

could collaborate with the famed physicist. She grew up in Germany and had her mathematics education delayed because of rules against women matriculating at universities. After she received her PhD, for a dissertation on a branch of abstract algebra, she was unable to obtain a university position for many years,



eventually receiving the title of “unofficial associate professor” at the University of Gottingen, only to lose that in 1933 because she was Jewish. And so she moved to America and became a lecturer and researcher at Bryn Mawr College and the Institute for Advanced Study in Princeton, New Jersey. There she developed many of the mathematical foundations for Einstein’s general theory of relativity and made significant advances in the field of algebra.

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## Russia

### Olga Ladyzhenskaya (1922 - 2004)



She was a Russian mathematician who worked on partial differential equations (especially Hilbert’s nineteenth problem), fluid dynamics. She provided the first rigorous proofs of the convergence of a finite difference method for the Navier-Stokes equations. She received the John von Neumann Lecture Prize in 1998 and the Lomonosov Gold Medal in 2002. She is the author of more than two hundred scientific works, among which are six monographs.

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## Links

- <https://www.telegraph.co.uk/films/hidden-figures/female-mathematicians-who-changed-the-world/>
- <https://www.britannica.com/biography/Sophie-Germain>
- <https://www.britannica.com/biography/Ada-Lovelace>
- <https://www.maa.org/press/periodicals/convergence/mathematical-treasure-mary-boole-on-the-psychology-of-mathematics>
- <http://exhibits.lib.berkeley.edu/spotlight/women-who-figure/feature/great-women-of-mathematics>

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## The Historical Review: European female Mathematicians

### Italy

#### Maria Gaetana Agnesi (1718-1799)



Italian mathematician, philosopher, theologian and humanitarian, best known for her seminal text on mathematical analysis which was published in 1748 as 1,020-page text called *Istituzioni Analitiche* (Analytical Institutions), believed to be the first mathematics book published by a

woman.

### France

#### Sophie Germain (1776 - 1831)



She is best known for her work in number theory and contributions to the applied mathematics of acoustics and elasticity. Her work on Fermat’s Last Theorem provided a foundation for mathematicians exploring the subject for hundreds of years after. Because of prejudice against her gender, she was unable to make

a career out of mathematics, but she worked independently throughout her life.

Unable to study at the École Polytechnique because she was female, Germain obtained lecture notes and submitted papers to Joseph Lagrange, a faculty member, under a false name. When he learned she was a woman, he became a mentor and Germain soon began corresponding with other prominent mathematicians at the time. Her work was hampered by her lack of formal training and access to resources that male mathematicians had at the time. But she became the first woman to win a prize from the French Academy of Sciences, for work on a theory of elasticity.

## England

### Ada Lovelace (1815 - 1852)



Augusta Ada Byron (later Countess of Lovelace) never knew her father, the poet Lord Byron, who left England due to a scandal shortly after her birth. Her overprotective mother, wanting her daughter to grown up as unemotional as possible, encouraged her study of science and mathematics. As an adult, Lovelace began to correspond with the inventor and mathematician Charles Babbage, who asked

her to translate an Italian mathematician's memoir analyzing his Analytical Engine (a machine that would perform simple mathematical calculations and be programmed with punchcards and which is considered one of the first computers). Lovelace went beyond completing a simple translation, and wrote her own set of notes about the machine and even included a method for calculating a sequence of Bernoulli numbers; this is now acknowledged as the world's first computer program.

### Mary Everest Boole (1832 - 1916)

She is best known for her writing a series of books and articles, publishing them regularly until the time of her death. "Logic Taught by Love" was published in 1889. In 1904 Mary published "The Preparation of the Child for Science." This book ultimately had a great impact on progressive schools in England and the United States in the first part of the twentieth century. She also invented curve stitching, or what we call today, string geometry, to help children learn about the geometry of angles and spaces [commemorated in a "Garfield cartoon."] [In 1909, Boole published "Philosophy and Fun of Algebra."]



Mary Boole had a fascination with the science of the psychic or spirit world. It took over fifteen years to get her book, "The Message of Psychic Science for Mothers and Nurses", published due to the controversy over the subject matter. It was over this book that Mary lost her job as a librarian.

Mary considered herself a mathematical psychologist. Her goal was to try "... to understand how people, and especially children, learned mathematics and science, using the reasoning parts of their minds, their physical bodies, and their unconscious processes."

## Russia

### Sofia Kovalevskaya (1850 - 1891)

Sofia Kovalevskaya was the first major Russian female mathematician, responsible for important original contributions to analysis, differential equations and mechanics, and the first woman appointed to a full professorship in Northern Europe. She was also one of the first women to work for a scientific journal as an editor. Although she published only ten papers on mathematics and

mathematical physics, many of these included groundbreaking theories or the impetus for future discoveries.



Her early work on the theory of differential equations was a particularly valuable contribution to mathematics and led to what is now known as the Cauchy-Kovalevsky theorem for analytic partial differential equations. Kovalevskaya's other great breakthrough was her paper on the rotation of an unsymmetrical solid body

around a fixed point, now known as the Kovalevsky top. In 1888, she became the first woman to be elected a corresponding member of the Russian Academy of Sciences. In the same year, she was awarded the Prix Bordin of the French Academy of Sciences for a paper on the rotation of a solid body around a fixed point. Kovalevskaya also gained a reputation as a writer, an advocate of women's rights, and a champion of radical political causes. She composed novels, plays, and essays, including the autobiographical *Memories of Childhood* (1890) and *The Nihilist Woman* (1892), a depiction of her life in Russia. An extraordinary person, Sofia Kovalevskaya was an active advocate of women's rights. It was her struggle to obtain the best education available which began to open universities' doors to women. In addition, her ground-breaking work in mathematics made her male counterparts reconsider their archaic notions of women's inferiority to men in science, thus paving the way for future women scholars to succeed.

## Germany

### Emmy Noether (1882 - 1935)

In 1935, Albert Einstein wrote a letter to the New York Times, lauding the recently deceased Emmy Noether as "the most significant creative mathematical genius thus far produced since the higher education of women began." Noether had overcome many hurdles before she