Triumph: The Parity Experiment. For a few years after 1952, Wu's interest gradually shifted from beta decay to other topics. But a conversation with her Columbia colleague and fellow Chinese American physicist Tsung Dao Lee (Li Zhengdao in pinyin) in the spring of 1956 rekindled her passion for beta decay. At the time, Lee and Chen Ning Yang (Yang Zhenning in pinyin), another Chinese American physicist at Princeton's Institute of Advanced Study, were investigating the possibility that particles involved in weak interactions—beta decay was one example—might not follow the law of parity. Simply stated, the law of parity—or the conservation of parity—meant that nature did not discriminate between right and left; if a process is possible, its mirror imaged counterpart should be equally possible. But in order to explain several mysteries in the behaviors of elementary particles, Lee and Yang were forced to suspect that perhaps the widely accepted law of parity was violated in weak interactions. While most physicists—theoretical and experimental—were highly skeptical of any such speculation, Wu took it seriously. What Lee and Yang found, with Wu's assistance, was that no one had ever tested the law in weak interactions. So Wu reasoned that even if the law held, an experiment to prove it would be significant and worthwhile. Her choice of a reaction for testing parity was the beta decay of radioactive cobalt ^{60}Co.

Wu's idea was to line up the spins of the ^{60}Co nuclei and then detect the direction of the beta particles (electrons) that were emitted from the nuclei. If the law of parity held, electrons should come out in both directions—along and opposite the direction of the spin of the nuclei—in equal numbers. Otherwise, parity would be broken. Conceptually simple, the experiment was technically extremely difficult. A big challenge was to cool the ^{60}Co to 0.01 degree Celsius above absolute zero (–273.14^{0}C[–459.65^{0}F]) to reduce background noise. Fortunately, Wu found a group of capable collaborators, headed by Ernest Ambler, with low-temperature facilities at the National Bureau of Standards (NBS) to carry out the experiment, with additional assistance from her graduate student Marion Biavati. Overcoming many obstacles they found, by late 1956 and early 1957, that indeed, as Lee and Yang had suggested, the law of parity was violated in beta decay: more beta particles were emitted in the direction opposite that of the nuclear spin than along it. Two groups of physicists—Richard Garwin, Leon Lederman, and Marcel Weinrich at Columbia and Jerome Friedman and Valentine Telegdi at the University of Chicago—quickly confirmed the breaking of parity in other processes of weak interactions.

The fall of parity came as a shock to many physicists, including Wolfgang Pauli, the sharp-tongued Austrian-Swiss physicist (and Wu's close friend), who could not believe that God was "left-handed" (in weak interactions). As one of the most dramatic episodes in modern physics, the investigation on parity overthrew one of the fundamental laws of nature and heralded, in Wu's own words, a "sudden liberation of our thinking on the very structure of the physical world" (Wu, 1973, p. 118.) It led to new advances in many directions and paved the way, eventually, for the unification of the weak and electromagnetic forces. Columbia's Physics Department called a press conference on 15 January 1957, which was presided over by a proud Rabi, to announce the breakthrough by Wu and her colleagues. The next day the *New York Times* carried the news on its front page and spread it to the rest of the world.

The significance of the research by Lee, Yang, Wu, and her NBS collaborators was immediately recognized by the physics community, but when the Nobel Prize in Physics for 1957 was announced, it went only to Lee and Yang, not Wu. While she felt happy for her friends, who were the first Chinese to ever win the prize, and she never conducted research just to win the prize, she clearly was disappointed by her exclusion, as were many others, including Lee, Yang, and Rabi, who felt that she deserved the honor. Over the years Wu received just about every other award for a scientist, mainly for her parity experiment but also for her other achievements. She was given an honorary doctorate of science by Princeton University, elected a member of the National Academy of Sciences, promoted—finally—to full professorship at Columbia, and named recipient of the Research Corporation Award, all in 1958. From the National Academy she also received the Comstock Award in 1964. In 1972 she was made the first Michael I. Pupin Professor of Physics at Columbia and elected a member of the American Academy of Arts and Sciences. Three years later she became the president of the APS and received the National Medal of Science from President Gerald Ford. Then, in 1978, she received the first Wolf Prize in physics from the Wolf Foundation of Israel. For many of these awards, she was the first woman or one of the first women so honored.

Later Research and Activities. Wu maintained a strong track record following her parity triumph, as best exemplified by her experiment on the conservation of vector current (CVC) in beta decay in 1963. In the late 1950s, particle theorists Richard Feynman and Murray Gell-Mann at Caltech, whose thinking had been liberated by the breaking of parity, had proposed the CVC theory in a major step toward the unification of two of the four fundamental forces in nature: the electromagnetic and weak forces (the other two are strong and gravitational forces). When initial experiments failed to confirm the CVC hypothesis, Gell-Mann turned to Wu, reportedly pleading: "How long did Yang and Lee pursue you to follow up on their work?"(McGrayne, 1993, p. 278). When she finally did the experiment with two graduate students, the results unequivocally confirmed the theory. Other experiments that Wu conducted with students and collaborators in the 1960s and 1970s upheld her reputation for being both accurate and hard-driving. These included investigations on double-beta decay, carried out half a mile underground in a salt mine near Cleveland, Ohio on the so-called muonic atoms in which muons take the place of electrons in normal atoms; on Mössbauer spectroscopy and its application in the study of sickle-cell anemia; and on Bell's theorem, with results confirming the orthodox interpretation of quantum mechanics.

Taking advantage of her parity celebrity, Wu began to speak out on social and political issues, especially on equality for women in science. At a Massachusetts Institute of Technology symposium in 1964, for example, she lamented the lack of women in science due to both cultural biases and professional discrimination. "I sincerely doubt that any open-minded person really believes in the faulty notion that women have no intellectual capacity for science and technology" (Wu, 1965, p. 45). Counting proudly the achievements of women nuclear physicists such as Marie Curie and Lise Meitner, she declared that "never before have so few contributed so much under such trying circumstances!" (p. 47). In 1975, from the platform of the APS presidency, she urged the federal government to increase funding for education and basic research.

During the later stage of Wu's life, her Chinese heritage and connections began to take on growing importance for her. She had always maintained contact with the scientific community in Taiwan, even though the parity experiment in 1956 prevented her from taking a prearranged around-the-world trip that had included a stop there. In 1962 she finally traveled, with her husband, to Taiwan for a meeting of the Academia Sinica, of which she was elected the first woman member in 1948 and of which her beloved teacher Hu Shi was then president. While apolitical in general, around this time she signed petitions against the arrests of political dissidents and advised Jiang Jieshi against launching a project to make atomic bombs. The reopening of U.S.-China relations in the early 1970s made possible her first return to the mainland, again with her husband, in 1973. On this bittersweet and nostalgic journey, Wu mourned the fact that she never got to see her parents and brothers again before they died in the 1950s and 1960s. She was, however, delighted by a six-hour meeting with Premier Zhou Enlai, whom she admired as a moderate leader pushing for the modernization of China. With the flexibility that came with her retirement from Columbia in 1981, Wu traveled more frequently to both sides of the Taiwan Strait to advise the governments on science policy, promote education and science, and receive many honors and awards. In 1989, when the Chinese government cracked down on students demanding democracy and political reform in Beijing's Tiananmen Square, she voiced her disapproval. Nevertheless, she was elected one of the first foreign academicians of the Chinese Academy of Sciences in 1994. A household name in mainland China, Taiwan, and Hong Kong, Wu, as a "Chinese Curie," became a role model for many Chinese students, especially girls and women, with scientific aspirations. When Wu died, her ashes were buried, according to her will, in the courtyard of her father's Mingde school, joined several years later by that of her husband.

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