

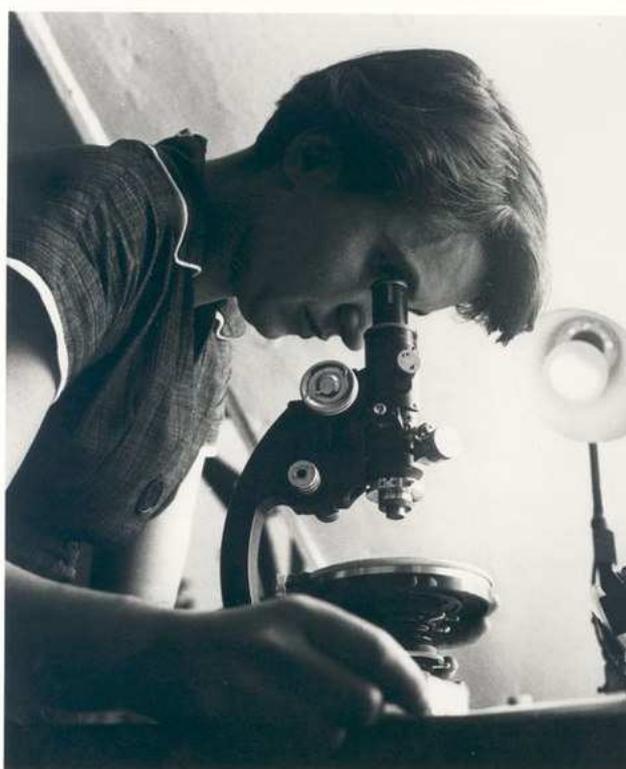
8 March. We remember Rosalind Franklin, the great female DNA scientist.

DNA was first isolated by Friedrich Miescher, a Swiss biochemist in 1869. It was a brilliant, but not complicated operation: DNA can be extracted from a mixture of any cells, even your own, even at home. The recipe for the experiment is really very simple and can be found at the end of this story.

The structure of DNA was revealed only a century later, in 1953, by the scientists James Watson, an American, and Francis Crick, an Englishman, who won the Nobel Prize for this work in 1962 together with another researcher, Maurice Wilkins.

Yet, this was not really entirely true.

While Watson and Crick were working on the DNA structure in the Department of Physics at Cambridge University, a young female colleague of Wilkins was making splendid crystals at King's College London: her name was Rosalind Franklin.



Rosalind Franklin. Credits: Wikipedia

X-ray crystallography is a formidable investigatory technique with which it is possible to study the arrangement of atoms and molecules in a microscopic crystal. Some substances, like salt, sugar or quartz, spontaneously form crystals while others, like proteins or DNA, crystallise only with the aid of sophisticated and often very slow procedures. A good crystallographer must be extremely precise and infinitely patient, and Rosalind excelled in both these areas. In 1951, she

succeeded in obtaining and photographing a DNA crystal. Those X-ray photos were extraordinarily well-defined and one in particular, number 51, allowed Rosalind to infer that DNA has two paired filaments. But relations between her and Wilkins were very strained. She was a woman, brilliant, determined and also Jewish, too much for that conservative and chauvinistic environment. In his book *The Double Helix* published in 1968, Watson wrote about the Nobel-prize winning discovery saying, on the subject of Rosalind: "The real problem, then, was Rosy. The thought could not be avoided that the best home for a feminist was in another person's lab." Maurice Wilkins spoke of her in not very complementary terms and did not think twice about subtracting a copy of photo 51 from her to show to Watson and Crick. When they saw the picture, they were amazed: it was proof of the existence of the helical double filament structure that they had only conjectured. When Watson and Crick announced their discovery to the world in 1953, Rosalind was sincerely delighted and congratulated them. She never knew of the vital role she had played in the description of the DNA structure. She died in 1958 aged only 37 years due to a tumour probably caused by continuous exposure to X-rays without sufficient protection. The merits of Franklin were partially recognised many years after her death. In the last chapter of *The Double Helix*, Watson wrote: "All of these people, [written about in this book are still alive], should they desire, can indicate events and details they remember differently [...]. But there is one unfortunate exception: Rosalind Franklin [...] we both came to appreciate greatly her personal honesty and generosity, realizing years too late the struggles that the intelligent woman faces to be accepted by a scientific world which often regards women as mere diversions from serious thinking. [Rosalind] continued working on a high level until a few weeks before her death." A biographical book and a film starring Nicole Kidman as Franklin tell her story.

by Andrea Bellati

Create a ball with your DNA

In order to extract human DNA you need a sample of something that contains a little of it and is not painful to extract. If we exclude slicing off a little fat from where we accumulate more of it, saliva will do very well because it brings with it cells from inside the mouth mucosa and tongue. Remember that we have only 46 chromosomes and therefore you will need at least two inches of saliva.

What you need:

- a small jam jar (clean) with a lid
- a coffee spoon
- a glass
- an empty small plastic bottle
- a small plastic bottle full of water
- wooden skewers
- 95° food-grade alcohol
- fine cooking salt
- concentrated washing up liquid
- water

Before beginning

Fill the empty bottle with alcohol and put it in a freezer for a couple of hours. When needed, the alcohol must be ice-cold.

Procedure:

Pour the water in the bottle into the glass.

Dissolve a coffeespoonful of salt in the water and fill your mouth with the salt solution. Thoroughly, slowly and carefully gargle without swallowing the solution. Move the salty water inside your cheeks, and over and under your tongue. In this way you can gently remove the cells of your oral mucosa.

Spit the water into the jam jar and look closely: can you see your cells? No? Of course you can't. They are minuscule. Fear not, however, they are there and now we have to destroy them to free the DNA in the water.

You can use the rest of the water in the bottle to get rid of the nasty salty taste in your mouth. Therefore drink the rest of it, also because hydration is always important.

Put a few drops of washing up liquid in the jar and screw on the lid. Now very gently shake the solution of spit and soap without forming lather. This operation serves to break up the cell membrane that is made up of fats, just like dirt that encrusts plates.

Now very gradually add the cold alcohol. You can trickle it down the side of the jar so that it does not immediately mix with your solution of spit, salt and soap.

Wait for a minute or so.

You will see that something gelatinous and whitish has built up.

There it is, your DNA.

Take a skewer and roll your DNA around it like spaghetti. You can pick it up, and you will note that it is threadlike.

There you are, now you can marvel, inside it are the instructions for assembling your body.

Books to read

The Double Helix. James D. Watson. Simon & Schuster.

Rosalind Franklin. The Dark Lady of DNA. Brenda Maddox. HarperCollins.

Films to see

PHOTOGRAPH 51. Directed by Michael Grandage. 2018.