

Name _____



Rosalind Franklin

By Cindy Grigg

There is probably no other woman scientist with as much controversy surrounding her work as Rosalind Franklin. She was responsible for much of the research and discovery work that led to the understanding of the structure of DNA. Due to her very unfortunate early death and her male coworkers' attitudes about women scientists, she was never given credit for it. Here is her story.



Rosalind Franklin was born in London, England, on July 25, 1920. She always liked facts. She was precise and logical, and impatient when things were otherwise. Franklin excelled at science and attended one of the few girls' schools in London that taught physics and chemistry. She decided to become a scientist when she was fifteen. Her father, however, wanted Rosalind to become a social worker. He disapproved of a university education for women, and he refused to pay for it. Rosalind's aunt said that she would pay and that Rosalind should go. Rosalind's mother also took her side until her father gave in.

She earned a doctorate degree from Cambridge University in 1945 in physical chemistry. Before she was 26 years old she published five papers on the subject of coal and charcoal and how to use them effectively. She then worked in Paris where she learned x-ray diffraction techniques: using x-rays to create images of crystallized solids.

In 1951 Franklin went back to England as a research associate in John Randall's laboratory at King's College, Cambridge. At Randall's lab, she met Maurice Wilkins for the first time. They both had separate projects and research groups. By this time, DNA was known to be the only substance capable of storing all the information needed to create a living organism. What was not known was what the DNA molecule looked like or how it performed its function as hereditary material.

Franklin was given responsibility over the DNA project while Wilkins was away on vacation. When he returned, he mistakenly treated her as a lowly technical assistant. Even after he realized his error, Wilkins never changed his attitude towards Franklin. This was probably due to the fact that women weren't numerous or respected in the field of science at that time. At King's College, women were not allowed to eat lunch in the common room where the men did. At the end of the day, the men talked about their work at a men-only pub. Franklin continued her DNA research with slight friction at the laboratory.

The technique which Rosalind Franklin pioneered with DNA is called x-ray crystallography. With this technique, the locations of atoms in any crystal can be mapped by looking at the image of the crystal under an x-ray beam. In the early 1950s, scientists were just learning how to use this technique to study biological molecules.

Franklin made marked advances in x-ray diffraction techniques with DNA. She adjusted her equipment to produce an extremely fine beam of x-rays. She extracted finer DNA fibers than ever before and arranged them in parallel bundles. She studied the fibers' reactions to humid conditions. All of these allowed her to discover crucial keys to DNA's structure.

After complicated analysis, she discovered, and was the first to state, that the sugar-phosphate backbone of DNA lies on the outside of the molecule. She also described the basic helical structure of the molecule.

Wilkins shared Franklin's data, without her knowledge, with James Watson and Francis Crick. Watson and Crick saw that each strand of the DNA molecule was a template for the other. During cell division, the two strands separate and on each strand a new piece is built, just like the one before. This way DNA can reproduce itself without changing its structure, except for occasional errors, or mutations.

Watson and Crick published their proposed structure of the DNA molecule in March 1953. Franklin's work did appear as a supporting article in the same issue of the journal. She published x-ray diffraction pictures of DNA in the journal *Nature* in April 1953.

Shortly after this, Miss Franklin left King's College. She headed her own research group at Birkbeck College in London. She turned her attention to viruses, publishing seventeen papers in five years. Her group's findings laid the foundation for structural virology. In 1956 she began experiencing pain and learned that she had cancer. She continued to work through three surgeries and chemotherapy until a



Name _____

few weeks before her death on April 16, 1958.

Four years after her death, James Watson, Francis Crick, and Maurice Wilkins were awarded the Nobel Prize for the double-helix model of DNA in 1962. It is a tremendous shame that Franklin did not receive due credit for her essential role in this discovery, either during her lifetime or after her early death at age thirty-seven. The Nobel Prize cannot be awarded posthumously, after someone is dead.

A debate about the amount of credit due to Franklin continues. What is clear is that she did have a meaningful role in learning the structure of DNA and that she was a scientist of top rank. J.D. Bernal described her in Nature: "As a scientist, Miss Franklin was distinguished by extreme clarity and perfection in everything she undertook. Her photographs are among the most beautiful x-ray photographs of any substance ever taken."

Rosalind Franklin

Questions

1. When and where was Rosalind Franklin born?

2. What technique did Rosalind Franklin pioneer?

- A. photography
- B. x-ray crystallography
- C. DNA modeling

3. Rosalind discovered and was the first to state that _____.

- A. DNA was a helical (helix) molecule
- B. the sugar-phosphate backbone of DNA was on the outside of the molecule
- C. both a and b

4. How did Watson and Crick know about Franklin's data?

- A. Franklin gave it to them.
- B. Wilkins gave it to them with Franklin's knowledge.
- C. Franklin published it first.
- D. Wilkins gave it to them without Franklin's knowledge.

5. What caused Rosalind Franklin's death?

- A. heart attack
- B. a war
- C. cancer
- D. a mysterious accident

6. What does posthumously mean?

- A. after someone's death
- B. with great honor
- C. co-written
- D. with great shame

7. Who received credit for describing the double-helix model of DNA?

- A. Rosalind Franklin
- B. John Randall and Rosalind Franklin
- C. Watson, Crick, and Wilkins

8. When did Franklin die?

- A. 1958
- B. 1953
- C. 1951
- D. 1955