offended no one, and shunned the public eye. She insisted all her life that being female had never been an obstacle to her scientific success -- a naive stance or, perhaps, a canny strategy.

About Wrinch's controversial career, Hodgkin wrote: "Probably some of the intensity of feeling in the case of Dorothy Wrinch was due to the major importance of the scientific problem itself, the structure of proteins -- nobody could be indifferent to the search for the truth about proteins." Later, among Hodgkin's papers, Senechal found a draft of her letter with a last line crossed out: "and the success which she appeared to achieve was so outstanding." The compelling beauty of Wrinch's protein model had brought her too close to the sun. Ultimately, Senechal gives us no definitive reason for Wrinch's downfall, but in the end does it matter? Emily Dickinson would seem to get the last word.

I died for beauty, but was scarce
Adjusted in the tomb,
When one who died for truth was lain
In an adjoining room.

He questioned softly why I failed?
"For beauty," I replied.
"And I for truth, -- the two are one;
We brethren are," he said.

And so, as kinsmen met a night,
We talked between the rooms,
Until the moss had reached our lips,
And covered up our names.

*Jenny McPhee's novels include* A Man of No Moon*,* No Ordinary Matter*, and* The Center of Things*. She lives in London, but mostly she resides at www.jennymcphee.com.*