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Marie Curie: The Quantum Matriarch

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Marie Curie: The Quantum Matriarch

Abstract

Entitled "Marie Curie: The Quantum Matriarch," this paper illuminates the extraordinary life and enduring legacy of Marie Curie, whose groundbreaking work in radioactivity revolutionized the scientific landscape. Born as Maria Skłodowska in the heart of Warsaw, Curie's odyssey from Poland's clandestine Flying University to the hallowed halls of Paris' Sorbonne epitomizes her tenacious quest for enlightenment amidst the shackles of societal norms. In collaboration with her spouse, Pierre Curie, she discovered the elements polonium and radium, thereby introducing the concept of "radioactivity" to the world and securing Nobel accolades in both Physics and Chemistry. This paper ventures into her intimate tribulations and professional adversities, spotlighting the scourge of gender discrimination and the harrowing repercussions of radiation. The Curies' pioneering research not only propelled the frontiers of science but also forged pivotal pathways in medical therapeutics, particularly in oncology. Marie Curie's monumental legacy, immortalized by her resting place in the Panthéon, stands as a beacon of inspiration, underscoring a relentless pursuit of truth that surmounts the confines of gender and societal limitations. Through a tapestry of historical chronicles and nuanced storytelling, this paper pays homage to Curie's colossal imprint on science and her unyielding spirit.

Keywords

Marie Curie, Biography, Life, Quantum Mechanics, Women in Science, Radioactivity Research, Nobel Laureates in Physics

Disciplines

History of Science, Technology, and Medicine | Philosophy of Science | Physics

Comments

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“Marie Curie: The Quantum Matriarch”

M. Skłodowska Curie

Introduction

Once upon a time, in the heart of Paris, there was a laboratory that glowed with an otherworldly light. It was here that Marie Curie, a scientist of unparalleled brilliance, launched on a quest that would alter the course of history. Marie's journey began in a world where the contributions of women were often overshadowed by their male counterparts. Yet, she was determined to carve her own path through the mysteries of the quantum realm. Her relentless pursuit of knowledge led to the discovery of two peculiar elements, which she named “Polonium” and “Radium”. These discoveries were so groundbreaking that they earned her not one, but two Nobel Prizes, making her the first woman to receive such an honor and the only person to be awarded in two different scientific fields.

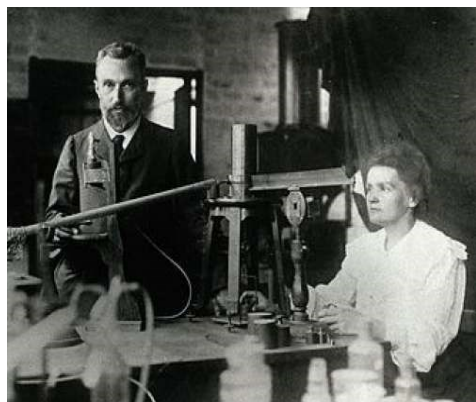
The Curies, Marie and her beloved husband Pierre, became the dynamic duo of the scientific world. Together, they unlocked the secrets of radioactivity, a term that Marie herself coined. Their work was not just a partnership of minds, but a symphony of souls, harmonizing to unravel the fabric of the universe. In time, Marie's discoveries led to the founding of the Curie Institutes in Paris and Warsaw, trajectory foundations of medical research that would shine for generations to come. But her journey was not without peril. The very elements that brought her fame also brought a silent foe—radiation. It was an invisible battle that Marie fought bravely until her last breath in 1934. Marie's final resting place is the Panthéon in Paris, a monument reserved for the nation's heroes. Her entombment there is not just a recognition of her scientific achievements, but a symbol of her indomitable spirit. **This paper**, a blend of fact and fiction, pays homage to Marie Curie's extraordinary life. It is a tale of triumph and tragedy, of a woman who dared to dream in a world that was just waking up to the potential of the atom. Her legacy is a reminder that the quest for knowledge knows no gender, and the light of discovery shines on those who dare to seek it.

Life, Love, and Education

In the land of Poland, in the city of Warsaw, under the roof of a house filled with the love of learning, was born a girl named Maria Skłodowska. It was the year 1867, and the world was yet to witness the brilliance she would bring. Maria grew up in a family where education was the most cherished treasure, despite the shadows of financial hardship and personal loss that loomed over them. Her father, Władysław, a sage of numbers and nature's laws, instilled in his children the flame of curiosity. Maria, the youngest of five, was no stranger to adversity. Her path to knowledge was blocked by the gates of higher education, which stood firmly closed to women. But where there's a will, there's a way, and Maria found hers through the secret corridors of the Flying University, where forbidden knowledge was shared in whispers.

Curie hailed from a Polish family of educators, with her parents both working as teachers. However, their employment was unstable, leading to frequent moves and a gradual downsizing of their living quarters. Tragedy struck when Curie was just 11 years old, with the loss of her mother to tuberculosis and her oldest sister to typhus.

After her excellent school examination results, she had to stop her studies as girls were not admitted to universities in Poland. She decided to give private lessons to help support her family, particularly her sister Bronislawa who was a medical student in Paris. During her teenage years, Curie struck a deal with her sister Bronya: she would provide financial support for Bronya's medical studies in Paris, with the expectation that Bronya would later assist Curie. To fulfill her end of the bargain, Curie worked as a governess and private tutor from the age of 17, juggling her responsibilities while striving to pursue her own studies during whatever spare moments she could find.



A pact of dreams was made with her sister Bronislawa, a promise to lift each other up to the heights of academia. And so, with a heart full of hope and a mind thirsty for knowledge, Maria set off for Paris in 1891. At the age of 24, she transformed into Marie, the Sorbonne's star, diving deep into the facts of physics, chemistry, and the enigmatic world of mathematics.



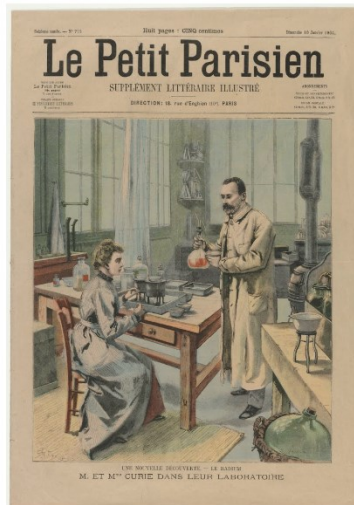
In the City of Lights, Marie's destiny intertwined with Pierre Curie, a professor in general physics at the Municipal School of Industrial Physics and Chemistry (Paris), a man whose passion for the unseen matched her own. Their love story was not just written in letters and glances but also in the language of science. Together, they danced with the atoms, uncovering the secrets of magnetism and the phenomenon of radioactivity. Their union was sealed in 1895, not just in matrimony but in a partnership that would etch their names in the annals of science. They shared everything from the thirst of discovery to the simple joys of cycling through the French countryside and exploring the world beyond their laboratory. *Fig 1 (Right: Władysław Skłodowski, daughters (from left) Maria, Bronislawa, Helena, 1890)*

“[Pierre] had dedicated his life to his dream of science: he felt the need of a companion who could live his dream with him.”- Marie Curie

In Pierre, Marie found her equal, her ally, her collaborator in the grand adventure of life and science. Despite initial reluctance due to plans of returning to Poland, Marie was convinced by Pierre to pursue a Ph.D. Their journey was a testament to the power of love and intellect, a duet that resonated through the ages, inspiring those who dare to dream and discover. They had two children named Irène Joliot-Curie (1897–1956) and Eve Curie (1904–2007). And so, the legacy of Marie Curie, born Maria Skłodowska, continues to shine, a beacon for all who follow in her footsteps, seeking to unravel the mysteries of the universe. *Fig 2 (Left: Pierre and Marie Curie in the laboratory, c. 1904)*

Common Work Between the Love Birds: Discovery of Radioactivity

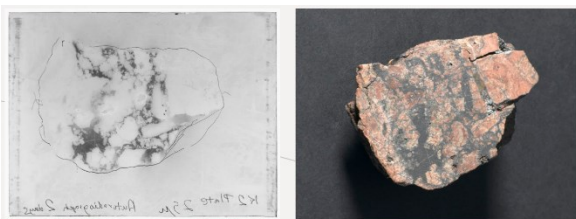
Between 1895 and 1905, following Pierre Curie's guidance, Marie Curie worked hard on a study of the properties of radiation initially observed by Henri Becquerel. She coined the term "radioactivity" to describe the phenomenon she investigated. In 1898, the Curies unlocked two novel radioactive elements, polonium and radium, present in minute quantities within uranium ores. Marie defended her doctoral thesis on "the new radioactive substances" in June 1903, shortly before jointly receiving the Nobel Prize in Physics with Pierre Curie and Henri Becquerel. This recognition marked a turning point in their lives. Despite their newfound fame, they persisted in their research under challenging conditions.



Front page of the newspaper "Le Petit Parisien" on January 10th 1904 with a drawing representing Pierre and Marie Curie in their laboratory. Source : Musée Curie (coll. imprimés), 1904-01-10. From the collection of Musée Curie

With her husband Pierre's electrometer in hand, she started decoding uranium rays. Her experiments whispered a bold new hypothesis: radiation was an affair of the atom's heart. The Curies' quest was fraught with trials. Yet, their resolve was unyielding. And so, in the summer of 1898, the world heard of "polonium" and "radium", siblings born of the Curies' relentless toil. Their pursuit to isolate these elusive elements was a Herculean task, especially the ghostly radium, which bounced just beyond their grasp. But triumph awaited them, as their findings revealed radium's power to vanquish tumor cells—a hope in the battle against the unseen enemy within. *Fig 3 (Right: Pierre and Marie Curie in the laboratory, c. 1904)*

"We therefore believe that the substance which we have isolated from pitchblende contains an unknown metal. If the existence of this new metal is confirmed, we propose to call it "Polonium", from the name of the country of one of us." - P. Curie and M. S.-Curie, Science Academy Report, July 18th, 1898



Marie's scholarly triumphs soared. She became the first woman to grace the faculty of the École Normale Supérieure, while Pierre joined the ranks of the University of Paris. In the summer of 1903, Marie, now Dr. Curie, emerged with a doctorate, her name etched in the annals of academia. In

1903, for their work, Marie Curie, her husband Pierre, and Henry Becquerel, were awarded the Nobel Prize for Physics. The Nobel Prize committee reportedly first considered giving the award to Pierre Curie and Henry Becquerel, but Pierre worked behind the scenes to ensure that Marie Curie won appropriate recognition by being included. Yet, the shadows of gender bias loomed large, silencing her voice at the Royal Institution in London. As the world marveled at radium, commercial interests took hold, reaping fortunes from the Curies' labor of love—a labor from which they never sought to profit. *Fig 4 (Left: Marie Curie also discovered polonium and radium. Science Museum Group (CC by 4.0))*



Marie Curie explains to a group of nurses the potential benefits of radium treatment, 1916 © Association Curie Joliot-Curie

During the tumult of World War I, Curie advocated the application of X-rays in medical settings. She pioneered the development of radiological vehicles, affectionately dubbed "petites Curies," to facilitate on-site X-ray examinations for injured soldiers, enabling more precise surgical interventions on the battlefield. Curie's strong belief in the societal benefits of

scientific inquiry spurred her efforts, driven by her earlier findings alongside her husband regarding the efficacy of radium in targeting malignant cells, a breakthrough in cancer treatment.

Amidst their groundbreaking research, the Curies balanced their scientific pursuits with family life, raising two daughters, Irène and Eve. Pierre Curie, deeply committed to Marie's work, eventually redirected his own scientific endeavors to collaborate with her on the study of radioactivity. *Fig 5 (Marie Curie explains to a group of nurses the potential benefits of radium treatment, 1916 © Association Curie Joliot-Curie)*

From Wife to Professor: Tragic Events

It was in 1903 that Marie and Pierre lost a child, born prematurely. Radiation poisoning from working with radioactive substances had begun to take a toll, though the Curies did not know it or were in denial of that. They were both too sickly to attend the 1903 Nobel ceremony in Stockholm. In 1904, Pierre was given a professorship at the Sorbonne for his work. The professorship established more financial security for the Curie family—Pierre's father had moved in to help care for the children. Marie was given a small salary and a title as Chief of the Laboratory. That same year, the Curies established the use of radiation therapy for cancer and lupus, and their second daughter, Ève, was born. Ève would later write a biography of her mother. In 1905, the Curies finally traveled to Stockholm, and Pierre gave the Nobel Lecture. But Marie was annoyed by the attention to their romance rather than to their scientific work. Undeterred, she assumed Pierre's teaching duties and became the first woman to hold a professorship at a French university. Despite facing personal and professional adversity, Marie's strong determination and scientific contributions earned her international acclaim, culminating in her Nobel Prize in Chemistry in 1911.

But security was short-lived, as Pierre was killed suddenly in 1906 when he was run over by a horse-drawn carriage on a Paris Street. This left Marie Curie a widow with responsibility for raising her two young daughters. Marie Curie was offered a national pension but turned it down. A month after Pierre's death, she was offered his chair at the Sorbonne, and she accepted. Two years later she was elected a full professor—the first woman to hold a chair at the Sorbonne.

Scientific Contributions and Noble Prizes

"It was like a new world opened to me, the world of science, which I was at last permitted to know in all liberty." - Marie Curie

Throughout her life, Madame Curie actively advocated for the use of radium to alleviate suffering. During World War I, she, along with her daughter Irene, personally dedicated herself to this remedial work. Madame Curie maintained her passion for science and played a significant role in

establishing a radioactivity laboratory in her hometown. In 1929, President Hoover of the United States presented her with a gift of \$50,000, contributed by American science enthusiasts, to purchase radium for the laboratory in Warsaw.

Madame Curie, characterized by her quiet dignity and humility, earned widespread esteem and admiration from scientists worldwide. She served on the Conseil du Physique Solvay from 1911 until her passing and had been a member of the Committee of Intellectual Co-operation of the League of Nations since 1922. Her scientific contributions are documented in numerous papers and publications, including "Recherches sur les Substances Radioactives" (1904), "L'Isotopie et les Éléments Isotopes," and the seminal "Traité de Radioactivité" (1910).

The significance of Madame Curie's work is evident in the numerous accolades she received. She was awarded honorary degrees in science, medicine, and law, as well as honorary membership in learned societies worldwide. Alongside her husband, she was honored with half of the Nobel Prize for Physics in 1903 for their research into spontaneous radiation discovered by Becquerel. In 1911, she received a second Nobel Prize in Chemistry for her contributions to radioactivity. Additionally, she and her husband were recipients of the Davy Medal of the Royal Society in 1903. In 1921, President Harding of the United States presented her with one gram of radium on behalf of the women of America, recognizing her invaluable service to science. *Fig 6 (Right: Marie Curie (left foreground) with U.S. Pres. Warren G. Harding, 1921.)*



Marie Curie with the US President Mr. Harding, Washington D.C. May 20th 1921. (Pub. A.C.C.S. Source: World-Cart Book, A.C.C.S., 1903-1926, from the collection of Musée Curie)



Marie Curie driving the Renault car that she converted into a radiological unit during the first World War, 1917 © Association Curie Joliot-Curie



One of Marie Curie's mobile x-ray units used by the French Army (Bibliothèque nationale de France, département Estampes et photographie)

During World War I, Marie Curie chose to support the French war effort actively. She put her prize winnings into war bonds and fitted ambulances with portable x-ray equipment for medical purposes, driving the vehicles to the front lines. She established two hundred permanent x-ray installations in France and Belgium. *Fig 7 (Left: Marie Curie*

driving the Renault car that she converted into a radiological unit during the first World War, 1917 © Association Curie Joliot-Curie)

After the war, her daughter Irene joined Marie Curie as an assistant at the laboratory. The Curie Foundation was established in 1920 to work on medical applications for radium. Marie Curie took an important trip to the United States in 1921 to accept the generous gift of a gram of pure radium for research. In 1924, she published her biography of her husband, P. Curie.

Attempted Scandal

In the subsequent years, Marie Curie dedicated herself to organizing her research efforts, overseeing the work of fellow researchers, and securing financial support. Her comprehensive work, the Treatise on Radioactivity, was published in 1910. However, in early 1911, Marie Curie faced disappointment when she fell short of election to the French Academy of Sciences by just one vote. Emile Hilaire Amagat said of the vote, "*Women cannot be part of the Institute of France.*"

Marie Curie refused to have her name resubmitted for nomination and refused to allow the Academy to publish any of her work for ten years. The press attacked her for her candidacy. Nevertheless, that same year she was appointed director of the Marie Curie Laboratory, part of the Radium Institute of the University of Paris, and of the Institute for Radioactivity in Warsaw, and she was awarded a second Nobel Prize.

Tempering her successes that year was a scandal: a newspaper editor alleged an affair between Marie Curie and a married scientist. He denied the charges, and the controversy ended when the editor and scientist arranged a duel, but neither fired. Years later, Marie and Pierre's granddaughter married the grandson of the scientist with whom she may have had the affair.

International Legacy and Meeting with Albert Einstein

Marie Curie's path in the world of science was full of important discoveries, but it also had its share of complicated relationships with other scientists, like Albert Einstein. Despite Einstein's occasional private remarks about her, their interaction at the inaugural Solvay Conference in 1911 left a lasting impression on both. As the youngest participant, Einstein was impressed by Curie's "*sparkling intelligence*," while Curie, already an esteemed scientist, was equally impressed with him. Their mutual admiration led Curie to provide Einstein with a glowing reference that aided in securing his first professorship in Prague. In the face of the scandal involving her alleged affair, which made the papers (or made the news) just after the conference, Curie became embroiled in controversy due to rumors of an affair with her colleague Paul Langevin.



Fig 8 (Right: Albert Einstein (back, second from right) and Marie Curie (front, Second from right) met at the 1911 Solvay Conference on Physics.)

Einstein, offering his support, advised her to ignore the negative press—a testament to their budding friendship. Their collaboration truly blossomed in 1922 when they embarked on nine years of joint projects for League of Nations committees. Though records of their interactions during this time are scarce, their shared commitment to scientific endeavors is evident. Their final meeting at the Solvay Conference in 1933 occurred just months before Curie's passing, solidifying the depth of their friendship. Einstein's tribute to Curie following her death provides poignant insight into their relationship. He praised her "*human grandeur*" and admired her strength, purity of will, and objectivity—a testament to the profound impact she had on him. While historical documents offer glimpses into their connection, the true depth of their friendship remains a subject of fascination and speculation.



Fig 9 (Left: Visit of the Radium Institute by the french President Doumergue, 1928 (coll. ACJC), Source : Musée Curie (coll. ACJC), 1928, From the collection of: Musée Curie)

Marie Curie's eminence as a scientist led her to participate in numerous scientific and medical congresses, where her insights were highly valued. Her laboratory served as an international model for the study of radioactive substances and the application of radiation in combating cancer. In 1920, she co-founded the Curie Foundation with Dr. Regaud, establishing it as a global authority in cancer treatment through radiation. However, the scarcity of radium posed a significant challenge to her research endeavors. To address this, a substantial fundraising campaign was organized among American women in 1921 to procure one gram of radium for Marie Curie. Her trip to the United States to receive this donation was a moment of great pride. In 1922, Marie Curie's stature in the scientific community was further recognized when she was elected as a member of the Academy of Medicine. She also served on the International Committee on Intellectual Cooperation of the League of Nations. Marie Curie's influence extended beyond national borders, as she traveled extensively to advocate for her laboratories' scientific pursuits and collaborate with fellow scientists worldwide. Under her leadership, research on radiation flourished at the Radium Institute, culminating in the discovery of artificial radioactivity by Irene and Frederic Joliot-Curie in 1934.



Marie Curie planting a tree at the Radium Institute of Warsaw, May 29th 1932 (coll. ACJC). Source : Musée Curie (coll. ACJC), 1932-05-29, From the collection of: Musée Curie

Fig 10 (Right: Marie Curie planting a tree at the Radium Institute of Warsaw, May 29th 1932 (coll. ACJC), Source : Musée Curie (coll. ACJC), 1932-05-29, From the collection of: Musée Curie)

“The undersigned members think that the Academy would be honored by electing Madame Curie as an associate member, in recognition of the part she has played in the discovery of a new treatment: curietherapy.”- Academy of Medicine, February 7th, 1922

Challenges Faced as a Woman in the Early 20th Century

Marie Curie's journey through the scientific world was one defined by perseverance, determination, and the relentless pursuit of knowledge. Despite male dominance in the sciences and higher education, her thirst for knowledge led her to the Sorbonne in France, where she pursued studies in physics and mathematics. Her early years at the Sorbonne were marked by academic excellence, earning her top honors in physics and second place in mathematics. Yet, even in the academic sphere, the challenges of being a woman persisted. In the words of Katarzyna Siewierska, *“Marie was not allowed to speak, and Pierre gave the talk.”* This injustice, though glaring, did not deter Marie from her pursuit of scientific discovery. She became the first woman to win a Nobel Prize and remains the only person to have won Nobel Prizes in two different scientific fields—physics and chemistry.

“I was taught that the way of progress was neither swift nor easy.”- Marie Curie

Inspired by the groundbreaking discoveries of Wilhelm Röntgen and Henri Becquerel, Marie put on her own research into the radioactive properties of uranium ore. As Katarzyna Siewierska aptly observes, *“Marie's achievements make her a true pioneer, as she was the first truly successful female scientist.”* Her legacy continues to inspire generations of scientists, serving as a beacon of hope for those who dare to defy convention and pursue their passions, regardless of the obstacles they may face.

During this challenging period, Marie Curie's unwavering commitment and dedication to her scientific pursuits garnered international acclaim. *“She was being discouraged from going to Stockholm to collect the prize; however, she believed that her personal life had nothing to do with her career and that she deserved to go and accept the prize and have dinner with the King of Sweden.”*, says Katarzyna Siewierska.

In the late 19th and early 20th centuries, societal norms and cultural expectations imposed significant barriers for women in the scientific community. Women were often denied access to formal education, barred from academic institutions, and excluded from professional opportunities. The prevailing belief was that women were intellectually inferior to men and lacked the capacity for rigorous scientific inquiry. Curie's early experiences at the Flying University in Poland, where forbidden knowledge was shared clandestinely, illustrate the lengths to which she and other women had to go to access education. Even after relocating to France and enrolling at the Sorbonne, Curie faced discrimination and skepticism from male peers and educators. Despite earning top honors in physics and mathematics, she was often overlooked and underestimated due to her gender.

Navigating these challenges required not only exceptional intellect and dedication but also strategic alliances and support networks. Curie found a crucial ally in her husband, Pierre Curie, who recognized and valued her scientific abilities. Their partnership, both personal and professional, allowed Marie Curie to flourish in her research and overcome many of the barriers she faced as a woman in science. However, even with Pierre's support, Curie still had to contend



Eve, Marie and Irène, 1908 (coll. ACJC), Source : Musée Curie (coll. ACJC), 1908, From the collection of: Musée Curie

1908 (coll. ACJC), Source : Musée Curie (coll. ACJC), 1908, From the collection of: Musée Curie

with institutionalized sexism and gender bias. Despite her groundbreaking discoveries in radioactivity, she was initially excluded from prestigious scientific societies and denied recognition for her contributions. The Nobel Prize committee, for example, initially considered awarding the Nobel Prize solely to Pierre and Henri Becquerel, overlooking Marie's essential role in their research. Nevertheless, she refused to be sidelined or silenced by the prevailing attitudes toward women in science, advocating for her work and challenging the status quo. Through her groundbreaking research and achievements, Curie not only shattered gender stereotypes but also paved the way for future generations of women in STEM fields.

Health Struggles and Death

“It would be a fine thing, in which I hardly dare believe, to pass our lives near each other, hypnotized by our dreams: your patriotic dream, our humanitarian dream, and our scientific dream.”- Letter from Pierre to Marie, August 1894

The Curies, pioneers in their field, embraced the glow of discovery, unaware of the silent specter that lurked within. The very essence of their work, the radiant materials they so carefully studied, bore a hidden cost. It was a time when the world was naive to the dangers of the invisible force

they had harnessed. As the years passed, the toll of their endeavors became heartbreakingly clear. Both Marie and her daughter Irene, who followed in her mother's scientific footsteps, were struck down by the cruel hand of leukemia, a likely legacy of their lifelong dance with radioactivity. Marie's notebooks, filled with observations and secrets of the atomic age, turned into relics too potent for human touch, their pages saturated with the silent power that defined her life's work. The twilight of the 1920s brought with it a dimming of Marie's own light. Her vision, once so keen and bright, was clouded by cataracts, a veil drawn across her eyes by the very discoveries that had brought her fame. Seeking solace and respite, Marie retreated to a sanatorium, a haven amidst the mountains, where she was joined by her youngest daughter, Eve. Despite her success, Marie continued to face great opposition from male scientists in France, and she never received significant financial benefits from her work. By the late 1920s her health was beginning to deteriorate. She died on 4 July 1934 from leukaemia, caused by exposure to high-energy radiation from her research.

Conclusion

Marie Curie was more than just a scientist; she was a trailblazer who refused to be confined by the societal norms of her time. Her contributions to quantum mechanics and her impact as a role model for women in science continue to be felt today. As we reflect on her life and work, we are reminded of the power of resilience, the importance of curiosity, and the transformative potential of science.

Works Cited

- Farmelo, Graham. "When Einstein Met Curie: Historical Documents Hint at a Fulfilling Friendship Between the Two Physicists." *Science*, 2 July 2021, pp. 33, <https://www.science.org/doi/pdf/10.1126/science.abj1411>, Accessed 14 Apr. 2024.
- "Marie Curie." Nobel Prize, *Nobel Media* AB 2022, <https://www.nobelprize.org/womenwhochangedscience/stories/marie-curie>, Accessed 15 Apr. 2024.
- Musée Curie. "Discover the Incredible Life and Work of Marie Curie: The Scientist Who Carried Radioactive Radium in Her Pockets." Musée Curie, https://artsandculture.google.com/story/KAVBRtM_cxEA8A, Accessed 15 Apr. 2024.
- Marie Curie – Nobel Lecture. NobelPrize.org. Nobel Prize Outreach AB 2024. Mon. 15 Apr 2024. <[https://www.nobelprize.org/prizes/physics/1903/marie-curie/lecture/Lewis, Jone Johnson](https://www.nobelprize.org/prizes/physics/1903/marie-curie/lecture/Lewis_Jone_Johnson). "Marie Curie: Mother of Modern Physics, Researcher of Radioactivity." ThoughtCo, Dotdash Meredith, 2019, <https://www.thoughtco.com/marie-curie-biography-3529555>
- Siewierska, Katarzyna. "The Struggles and Contributions of Marie Curie." Trinity News, 3 March 2017, <https://trinitynews.ie/2017/03/the-struggles-and-contributions-of-marie-curie>
- "Marie Curie (1867 - 1934)." BBC, British Broadcasting Corporation, https://www.bbc.co.uk/history/historic_figures/curie_marie.shtml
- Encyclopedia Britannica. "Marie Curie." *Encyclopedia Britannica*, Encyclopædia Britannica, Inc., 31 Mar. 2024, <https://www.britannica.com/biography/Marie-Curie/Death-of-Pierre-and-second-Nobel-Prize>
- Lewis, Jone Johnson. "Marie Curie: Mother of Modern Physics, Researcher of Radioactivity." ThoughtCo, Dotdash Meredith, 16 Mar. 2019, <https://www.thoughtco.com/marie-curie-biography-3529555>
- "Marie Curie (1867-1934)." Womenpedia, the wiki of inspiring women, Womenpedia Org., Last edited by Administrator, 29 Oct. 2023, <https://www.womenpedia.org/en/women-in-stem/marie-curie>
- <https://geniuses.club/genius/marie-sklodowska-curie>