Marie Curie: Breaking Barriers in Science History

Makayla Wirkus
Junior Division
Historical Paper
Paper Length: 1846

Is your life goal to change the world? It was the goal of Maria Sklodowska or as you know her today, Marie Curie. Her goal was to add new elements to the periodic table, in which she accomplished. She not only accomplished that, but became the first woman to win a Nobel Prize and the only person to ever win it in two different categories. By breaking many barriers in women and science history, Marie Curie became one of the most influential scientists of all time.

Maria Sklodowska was born on November 7th, 1867, in Warsaw Poland. She grew up a difficult life, with her parents both being teachers and both moving from job to job. She was the youngest of five brilliant children. Maria began to lose her faith when she was nine years old after her oldest sister, a 15 year-old storyteller died of typhus, a severe fever. Two years later in 1878, she lost her mother to tuberculosis. Growing up, her family also struggled with a Tsarist regime, which was trying to get rid of the polish culture. All of these hardships, pushed Maria even harder to accomplish her goals, and influenced her breaking barriers.

Despite Maria's struggles early in her life, she began tutoring and teaching children at age seventeen. Teaching continued Maria's excitement about science. Soon after in 1891, she wanted to enroll at Warsaw University, which her brother attended, but the Russian government didn't allow women to attend Universities in its empire. She then moved to France and enrolled in Sorbonne University, where two years later got her license in physical sciences. Pushing through having to move schools because she was a girl, and still receiving a degree broke another barrier in women's success. About one year after that she adopted the French spelling of her name, Marie in order to fit into the culture. She is known today as Marie Curie.

While researching at Sorbonne University Marie met Pierre Curie in Spring, 1894 and then married him the next year. Two years later, 1897, Marie and Pierre had their first child Irene Curie. While still studying at Sorbonne, Marie became a professor in physics at the Ecole Normale Superieure for girls, in 1900. Inspired by Wilhelm Roentgen's Nobel Prize in Physics

1901 for rays with radiation and Henri Becquerel's work with uranium rays, Marie's interests were sparked. Since all attention went to the "radiation rays," and uranium rays were ignored Marie Curie decided to research and discover uranium rays. At the time uranium rays were not very clear and only fogged photographic plates. Pierre then dropped his research on crystals and decided to help Marie with hers. They started their research at the Municipal School of Industrial Physics and Chemistry, where Pierre worked.

Marie's hypothesis was that the atom wasn't the smallest thing, so they began to break down the uranium. They found it mostly contained pitchblende. Also, pitchblende and chalcocite were more radioactive than simple uranium, and since, there was more pitchblende than chalcocite they began focusing on pitchblende. They were having trouble researching pitchblende, because it had more than thirty element combinations. So, Marie and Pierre separated pitchblende's elements into compounds, which are the items that make up the element, to see which elements were radioactive. They separated the compounds by dissolving pitchblende into acid. After separating compounds they used an electrometer, which Pierre and his brother Jacque previously made, which allowed them to see which elements were the most radioactive. While doing this the Marie and Pierre figured out fractions made of mostly bismuth and barium were very radioactive. Marie and Pierre concluded they must have found a new element because it chemically acted just like bismuth, but was radioactive, and named it polonium. The radioactive element in barium was named radium. In discovering these two, more radioactive elements, Marie Curie and Pierre broke another barrier in science history.

Since the lab room the Curies were working in was small and hard to work in, they decided to take their research to an abandoned dissecting medical school room. She then began trying to isolate radium from barium, which became very difficult. Luckily, the Central Chemical Products Company was able to help; Andre Debierne, one of Pierre's colleagues,

helped them by adapting their techniques into larger-scaled industrial processes. In return the Curies gave them small amounts of radium, wages, and chemical products. Even after all of this assistance it still took over three years to isolate one tenth of a gram of radium. That is when, 1902, radium was added to the periodic table and Marie's life goal was achieved. Isolating radium took Marie over four years. However, they were never able to isolate polonium from bismuth, because it only had a half life of 138 days.

Even after all of her work with isolating radium that was not the reason she won the Nobel Prize. Marie Curie, Pierre Curie, and Henri Becquerel won the 1903 Nobel Prize in Physics for their discoveries with radiation in uranium rays. In doing so, Marie Curie became the first woman to ever win a Nobel Prize, which broke a barrier for women and their success. Still today Marie is 1 of the 5 women to win the Nobel Prize, the other 179 awards were given to men. This Nobel Prize only mentioned their work with uranium rays because it was thought they could win a future Nobel Prize in Physics. Which Marie Curie was not originally nominated for, so a woman who knew about this wrote Pierre a letter. Pierre then eventually got Marie nominated for the award. This recognition was a barrier broken by Marie Curie and women's recognition in this time period. Marie also achieved many other things that year. She received her doctorate in science and was invited to the Royal Institute in London along with Pierre. Although, she had many achievements in 1903, Marie Curie took many stepbacks. In August, Marie had a miscarriage and Pierre's health began to worsen because of his exposure to radiation. Also, because of their Nobel Prize and the publicity which they got from it, was very hard to continue their scientific work.

Even though Marie and Pierre had so much publicity they decided to continue their research on uranium. Where then the next year their second daughter Eve Curie was born and Pierre made Marie the chief assistant at the laboratory. Two years later in 1906, Pierre Curie

was killed in an accident, when a horse and cart hit him. According to Kathleen Krull, children's books author, Marie Curie never gave up and her work ethic was heroic. Supporting that, Pierre's death pushed Marie to work even harder in trying to develop what is known today as x-rays. She continued researching and four years later, 1910, Marie's radioactive discoveries were published and made known to those who were not already familiar with Marie's discoveries. About one year later in 1911, Marie Curie won her second Nobel Prize, but this time in physics. 1(Marie Curie-Facts)"She successfully produced radium as a pure metal, which proved the new element's existence beyond a doubt," which is the reason she won her second Nobel Prize. Winning this Nobel Prize, allowed Marie to become the first person and only woman to receive two Nobel Prizes in different categories. Although she won the Nobel Prize, her health became so bad because of her exposure to radiation she was barely able to attend the award ceremony. This accomplishment broke another barrier in women's and science history. Shortly after her second Nobel Prize winning, Sorbonne built a two laboratory radium institute. Marie Curie directed one of them, focusing on radioactivity, and the other focused on treating cancer.

The next two years, Marie's life took a turn for the worst. She became involved in a more than friendly relationship with married student, Paul Longevin, who was unhappy with his wife. False rumors were spread around that they previously were involved in a relationship, while Pierre was still alive. Some top twenty scientists along with Langevin and Curie travelled to a French press talking about radioactivity, but she returned home to an angry mob, which forced Marie and her kids to stay with a friend. All of this publicity ended their affair, though. She was then diagnosed with depression and received kidney surgery. She spent 1912 recovering in a private clinic and a rented house. Marie Curie's health finally started getting better and she devoted the rest of her life mostly to the radium institute.

In 1914, World War I started and Marie figured she could help find bullets, shrapnel pieces and broken bones. So, Marie convinced the government to help her set up the military's first radiology center. She knew the risks of being around so much radiation but she continued to help. Through risking her life Marie Curie broke another barrier for health and future military assistance. Marie began convincing automobile shops to donate parts and help create radiology vehicles. Twenty radiology vehicles were equipped and ready by October, 1914. Marie and her oldest daughter Irene, then went to the battlefields and began treating wounded soldiers along with many other women. Two-hundred other radiology rooms were also built during the war. Marie and her daughter were thought to have x-rayed over one million soldiers and may have saved countless lives. In honor of Marie, the vehicles were known as Petites Curie. Their war efforts won Irene a military medal, but Marie did not receive anything. Maybe she was still not forgiven for her affair with Paul Langevin.

In 1918, Marie received a lot of recognition for her work with radiation. First, the radium institute became a universal center for chemistry and nuclear physics. Marie Curie and Irene Curie were also invited to receive a gram of radium from President Warren G Harding in honor of their work with radium and radiation. Two years later, 1920, the Curie Foundation was created by Marie and some of her colleagues. The Curie Foundation was created to fund the institute's studies and to continue scientific research. This foundation grew very popular over the next two decades and helped with the treatment of cancer. Although, she had just received great accomplishments, she was not in full health. By the time Marie was 55, she had symptoms of cataracts, anemia, muscle aches, and many others. In 1922, in honor of Marie's work, she became a member of the Academy of Medicine and the International Commission on intellectual Co-operations. About 12 years later, July 4, 1934, Marie Curie died of aplastic anemia caused from exposure to radiation.

Marie Curie left a significant impact on science, opened new doors for discovery, and women in history. During her lifetime she broke many barriers which led to how the world is shaped today. Marie Curie stated, “One never notices what has been done; one can only see what remains to be done.”

Endnotes

1.Marie Curie – Facts. NobelPrize.org. Nobel Media AB 2019. Wed. 4 Dec 2019. <https://www.nobelprize.org/prizes/physics/1903/marie-curie/facts/>

Bibliography

Primary Sources

Rosebud County News (volume) (Forsyth, Mont.), 17 Dec. 1903. Chronicling America: Historic American Newspapers. Lib. of Congress. <https://chroniclingamerica.loc.gov/lccn/sn85053117/1903-12-17/ed-1/seq-2/>

This was a very useful primary source because it helped me understand the impact it had on that time period and the advancements she has made in todays life.

Secondary Sources

Rogers, Kara. *The 100 Most Influential Scientists of All Time*. Britannica Educational Publishing in Association with Rosen Educational Services, 2010.

This book was a good source because it helped me gain simple background knowledge. This book helped me gain the base of my knowledge, so I am able to understand future, more detailed information. This book explained Marie's life to becoming a Nobel Prize winner.

Krull, Kathleen, and Boris Kulikov. Marie Curie: by Kathleen Krull ; Illustrated by Boris Kulikov. Viking Children's Book, 2008.

This book was one of my most useful secondary sources because it helped me find many details about her main discoveries of radium and polonium. It also helped me find additional background knowledge about Marie Curie.

Pasachoff, Naomi. "Marie Curie and the Science of Radioactivity." *Marie Curie - Recognition and Disappointment (1903-1905)*, 2000, history.aip.org/exhibits/curie/recdis2.htm.

I used this source because I wanted to know more about the process of how Marie won the Nobel Prizes. This source also told me some of the experiences Marie went through.

Pasachoff, Naomi. "Marie Curie and the Science of Radioactivity." *Marie Curie - Research Breakthroughs (1897-1904)*, 2000, history.aip.org/exhibits/curie/resbr1.htm.

This was my most useful secondary sources because it told me all about her research and what she accomplished to win two Nobel Prizes. Furthermore, it explained to me the processes of excluding polonium and radium.

Pasachoff, Naomi. “Marie Curie and the Science of Radioactivity.” *Marie Curie - Recognition and Disappointment (1903-1905)*, 2000, history.aip.org/history/exhibits/curie/recdis1.htm.

This website was very helpful because it told me about the processes of winning the Nobel Prizes and the hardships she went through after.

Mcdonald, Andrew. “Marie Curie the Scientist: Biog, Facts & Quotes.” *Marie Curie*, 2019, www.mariecurie.org.uk/who/our-history/marie-curie-the-scientist.

This source was helpful because it helped me find further background information about Marie Curie and how she broke barriers.

Facts on the Nobel Prize in Chemistry. NobelPrize.org. Nobel Media AB 2019. Wed. 6 Nov 2019. <https://www.nobelprize.org/prizes/facts/facts-on-the-nobel-prize-in-chemistry>

This source benefitted me in many ways. It helped me gain more knowledge about other Nobel Prize winners. Also, it helped me understand how hard Marie and her family worked.

Facts on the Nobel Prize in Physics. NobelPrize.org. Nobel Media AB 2019. Wed. 6 Nov 2019. <https://www.nobelprize.org/prizes/facts/facts-on-the-nobel-prize-in-physics>

I used this source to gain more knowledge about the history of Nobel Prize winners. It also made me realize how big of an accomplishment Marie succeeded in doing.

Marie Curie – Nobel Lecture. NobelPrize.org. Nobel Media AB 2019. Mon. 2 Dec 2019. <https://www.nobelprize.org/prizes/physics/1903/marie-curie/lecture/>

This source was very helpful because it helped me understand the reasons Marie won her Nobel Prize.

Pasachoff, Naomi. “Marie Curie and the Science of Radioactivity.” *Marie Curie - War Duty (1914-1919)*, 2000, history.aip.org/exhibits/curie/war1.htm.

I used this source to help me gain an understanding of Marie's accomplishments and setbacks from 1914-1919. It also helped me gain more knowledge about her work with x-rays.

Marie Curie – Facts. NobelPrize.org. Nobel Media AB 2019. Wed. 4 Dec 2019. <https://www.nobelprize.org/prizes/physics/1903/marie-curie/facts/>

This source helped me a lot because it helped me gain more information on why she won her Nobel Prizes and the work she put in.

Pasachoff, Naomi. “Marie Curie and the Science of Radioactivity.” *Marie Curie - The Radium Institute (1919-1934)*, 2000, history.aip.org/exhibits/curie/radinst1.htm.

This source helped me continue my timeline with my paper and figure out what was happening in Marie’s life from 1919-1934.

History.com Staff. “Marie Curie: Facts About The Pioneering Chemist.” *History.com*, A&E Television Networks, 7 Nov. 2011, www.history.com/news/marie-curie-facts.

This source also helped me fill in the gaps on things I was missing to my paper and become more factual. It helped me gain simple knowledge on what happened through her lifetime.