

**Workshop on Women in Science and Engineering
Poster Biographies**

**Maria Goeppert-Mayer
(1906 – 1972)
Physicist**



Maria Goeppert-Mayer grew up in Göttingen, Germany, at a time when its university was becoming one of the principal hotbeds of twentieth-century theoretical physics. Heir to six generations of university professors, Goeppert-Mayer had planned to study and teach mathematics, but found herself more drawn to the mysterious relations of matter and energy illuminated by the new quantum physics. She studied with one of the key exponents, Max Born, gaining her doctorate in 1930, and thereafter lived and worked in the U.S. with her husband, also a scientist. Geoppert-Mayer provided isotope-separation research for the Manhattan Project before joining Enrico Fermi at the Institute for Nuclear Studies at the University of Chicago in 1948. There she posited her "shell-model" of atomic nuclei, which fundamentally clarified the relationship between nuclear properties and periodicity in their components' arrangement. A landmark in the development of nuclear physics, Geoppert-Mayer's shell model gained her and collaborator Hans Hensen the Nobel Prize in physics for 1963.

**Marie Curie
(1867 – 1934)
Physicist**



Discoverer of radium polonium, and the nature of radioactivity, Marie Curie (1867-1934) was born to a family of Polish intellectuals who encouraged her scientific interests. She distinguished herself in physics and mathematics at the Sorbonne, on a scholarship so meager she could barely afford to eat, and in 1895 married fellow physicist Pierre Curie. Stimulated by Henri Becquerel's discovery of radioactivity, the two pioneered this new field of physics, isolating new radioactive elements from mineral matter and contributing important experimental data to problems of matter-energy interactions. The Curies shared many awards for their work, including the 1903 Nobel Prize in physics. (Pierre declined the Légion d'Honneur, in protest of its being awarded only to men.) After Pierre's untimely death in 1906, Marie continue her work with radium, gaining a second Nobel Prize (chemistry) in 1911. The Curies' elder daughter, Iène Joliot-Curie, herself became a Nobel Prize-winning physicist; their younger daughter Eve produced a biography of Marie Curie that remains among the best.

Chien-Shiung Wu
(1912- 1997)
Experimental Physicist



Born and raised in China, Wu studied physics at the prestigious National Central University and then in the United States at the University of California, Berkeley. She joined the Manhattan Project at Columbia University in 1944, initially focusing on uranium enrichment and neutron research. Later she helped devise an ultralow-temperature apparatus with which to study symmetry in relation to nuclear structure, leading to her celebrated demonstration of nonsymmetry in the phenomena of weak nuclear interactions. In these and other experiments Wu, also a professor at Columbia, has combined scientific rigor with the joy and mystery of the creative spirit. In 1956, two physicists, Tsung Dao Lee, and Chen Ning Yang proposed that parity was not conserved for weak interactions. Dr. Wu tested the proposal by observing the beta particles given off by cobalt-60. She observed that there is a preferred direction of emission, and that therefore, parity was not conserved for this weak interaction. In other words, Dr. Wu was able to prove that identical nuclear particles do not always act alike, and, thereby, disprove, what was then, a widely accepted "law" of nature! For the discovery that the law of parity was not conserved, both Lee and Yang won the 1957 Nobel Prize in Physics and revolutionized the study of particle physics, but to the disappointment of many, Dr. Wu was not included. Even though she did not receive the Nobel Prize, she was given many other honors and awards. She was elected to the U.S. National Academy of Sciences, and received the Medal of Science in 1975. She also became the first woman ever to be awarded an honorary doctorate from Princeton University. Dr. Wu continued to teach at Columbia University, and continued to conduct nuclear research and taught until her retirement in 1981. After her retirement, she lectured widely

and encouraged the participation of young women in scientific careers. Known as the "First Lady of Physics," Dr. Chien-Shiung Wu did the seemingly impossible and disproved a law of nature.

Rosalind Franklin
(1920 – 1958)
Scientist



More than half a century ago, international scientists raced to discover the secret of life. At the forefront of this effort was a brilliant British researcher who brought her substantial gifts to the study of DNA. Her name was Rosalind Franklin. Franklin was educated at a private school in London where she studied physics and chemistry from an early age, at an advanced level, especially so for a woman at that time. An excellent and dedicated student, she earned a Ph.D. in physical chemistry in 1945 from Cambridge University. Early in her career, it was Rosalind Franklin who painstakingly conceived of and captured "Photograph 51" of the "B" form of DNA in 1952 while at King's College in London. It is this photograph, acquired through 100 hours of X-ray exposure from a machine Dr. Franklin herself refined, that revealed the structure of DNA. The discovery of the structure of DNA was the single most important advance of modern biology. Quite simply, it changed the future of healthcare forever. James Watson and Francis Crick, working at Cambridge University, used Photograph 51 as the basis for their famous model of DNA that culminated in their Nobel Prize in 1962. Rosalind Franklin tirelessly blazed trails wherever she went. Her finely honed intelligence, devotion to the highest standards in research, thoughtful mentoring, unwavering loyalty to friends, and deep commitment to social justice mandated for Rosalind Franklin, a Life in Discovery.

Rachel Carson
(1907 – 1964)
Biologist



Rachel Carson made a successful career combining the interests of her youth—science and literature—as a marine biologist, editor for the U.S. Fish and Wildlife Service, and best-selling author of books such as *The Sea Around Us* (1951). The lyrical, explosive *Silent Spring* (1962), completed with heroic effort as Carson battled cancer, brought unprecedented attention to the dangers of indiscriminate use of chemical pesticides and was a prime catalyst of the U.S. environmental movement in the latter half of the twentieth century. Though the pesticide industry reacted to *Silent Spring* by attempting to discredit Carson and her findings, she coolly and firmly continued to speak out the need to temper technological progress with a broader view of its effects.