

Marie Curie (1867-1934)

At the time of Marie Curie's birth in Warsaw on November 7, 1867, Poland was split between Austria, Prussia, and czarist Russia; Warsaw was in the part of Poland controlled by the czar. Despite the czar's efforts to stamp out Polish nationalism by keeping the people ignorant of their culture and language, Marie's parents did their best to overcome restrictions placed on them by their Russian supervisors. Marie's parents instilled in her a passion for the knowledge denied to them by their Russian rulers. After graduating high school in 1883 with a gold medal, Marie and her sister Bronya joined other friends in attending the Floating University; an illegal night school that got its name because its classes met in changing locations in order to evade the watchful eyes of czarist authorities. The students that attended this university were part of a grass-roots educational movement hoping to raise the likelihood of Polish liberation.

In 1891, Marie left Warsaw and enrolled at the Sorbonne in Paris to continue her education. Her living arrangements during this time were basic and stories from these years tell how she kept herself warm during the winter by wearing every piece of clothing she owned, and how she fainted from hunger because she was too absorbed in study to eat. Although she had an extensive education in Poland, Marie was insufficiently prepared for her future at the Sorbonne. Neither her math and science background nor her proficiency in technical French equaled that of her fellow students. Refusing to lose heart, she determined to overcome these shortcomings through diligent work.

Despite her initial shortcomings, Marie finished first in her master's degree physics course in the summer of 1893 and second in math the following

year. In search of space to conduct her research, Marie mentioned her need for a lab to a Polish physicist of her acquaintance. This friend introduced Marie to Pierre Curie, a pioneering researcher on magnetism at the Municipal School of Industrial Physics and Chemistry in Paris. Marie was able to acquire a small space in Pierre's laboratory, and soon began developing a romantic relationship with Pierre. Despite their growing relationship, Marie was unsure about continuing on to complete her doctorate and returned to Warsaw for a much needed vacation. During this time, Pierre wrote Marie love letters that convinced her to move back to Paris to pursue her doctorate as well as their romantic relationship.

After moving back to Paris, Marie insisted that Pierre also pursue his doctorate by writing up his research on magnetism. Through Marie's help, Pierre received his doctorate in 1895 and was promoted to a professorship. A few months later, Marie and Pierre were married by a humble civil ceremony, because neither wanted a religious ceremony. Juggling household and professional responsibilities was something Marie had to learn from the onset of her married life. In addition to the two master's degrees she held by the time of her marriage, she decided to earn a certificate that would permit her to teach science to young women. Meanwhile, she continued to conduct her research on the magnetic properties of steel in an effort to earn her doctorate. The director of the Municipal School of Industrial Physics and Chemistry granted her permission to complete that work on the school premises, although even Pierre had no private laboratory there.

Inspired by previously published works by German physicist Wilhelm Roentgen and French physicist Henri Becquerel, Marie began exploring the intricacies of uranium rays for her doctoral thesis. Utilizing an invention of Pierre's made many years before; Marie was able to confirm Becquerel's observations that the electrical effects

of uranium rays are constant, regardless of its physical state. Likewise, her study of the rays emitted by different uranium compounds validated Becquerel's conclusion that the minerals with a higher proportion of uranium emitted the most intense rays. She went beyond Becquerel's work, however, in forming a crucial hypothesis: the emission of rays by uranium compounds could be an atomic property of the element uranium--something built into the very structure of the atoms. Marie's hypothesis was revolutionary and ultimately contributed to a fundamental shift in scientific understanding. Her work disproved the notion that atoms are "undivided," as their name denotes, and suggested that atoms possess a complex inner structure that stores an immense amount of energy. This research on the behavior of uranium and thorium led Marie to invent the word radioactivity, based on the Latin word for "ray."

Pierre was so intrigued by Marie's work that he dropped his own research to help with hers. Together they developed a new method of chemical analysis in order to determine the chemical composition of uranium ore. They suspected the highly radioactive nature of uranium ore might be due to the presence of other elements yet to be discovered. Their predictions were right and in 1898 they published two papers placing two new elements in the periodic table: radium (Latin for "ray") and polonium (in honor of Marie's natal country).

Their new substances glowed! The fact that material containing radium spontaneously emitted light was among the results the Curies presented at the first International Physics Conference, held in Paris in 1900. Other scientists were intrigued by the implications of the idea that processes within the atom were responsible for radioactive phenomena. A thriving industry grew on the miracle of radium in medical treatments of cancer and other ills, however, staying true to the heart of

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Marie Curie

Nobel Prize Winning Chemist and
Physicist, Teacher, Mother
(1867-1934)



“Nothing in life is to be feared. It is only to be understood.”

their science, Marie and Pierre made no money off of their profitable discovery. The Curies began to develop financial problems; their amazing work made them very little money and they had a young child and elderly parent to care for at home. Anxious to contribute to her family's income, Marie, the first woman to earn a doctorate in France, also became the first woman to be appointed lecturer at France's best teachers' training institution for women.

Despite these great achievements the French government did very little to honor Marie's work. In early June 1903, both Curies were invited to London as guests of the prestigious Royal Institution. Since custom ruled out women lecturers, Pierre alone described their work in his "Friday Evening Discourse," however he was careful to describe Marie's crucial role in their collaboration. This honor to speak in London was only surmounted two years later in Stockholm. In December 1903, Becquerel and both Curies were awarded the Nobel Prize for Physics. At this point, however, both Marie and Pierre were suffering from pain and other symptoms linked to their work with radioactivity. They had both lost a great deal of weight, had permanent damage on their hands, and were much too sick to travel to Stockholm to receive their honor. Tragically, three years after winning the Nobel Prize Pierre was killed instantly in a bicycle accident. The country rallied in support of the Curies and not only offered Marie a state pension to care for her family, but also offered her Pierre's teaching position at the Sorbonne. By accepting the position, Marie became the first female professor at the Sorbonne and hoped to establish a state-of-the-art lab in Pierre's memory.

Marie's accomplishments continued after Pierre's death. In 1910, she published a textbook entitled *A Treatise on Radioactivity*, and in it secured the right to define an international standard for radium emissions, dubbed a Curie. In 1911, Marie was

once again honored with a Nobel Prize. Although the prize was awarded for the work done to secure her previous Nobel, this Nobel Prize was awarded in chemistry, instead of physics. Marie Curie dedicated most of the rest of her life to the Radium Institute, which she considered both a tribute to Pierre's memory and a contribution to the betterment of human society.

Although the cause was unknown at the time, Marie suffered many illnesses in her later years as a result of radiation exposure. The debilitating effects of this exposure sadly resulted in her death on July 4, 1934. **Marie Curie will be remembered as a pioneer for women in the sciences. She proved that women possess the same scientific capacity as men and did so in a country and language foreign to her own. Her work is an inspiration to all women and immigrants around the world who passionately struggle for their dreams.**

The Words of Marie Curie

“One never notices what has been done; one can only see what remains to be done.”

“The older one gets the more one feels that the present must be enjoyed: it is a precious gift, comparable to a state of grace.”

“Science is essentially international, and it is only through lack of historical sense that national qualities have been attributed to it.”

“One of our joys was to go into our workroom at night...The glowing tubes looked like faint, fairy lights.”

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