



# Maria Goeppert-Mayer

1906 -1972

Awarded the Nobel Prize for Physics in 1963

Few women have ever won a Nobel Prize for Physics, but Maria Goeppert-Mayer was one who did. She discovered the *shell structure* of the nucleus.

When Maria was working on the theory of the origin of the elements she found that some elements in the universe were more abundant than could be predicted by current theories. The same elements were also unusually stable, moreover she noticed that the nuclei of the stable elements had a 'magic number' of neutrons or protons: **2, 8, 20, 28, 50, 82 and 126**. She wondered *why*? She began to think of a model for the nucleus, similar to the orbital model of the atom, where electrons are spinning around the nucleus. She (and, independently, Hans Jensen) proposed a shell model in which the protons or neutrons move in orbits around the center of the nucleus, something like an 'onion' with layers of revolving protons and neutrons.

Her 'magic numbers' would represent the point at which the various layers, or 'shells' would be complete and therefore stable. The particles in the nucleus were both spinning on their axes and orbiting a central point. For her 'onion-shell' model the famous physicist Wolfgang Pauli dubbed her the '**Madonna of the Onion**'.

Maria Goeppert-Mayer was born in 1906, in Kattowitz in Upper Silesia, which was German at that time. Her father was professor of pediatrics at the University of Göttingen. Her mother was a former teacher of piano - she provided a home filled with flowers and music. The Goepperts came from several generations of professors, and it was expected that Maria would continue the family tradition. Because of difficulties in post war life she was educated mostly privately. She entered the University of Göttingen in 1924 to study mathematics but very soon, under the influence of Max Born's lectures, she turned to physics. Maria spent a term in Cambridge where she learned English and met the distinguished Ernest Rutherford.



*A lifetime of smoking contributed to her premature death*

Maria's mother sometimes took student boarders into their grand house. One was an American, who studied chemistry, Joseph E. Mayer. Maria and Joe became close, going hiking, skiing and playing tennis together. In 1930 they married. Soon after her marriage she completed her doctorate with a thesis in theoretical physics.

After graduating, Joseph Mayer was offered a job at the Johns Hopkins University in Baltimore, Maryland. Maria followed her husband but could provide research just as a volunteer without official responsibilities. Meanwhile, the couple had two children, Marianne and Peter.

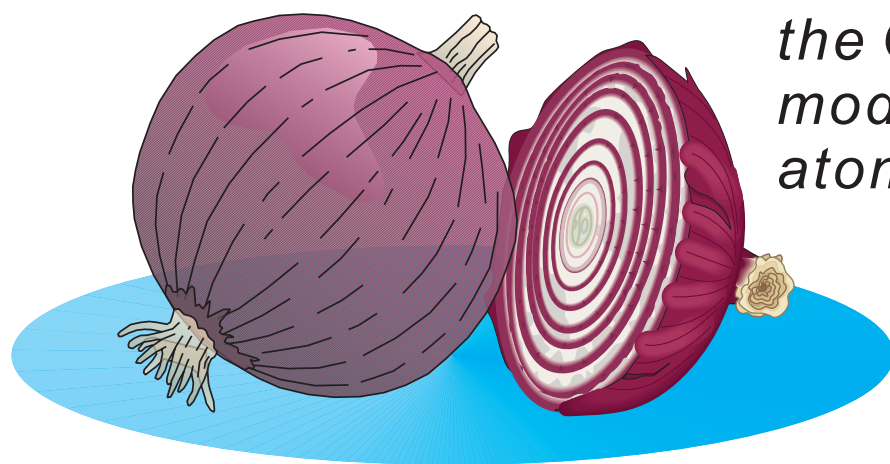
When Mayer lost his position at the Johns Hopkins, he and Maria left for Columbia University in New York.

It was not until 1941 when Goeppert-Mayer was offered her first real teaching job. In the same year she was invited to join the secret research group which was working on the separation of Uranium-235. The uranium was to be the fuel for a nuclear fission bomb.

After World War II, the Mayers moved to Chicago and very soon Maria won a position at the Argonne National Laboratory where she worked with Edward Teller on the theory of cosmic origin to explain element and isotope abundances in the universe; it was here that she made her great discovery.

Goeppert-Mayer was a member of the National Academy of Sciences and received many honorary doctorates.

As she became older her health declined. A lifelong smoker, and debilitated by a stroke, she began to have heart problems. She died in 1972 after a heart attack.



*She developed the Onion-shell model of the atomic nucleus*