

The Woman Who Changed the Course of Science

Marie **Curie**



Imagine this: You are a young Polish woman whose dream is to become a scientist, but in Poland women aren't even allowed to go to universities. So what do you do?

Your name is Marie Curie, and you are accepted to the Sorbonne, the prestigious University of Paris, when you are twenty-four and become the first woman to receive a master's degree in physics from the Sorbonne. You also become the first woman to teach at the Sorbonne and the first woman to hold the rank of full professor in the scientific world. You are also the first person to receive the Nobel Prize twice and for two different sciences—first physics,

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"Nothing in life is to be feared. It is only to be understood."

—Marie Curie
(1867–1934)



They Stood Alone!

then chemistry. You are later described all over the world as the Polish French scientist whose work put humanity on a new scientific course.

Marie was born Maria Sklodowska in Warsaw, Poland, on November 7, 1867, the youngest of five children. Her father was a professor of mathematics and physics, and her mother had been the director of a girls' boarding school.

The family focus was on education and serving others, and they believed that learning was the most exalted goal in anyone's life. They believed that learning would keep Poland's intellect alive and restore her independence as the Polish people were struggling under the crushing yoke of the Russian tsars who ruled over them.

Marie was just a young girl when she lost both her mother to tuberculosis and her sister Zosia to typhus. To cope with these painful losses, the children pretended they were genius doctors who discover a miracle cure.

Marie was the star pupil in her class at Warsaw's Pension Sikorska, a private school for girls. And it was Marie who saved her classmates, her teacher, and the director of the school from possible Siberian exile when Mr. Hornberg, the Russian school inspector, made one of his surprise visits.²⁹

The school inspectors made surprise visits to the school, hoping to catch the students studying Polish history and speaking Polish which were forbidden by the tsar.

When the inspector demanded answers to his questions about Russian history, Marie responded correctly in perfect Russian. She could also have responded in German, English, or French as well.

Her dream was to study physics at the University of Paris (the Sorbonne), the most distinguished school of science in the world, so she and her older sister Bronia made a pact. Marie

would work and help support Bronia through medical school and then after graduation, Bronia would help support Marie.

Finally, in September 1891, eight years after graduating at the top of her high school class, she was ready to continue her own education. With the blessings of her father, she packed her clothes and moved to Paris where she lived in a tiny, bare attic room—freezing in the winter and broiling in the summer.

Two months later, having passed the exams, she was accepted as a student of physics at the Sorbonne. A brilliant student, she graduated first in her class with a degree in physics in 1893, the first woman to receive a master's degree in physics from the Sorbonne.

She was hired in 1894 to do a study of the magnetic properties of steel. It was then that she met Pierre Curie, a noted physicist and the manager of the laboratory where she would conduct her research.

Pierre and Marie spent every spare minute together discussing science and, a year later, they were married.

In 1896 another scientist, named Antoine Henri Becquerel, told the Curies about the glowing rays he had seen in a brown lump of uranium ore called *pitchblende*, and Pierre suggested that Marie use that for the subject of her doctoral degree.

Marie began testing chemical elements to identify the substance causing the glow. A year later she concluded that the mysterious substance was an unknown "radiant" element.

She and Pierre announced the discovery of this new element in July 1898, and she named it *polonium* for her native country Poland.

But there was something more powerful still trapped in the pitchblende. Later that year, on December 26, the Curies announced the existence of a second element, more highly radioactive than any other known. They named it *radium*.

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To prove the existence of these new elements, they needed to isolate enough of each element from the pitchblende in order to measure the precise atomic weight (the weight of one atom of an element) of each element.

Over the next four years, she and Pierre labored in an old, leaky shed and finally, in 1902, she produced one-tenth of a gram of pure radium from a ton of pitchblende.

The amount was like a teardrop in the ocean, yet its glow was a million times stronger than that of uranium rays. What awesome power lay in the atomic structure of that element!

At the time scientists believed that atoms of elements were unchangeable whereas the Curies were proving that the atoms of radioactive elements were constantly changing and even transforming from one element into a completely different one. As atoms of radioactive elements changed from one element into another (the decay process), they released energy which Marie called "radioactivity."

On June 25, 1903, having submitted her paper "Researches on Radioactive Substances," she was formally awarded her doctor of physical science degree—the first woman in France to be awarded the doctorate of science degree.

In November 1903, the Nobel Prize in Physics was awarded to Henri Becquerel and to the Curies for their work on radioactivity—the first Nobel Prize awarded to a woman.

The following year, Pierre was appointed full professor at the Sorbonne and given a laboratory with three assistants. One was Marie, the most celebrated woman of science in the world.

When Pierre was killed in April 1906 in an unfortunate accident, Marie replaced him at the Sorbonne. She was given only the rank of assistant professor, but she was still the first woman ever to teach at the Sorbonne.

Two years later, in 1908, she was promoted to full profes-

sor, becoming the first woman to hold such high rank in the scientific world.

In 1911 she was proposed for membership in the French Academy of Science, but her name was rejected when one member insisted that women could not be included in the membership.

Later that year she was awarded the Nobel Prize in Chemistry for the discovery and isolation of polonium and radium which she dedicated to her husband's memory. This was the first time anyone had received the Nobel Prize twice and for two different sciences—first physics, then chemistry.

Marie's only wish was to see Pierre's and her work used to improve the human condition, especially to cure cancer. It was her hope that by exposing diseased tissue to controlled radium rays, illnesses such as cancer could be conquered.

In 1914 she was appointed the director of the Radium Institute in Paris; students and technicians came to the institute from around the world. Among them were young Poles whose expenses were secretly paid by Marie.

She also took to the battlefields of France during World War I from 1914 to 1918 with her daughter Irene in a truck loaded with X-ray and radium therapy equipment. Over one million wounded soldiers were X-rayed for bullets and shrapnel and, knowing exactly where to operate, doctors were able to save countless lives.

In 1921 Marie made her first trip to the United States where President Warren Harding presented her with a gram of radium purchased with a collection taken up by American women.

In 1922 she was elected to the French Academy of Medicine for her contributions to radiological medicine, the only woman so recognized.

In 1925 she returned to Warsaw, now the capital of Poland, to lay the cornerstone of the Radium Institute of Warsaw.

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She died nine years later on July 4, 1934, at age sixty-six of leukemia, brought on by her years of exposure to high levels of radiation. After her death the Radium Institute of Warsaw was renamed the Curie Institute.

Marie Curie explored the nature of uranium rays, coined the term *radioactivity*, discovered the elements polonium and radium, and isolated pure radium for the first time.

The Curies unlocked the secrets of the atom and revolutionized modern science which ushered in the nuclear age.