

## TEXT SUPPLEMENT (Ch 2): Franklin

### Science and Fair Play: The Case of Rosalind Franklin

A large part of the effort to reveal the molecular structure of DNA centered on a technique known as X-ray diffraction. In this technique, the molecules being examined must first be crystallized; for studies of DNA, the sodium salt of deoxyribonucleic acid was used instead of the acid itself because it was more easily crystallized. The crystals are then exposed to X-rays and the reflections produced by the atoms in the crystal are examined on photographic film. The images produced by X-ray diffraction are very difficult to interpret and require a sharp mind and a strong mathematical background. Rosalind Franklin (1920–1958), who worked in the laboratory of Maurice H.F. Wilkins, was an expert in reading and interpreting such X-ray diffraction photographs, a process that required many hours of careful measurement and calculation. (Today, there are powerful computers that process X-ray diffraction patterns, but in the 1950s this work was all done by hand.) Watson and Crick used Rosalind Franklin's data to figure out the structure of DNA. The 1962 Nobel Prize for this discovery was shared by Watson, Crick, and Wilkins. Rosalind Franklin had died by then, so she did not share in the prize (Nobel prizes are not given posthumously). Nonetheless, she did not receive the credit that her contribution to Watson and Crick's discovery deserved.

In his 1968 book, Watson admits that he got hold of Rosalind Franklin's results (including a critical X-ray photo) without her knowledge or permission. He writes:

"[Maurice Wilkins] revealed that with the help of his assistant Wilson he had quietly been duplicating some of Rosy's and Gosling's X-ray work.... When I asked what the pattern was like, Maurice went into the adjacent room to pick up a print of the new form...." (*The Double Helix*, 1968, p. 98)

"By then it had been checked out with Rosy's precise measurements. Rosy, of course, did not directly give us her data. For that matter, no

one at King's realized they were in our hands." (*The Double Helix*, 1968, p. 104–105)

Watson claims that his action was justified because the race to find the structure of DNA was highly competitive and because Franklin was, in his estimation, proceeding too slowly and in the wrong direction. Undoubtedly, there were other issues involved. Watson never liked Rosalind Franklin, and he makes this abundantly clear in his book. Franklin's biographer, Ann Sayre, talks of Watson's "rationalization which implies that Rosalind, as an impediment standing squarely in the path of scientific progress, deserved to be pushed aside." (*Rosalind Franklin and DNA*, 1975, p. 143)

In a review of Watson's book, Andre Lwoff wrote: "His portrait of Rosalind Franklin is cruel. His remarks concerning the way she dresses and her lack of charm are quite unacceptable. At the very least the fact that all the work of Watson and Crick starts with Rosalind Franklin's X-ray pictures and that Jim has exploited Rosalind's results should have inclined him to indulgence." (quoted in Sayre, *Rosalind Franklin and DNA*, p. 194–195).

Ann Sayre has said, "Rosalind has been robbed, little by little; it is a robbery against which I protest" (p. 190). "Her work was appropriated and used without proper credit" (p. 194).

Among the questions that you might want to ponder are the following.

1. How would you describe Watson's use of Franklin's data? Was it 'robbery', or just 'looking' at her data? Is there a difference? In either case, do you think that competition in the race to discover the structure of DNA justified his actions?
2. Does high-pressure competition do more good for science, or more harm? Try to list both good and bad consequences before you decide.
3. Although everyone agreed that Franklin was a brilliant researcher, she was often criticized for not wearing makeup and for her lack of

interest in her clothing. What kind of treatment would a scientist like Rosalind Franklin be likely to receive today? Franklin differed in social background, politics, and religion from her male colleagues. Do a scientist's looks, religion, politics, or personality affect how her or his data are regarded?

4. In the 1950s, university boards and state commissions on discrimination did not exist. Under these conditions, did Rosalind Franklin have any option to protest her treatment?

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