Marie Curie

A Reading A–Z Level V Leveled Book
Word Count: 1,338

Connections

Writing

How would our world be different without the work of Marie Curie? Write an essay highlighting her achievements and their impact on our world today.

Social Studies

Research another woman who has won a Nobel Prize in science. Create a poster for your class, including biographical information about the scientist and her impact on science.

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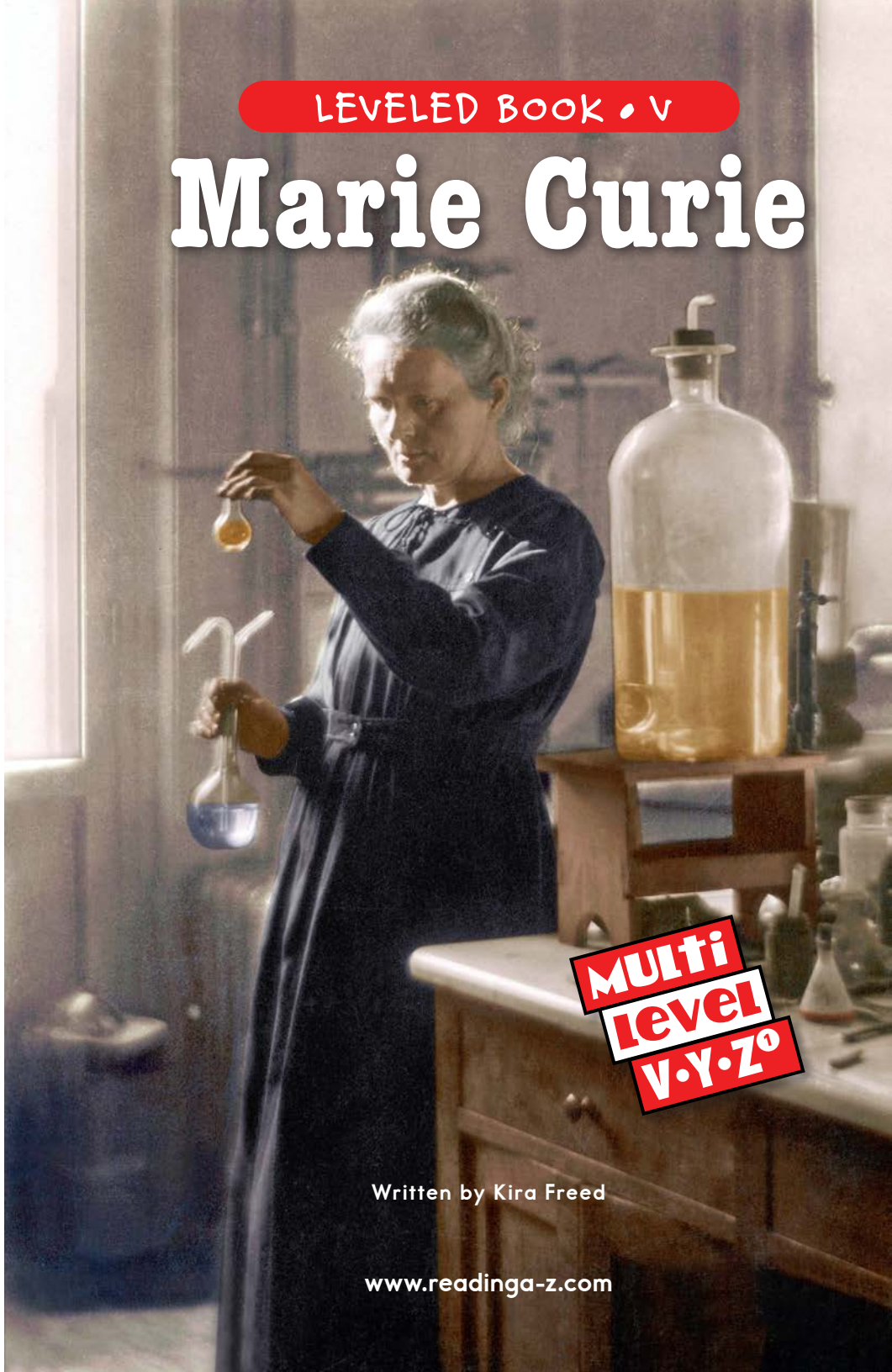
Marie Curie



MULTI LEVEL V•Y•Z¹

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Focus Question

Who was Marie Curie, and how did she change the world of science?

Words to Know

atoms	nominated
breakthroughs	perseverance
commission	physics
doctorate	radioactive
element	Sorbonne
Nobel Prize	X-rays

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Correlation

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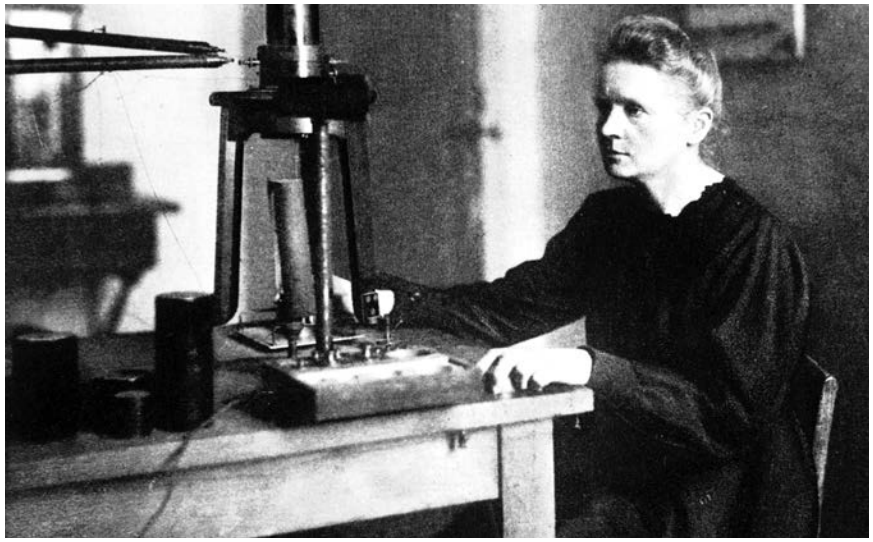

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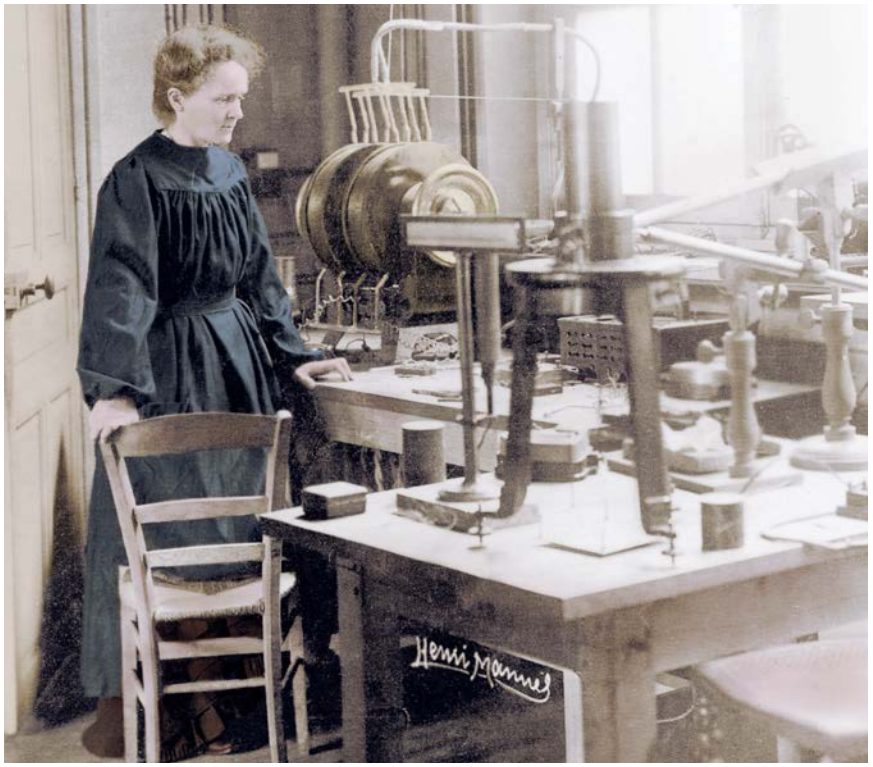


Marie Curie's laboratory was packed with scientific instruments, some of which were invented by her husband, Pierre, and his brother, Jacques.

Trailblazer

At a time when few women were scientists, one woman's research and discoveries changed the world. She left her homeland to study science and math at a leading university. She followed her scientific interests even though the world seemed to block her way at every turn. She was the first woman to be awarded a **Nobel Prize** and the only person ever awarded Nobel Prizes in two different scientific fields. This groundbreaking scientist was Marie Curie.

Marie Curie (center) sits for a photograph with her brother and sisters (left to right) Zosia, Hela, Joseph, and Bronya.

Early Years

Marie Curie was born Maria Sklodowska on November 7, 1867, in Warsaw, Poland. She was called Manya as a child and was the youngest of five children. Their father taught math and **physics** at a boys' high school.

When Manya was born, the part of Poland where her family lived was ruled by the Russian Empire. Loyalty to Poland put people's lives in danger.

Manya's father lost his job in 1873 because he supported Polish independence. Manya's oldest sister died in 1876, and her mother died two years later.

Manya was a bright, curious child and an outstanding student. She earned top honors when she graduated from high school at age fifteen in 1883.

The Sorbonne was, and still is, one of the finest universities in the world.

Patience and Preparation

Manya and her sister Bronya wanted to continue their studies, but women could not attend the University of Warsaw. They would need to leave Poland but did not have enough money. The sisters attended Warsaw's "floating university"—free education offered in secret by Polish teachers. Although the classes were no match for the finest European universities, they kept Manya up-to-date on scientific discoveries.

Both sisters wanted to attend the **Sorbonne** in Paris, but they could not afford the tuition. They made a deal: Manya would earn money for Bronya's education, and Bronya would return the favor after earning her degree. Manya worked as a tutor and governess for five years and studied science, literature, and other subjects in her free time. After helping her sister pay for her schooling, it was Manya's turn to attend.

Paris at Last

Manya moved to Paris in 1891 and enrolled at the Sorbonne. She took the name Marie—the French version of Maria—at that time. Two years later, she graduated first in her class with a master's degree in physics. The following year, she earned a second master's, in math.

Marie received a **commission** to study the magnetic properties of steel. She needed a laboratory for her research. Another scientist introduced her to a physics professor named Pierre Curie, who arranged for Marie to use some lab space where he worked.

Pierre Curie and Marie Sklodowska Curie as they appeared soon after they married.

Over time, Marie and Pierre fell in love. They married in July 1895 and had a daughter, Irene, two years later. Marie was still very involved with her work. After finishing her research, she decided to earn a **doctorate** at the Sorbonne.

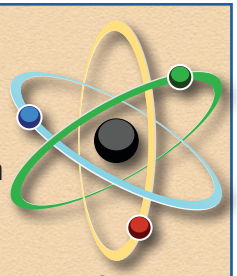
Wilhelm Roentgen's discovery of X-rays in 1895 set off a revolution in physics.

Two Types of Rays

Marie needed a topic for her doctoral research. Two important physics discoveries had been made not long before. In late 1895, Wilhelm Roentgen, a German physicist, discovered **X-rays**. Early the following year, French physicist Henri Becquerel discovered that the chemical **element** uranium also gave off rays, which were weaker than X-rays. Marie decided to study uranium rays.

Marie began to study the effect of uranium rays on air by measuring barely noticeable electric currents in air that had been blasted with uranium rays. Marie agreed with Becquerel that uranium in any form gave off electricity and that more uranium gave off stronger rays. She also demonstrated that the rays were a property of uranium's structure, not just its physical or chemical state. In addition, she discovered that another element, thorium, gave off rays as well.

The Birth of Atomic Physics



During Marie's time, scientists knew about atoms—the smallest particles of things. However, they thought that atoms could not be broken down into smaller units. Marie's uranium research led her to discover that atoms store a huge amount of energy. That discovery changed scientists' understanding of atoms and led to a new field of science—atomic physics.

Marie kept testing materials to see which ones gave off rays. She tested a mineral called pitchblende, which contains uranium. She found that it gave off more rays than could be caused by its uranium. She supposed that pitchblende must contain a second **radioactive** element—one that scientists didn't know about yet.

In 1898, Pierre Curie joined Marie in searching for the new element. After much research, they discovered two new elements: polonium (named for Marie's homeland) and radium (from the Latin word for "ray"). Pierre also proved that radium's radioactivity could harm living flesh. His discovery opened the doors to treatments for cancer and other illnesses.

Health Concerns

Marie and Pierre were often ill while doing their research. It wasn't clear whether the cause was working too hard or radiation. Marie did not accept the idea that radiation was to blame, but today we know that it can cause illness and death.

Achievements and Recognition

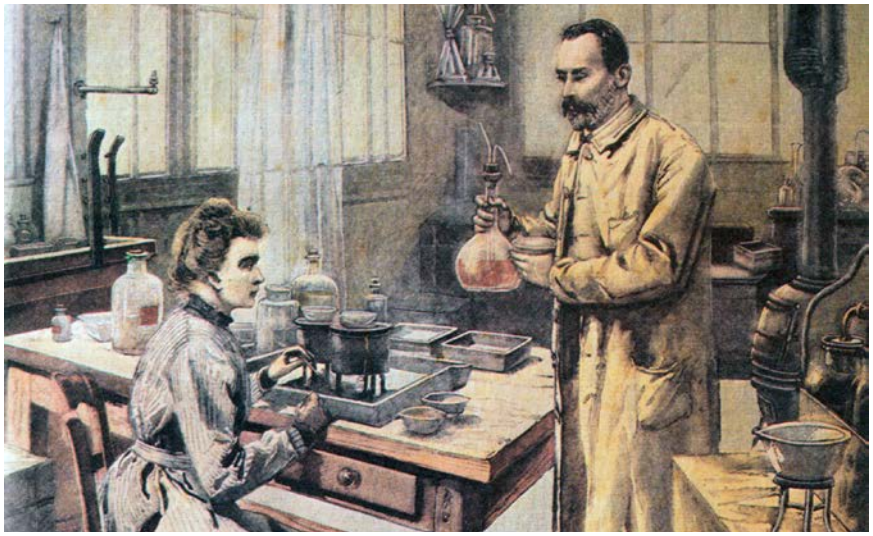
Marie earned her Doctor of Science in June 1903. She was the first woman in France to be awarded a doctorate and the first woman in all of Europe to be awarded a doctorate in science.

Marie was the one in charge of the physics research she and Pierre did. Even so, she was almost passed over for the Nobel Prize, one of the world's most respected awards, because she was a woman. Only Pierre Curie and Henri Becquerel were **nominated** for the 1903 Nobel Prize in Physics. When Pierre found out, he said it would be terribly unfair for Marie not to be included.

Marie's name was then added to the list, and she and Pierre won together, along with Becquerel, in December 1903. The award recognized their pioneering work on radiation. It was the first Nobel Prize awarded to a woman.

The Curies instantly became famous around the world. Pierre was given a better job at the Sorbonne, and Marie received a salary and became chief of laboratory. She was excited by the attention and new responsibilities.

The Curies had a second daughter, Eve, in 1904. Around the same time, the Sorbonne gave the Curies a new laboratory to work in.

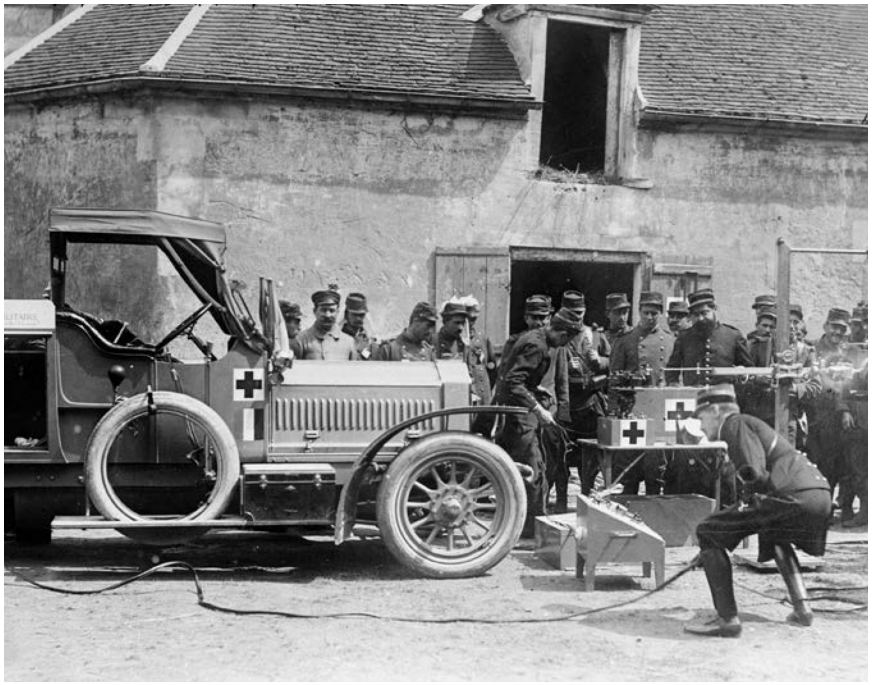


The Curies finally moved to a laboratory with more space in 1904.

Dark Times and More Fame

The Curies were enjoying their successes when tragedy struck. In 1906, Pierre was run over by a horse-drawn wagon and killed instantly. News of his death spread around the world. Marie was completely numb with shock but eventually found the strength to keep going. She was given Pierre's teaching position at the Sorbonne and was the first woman to become a Sorbonne professor.

Marie was awarded a second Nobel Prize, this time in chemistry, in 1911 for her work in radioactivity and her discovery of radium and polonium. She was the first scientist to be awarded two Nobel Prizes. To this day, she is the only person to be awarded prizes in two different areas of science.



French soldiers gather around one of the mobile X-ray trucks using Marie Curie's equipment on October 31, 1914. The machines undoubtedly saved the lives of many wounded soldiers during World War I.

On the Battlefront

World War I broke out in late July 1914, and Germany attacked France just a few days later. Most of Marie's staff left to fight in the war, and her scientific research had to stop. Marie looked for ways to put her science to work to help the war effort. She provided portable X-ray machines for treating wounded soldiers on battlefields and set up more than two hundred X-ray stations. She also learned how to use X-ray equipment and taught herself to drive so she could run the X-ray machines herself.

Timeline of Marie Curie's Life

1867 Born in Warsaw, Poland, November 7

1883 Graduates from high school

1891 Moves to Paris to attend Sorbonne

1893 Earns master's degree in physics

1894 Earns master's degree in math

1895 Marries Pierre Curie

1897 Begins her study of Becquerel rays; daughter Irene is born

1898 Announces discovery of polonium and radium

1903 Earns doctorate in physics; awarded Nobel Prize in Physics

1904 Daughter Eve is born

1906 Pierre dies; becomes Sorbonne's first female professor

1911 Awarded Nobel Prize in Chemistry

1914 Sets up a program of portable X-ray machines for use in World War I

1918 World War I ends; opens Radium Institute

1934 Dies on July 4

Marie Curie (center) traveled by ship to New York to tour the United States with her daughters Irene and Eve in 1921.

Later Life

After World War I ended, Marie worked nonstop to turn the Sorbonne's Radium Institute into a world-class center for radioactivity research.

Marie's daughter Irene and her husband were awarded the Nobel Prize in Chemistry in 1935. Sadly, Marie didn't live long enough to celebrate with them. We now know that radioactive substances are very dangerous, but that was not known during Marie's life. She died at age sixty-six on July 4, 1934, from an illness often caused by being around radioactivity for a long time. Marie was buried next to Pierre. In 1995, their remains were moved to the Panthéon in Paris, where France's most brilliant citizens are buried. Marie was the first and only woman to be buried there for her own achievements.

Gifts to the World

Marie Curie's work caused a huge shift in scientific understanding of **atoms** and led to new treatments in medicine. It also led to the discovery of radiocarbon dating, a way to learn the age of ancient life forms. Marie showed that careful scientific research can yield amazing **breakthroughs**.

Using a technique made possible by Marie Curie's discoveries, a researcher uses carbon dating to determine the age of scrolls found in an ancient Roman library.

She also showed the world how to stay strong in the face of difficult obstacles. In her words: "Life is not easy for any of us. But what of that? We must have **perseverance** and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained."

Glossary

atoms *(n.)* the smallest parts of elements (p. 15)

breakthroughs *(n.)* important events or advances in knowledge (p. 15)

commission *(n.)* a task or project that someone requests or authorizes (p. 7)

doctorate *(n.)* the highest degree a university can award; a Ph.D. (p. 7)

element *(n.)* a substance that cannot be broken down into simpler substances and is made up of only one kind of atom (p. 8)

Nobel Prize *(n.)* one of six prizes awarded each year for work in chemistry, economics, literature, medicine, or physics, or for advancing the cause of world peace (p. 4)

nominated *(v.)* named as a candidate for a job, award, or position (p. 10)

perseverance *(n.)* the quality of staying determined and committed despite challenge or delay (p. 15)

physics *(n.)* the scientific study of matter, motion, and energy (p. 5)

radioactive *(adj.)* producing a dangerous type of energy called *radiation* (p. 9)

Sorbonne *(n.)* a university in Paris, France, famous for its high academic standards (p. 6)

X-rays *(n.)* invisible energy that can go through many solid substances (p. 8)