



## 14.4 Chien-Shiung Wu

During World War II, Chinese-American physicist Chien-Shiung Wu played an important role in the Manhattan Project, the Army's secret work to develop the atomic bomb. In 1957, she overthrew what was considered an indisputable law of physics, changing the way we understand the weak nuclear force.

### Determined to learn



Chien-Shiung Wu was born on May 31, 1912, in a small town outside Shanghai, China. Her father had opened the region's first school for young girls, which Chien-Shiung finished at age 10.

She then attended a girls boarding school in Suzhou that had two sections—a

teacher training school and an academic school with a standard Western curriculum. Chien-Shiung enrolled in teacher training, because tuition was free and graduates were guaranteed jobs.

Students from both sections lived in the dormitory, and as Chien-Shiung became friends with girls in the academic school, she learned that their science and math curriculum was more rigorous than hers. She asked to borrow their books and stayed up late teaching herself the material.

Chien-Shiung Wu graduated first in her class and was invited to attend prestigious National Central University in Nanjing. There, she earned a bachelor's degree in physics and did research for two years. In 1936 Wu emigrated from China to the United States. She earned her doctorate from the University of California at Berkeley in 1940.

### A key scientist in the Manhattan Project

Wu taught at Smith College and Princeton University until 1944, when she went to Columbia University as a senior scientist and researcher and was asked to join the Manhattan Project. There she helped develop the process to enrich uranium ore.

In the course of the project, her renowned colleague Enrico Fermi turned to Wu for help with a fission experiment. A rare gas which she had studied in graduate school was causing the problem. With Wu's assistance, Fermi was able to solve the problem and continue his work.

### Right and left in nature?

After the war, Wu continued her research in nuclear physics at Columbia. In 1956, she and two colleagues, Tsung-Dao Lee of Columbia and Chen Ning Yang of Princeton, reconsidered the *law of conservation of parity*. This law stated that nature does not distinguish between left and right in nuclear reactions. They wondered if the law might not be valid for interactions of subatomic particles involving the **weak nuclear force**.

Wu was a leading specialist in **beta decay**. She figured out a means of testing their theory. She cooled cobalt-60, a radioactive **isotope**, to 0.01 degree above absolute zero. Next, she placed the cobalt-60 in a strong magnetic field so that the cobalt nuclei lined up and spun along the same axis. She observed what happened as the cobalt-60 broke down and gave off electrons.

According to the law of conservation of parity, equal numbers of electrons should have been given off in each direction. However, Wu found that many more electrons flew off in the direction opposite the spin of the cobalt-60 nuclei. She proved that in beta decay, nature does in fact distinguish between left and right.

### Always a landmark achiever

Unfortunately, when Lee and Yang were awarded the Nobel Prize in physics in 1957, Wu's contribution to the project was overlooked. However, among her many honors and awards, she later received the National Medal of Science, the nation's highest award for science achievement.

In 1973, she became the first female president of the American Physical Society. Wu died at 84 in 1997, leaving a husband and son who were both physicists.



## Reading reflection

1. Use a dictionary to look up the meaning of each boldface word. Write a definition for each word. Be sure to credit your source.
2. How did Chien-Shiung Wu's work in graduate school help her with her work on the Manhattan Project?
3. From the reading, define *the law of conservation of parity* in your own words.
4. How many protons and neutrons does cobalt-60 have? List the nonradioactive isotopes of cobalt.
5. Briefly describe Wu's elegant experiment that proved that nature distinguishes between right and left.
6. **Research:** Wu was the first woman recipient of the National Medal of Science in physical science. Two other women have since received this award. Who were they and what did they do?
7. What are three questions that you have about Wu and her work?
8. Suggest some possible reasons why Wu did not receive the Nobel Prize for her work.