



# Amalie Emmy Noether

## 1882 - 1935

Amalia Emmy Noether is regarded as one of the greatest female mathematicians and theoretical physicists of all time.

Emmy Noether worked mainly in the field of abstract algebra. It was said that 'she originated above all a new and epoch-making style of thinking in algebra'. However, she also succeeded in proving two theorems which were considered by theoretical physicists as very important for *general relativity*. One is known as *Noether's Theorem*, it established the equivalence between an invariance property and a conservation law. The other involved the relationship between an invariance and the existence of certain integrals of the equations of motion.

Emmy Noether was born in 1882, in the small university town of Erlangen, Germany. Her father, Max Noether, was a professor at the University of Erlangen and was himself an eminent mathematician who worked on the theory of algebraic functions. Her mother came from a wealthy family in Cologne.

Noether was brought up as a typical German girl. She learned to cook and took piano lessons. She enjoyed her dancing classes. Girls were not allowed to enrol in the gymnasium at that time. At first she studied mathematics and languages at the Stadtischen Hoheren Tochterschule and dreamed of being a teacher of French and English but she then changed her mind and went to university. She enrolled at the University of Erlangen, where women were accepted and, in 1908, received her Ph. D. in mathematics.



Gravitational waves

*She worked on the theory of General Relativity*



*She had to leave Germany when the Nazis came to power*



Noether started her research without payment at the Mathematical Institute of Erlangen. It was there where she began to work on algebra and published her first paper. In 1915 Hilbert (the well-known mathematician) invited her to Göttingen University, also without payment, because women were not admitted to the faculty. In 1922 she was named as an unofficial associate professor.

Noether was a brilliant teacher and students admired her. She organized her lectures in the form of discussions. She loved to spend her free time with her students, especially taking long walks. However her salary was still very modest.

During the winter of 1928-1929 Noether lectured as a visiting professor at the University of Moscow, and also participated at conferences in Bologna and Zurich. When she traveled she enjoyed observing new cultures. Her life changed in 1933 when the Nazis came to power. As a Jew and a woman she could not continue her job at the University. Fortunately, she was offered a professorship at Bryn Mawr, a women's college in Pennsylvania, in the USA.

In the spring of 1935, Noether underwent surgery to remove a uterine tumor. Although the operation was a success, she died four days later, apparently from a post-operative infection. She received honours only after her death.