Contents | Next

EMMY NOETHER

Born: Erlangen, Germany, March 23, 1882

Died: Bryn Mawr, Pennsylvania, April 14, 1935

Creative Mathematical Genius

It might be that Emmy Noether was designed for mathematical greatness. Her father Max was a math professor at the University of Erlangen. Scholarship was in her family; two of her three brothers became scientists as well. Emmy would surpass them all. Ultimately Max would become best known as Emmy Noether's father.

Amalie Emmy Noether spent an average childhood learning the arts that were expected of upper middle class girls. Girls were not allowed to attend the college preparatory schools. Instead, she went to a general "finishing school," and in 1900 was certified to teach English and French. But rather than teaching, she pursued a university education in mathematics

She audited classes at Erlangen as one of two women among thousands of men, then took the entrance exam. She entered the University of Göttingen in 1903, again as an auditor, and transferred back to Erlangen in 1904 when the university finally let women enroll. She received her mathematics Ph.D. in 1907.

Noether worked at the Mathematical Institute of Erlangen, without pay or title, from 1908 to 1915. It was during this time that she collaborated with the algebraist Ernst Otto Fischer and started work on the more general, theoretical algebra for which she would later be recognized. She also worked with the prominent mathematicians Hermann Minkowski, Felix Klein, and David Hilbert, whom she had met at Göttingen. In 1915 she joined the Mathematical Institute in Göttingen and started working with Klein and Hilbert on Einstein's general relativity theory. In 1918 she proved two theorems that were basic for both general relativity and elementary particle physics. One is still known as "Noether's Theorem."

But she still could not join the faculty at Göttingen University because of her gender. Noether was only allowed to lecture under Hilbert's name, as his assistant. Hilbert and Albert Einstein interceded for her, and in 1919 she obtained her permission to lecture, although still without a salary. In 1922 she became an "associate professor without tenure" and began to receive a small salary. Her status did not change while she remained at Göttingen, owing not only to prejudices against women, but also because she was a Jew, a Social Democrat, and a pacifist.*

During the 1920s Noether did foundational work on abstract algebra, working in group theory, ring theory, group representations, and number theory. Her mathematics would be very useful for physicists and crystallographers, but it was controversial then. There was debate whether mathematics should be conceptual and abstract (intuitionist) or more physically based and applied (constructionist). Noether's conceptual approach to algebra led to a body of principles unifying algebra, geometry, linear algebra, topology, and logic.

In 1928-29 she was a visiting professor at the University of Moscow. In 1930, she taught at Frankfurt. The International Mathematical Congress in Zurich asked her to give a plenary lecture in 1932, and in the same year she was awarded the prestigious Ackermann-Teubner Memorial Prize in mathematics.

Nevertheless, in April 1933 she was denied permission to teach by the Nazi government. It was too dangerous for her to stay in Germany, and in September she accepted a guest professorship at Bryn Mawr College. She also lectured at the Institute for Advanced Study in Princeton. The guest position was extended, but in April 1935 she had surgery to remove a uterine tumor and died from a postoperative infection.

---

* Gottfried E. Noether, "Emmy Noether (1882-1935)," in Louise S. Grinstein and Paul J. Campbell: *Women of Mathematics: A Bibliographic Sourcebook* (New York, Greenwood Press), 1987, pp. 165-170.

Contents | **Next**