A Biographical Sketch

Maria Salomea Skłodowska was born in Warsaw, Poland, on 7 November 1867 as the fifth child of Władysław and Bronisława (née Boguska) Skłodowski.* Her father was a teacher of physics and mathematics and her mother was the headmistress of a prestigious school for girls. Maria's parents raised her in a very patriotic atmosphere, even though Poland did not exist then as an independent country and Warsaw was under Russian occupation. Maria wrote, "Our father . . . used to translate foreign poems into Polish. On Saturdays we gathered to listen to him reading the masterpieces of Polish poetry and prose, we enjoyed these evenings immensely. . . ."

Maria suffered much under Russian oppression in her school days, but finally graduated from the state school with a gold medal at the age of 16. Since the Skłodowski family was very poor, Maria attempted to earn a living through private tutoring as her eldest sister Bronisława had done. On the other hand, the two teenagers attended lectures of the so-called "floating university" secretly organized in Warsaw. Maria wrote later, "I belonged to those young Poles who believed that the only hope for our nation was in a great effort to develop our intellectual and moral strength."

In the second half of the nineteenth century, higher education in the Russian empire was not open to women. Thus, Maria made a pact with her sister that would enable them to achieve their common aim to study in Paris. Maria would provide financial help to Bronia for her medical studies in Paris, which Bronia would later repay by helping Maria move to Paris to study. Maria had to undertake work as a governess with several families in turn. The most important of these jobs was at the Żórawski estate at Szczuki, less than 100 km north of Warsaw, where she organized a secret Polish primary school for the children of local peasants. She also fell in love for the first time, with the handsome Kazimierz Żórawski, but his parents did not want to hear about any plans for marriage.

Maria Skłodowska's father, Władysław, and mother Bronisława.

Maria came back to Warsaw and spent one year with her father, giving lessons again. She spent her evenings working at the laboratory of the Warsaw Museum of Industry and Agriculture, learning qualitative and quantitative chemical analysis, the chemistry of minerals, and gaining practice in various procedures. Maria wrote, "I developed there my taste for experimental research during these first trials." Maria left Poland for Paris in October 1891.

Maria Skłodowska was 24 when she registered as Marie Skłodowska at the Sorbonne to pursue a master's degree in physics. She soon discovered she was not as well prepared for university studies as she had thought. The scientific material was challenging and she needed more practice in French to fully understand the lectures. She first lived with her sister and brother in law, Casimir Dluski, and then decided to rent a room much nearer to the Sorbonne: "I am working a thousand time as hard as at the beginning of my stay." She became haunted by her studies, neglecting her health and not eating enough, up to the point of fainting. Her favorite subject to study was physics.

In June 1893, the result of her labors exceeded her own expectations: she had the highest score in the master's examination. Thanks to the efforts of a comrade, Miss Dydynska, the "Alexandrovitch Scholarship"

* In the Polish language the family name of women may have the ending "ska," whereas the male members of the family may have names ending with "ski."

Maria's parents with teachers at the school for girls.

was given to Marie, allowing her to study for another year in Paris. She received the second highest score in the master's examination in mathematics in 1894. That same year she met Pierre Curie.

Marie had been awarded a small grant to perform a systematic study of the magnetic properties of different kinds of tempered steels. A Polish professor, J. Wierusz-Kowalski, suggested that Marie meet Pierre Curie whom he thought could provide good advice on her research. Years before, Pierre had discovered piezoelectricity with his brother Jacques. He had later formulated symmetry laws in physics. More recently, he had developed extremely difficult experiments on magnetic properties as a function of temperature and established the well-known Curie law.

The Tschechoslovak Medal of 1967 commemorating the 100th anniversary of Marie Curie's birth. The inscription, in Latin, evokes Jachymov (Joachimstal) as the place from which the uranium ore for the Curies came.

The first time that Marie and Pierre met, it was clear that they had much in common. Their first conversation became a scientific dialogue, with Marie discussing her research problems and Pierre explaining his own research. This was quite striking for a man who had written in his diary many years before that "women of genius are rare." Pierre wanted to see Marie again. She explained that she would leave France the next summer, and that her duty was to settle in her homeland as a teacher. Eventually, she changed her mind and they were married on 26 July 1895.

Stamp block from the Republic of Guinea, 2001, showing Marie Curie in her laboratory. Note: the dates of birth and death are erroneously those of Pierre Curie.

The young couple rented a small flat in Paris, very near the school for physics and chemistry where Pierre Curie was a professor and had his laboratory. Marie was allowed to work at the school, an exceptional decision at the time. There, she finished her study of steel's magnetic properties. In the meantime, she prepared for the national competitive examination for teaching positions at secondary schools for girls. She never applied for a position. Instead, a few weeks after the birth of her first daughter in September 1897, she decided to prepare a thesis on the new radiation discovered by Henri Becquerel.

The spontaneous emission of radiation by uranium was a weak but very puzzling phenomenon. Marie would use a quantitative approach to go further than Becquerel's results: the precise measurement of electric charges produced by uranic rays in a primitive ionization chamber. This work was made possible by the extreme sensitivity of a piezoelectric quartz apparatus developed by Pierre.

The story of the discovery of polonium and radium is summarized in the three notes that Marie and Pierre sent to the French Academy of Sciences in 1898. The note published in April by Marie alone underlined a decisive result: two uranium minerals, found to be more active than uranium itself, may contain an unknown element. The second note (in July on polonium) was published with Pierre and the third (in December on radium) was published with Pierre and Gustave Bémont. In their research, polonium and radium were observed as traces among other elements. Marie then focused, with Pierre's help, on the separation of pure radium and the measurement of its atomic mass.

On 25 June 1903, she defended her thesis at the Sorbonne: "Researches on Radioactive Substances." The thesis was soon published and translated into several languages. That same year, Pierre and Marie Curie shared with Henri Becquerel the Nobel Prize in Physics for their research on radioactivity. In the meantime, Marie had been chosen to give lectures two times a week at the well-known École Normale Supérieure de Sèvres, an appointment that provided her with a small salary.

The Nobel Prize money undoubtedly eased the couple's financial situation. The prize also stimulated the authorities to nominate Pierre Curie as a full professor at the Sorbonne. As a consequence, Marie was appointed as Pierre's assistant (chief of work); her first official position. The thunderous notoriety which followed the Nobel Prize was, on the other hand, disruptive as it interfered with the research plans of the couple and their family life as well. "One would like to dig into the ground somewhere to find a little peace," Marie wrote to her brother.

A Polish stationery postcard of 1938. This version was meant for foreign mail and thus has inscriptions in Polish and French (a similar postcard for inland mail has inscriptions only in Polish).

Family life was quite important for Marie, in spite of her deep involvement in scientific research. The needs and progress of her children, Irène and second daughter Eve, born in December 1904, were a constant preoccupation. She had remained close to her family in Poland and was actively interested in everything concerning her motherland. A holiday stay with Pierre at Zakopane in the Polish Tatra mountains in 1899 was a happy occasion that brought together all of her family. Marie's sister and brother-in law, the Dulskis, had established a sanatorium in Zakopane. Later, Marie would send her daughters there for summer vacations and join them and her family for a short time in 1911. The two girls learned to speak and write her native language of Polish, but Marie deliberately raised them following French traditions.

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At the beginning of 1906, Marie's life seemed to have reached a happy equilibrium. She performed experiments about one or another question raised by controversial results published in the rapidly developing field of radioactivity. When the weather was fine, she used to spend a few days in the countryside near Paris with Pierre and the children. On Thursday 19 April, Pierre attended a meeting with other professors, but without Marie. It was raining when he left and as he crossed a street without noticing a heavy horse-drawn wagon he was run over and killed. Marie would never completely overcome the sudden catastrophe.

When the French government offered Marie an annual pension as Pierre's widow, she refused, stating that she was only 38 and could work. What she really desired was a laboratory to continue her research.

Marie's future as a scientist was at risk after Pierre's death. At the insistence of fellow professors, the council of the Faculty of Science finally decided to confer Pierre's chair to her along with the directorship of the laboratory. She was appointed two years later as a full professor. She soon resumed her work at the laboratory, focusing on radiochemical research, calibration of radium sources, and the preparation of the first radium standard.

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Marie was awarded the Nobel Prize in Chemistry in 1911 for the discovery of radium and polonium. This important event occurred as she underwent a dramatic period in her life. Her supposed affair with her colleague Paul Langevin had turned into a scandal with the publication of correspondence that they claimed, in vain, had been falsified. The French authorities were shaken enough by the campaign against Marie that they pushed for her to resign. A delegation from the Warsaw Scientific Society, headed by the famous Polish writer and Nobel Prize winner Henryk Sienkiewicz, visited Marie in Paris. They asked her to return to Warsaw and continue her research there. She refused. However, in 1913 she accepted the position of honorary director of the Radiological Laboratory in Warsaw and was admitted as an honorary member of the Warsaw Scientific Society, although she remained in Paris.

Her own laboratory, in rue Cuvier, was not large enough for the increasing number of scientists interested in the new field of radioactivity. The "fight for a laboratory" came to fruition in 1912 with the con-

Marie Curie (left), shown here with the Joliot-Curies and their young children.

struction of the Radium Institute. The first part of the laboratory was nearly finished when the war broke out in 1914. During the four years of the war, Marie's main preoccupation was organizing radiology and radiotherapy services for military hospitals.

With the war over, the Radium Institute slowly resumed its research in a country ruined by the war. In 1921, Marie Mattingly Meloney, the editor of a women's magazine in the United States, organized a subscription campaign among American women in order to offer one gram of radium to Marie Curie on her visit to the States. Marie's subsequent visit culminated with a reception at the White House with President Warren G. Harding. She came back from her travels with additional funds, equipment, and radioactive products for the Radium Institute.

At the same time, the Curie Foundation was created. Marie strongly supported the medical use of X-rays and radium radiation to treat cancer. She became a very active vice president in the International Committee on Intellectual Cooperation created by the League of Nations. Since Poland had become a free nation again, she visited with her family on different occasions. The last time was in 1932 when she took part, as honorary director, in the opening ceremony of the Warsaw Radium Institute. She donated to the Institute the gram of radium bought with the money collected in the States in 1929 via a second subscription campaign.

Irène, Marie's eldest daughter, became her closest assistant. And then, when Irène married Frédéric Joliot, she got another assistant and before long became a happy grandmother. She used to spend summer holidays partly with the family on the coast of Brittany, partly in the south of France. In her later years, Curie managed the Radium Institute and pursued her own research. In January 1934, her daughter and son-in-law discovered artificial radioactivity. It was a last joy for Marie, who died six months later. A few months following her death, the Nobel Prize in Chemistry was awarded to the Joliot-Curie couple "in recognition of their synthesis of new radioactive elements."

In this photograph taken by Ms. Lipkowski, her husband, Prof. Lipkowski (president of the Committee of Chemistry of the Polish Academy of Science) stands under a mural of Marie Curie in Warsaw. The large letters read "I was born in Warsaw." The smaller print says, among other things, that "Whenever she was giving a talk she started by saying 'I was born in Warsaw.'"

This biographical sketch was compiled by Hélène Langevin-Joliot and Jerzy Kroh.