

Book Review for *EMMY NOETHER – the mother of modern algebra* by M.
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Title: Emmy Noether

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The story of Emmy Noether is one of “little unknown girl makes good and becomes famous”. Not a lot is known about Noether’s early life growing up, but it is abundantly clear that she was blessed with strong family ties in secure circumstances. Such an environment tends to foster success for the individual, whenever one or both parents are supportive and expose the child to positive cultural and educational influences. The author chose to describe Noether’s biographical life rather than her mathematical accomplishments. In consequence Noether’s achievements are lightly mentioned, but they are presented without any mathematical details. It would be illuminating to follow Noether’s thinking through her discoveries and to track her development to mathematical maturity.

Emmy’s father, Max, was a mathematics professor in the college at Erlangen. Both parents tended to channel their daughter into preparation for domestic life as a wife and mother. However, Emmy was bright child, and solved puzzles and riddles of all kinds from an early age. She continually questioned her designated role as a girl, and queried her father why she, too, should not be a mathematician, ever resisting the rote of learning French, or of a musical instrument. One day she asked her father “what is algebra?”, and he provided her with some elementary examples, which stimulated her interest. They agreed that she could learn algebra. Emmy attended a girl’s school

(Tochterschule), but she wanted to learn what her brothers were learning. Her father's colleague at his college, Professor Paul Gordon, encouraged her study of algebra, and suggested that she could audit courses at the college. Generally, women were not permitted to attend university in nineteenth century Germany.

Noether earned a teacher's exam to teach English and French, but she wanted to teach mathematics and go on to receive an advanced degree from Goettingen. The success of mathematicians Kovalevsky in Poland and Young in England was an inspiration to her. Emmy was especially eager to follow Klein's work in formalizing algebra into an axiomatic subject. For the present she had to obtain her Ph.D. at Erlangen under her father and Paul Gordon and was the first young woman to do so.

Her work was entirely conceptual: commutative rings, set theory, and symmetry dealing with algebraic objects rather than specific equations, or numerical examples. Noether also worked with Ernst Fischer at Erlangen. Her parents proposed that she and Fischer become personally interested in one another, but Emmy declined. She apparently accepted that she was not gifted with good looks or many social graces, preferring to reserve all her energy and effort for mathematics. Her father intervened and brought her to Goettingen to visit with Hilbert and Klein. Hilbert obtained for Emmy an unpaid teaching position at Goettingen under his name. By 1915 Emmy became known as a serious mathematician in her own right, after her work in commutative algebra. During and after World War I, German scholars became increasingly isolated from academia in other countries.

Noether's work on Einstein's general theory of relativity helped formulate the mathematical basis for the theory. Also, she edited the mathematics journal "Mathematische Annalen". During this period Emil Artin came to Goettingen and studied with Emmy. She then obtained a position of Extraordinarius at Goettingen without salary but was able to mentor doctoral students. One of her post-doctoral students was Van der Waerden. P. S. Alexandroff came to Goettingen from Russia in 1923 to lecture, and to work with Noether. The period of the late 1920s and early 1930s was a wonderful one for the community of professors and students. At this time Emmy was enthused by Soviet Socialism in principle.

During the 1930s German politics changed when the Nazis took over the country, and a number of professors were expelled because of their ancestry. Fortunately for Noether, she was offered a position at Bryn Mawr College in Pennsylvania, when she realized she could no longer remain in Germany. Success was her companion for her remaining years at Bryn Mawr until April 1935 when she started to feel ill and was operated on for an ovarian cyst, dying from the complications of surgery at age 53. The world was deprived of great woman mathematician.

Emmy Noether-the Mother of Modern Algebra is an enjoyable book and quite readable by non-mathematicians. Younger school-age readers might be stimulated to learn more about the subject.