

Marie Curie, an extraordinary scientist and human being who still inspires us

Erika Poggiali,¹ Gianfranco Cervellin²

¹Emergency Department, Guglielmo da Saliceto Hospital, Piacenza; ²Academy of Emergency Medicine and Care, Pavia, Italy

Maria Salomea Skłodowska-Curie (7 November 1867 – 4 July 1934), known simply as Marie Curie, is surely the best-known scientist remembered as the first and only person and woman awarded with the Nobel Prize twice and in two different scientific fields:

Correspondence: Erika Poggiali, Emergency Department, “Guglielmo da Saliceto” Hospital, Via Giuseppe Taverna 49, Piacenza, Italy.

Tel.: +39.0523.303044

E-mail: E.Poggiali@ausl.pc.it

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in physics for her research of radiation phenomena (1903) and in chemistry for the discovery of polonium and radium (1911).¹ She was also the first woman in France to earn a Ph.D. and later became the first woman professor at the Sorbonne University (1906).

Marie Curie is often remembered as one of the most famous women in the history of science for her groundbreaking research in radioactivity, a term she coined along with her husband, Pierre Curie.

What is less well-known is her unwavering dedication to her research. Her remarkable qualities included a passion for science, high intelligence, a strong belief that her work would benefit humanity, and the perseverance to face the challenges ahead. For all these reasons, she chose not to patent her discoveries, believing that science should be accessible to all. This act of altruism reflects her deep belief in the importance of sharing knowledge and scientific progress for the common good.

It is remarkable how Marie Curie was never undeterred by the physical and personal hardships she faced. Throughout her life, she encountered significant challenges in overcoming the patriarchal prejudices of her time, striving to be recognized as an intellectual, a scientist, and ultimately as a professional woman. She worked tirelessly to dismantle numerous barriers and fight prejudices in order to “school the world” into not discriminating amongst scientists, just for the sake of science.

As a scientist, she experienced discrimination not only because of her gender but also her nationality. Initially, she was barred from attending certain universities due to her gender, and she was often excluded from presenting her research, even when she was the leading expert. Additionally, being a Polish immigrant in France further contributed to the discrimination she endured; she was labelled a “foreign woman” and faced attacks based on her background. The French Academy of Sciences repeatedly rejected her applications, underscoring the prejudice against women in science during that era.

Despite these challenges, Marie Curie’s brilliance and perseverance enabled her to make significant contributions to science and to overcome many obstacles in her path. For this reason, she is remembered not only for her scientific achievements but also for her tenacity in the face of adversity.

Few know that she was also a major “scientific hero” during World War I. Along with her 17-year-old daughter, Irène (Figure 1), who became her first radiological assistant, she saved millions of soldiers thanks to her extraordinary invention, the “radiological car”. X-rays had been discovered by Wilhelm Conrad Röntgen just a few years earlier, in 1895, thus the idea to incorporate them into an ambulance service was absolutely revolutionary. To realize her extraordinary project, she learned how to drive and took intensive courses in anatomy, the use of X-ray equipment, and auto mechanics. Just two months after the war began, she persuaded the government to allow her to establish France’s first military radiology centers.^{2,3}

As the newly appointed Director of the French Red Cross Radiology Service, she successfully convinced wealthy Parisian acquaintances to donate money and vehicles. When the government urged citizens to contribute their gold and silver, Marie Curie offered her two Nobel medals, along with all the other honours she had received over the years. Although the French National Bank declined her offer, Marie Curie still contributed by using most of her Nobel Prize money to purchase war bonds.

Marie Curie played a crucial role in transforming automobiles into mobile medical units during wartime. She persuaded automobile body shops to convert cars into vans and appealed to manufacturers to contribute to the war effort by donating equipment. This initiative led to the invention of the first “radiological car”, a vehicle equipped with an X-ray machine and photographic darkroom equipment, capable of reaching the battlefield where army surgeons could use X-rays to assist in surgeries. One significant challenge was the requirement for electrical power to produce the X-rays. Marie Curie addressed this issue by incorporating a dynamo — an electrical generator — into the car’s design, allowing the petroleum-powered car engine to provide the necessary electricity. By late October 1914, the first of 20 radiology vehicles, which French soldiers affectionately called “Petites Curies” (little Curies), was ready. These vans became the world’s first specially equipped mobile X-ray units.

However, the “Petites Curies” were useless without trained X-ray operators. To address this, Marie Curie initiated training courses for women volunteers, teaching them the skills needed to serve as radiological assistants at the Radium Institute. With the help of her daughter Irène, she recruited 20 women for the first training course. The curriculum included theoretical instruction on the physics of electricity and X-rays, as well as practical lessons in anatomy and photographic processing. Ultimately, a total of 150 women received X-ray training from Marie and Irène Curie.⁴

A photograph from 1914 shows Marie Curie driving a Renault automobile that had been converted into a mobile radiological unit (Figure 2). She was directly involved in assisting front-line hospitals, examining both soldiers and civilians on her own. Marie Curie installed X-ray equipment and provided guidance to medical staff. In addition to the mobile “Petites Curies” that travelled around the battlefield, she oversaw the construction of 200 radiological rooms at various fixed field hospitals located behind the battle lines. It is estimated that around 1.2 million wounded individuals were examined thanks to either the “Petites Curies” or the fixed X-ray units. Although she was often perceived as distant and somewhat aloof in her work, Marie Curie demonstrated compassion and active listening skills that reassured the wounded soldiers. As she stated, “the use of X-rays during the war saved the lives of many injured men; it also spared many from long suffering and lasting infirmity.”

The war ended on November 11th, 1918, but Marie Curie’s work related to the war continued for nearly another year. In the spring of 1919, she and her daughter Irène offered radiology courses to a group of American soldiers who remained in France while waiting for their passage home. That summer, Marie Curie summarized much of her wartime work in a book titled *Radiology in War*.⁴ By the fall of 1919, her laboratory at the Radium Institute was finally ready, and she would devote most of the rest of her life to it. Although few of the women X-ray workers were injured as a consequence of combat, they were not without their casualties. Many suffered burns from overexposure to X-rays. Marie Curie understood that high exposures posed future health risks, such as cancer later in life. Unfortunately, there had been no time to perfect X-ray safety practices in the field, leading to many X-ray workers

being overexposed. She was deeply concerned about this and later wrote a book on X-ray safety, drawing from her war experiences.

Marie Curie survived the war but was apprehensive that her extensive X-ray work would eventually lead to her demise. She died at the age of 66 in 1934 from aplastic anemia, a condition caused by years of exposure during her work. Her daughter, Irène, went on to continue her mother’s research and studies, and was awarded the Nobel Prize for Chemistry in 1935, just one year after her mother’s death, for having discovered artificial radioactivity, which is at the base of all the radioisotopes now available. Tragically, Irène also paid a high price for her studies: she died at the age 59 from leukemia, probably caused by ionizing radiation exposure.³

In the biography *Obsessive Genius: The Inner World of Marie Curie*, Barbara Goldsmith portrays Marie Curie as a “humanitarian hero of unparalleled vision, determination, and courage” who tried to balance a scientific career with her family obligations, the prejudice of society, the constant search for funding, and the struggle for recognition.^{5,6} As we look toward 2025, Marie Curie’s story remains relevant. Between 1901 and 2024, only 65 women have

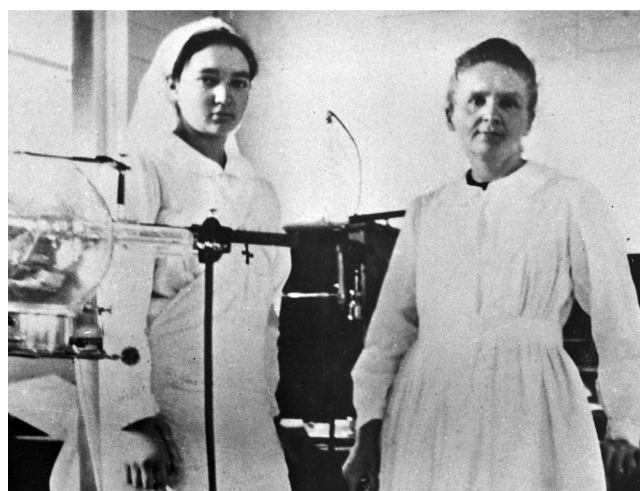


Figure 1. Marie Curie (right) and her 17-year-old daughter, Irène.



Figure 2. Marie Curie at the wheel of the first “Petite Curie”.

been awarded Nobel Prizes, compared to 874 men. Notably, Marie Curie is the only woman, and the only human being, to have received this honour twice (excluding Nobel Prizes for Peace). The most common categories for women Nobel laureates are Peace and Literature, while the rarest are Physics, Economics, and Chemistry.

In 2025, women still encounter significant challenges in professional opportunities. Despite advancements in various fields, they continue to face significant obstacles such as the gender pay gap, underrepresentation in leadership roles, and the ongoing struggle to balance work and family responsibilities. The life story of Marie Curie reflects the experiences of many women worldwide who continue to pursue their studies and careers with passion, curiosity, and tenacity, despite facing similar difficulties to those encountered by Marie Curie in the early twentieth century. From a romantic perspective, one might feel that Marie Curie is out there, silently yet powerfully cheering all women on.

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