

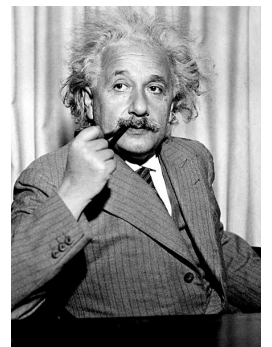
# The Theorem at the Heart of Physics



In 1917, a mathematician, working in obscurity in an inner office of the famed Göttingen University, was given an assignment: prove that Einstein's new theory of gravity, the General Theory of Relativity, made sense. Her boss, who happened to be the greatest mathematician of his time, thought she might succeed where others had failed, as he knew she had helped Einstein get his math right.

Her name was Emmy Noether. She did succeed, by using the most advanced mathematics of the day to prove a powerful new theorem. This result finally explained the mysterious conservation of energy, unifying the concepts of symmetry and conservation under one framework that brought a new level of harmony and beauty to physics.

Her theorem would be rediscovered 40 years later by high-energy physicists and become their guide to the world of fundamental particles and forces. It now stands at the core of the Standard Model, our fundamental theory of matter. Today this theorem is finding surprising new applications at the forefront of various fields from quantum computing to economics.



Emmy Noether would die before learning of these applications of her work, two years after escaping the Nazis by fleeing to the United States. In this talk I will describe her tragic and inspiring life, and discuss the importance of her Theorem for the development of physics.

The talk will be suitable for anyone who has taken an introductory physics course.