HEALTH HEROES

MARIE CURIE

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THIS STORY of the life of MARIE CURIE is an adaptation by GRACE T. HALLOCK from the book MADAME CURIE, written by her daughter, EVE CURIE, translated by VINCENT SHEEAN, and copyrighted 1937 by Doubleday, Doran & Company, Inc., New York.

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The mother whom little Manya adored

Little Manya

There were five children—four girls and one boy—in the Sklodovski family, and Marya, whose pet name was Manya, was the youngest. Her father, Vladislav Sklodovski, was professor of physics and under-inspector in a high school for boys, and the family lived in one wing of the high-school building. Here the little girl Manya lived happily for a while, with her sisters and brother and her kind father and the gentle, beautiful mother whom she adored. She played merry, noisy games with the younger children in a great square room where four beds stood one in each corner. With her older sister Zosia she went for walks in the garden near her home. But most of all she loved to read or to sit and dream on a little hassock near her mother.

Of all their many cousins the Sklodovski children were the only ones who lived in the city. In every part of Poland they had relatives who were farmers and who had room enough in their houses to take in the professor and his family in the fine summer weather. Even as a tiny child Manya looked forward during the cold, bleak winter to happy holidays in the country, where she paddled in the brook and made mudpies, which she put out to dry in the sun, and climbed trees and shared with her country cousins in their secret stores of plump gooseberries and tender young carrots and sweet cherries and cool crackling cabbage leaves. She was always to keep her love for the sights and sounds of the countryside where as a child she lived the outdoor life of a hardy little peasant.

Dark Years

When Manya was only 6 years old a succession of catastrophes struck the Sklodovski family. The father's salary was reduced and his lodging in the boys' high school was taken away from him because he was not humble enough to suit the Russian authorities. The family's manner of living changed. The professor was obliged to take several young boys to board, and the house in which the family had finally settled became like a noisy barracks. All this was bad enough, but real trouble came when two of Manya's sisters, Bronya and her beloved older sister Zosia, came down with typhus fever. Zosia died, and for little Manya this was the first encounter with a great sorrow. Two years later, when she was 10 years old, she lost her beloved mother too. Thus the little girl who was to become Marie Curie learned early that life could be hard and sad as well as gay, or fanciful, or sweet.

School Days in Poland

Manya had learned to read when she was 4 years old. It was her great passion. While she was reading she completely lost consciousness of what was happening around her. Her sisters and friends often tried to get her to raise her eyes from a book by making a great hubbub or playing tricks on her, but their efforts were all in vain. Combined with this ability to concentrate, Manya had the gift of a remarkable memory. In school nothing seemed hard for her. Although she was the youngest in her class she was always first in arithmetic, in history, in literature, in languages, and in catechism. When she was 10 years old she attended a private Polish school for girls, where the school-

Manya with her brother and sisters. Left to right—Zosia, Hela, Manya, Joseph, and Bronya

A scene in the ancient city of Warsaw where Manya was born

mistress dared to teach the history and literature of Poland in Polish. When a Russian inspector came to spy on the school Manya was always called upon to recite because she spoke Russian perfectly and always knew the answers to the questions asked by the inspector. Inwardly rebellious but outwardly obedient, the little girl repeated the names and dignities of Russian rulers with a perfect Russian accent and then, when the inspector had departed satisfied, burst into tears.

When she was 14 years old, Manya went to the government high school. It was a great change, after attending a Polish school, to become the pupil of an official institution governed by Russians. But it was a necessary change, for the government schools were the only ones that granted recognized diplomas. Manya and her bosom friend, a merry little girl named Kazia, were, like all Poles, ardent patriots. Their way of showing scorn for the oppressor of their beloved country was to make secret fun of their Russian teachers. But in spite of everything, honest Manya had to confess to Kazia that she liked school—even that she loved it. When she graduated in June 1883 she was presented with a gold medal for scholarship.

One Carefree Year

Her school days over, the great question was what to do next. Professor Sklodovski was barely able to pay for rent and food on his small salary as a professor. The four Sklodovski children—Joseph, Bronya, Hela, and Manya—would have to earn their own livings. For one glorious year, however, Manya did not need to worry about her future. For the first and last time in her life she tasted the joys of laziness. She visited her relatives, first in one province and then in another, continually discovering new beauties in the country earth over which her family was scattered. She helped to organize merry parties and dances, and one night she danced away the soles of her fine new shoes.

The Sisters

Back in Warsaw after her year of roaming, Manya began to earn her living by giving private lessons to the children of wealthy families. At the same time she continued her studies by attending night classes taught by Polish teachers, who gave their services free.

But this busy life of work and study was not enough for the impetuous 17-year-old girl with the short rebellious curls and the dreaming ash-gray eyes. How could she ever quench her thirst for knowledge in a city where the university was closed to women? And what of Bronya, who had for so long kept house for them all without one murmur of complaint, but whose great secret wish was to go to Paris and study medicine in the famous French university called the Sorbonne?

Manya forgot her own dreams to help Bronya. "I've thought a lot lately," she said

Professor Sklodovski with his grown-up daughters, Manya, Bronya, and Hela

to her sister one day. "I've also talked to father. And I think I've found out a way."

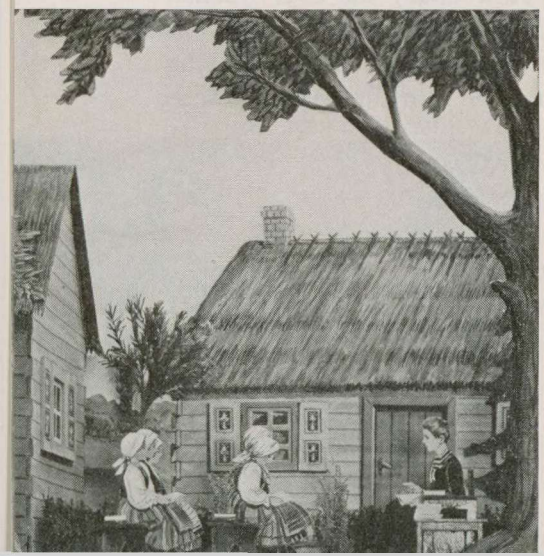
Bronya looked up, puzzled, from the figures she was scribbling on a piece of paper as she counted up her money. "A way?" she asked.

Manya's great idea was to get a job as governess in a family so that she could earn enough money to help Bronya go to Paris. When her sister protested Manya said: "You are 20 years old. I am only 17. You have been waiting for years, and I've got lots of time. When you are making money, you can help me."

The Governess

Manya's first job as governess was in the city of Warsaw, where she could be near home and see her father every day. But when she heard of a better-paid job far from home she did not hesitate. For three long years she lived in an isolated country house surrounded by flat beet fields as far as the eye could see. She taught the children of the family, and in her free time pored over out-of-date textbooks of mathematics and physics trying to teach herself the subjects she loved.

One day she met some little peasants in the muddy road, boys and girls miserably dressed, with bold faces under their hempen hair. Instantly there was born again an early dream—to serve her country by bringing the light of knowledge to the poor peasant folk who in those days were kept in the darkness of ignorance by their rulers. And so she organized a little school, where at the day's end she taught peasant children what their parents and their parents' parents could not do—to read and write.



Manya teaching a class of peasant children
From diorama by Francis J. Rigney

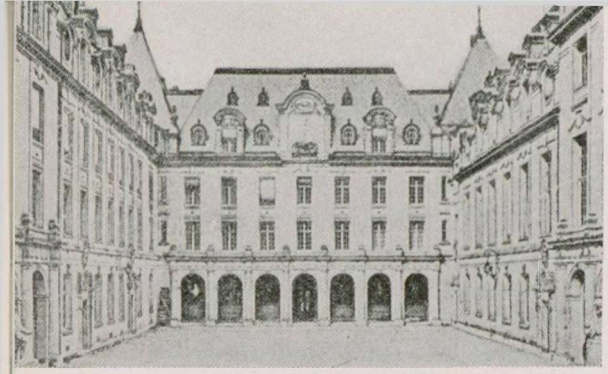
Off to Paris

In 1891, after years of waiting, it was Manya's turn to go to Paris and study at the Sorbonne. Her father had retired from teaching and had obtained a post which enabled him to help a little with the education of his daughters. Bronya was married to a brilliant young Polish physician and the two were practicing medicine in Paris. "And now you, my little Manya; you must make something of your life some time," wrote Bronya.

"Little Manya" was 24 years old by then. She had almost given up the thought of making something of her life. But urged by her sister, who offered her a home in Paris, she at last found herself rumbling across Germany toward the city of her dreams, sitting on a folding chair in a fourth-class railway carriage almost as bare as a freight car, and surrounded by all sorts of awkward packages—food and drink for three days on the train, books, a little bag of caramels, a quilt . . .

The University

A double-decked omnibus drawn by three horses labored up the steep slope of the Boulevard Saint-Michel in the city of Paris. Sitting on top where the seats were cheapest was a fair-haired girl clutching an old portfolio of worn leather. For the first time she was breathing the air of a free country. For the first time she heard people all about her speaking the language they wished to speak. The horses slowed down, then stopped. She was in the street running—running toward the great iron gate of the Sorbonne, the greatest,



The interior court of the Sorbonne

the most famous of all universities.

With the small amount of money she had saved, ruble by ruble, the girl had won the right to listen to whatever courses she chose in the Faculty of Sciences. She had a right to a place in the science laboratories, where she could handle apparatus and make simple experiments. She was not Manya any more; she was not even Marya. She was Marie—shy, stubborn-faced, and poorly dressed, but with happiness lighting up her ash-gray eyes.

A Spartan Existence

During her early days in Paris, Marie lived with her sister and brother-in-law. But their apartment was too far from the University; every day Marie had to spend a few precious pennies for bus fare. Besides, she could not find there the freedom from distraction that she needed. She considered every minute spent away from her studies as a minute lost.

After a family council it was decided that Marie should go to live in the Latin Quarter of Paris, which was near the Sorbonne. She had only about 60 cents a day to spend for lodging, food, clothes, coal, and her expenses at the University.

For three years, in one little attic after another, alike only in their cheapness and discomfort, she led a life devoted to study alone. She did not allow herself any friendships or diversions. She did not admit that she could be hungry or

cold. In order not to buy coal she often neglected to light her little stove, and wrote figures and equations without noticing that her fingers were getting numb and her shoulders shaking. For weeks at a time she ate nothing but buttered bread and tea. When she wanted a feast she bought herself a piece of chocolate or a half pound of cherries or a bunch of radishes. Often she worked through the night until 2 or 3 o'clock in the morning and then, after only four or five hours sleep, went to her classes.

This strange, inhuman existence changed the rosy-cheeked, healthy girl who had left Warsaw into a pale, thin shadow of her former self. But all that mattered to her was work. She felt equal to learning everything mankind had ever discovered. She specialized in mathematics, physics, and chemistry, and became familiar with the manual dexterity and minute precision necessary for scientific experiments. She loved passionately the "climate" of the laboratory, where silence and attention were the watchwords, and this love stayed with her until her last day on earth.

In July 1893 Marie slipped into the crowded amphitheater at the University, where the names of those who had passed their examination for the master's degree in physics were to be read in order of merit. In a sudden silence she heard the examiner pronounce first of all her own name: *Marie Sklodovska.*

One degree was not enough. Marie also wanted the master's degree in mathematics. After a vacation in Poland she returned to Paris, cheerful and a bit plump, having been stuffed with food for three months in all the houses of all the Sklodovskis in Poland, indignant as they were at her thinness. Her savings were all gone, but she had been awarded a scholarship which would last her for 15 months if she practiced rigid economy.

The old, hard life began once more—the life that in her hours of triumph and fame Marie looked back upon as the time when it came closest to perfection. To be young, to be lonely and poor, and yet to live to the fullest; to know herself to be the humble, unknown companion of the great scientists of the past, and yet to feel dimly that her destiny was linked with theirs—all this gave her a feeling of pride and contentment that she was never to have again.

Pierre Curie

One day in the home of a friend Marie met a French scientist of genius who taught in the municipal School of Physics and Chemistry. To Marie this Frenchman seemed young, although he was 35 years old. His old-fashioned clothes hung loosely on his tall body. His grave face, lengthened by a rough beard, was made beautiful by the depth and serenity of his eyes and the charm of his smile. His name was Pierre Curie.

Pierre saw a graceful girl with fair hair, ashen gray eyes, and a high, curved forehead, with hands stained by the acids of the laboratory and roughened by housework. The two began talking, and Pierre was astonished and charmed to find himself using technical terms, complicated formulas, in a conversation with a young and beautiful woman. She understood what he was saying. How wonderful that seemed to the lonely scientist!

Pierre as he looked when he first met Marie

It took Pierre a long time to persuade Marie to marry him. She felt that she could not leave her family forever and abandon her dreams of helping her oppressed fatherland. But at last Pierre won. On July 26, 1895, Marie awoke for the last time in her bare attic. She put on her wedding dress, a gift from the aged mother of her brother-in-law. "I have no dress except the one I wear every day," Marie had said. "If you are going to be kind enough to give me one, please let it be practical and dark, so that I can put it on afterwards to go to the laboratory."

The Young Couple

The flat of three tiny rooms in which the young couple settled in Paris was singularly lacking in comfort. They refused the furniture offered to them by Pierre's father. It would take too long to dust. The room in which they worked had bare walls and was furnished only with books, a white wooden table, an oil lamp, and two chairs—one for Marie, one for Pierre. There were no chairs for callers who might disturb their studies.

Pierre earned 500 francs (about $100) a month teaching at the School of Physics. This was all the couple had to live on, but that did not trouble them. The difficult thing was to get the work of one day into 24 hours. Marie passed the whole morning and afternoon in the laboratory of Pierre's school, where a place had been found for her. She was making a study of the magnetic properties of various steels which had been ordered by the Society for the Encouragement of National Industry. She was also studying for an examination which she must pass in order to teach in France. She had to keep the house clean and tidy, too, and learn how to cook. She did not even know what one put into soup. She was afraid her French mother-in-law might find out that she could not make an omelette and ask what on earth they taught young girls in Poland.

Little by little she improved in house-

"The little student," the picture of Marie that Pierre loved best

keeping wisdom. Before going to the laboratory she would regulate with a physicist's precision the gas flame under the stewpans in which the next meal was cooking. In a quarter of an hour she would regulate the flame on a laboratory burner with the same careful precision.

In the second year of their marriage a daughter was born to Marie and Pierre. She was Irène, a beautiful baby and a future Nobel prize winner. The thought never occurred to Marie that she might have to choose between family life and a scientific career. She had them both and cheated neither. She kept house, bathed her daughter, and then flew to the laboratory, leaving the baby under the watchful eye of her father-in-law, Dr. Curie.

Becquerel's Rays

At the end of the year 1897 Marie had to her credit two university degrees, a diploma which permitted her to teach, and a study on the magnetic properties of steels. The next step was the doctor's degree. Looking about for a subject for original research, she was attracted by a discovery made by a French scientist named Henri Becquerel.

There are certain substances that fluoresce, or glow, when they are exposed to light. Early in the year 1896, a few weeks after Wilhelm Konrad Roentgen had announced his discovery of X-rays, the French mathematician Henri Poincaré suggested that it might be worth while trying to find out whether or not the rays produced by these fluorescent substances are similar to X-rays. Becquerel undertook this investigation. Fortunately he

Pierre and Marie with the bicycles on which they took many pleasant trips

began his experiments with the salts of a rare, highly fluorescent mineral called uranium. He placed a small metal tray containing the uranium salts on a photographic plate wrapped in black paper. Then he exposed the salts and the plate to the sunlight. When the plate was developed he found that the place where the uranium salts had lain was revealed by dark spots on the plate.

One day when it was cloudy Becquerel put a photographic plate and a tray containing uranium salts into a dark drawer and forgot about them for several days. When he finally remembered to take them from the drawer, he hit on the idea of developing this plate immediately. To his great astonishment he found the same kind of dark spots on the plate. Becquerel concluded from this experiment that apparently neither sunlight nor fluorescence had anything to do with the power of uranium salts to darken a photographic plate. Further experiments proved that penetrating and invisible rays were *emitted spontaneously* from all uranium compounds, whether they were fluorescent or not.

Radioactivity

Marie Curie now entered the picture. She and Pierre were fascinated by the mystery of Becquerel's rays. Here was a chance for a great adventure into an almost unknown realm of science. But first Marie had to find a place to work. Her little corner in the school laboratory was not big enough for the equipment she would need. Finally the director of the school gave her the free use of a little glassed-in storeroom on the ground floor. The walls sweated with damp. In the winter it was very cold. Here Marie started out to measure the radiant energy of uranium rays. These rays make the air a conductor of electricity. The energy of the rays therefore can be determined by measuring the

electric current produced by their passage through the air. To do this Marie used a special kind of electrometer, which had been invented by Pierre and his brother Jacques. She first discovered that the intensity of uranium radiation could be measured very accurately, and that it depended upon the amount of uranium contained in the samples she examined.

It then occurred to her that uranium might not be the only chemical element capable of giving off these mysterious rays. Immediately she undertook to examine with her electrometer all the chemical elements or compounds of elements known at that time. She soon discovered that one other element, thorium, also gave out spontaneous rays like those of uranium. It was then that she gave the name *radioactivity* to this new form of radiant energy.

In her experiments, Marie not only examined simple compounds of uranium and thorium but also a large number of mineral specimens from the collection at the School of Physics. She knew in advance that those which contained uranium or thorium would be radioactive; that all the others would not. But in certain uranium and thorium ores, especially in a sample of an ore called pitchblende from a mine in Austria, she found radioactivity far more powerful than could be accounted for by the amount of thorium or uranium they contained. She must be mistaken. She did the experiment over 10 times, 20 times. The results were the same.

Remember that, time and again, she had measured the intensity of radiation from a given amount of pure uranium or pure thorium. She had analyzed her sample of pitchblende and knew how much pure uranium and thorium it contained. She knew, too, that no other known element was radioactive. It was simple—so very simple that it took her breath away. Mixed with the pitchblende ore there must be a very small amount of another chemical element far more powerful than uranium or thorium.

A New Element

The discovery of a new element is just as important in the world of elements where physicists and chemists are at home, as is the discovery of a new country in the familiar world of lands and seas. Although Marie had proved to herself that this new element must exist, she now had to make it come out of hiding. She must isolate it and announce with certainty, "It is there!" Pierre was so impressed with the results Marie had already obtained that he left his own important study of crystals to help her. Now there were two brains and four hands seeking the unknown element in the damp little workroom.

As the work progressed the two prospectors found that the highly radioactive material was centered in two different chemical fractions of the pitchblende. There were *two* new elements! In July 1898 they announced the existence of one, which Marie named *polonium* in honor of her beloved country. A few months later, in December 1898, they announced the existence of the other, to which they gave the name of RADIUM.

Now this does not mean that Marie and Pierre had actually seen and handled radium. They only knew of its existence because they had found in the pitchblende an element called barium, which is not itself radioactive but which was associated with a very small amount of something that made it highly radioactive. The radioactivity of this unknown something, in its pure state, therefore must be enormous.

Still, nobody had *seen* radium. Nobody had touched it or weighed it or examined it or put it in a bottle. "Show us some radium and we will believe you," said the doubting chemists. To prove to the world that radium really exists, Marie and Pierre Curie were now to labor for four years.

The Discovery of Radium

The Curies knew the method by which they could hope to isolate radium. But it meant treating huge quantities of pitchblende ore in order to obtain even a few grains of the precious metal. Where could the two scientists get enough ore? Where could they put it if they did get it? How were they to pay for it?

One morning a wagon loaded with heavy sacks drew up before the School of Physics. Pierre and Marie Curie ran bareheaded into the street in their laboratory gowns. Pierre was calm, but Marie could not contain her joy. It was pitchblende, *her* pitchblende. She cut the strings of the sacks and plunged her two hands into the dull brown ore, still mixed with pine needles from Bohemia.

The ore had come from mines where it had already been treated to extract uranium salts used in making glass. Marie and Pierre had figured that radium should remain intact in the ore after the extraction of uranium. The Austrian government had presented the Curies with a ton of this apparently worthless ore.

The only place they could find to carry on their experiments was an abandoned shack belonging to the School of Physics. This shed was separated from Marie's first little workroom by a courtyard. The shed had no floor. It was furnished only with some worn kitchen tables, a blackboard, and an old iron stove with a rusty pipe. When it rained, the roof leaked drop by drop in places that the scientists had to mark so that they would not put apparatus there. In the cold of winter they froze. In summer the shed was like a hothouse.

Marie had chosen as her part of the search the actual chemical treatments which would permit her to obtain salts of pure radium. Inside the shed her husband was absorbed

by delicate experiments. Outside in the courtyard, dressed in her old dirt-covered and acid-stained smock, her hair blown by the wind, surrounded by smoke which stung her eyes and throat, Marie was a sort of factory all by herself. Sometimes she passed the whole day stirring a bubbling mass with an iron rod nearly as big as she was. "And yet," Marie wrote later, "it was in this miserable old shed that the best and happiest years of our life were spent."

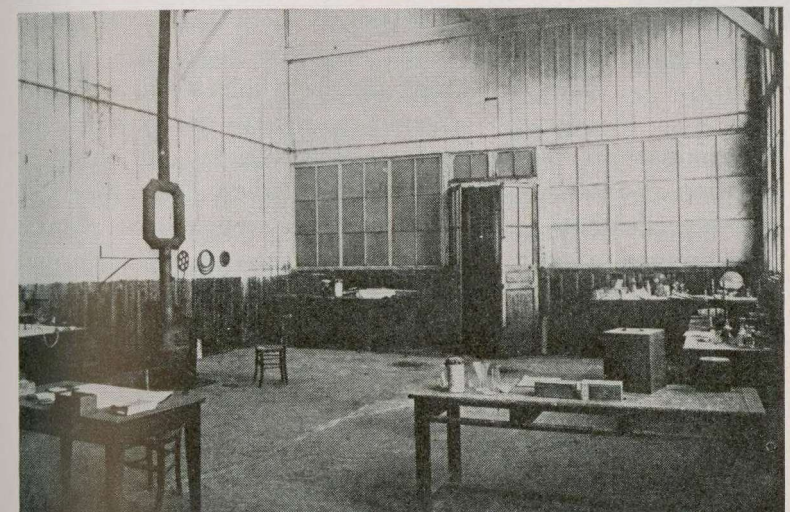
The days of work became months and years, but Pierre and Marie were not discouraged. As they worked they talked about their beloved radium.

"I wonder what *It* will look like," said Marie one day. "Pierre, what form do you imagine *It* will take?"

"I don't know," her husband answered gently. "I should like it to have a very beautiful color . . ."

In 1902—45 months after the day on which the Curies announced the probable existence of radium—Marie, after conquering almost insurmountable obstacles, succeeded in preparing a small pinch (one tenth of a gram) of pure radium and in making a first determination of its atomic weight. The doubting chemists, of whom there were still a few, could only bow before the facts. Radium officially existed.

The shed in which radium was discovered

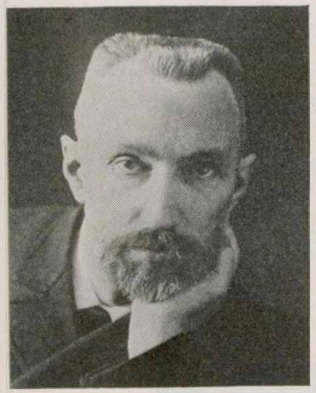


It was 9 o'clock at night. Pierre and Marie were in the little house where they had been living since 1900. Old Dr. Curie, who lived with the couple, had gone to bed. Their small daughter was asleep.

Marie, who was hemming an apron for Irène, said suddenly, "Suppose we go down there for a moment?"

It was dark in the little courtyard. The door of the shed squeaked as Pierre opened it.

"Don't light the lamps!" said Marie. In the dark shed precious particles of radium, white like table salt, gleamed in their tiny glass receivers. Marie and Pierre turned their faces toward the pale blue glimmering, toward radium—*their* radium. It was a moment that Marie was to remember forever.



The picture of Pierre Curie that Marie loved best

A Hard Life

Pierre and Marie would have been altogether happy if they could have spent all their time in the laboratory. Unfortunately they had to make a living too. Irène's coming had increased their expenses. They had to finance the cost of the search for radium themselves. A professor's salary in the School of Physics was not enough to pay for everything. In 1898 Pierre applied for the vacant post of professor of physical chemistry at the Sorbonne. He was refused. Not until he had been acclaimed by the whole world was this physicist of genius to receive an appointment as professor at the Sorbonne. However, he did obtain a position at an annex of the University where the subjects of physics, chemistry, and natural science were taught. Marie also secured a post as instructor in physics at a normal school for girls at Sèvres, near Versailles.

The family budget was now balanced, but torn between their own work and their jobs they often forgot to eat and sleep. Unconscious of their folly the pair abused their strength. Several times Pierre, attacked by severe rheumatic pains, had to give up and go to bed. Marie became pale and thin. To warnings and reproaches from their friends Pierre and Marie answered, "But we do rest; we take holidays in the summer." So they did, only to be haunted with the desire to get back to the laboratory.

From 1899 to 1904 the Curies published 32 scientific papers on radium and its properties. From all over the world letters, signed by the greatest names in science, came to them. Workers rushed into the search for other radioactive elements or into the intensive study of radium itself.

An Important Decision

Marie had with her own hands extracted the first gram of radium from eight tons of pitchblende. She was never to be separated from it. After her death it became the property of her laboratory. Because of the expense of extracting it, radium became one of the dearest substances in the world. In the early years of the 20th century the price put on it was $150,000 a gram (about 1/28 of an ounce)—$150,000 for one fifth of a teaspoonful of a dull white powder, much like common kitchen salt! But what could it not do? Its radiation was 2,000,000 times stronger than that of uranium. Its rays could travel through the hardest and most opaque matter. Only a thick screen of lead was able to stop their invisible flight. The greatest miracle of all was that radium could do something for the happiness of human beings. It was to become their ally in the fight against cancer. As soon as it was learned that radium was useful—magnificently useful—the radium industry was born.

By isolating radium, Marie had invented a technique and created a process for manufacturing it. Factories could not produce it unless their engineers knew the secret of the delicate operations involved.

One Sunday morning a postman delivered a letter from America to the Curies. After reading it Pierre said to his wife: "We must speak a little about our radium. Soon the whole world will be wanting it. Just now, in this letter, some technicians in America want information about how to produce it."

"Well then?" Marie was not especially interested.

Pierre explained patiently that they had two choices. "We can describe the results of our research without reserve, including the processes of purification . . . Or we can consider ourselves to be the 'inventors' of radium. In this case it would be necessary, before publishing exactly how you worked to treat pitchblende, to patent the technique and assure ourselves in that way of rights over the manufacture of radium throughout the world."

Marie thought for a few seconds. Then she said: "It is impossible. It would be contrary to the scientific spirit."

Pierre's face lighted up. "I think so too," he said. Then to settle his conscience, he tried to make Marie understand the importance of this decision. "Our life is hard," he said, "and it threatens to be hard forever . . . This patent would mean a fortune . . ." And then he mentioned with a little smile the only thing that would be hard to give up. "We could have a fine laboratory too."

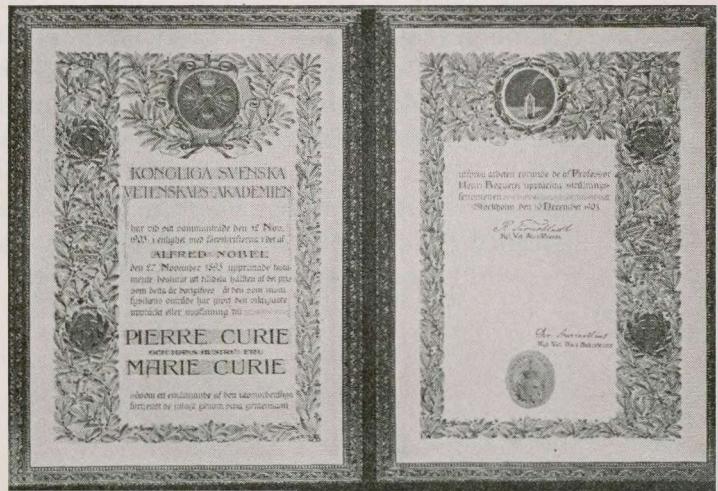
Marie shook her head. She and Pierre had chosen forever between poverty and fortune. They got out their bicycles and went for a ride in the country. In the evening, tired out, they came back with their arms filled with leaves and bunches of wild flowers.

Fame

In 1903 began the ominous rumblings of that storm of fame which was soon to break over the heads of Marie and Pierre Curie. In June they were invited to London to lecture on radium before the Royal Institution, and Marie uneasily felt thousands of glances fixed upon her. They were glad to get back to their shed. In November they received the Davy Medal, one of the highest awards of the Royal Society of London. And then, in December, the storm burst. The Nobel Prize in Physics was awarded half to Marie and Pierre Curie and half to Henri Becquerel for their discoveries in radioactivity. Marie Curie had become the first, and for the moment the only, celebrated woman scientist in the world.

The prize, 70,000 gold francs (about $14,000), meant freedom from some of their most pressing cares. Now they could have a laboratory assistant, and a bathroom for their little house, and new wallpaper for a shabby room. There were gifts, too, for relatives and friends, but it never occurred to Marie to celebrate by buying anything for herself, not even a new hat. And she kept on with her teaching, although she made Pierre leave the School of Physics.

The Curie home and the shed where radium had been discovered were besieged by newspaper reporters, photographers, and mobs of curious people. The huge work table


KONGLIGA SVENSKA VETENSKAPS-AKADEMIEN

ALFRED NOBEL

PIERRE CURIE

MARIE CURIE

The Nobel prize award won in 1903 by Pierre and Marie Curie (with Henri Becquerel) for their work on radioactivity

Marie Curie with her daughters Irène and little Eve in 1905

was piled with telegrams. There were newspaper articles by the thousands, hundreds of requests for autographs and photographs, invitations by the score. The Curies, who had endured poverty, overwork, and even injustice without a complaint, now for the first time grew nervous. When would this hubbub end? It interfered with their work. And there was so much yet to be done!

On December 6, 1904, the Curies had another daughter, a plump baby crowned with shaggy black hair. This was Eve, who long years later wrote the beautiful story of her mother's life.

Alone

The name of Curie was now a "great name." In 1905 Pierre was elected to the Academy of Sciences, the highest honor that can be paid to a French scientist. Meanwhile a chair in physics had been created for him at the Sorbonne, but he still asked in vain for the fine laboratory that was the only thing he had ever wanted. Not for another eight years was the laboratory of his dreams to be built—a building that he was never to see.

Late in the afternoon of a rainy April day in the year 1906 Marie, vivid and gay, came home after a long day's work. She found callers there, a representative of the President of the Republic of France and two of her husband's closest friends, one of them the dean of the faculty of the Sorbonne. She saw the stricken look on their faces. Vaguely she heard someone telling her that her husband was dead, that he had met with a terrible accident. He had been run over by a

heavy horse-drawn wagon while crossing a busy street.

Marie remained motionless. After a long silence her lips moved at last in a single question, "Pierre is dead?" From that moment Madame Curie became a sad and incurably lonely woman. Between Pierre and Marie there had been a worker's comradeship, light and charming, which was perhaps the most delicate expression of their deep love for each other. Now Marie had to go on alone.

In May 1906 the Faculty of Science of the University of Paris unanimously appointed Madame Curie to the chair in physics at the Sorbonne that had been created for her husband. This was the first time that a position in French higher education had been given to a woman. On the day in November when she was to deliver her first lecture, a curious crowd filled the small lecture room and overflowed into the square outside. The students who had come to take notes had to cling to their seats to keep from being dislodged. There were whisperings and questions. What would be the first words of the only woman the Sorbonne had ever admitted among its masters in the 650 years of its existence? Would she speak of her husband? It was the custom for a new professor to praise his predecessor.

Half past one . . . The door opened and Marie Curie walked to the chair in a storm of applause. She bowed and then began: "When one considers the progress that has been made in physics in the past 10 years . . ." She had started her course of lectures precisely where Pierre Curie had left off. Tears rose to the eyes and fell upon the faces there.

The personal fame of Marie Curie mounted and spread like a rocket. Honorary degrees and memberships in foreign academies arrived by the dozen. The greatest honor of all was the Nobel Prize in Chemistry for the year 1911. No other person, man or woman, has ever been judged worthy of receiving this award twice.

The War

In order to develop the new science of radioactivity the Sorbonne and the Pasteur Institute jointly founded an Institute of Radium, consisting of two sections: a laboratory of radioactivity, placed under the direction of Marie Curie; and a laboratory and a hospital in which studies in the treatment of cancer by radium were directed by a famous physician. It was finished in 1914 just as the World War began. Although Marie was worn out with work and illness, she then had only one thought: to serve her second fatherland.

The discovery of X-rays by Roentgen in 1895 had made it possible to see and to photograph the forms of bones and organs in the living body. In one instant a rifle bullet or fragment of shell could be discovered in its hiding place in a wound. Madame Curie realized at once how valuable X-rays would be to the army surgeons. Immediately she collected all the X-ray apparatus she could find at the manufacturers and in laboratories and distributed it to hospitals near Paris. Volunteer X-ray operators were recruited from among the professors, engineers, and scientists.

For ambulance work near the front she created, with funds from the Union of Women of France, the first "radiological car." This was an automobile equipped with X-ray apparatus and a dynamo which, driven by the motor of the car, furnished the necessary current. Later 20 more of these cars, nicknamed "little Curies," were equipped by Marie. In addition she installed 200 radiological rooms in dressing stations and hospitals for the wounded.

The pavillon Curie of the Institute of Radium built just before the World War

America

"If you had the whole world to choose from what would you take?" On a morning in May 1920, a year and a half after the war had ended, this question was asked of Marie by an American woman whose imagination had been stirred by the greatness of her life and work. Madame Curie replied gently: "I need a gram of radium to continue my researches, but I cannot buy it: radium is too dear for me."

The only radium Marie Curie possessed was the gram which she and Pierre had prepared with their own hands. This was needed for the treatment of cancer patients in the hospital of the Institute of Radium. In less than a year the American woman, whose name was Mrs. William Brown Meloney, wrote to Madame Curie: "The money has been found, the radium is yours." Women all over America, rich and poor alike, had helped to buy this precious gift. Now they wanted Madame Curie to come to America to receive it. At first she hesitated. She had always been afraid of publicity, but she was touched by this gift. For the first time in her life, at the age of 54, she accepted the obligations of a great official journey. Her daughters, delighted with the adventure, went with her.

Everywhere in America she was given tremendous ovations. Her gram of radium was presented to her by the President of the United States. Even before knowing her the American people had loved her. Now they surrounded her with boundless devotion. The crowds bewildered and frightened her. She became so tired and weak that she had to

Irène Curie on the step of one of the Radiological Cars equipped by her mother and nicknamed "little Curies"

cut short her visit and return to France. Later she journeyed to America once more to receive another gram of radium from a small group of friends and admirers for the Marie Sklodovska-Curie Institute of Radium which had been built in Warsaw by the Polish people. Her girlhood dream of serving her beloved country had at last come true.

The End of the Journey

Almost to the very end, Madame Curie's life was filled with work. When she was not lecturing at the University or away on a scientific mission, she was busy all day long in her laboratory. She had a great affection for the young research students who worked with her. One of her greatest joys was to help them celebrate their scientific triumphs.

On one sunny day in May 1934 she stayed until half past three in her laboratory, wearily touched the tubes and the apparatus—her faithful companions. "I have a fever, and I must go home," she murmured to her collaborators. As she walked through the garden she had planned and cherished, she saw a rambler rose that looked sickly. Her worried glance toward a blighted plant was her farewell to the laboratory. On July 4, 1934, the news that Marie Curie's work on earth had ended was flashed around the world. She was a victim of a form of anemia, caused, as her physicians believed, by her long exposure to the radiations of the element she and her husband had discovered.

Marie Curie talking with Mrs. Robert G. Mead of the New York City Cancer Committee in the Library of the Institute of Cancer Research at Columbia University on her second visit to America

Madame Curie with her daughter Irène in the laboratory of the Institute of Radium

What Is Radium?

Nineteenth-century scientists thought they had proved that it was impossible to transmute, or change, one element into another element, as the alchemists of the Middle Ages had once dreamed of doing. Then it was discovered that radioactive elements, of which radium is one, changed gradually and constantly of their own accord. This change takes place by a series of sudden explosions. It may be compared to the popping of popcorn or the setting off of a pack of firecrackers. In a given instant of time only a few popcorn grains or a few firecrackers explode, but in the end they will all have exploded. The tiny particles of matter in radium that correspond to individual firecrackers or popcorn grains are atoms. It takes about 1,700 years for half of the atoms in any mass of radium to disintegrate.

When a radium atom explodes, electrified particles in the core, or nucleus, shoot forth from the atom with terrific speed. Comparatively large particles make up what are known as the alpha rays of radium. They travel at speeds of 9,000 to 20,000 miles a second. Alpha rays can be stopped by a sheet of paper.

Very small, very light particles expelled from an exploding atom make up what are called the beta rays of radium. They travel much faster than alpha particles. Some of them almost reach the speed of light (186,000 miles a second). Beta rays therefore penetrate farther into matter than alpha rays. They are stopped by a sheet of lead one millimeter thick.

The shooting forth of beta rays is always accompanied by the radiation of the gamma rays of radium. Gamma rays are truly rays. That is, they are not streams of electrified particles but a form of radiant energy, just as radio waves and visible light and X-rays are forms of radiant energy. The wave lengths of gamma rays are extremely short, and therefore their penetrating power is very great. Gamma rays from radium can pass through a three-inch sheet of lead.

The radium atom, after an alpha particle has been expelled, becomes a radon atom. Radon is a gas which is sometimes called the emanation of radium. Like radium it, too, is radioactive. It can be "pumped off" from radium and used for the treatment of cancer. Radon gas has a very short life, as it loses half of its value in a little over three days. A small particle of pure radium is used in a hospital as a source of supply for radon treatments. As the breakdown of radium continues, a large number of products are obtained, some with short lives, others with long lives. The final stage which the breakdown of radium reaches is a form of lead.

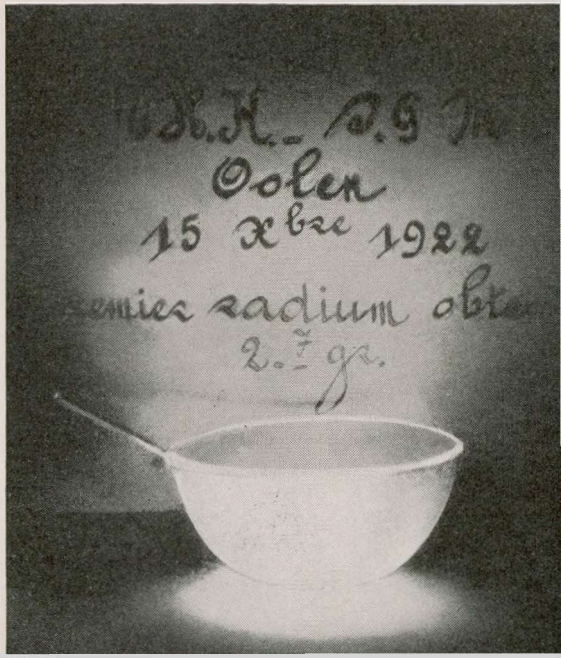
Radium in the Treatment of Cancer

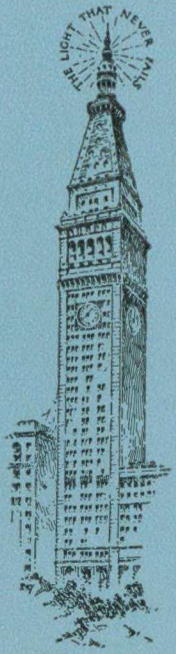
A cancer is a tumor, or growth, containing abnormal cells which multiply by cell division, just as the cells of healthy tissue multiply by cell division. Today, if cancer is discovered early enough, many types can be treated successfully by surgery, or by irradiation with radium rays or X-rays, or

by a combination of the two. X-rays and radium rays can plow through overlapping tissues and kill cancer cells deep in the interior of the body. The chief advantage of radium in treating deep-seated cancer is that tiny capsules containing it or its emanation, radon, can be planted inside of the tumor, thus making it unnecessary for the rays to pass through the skin, as is the case with X-rays.

Marie Curie's name will be immortal as long as the human race exists, not only because the discovery of radium marked the beginning of modern atomic physics, but also because radium in the hands of the medical profession has become a powerful instrument of healing.

A tiny particle of radium in the dish furnished the light by which this picture was taken





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