

# Marie Curie: Breaking Barriers in The Scientific Community

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Junior Division

Group Performance

Process Paper: 479 words

# **Process Paper**

## **How We Chose Our Topic**

Our topic this year is on the female scientist, Marie Curie. We wanted to do a topic with a strong woman role and something to do with science. At first, we searched the internet looking for famous women in history. When we found out about Marie Curie, we were instantly fascinated. We've never really learned about Marie's life before and after she discovered radium and polonium, so we wanted to learn more. We came upon this website about Marie Curie and started reading right away. As we read more, we made Marie Curie our National History Day topic. We were perplexed by how many accomplishments she made and how many challenges she overcame.

## **How We Conducted Our Research**

When we started our research, we knew Marie Curie had discovered two elements but not much else. We had started on the internet looking at websites and then went to find some books in our school and the local library. In class, we had time to find many great primary and secondary resources that contributed to our understanding of Marie Curie's life and accomplishments. When we came across the website for the Library of Congress, we knew we could find a lot of great primary sources such as newspapers, letters, and photographs. All of our primary sources helped us understand in detail about important events. Our secondary sources helped a lot as well giving us specific timelines and events in her childhood and in her adulthood.

## **How We Selected Our Category And Created Our Project**

We had always loved being in performances and the excitement that can come with acting. After we both agreed to do a performance, we started by looking at previous group

performances on the National History Day website. After looking at previous junior group performances, we began to form an idea of how we wanted our performance to go. We made a rough draft of our script and started to think of possible props that we needed. After timing and reading through our script a number of times, we started revising our script until it met our satisfaction and the time limit. After we wrote our final script, memorizing our script was key.

### **How Our Topic Relates To The National History Day Theme**

Marie Curie is our topic this year and she broke many barriers in history. Our topic relates to the National History Day theme because Marie Curie was a scientist who was the first woman to do many things in the world of science. She was the first woman to discover an element and she even discovered a second element later on in life. Her discoveries resulted in a Nobel Prize in Physics and Chemistry, as well as many other medals. In fact, Curie was the first woman to earn a Nobel Prize and the first person to earn two Nobel Prizes. Marie Curie was also the first female professor at the Sorbonne, and the first woman to be entombed in the Paris Panthéon for her honorable scientific achievements.

# Annotated Bibliography

## Primary Sources

### Books

#### Traité de Radioactivité

Marie Curie, "Traité de Radioactivité," *Hay Exhibits*, accessed January 12, 2020, <https://library.brown.edu/exhibit/items/show/49>

This website has Marie Curie's thesis on radioactivity. This was helpful in providing us with information on Marie's work on radium and radioactivity.

#### Remarks of President Harding

"Remarks of the President in Presenting to Madam Curie a Gift of Radium from the American People." *The Library of Congress*, [www.loc.gov/item/21026534/](http://www.loc.gov/item/21026534/).

This is a booklet that holds President Harding's remarks when giving Marie Curie a gram of radium. This was very useful in the paragraph of our play about Curie's visit to America.

### Letters

#### Library of Congress

"Letter from Marie Curie to Alexander Graham Bell, September 28, 1903." *The Library of Congress* <https://www.loc.gov/resource/magbell.12200101/?sp=1>

This is the letter from Marie Curie to Alexander Graham Bell. It goes to show that Marie had formed bonds with other scientists working on improving the world.

#### Albert Einstein Letter

Popova, Maria. "Don't Heed the Haters: Albert Einstein's Wonderful Letter of Support to Marie Curie in the Midst of Scandal." *Brain Pickings*, 19 Apr. 2016, [www.brainpickings.org/2016/04/19/einstein-curie-letter/](http://www.brainpickings.org/2016/04/19/einstein-curie-letter/).

This is the letter that Albert Einstein sent Marie Curie to live her spirits in the midst of the scandal with Langevin. It gave us a great look at how Einstein supported Curie and all of the work she did.

## Newspapers

### Library of Congress

“Evening Star. [Volume], October 13, 1929, Image 95.” *Library Of Congress*, The Library of Congress <https://chroniclingamerica.loc.gov/>

This newspaper gave us information on Marie’s returning trip to America. This is important because it shows how other people, especially in other countries, supported a woman of science.

### Library of Congress

Harding, Warren G. Remarks of the President in presenting to Madam Curie a gift of radium from the American people. Washington, Govt. print. off, 1921. Pdf. Retrieved from the Library of Congress, <[www.loc.gov/item/21026534/](http://www.loc.gov/item/21026534/)>.

This website had the document that had remarks of President Harding presenting a gift of radium to Marie Curie. This helped us see what the President of the United States thought of Marie Curie.

### Library of Congress

Jennifer. “Marie Curie: A Gift of Radium.” *Marie Curie: A Gift of Radium | Inside Adams: Science, Technology & Business*, 10 Mar. 2015, [https://blogs.loc.gov/inside\\_adams/2015/03/marie-curie-a-gift-of-radium/](https://blogs.loc.gov/inside_adams/2015/03/marie-curie-a-gift-of-radium/)

This website gave us a look at how newspaper writers in different countries think of Marie Curie’s discovery of radium. Such as, how people in America viewed the founding of this new element.

### Library of Congress

“New-York Tribune. [Volume], December 17, 1899, Page 8, Image 8.” *Library Of Congress*, The Library of Congress, [https://chroniclingamerica.loc.gov](https://chroniclingamerica.loc.gov/)

This newspaper gave us some information on Marie Curie finding radium and polonium. This also gave some input on how the higher class and the public view her discoveries.

### Library of Congress

“New-York Tribune. [Volume], May 22, 1921, Page 3, Image 47.” *Library Of Congress*,  
This newspaper gave us a look at Marie and her discoveries. It went on to explain  
her achievements and how extraordinary her discoveries were.

Library of Congress

“The Washington Times. [Volume], March 13, 1921, FINAL EDITION, Image 1.”  
*Library Of Congress*, The Library of Congress, <https://chroniclingamerica.loc.gov>  
This newspaper is a primary source because it came out when Marie Curie was  
still alive. Plus, this newspaper gives great detail on the Marie Curie Radium Fund  
and her trips to America.

## Photographs

Library of Congress

“*Curie*” - *Prints & Photographs Online Catalog (Library of Congress)*,  
<https://www.loc.gov/>

This website gave us articles and pictures of Marie Curie and Pierre Curie during  
their lifetimes. As well as pictures of Marie with her daughters and Marie  
throughout her lifetime.

Library of Congress

“[Mme. Marie Curie].” *The Library of Congress*, [www.loc.gov/item/2014687674/](http://www.loc.gov/item/2014687674/).  
This photograph gave us a good idea of how Marie Curie dressed. We used this as  
a reference for what our costumes such look like in our performance to get as  
much historical accuracy as possible.

## Quotes

Marie Curie Quote

Curie, Marie. “Marie Curie Quote.”

This is a quote by Marie Curie on how you should never stop trying. This goes to  
show that she kept trying no matter what. We used this in our performance to  
show her point of view on life.

Nobel Prize Ceremony Quote

“The Nobel Prize in Chemistry 1911.” *NobelPrize.org*

This website gave us a quote from the Nobel Prize Ceremony, which awarded  
Marie Curie the Nobel Prize in Chemistry, which we used in our performance.

## Secondary Sources

### Books

#### The Chain Reaction

Fox, Karen. *The Chain Reaction: Pioneers of Nuclear Science*. Produced in Braille for the Library of Congress, National Library Service for the Blind and Physically Handicapped by National Braille Press, 2000.

This book had a chapter on Marie Curie. It told the life of Marie Curie. We used this to begin our project and understand the basics.

#### Marie Curie: A Life of Discovery

Milani, Alice, and Kerstin Schwandt. *Marie Curie: A Life of Discovery*. Graphic Universe, 2019.

This book gave us great detail on the most important things that happened to Marie Curie. It had conversations, letters, and Marie Curie's thoughts. We used this to create the letters between the two sisters and used Marie Curie's thoughts.

#### Obsessive Genius: The Inner World of Marie Curie

Goldsmith, Barbara. *Obsessive Genius*. W. W. Norton & Company, Inc., 2005.

This book gave a very detailed account of both Marie Curie's personal and professional life. It contained photographs and excerpts from her journal and her daughter Eve's journal. We learned many things about Curie and her family from this source.

### Websites

#### When Women Crowdfunded Radium For Marie Curie

Eschner, Kat. "When Women Crowdfunded Radium For Marie Curie." *Smithsonian Magazine*, 19 May 2017,

<https://www.smithsonianmag.com/smart-news/when-women-crowdfunded-radium-marie-curie-180963305/>

This website showed us how much Marie Curie needed radium to continue her research but it was too expensive at, \$100,000 which is about \$1.3 million today. This website also gave us information on her trip to the Radium Institute.

#### Marie Curie

"Marie Curie." *Encyclopedia Britannica*, 3 Nov. 2019,  
<https://www.britannica.com/biography/Marie-Curie>

The website gave a very detailed story of Marie Curie's life. It also contained a video of an interview with Alan Alda about his 2011 play *Radiance: Passion of Marie Curie*. We used the interview for some information on Marie's life and used the new information in our play.

### Marie Curie: Her Life, Achievements, and Legacy

Evans, Elinor. "Marie Curie (1867–1934): Her Life, Achievements and Legacy." *HistoryExtra*, 4 June 2019,

<https://www.historyextra.com/period/first-world-war/life-of-the-week-marie-curie/>

This website gave us some information on Marie Curie's achievements and what she left behind. Her legacy was very important to the woman working in the world of science. We used this website to understand what her achievements were and how they affected the future.

### Marie Curie Got Her Start At a Secret University For Women

Grunshauer, Eric. "Marie Curie Got Her Start At a Secret University For Women." *Atlas Obscura*, 4 Aug. 2016,

<https://www.atlasobscura.com/articles/the-secret-polish-university-for-women-where-marie-curie-got-her-start>.

This website helped us get information on how the Flying University started the curriculum for women and why. It also gave us information on Marie Curie at the Flying University. We used this to create a paragraph on her life at university.

### How the Work of Marie Curie Restricted the Advancement of Future Female Scientists

"How the Work of Marie Curie Restricted the Advancement of Future Female Scientists."

*How the Work of Marie Curie Restricted the Advancement of Future Female Scientists* | *Eukaryon* | Lake Forest College,

<https://www.lakeforest.edu/live/news/5493-how-the-work-of-marie-curie-restricted-the?preview=1>

This website showed how Marie Curie's discovery overshadowed those of other female scientists.

### Marie and Pierre's Life and Discoveries

Marie and Pierre Curie and the discovery of polonium and radium. NobelPrize.org. Nobel Media AB 2019. Wed. 24 Apr 2019.

<https://www.nobelprize.org/prizes/themes/marie-and-pierre-curie-and-the-discovery-of-polonium-and-radium>

This site gave us some valuable information on how they earned their Nobel Prizes and how they made their discoveries. It also gave us information on Marie and Pierre's life.

### Marie Curie

"Marie Curie." Famous Scientists. famousscientists.org. 8 Sep. 2014. Web. 8/24/2019  
<[www.famousscientists.org/marie-curie/](http://www.famousscientists.org/marie-curie/)>.

This site gave us an outlook of Marie's achievements.

### Marie Curie: 7 Facts on the Groundbreaking Scientist



McHugh, Brendan. "Marie Curie: 7 Facts on the Groundbreaking Scientist."  
*Biography.com*, A&E Networks Television, 24 June 2019,  
[www.biography.com/news/marie-curie-biography-facts](http://www.biography.com/news/marie-curie-biography-facts).

This website gave us a few facts on Marie Curie's work and accomplishments.

It is a secondary source because it did not come directly from someone in her time period or Mrs. Curie herself.

Library of Congress

*The Library of Congress*, The Library of Congress,  
[www.loc.gov/search/?q=radium&st=gallery](http://www.loc.gov/search/?q=radium&st=gallery).

This website gave us a look at everything published on radium. This is a secondary source because it wasn't all published during the time when Marie Curie was alive.



*Kinsley:* "There is nothing more to be said. Anything about Polish culture is illegal and worst of all, you are a girl. We restrict the way women can learn and what women can learn, and you are no exception."

*(Kinsley leaves and takes the book with her. She exits behind the curtain.)*

*Lucy:* "Instances like this happened all over Russian controlled Poland. In 1863, the Ministry of Education had sent out a decree to every university council in the country banning women from enrolling in college. But that barrier didn't stop women willing to learn. The Flying University began in Warsaw, the capital of Poland, in 1882. Secret classes for women began taking place in private homes, moving from house to house to avoid the detection of the government. Lectures and seminars were taught by Polish historians, philosophers, and professors who could not only give others a proper education but one that celebrates Polish heritage without the influence of outside powers. In 1883, at the age of fifteen, Maria graduated from secondary school at the top of her class. She dreamed of attending the University of Warsaw, but there were two great barriers standing in her way."

*(Kinsley, dressed as Maria's father, is sitting at a table and Lucy goes to stand by her father.)*

*Kinsley:* "So, Maria... graduation is arriving here soon. Have you thought about what you're going to do after school?"

*Lucy:* "Father, you know I want to attend the University of Warsaw and continue my education."

*Kinsley:* *(Takes Lucy's hand.)* "Maria, I am so glad you find happiness in learning but I am afraid that I do not have enough money to send you to college. Also, you are a woman. You know that-"

*Lucy:* "I know the University of Warsaw does not accept women but I must try, Father. I'll get a job and earn enough to send myself to college. I can only hope that people will open their minds to see that everyone should get a true education... even women."

*(Lucy exits behind curtain.)*

*Kinsley:* *(Gets up to leave)* "I can only hope so."

*(Kinsley steps up to the front.)*

*Kinsley:* "When Maria was 16, she made a pact with her sister, Bronisława, that Maria would work as a private tutor and set aside money to pay for Bronya's tuition at medical school in Paris, and her living expenses. She also attended classes at the Flying University. After two years, Maria soon figured out that she wasn't saving money efficiently so she changed her job to governess. While working, Maria communicated with her sister through letters like this."

*(Kinsley exits behind curtain.)*

*Lucy: (while sitting at the table writing a letter)* "My dear sister Bronya, if you only knew how I long to go to Warsaw, if only for a few days... Let's not even speak about the state of my clothes- but my soul too is worn out. Ah, if I could leave this icy atmosphere for just a few days... The constant control I must keep over my words, my expression, my movement... it wears me out. If a man's family won't let him marry a poor governess, he can go to Hell! Besides, nobody asked him to. But why pile on? Why upset an innocent soul? My plans for the future? I have none. Or rather, they are too commonplace and simple to mention. If I ever had any others, they have gone up in smoke. I have buried them. Locked them up. Sealed and forgotten them."

*(Lucy exits behind curtain, as Kinsley comes out, dressed as Bronya, and sits down at the table.)*

*Kinsley: (while writing)* "My little Manya, you must make something of your life. If you can manage to save a few hundred rubles this year, you can come and live with us in Paris next year. I guarantee that in two years you will have your master's degree. Now is your time to decide. You have been waiting too long. Think about it. You can't waste your gifts on a man who will not marry you. And you have gifts. I know it."

*(Kinsley exits behind the curtain, as Lucy enters.)*

*Lucy:* "After Maria ended her job as a governess at three years, she moved to Paris to enroll at the Sorbonne University. At first, she lived in the home of her sister and her husband. Maria became Marie when she enrolled at the Sorbonne in the fall of 1891. Marie went to the university from 1891-1897, constantly working through the barriers of being one of the only women in college. Marie completed her education with a master's degree in physics and another in mathematics."

*Kinsley:* "While still in university, Marie met Pierre, who was also a scientist studying crystals. Marie started researching a new strange substance that was found while using x-rays. The two were then married in 1895. The couple began

working together in a small shack on February 1, 1896. They examined a number of metals, salts, oxides, and minerals. Marie soon discovered that the more uranium they contain, the more active they were. But two uranium minerals were more active than uranium: pitchblende and chalcocite. In April 1898, Curie's research revealed that thorium compounds, like those of uranium, emit Becquerel rays. Again the emission appeared to be an atomic property. To describe the behavior of uranium and thorium, she invented the word "radioactivity" -based on the Latin word for ray. All of these things she did took years to accomplish. It was no doubt a struggle for the Curie's, but all of that hard work they did paid off."

*Lucy:* "On July 18, 1898, Marie and Pierre came upon the discovery of a new element. Marie named this new element polonium after her native country, Poland. On December 26, 1898, Marie and Pierre Curie examined another new strange substance that they concluded was radioactive. After testing and examining this material, they figured out that it was a new element, which they named radium after its abundance of radioactivity. The research that Marie and Pierre did with radioactivity was absolutely extraordinary. Together with her husband, she was awarded half of the Nobel Prize for Physics in 1903, for their study into the spontaneous radiation discovered by Becquerel, who was awarded the other half of the Prize. In fact, Marie Curie was the first woman to earn a Nobel Prize."

*Kinsley:* "Unfortunately, the radiation that is given off of the two elements can weaken a person over time by killing living cells. Everyone believed that radiation had curative properties, even though the truth was that it was extremely dangerous. They would use it in different types of products, even in foods and drinks. With Marie and Pierre working in a small shack with lots of radioactive exposure, they slowly became weaker. Sadly, a tragedy occurred on April 19, 1906."

*(Lucy is standing at a table examining a test tube of radium, while Kinsley runs in as a male friend, obviously distraught.)*

*Kinsley: (While gasping for breath)* "Marie, I... I have some bad news.

*Lucy:* "What is it?"

*Kinsley:* "Pierre, he... he was hit by a wagon and... *(pauses and voice begins to trail off)* was too weak to get up."

*Lucy: (Turns head slowly and looks at the test tube of radium)* "You... did this to him! All of this radiation made him weak. Oh, Pierre! I'm so sorry."

*(Lucy walks out crying)*

*Kinsley:* "Since Pierre worked as a professor at the Sorbonne University, Marie Curie was given the opportunity to take the job, which is exactly what she did. She kept up with her scientific studies and learned more about radium and polonium. In the year of 1910, people finally started to realize the effects of radium. The Nobel Prize in Chemistry, 1911, was awarded to Marie Curie, 'in recognition of her services to the advancement of chemistry, by the discovery of the elements radium and polonium, by the isolation of radium and the study of the nature and compounds of this remarkable element.' This was a huge accomplishment, not only for the scientific community but for women in the world of science! Marie Curie was the first person to win two Nobel Prizes."

*(Kinsley exits behind curtain.)*

*Lucy:* "Marie Curie died on July 4th, 1934 due to aplastic anemia, a blood disease that often results from exposure to large amounts of radiation. Throughout Marie's life, she suffered from depression and many hardships. However, with help from fellow scientists, she persevered through it all to become a trailblazer that no one will ever forget. Her achievements with radium and radioactivity were used to help develop the beginnings of chemotherapy. Marie Curie was the first woman to be buried at the Pantheon in Paris for her scientific achievements. Not only that, but she wasn't even French, as were all of the other honorable people buried there. In fact, Marie was a woman of many firsts. She was the first woman to earn a Nobel Prize, the first person to earn two Nobel Prizes, and the first woman to teach at the Sorbonne."

*(Kinsley enters.)*

*Kinsley:* "Marie Curie was an amazing scientist and woman. She was known to be one of the greatest minds to live. Marie earned her first Nobel Prize in physics, the Davy Medal, the Matteucci Medal, the Elliott Cresson medal, Nobel Prize in Chemistry, the Willard Gibbs Award, the Benjamin Franklin Medal, and the John Scott Legacy Medal and Premium. Using additional money, they started the Marie Curie Fellowship award. Her contributions to science broke many scientific and gender barriers. Although she was discriminated against for being a woman working in the field of science, she strived to achieve impossible feats in physics and chemistry. Marie Curie once said, 'Life is not easy for any of us. But what of that? We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained.'"

*(Kinsley and Lucy bow.)*

