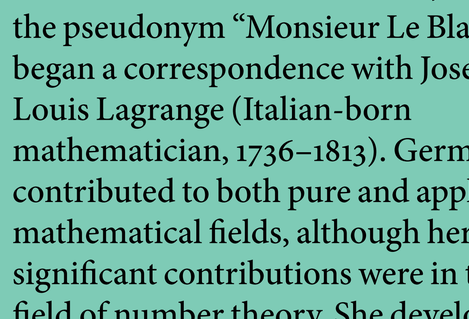
Mathematicians
A–Z

Germain
Hypatia
Ionel
Jackson

UNIVERSITY OF OXFORD
Mathematical Institute

Sophie Germain
(France, 1776–1831)

Sophie Germain began studying mathematics at age 13, during the politically turbulent era of the French Revolution (1789–1801). Although barred from entering the École Polytechnique in 1794 (because of her gender), Germain nevertheless obtained mathematics lecture notes and, under the pseudonym "Monsieur Le Blanc", began a correspondence with Joseph-Louis Lagrange (Italian-born mathematician, 1736–1813). Germain contributed to both pure and applied mathematical fields, although her most significant contributions were in the field of number theory. She developed several novel approaches to proving *Fermat's Last Theorem* (see below) for general exponents *n*. Although she was unable to prove the full version of the theorem (and it would go unsolved for almost another 200 years), her work became a basis for later mathematicians attempting to solve this problem. Germain was also a pioneer of elasticity theory; in 1816 she won the *prix extraordinaire* from the Institut de France for her essay *Memoir on the Vibrations of Elastic Plates*.

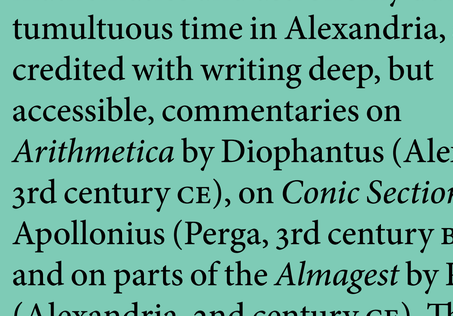


Fermat's Last Theorem: for all $n > 2$, the equation $x^n + y^n = z^n$ has no positive integer solutions x, y, z.

Originally stated c. 1637 by Pierre de Fermat (French mathematician, 1607–1665), the first successful proof was published in 1995 by Andrew Wiles (English mathematician, b. 1953).

Hypatia
(Alexandria, c. 350–370 CE – 415 CE)

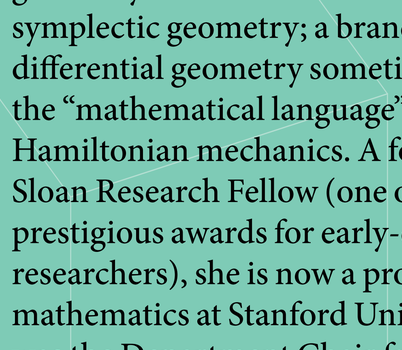
Hypatia of Alexandria is the earliest female mathematician whose life and work are reasonably well-documented. She was a Greek Neoplatonist philosopher, astronomer, and mathematician, renowned in her time as an efficacious lecturer at the Platonist school in Alexandria. Hypatia strove to preserve the heritage of Greek mathematics and astronomy during a tumultuous time in Alexandria, and is credited with writing deep, but accessible, commentaries on *Arithmetica* by Diophantus (Alexandria, 3rd century CE), on *Conic Sections* by Apollonius (Perga, 3rd century BCE), and on parts of the *Almagest* by Ptolemy (Alexandria, 2nd century CE). Though her original work is now lost, it is suspected her writings live on through the modern editions of these books. Outside of mathematics, Hypatia acted as an advisor to Orestes, the Roman prefect of Alexandria. She ultimately was drawn into a political feud between Orestes and Cyril, the Christian bishop of Alexandria, over which institution – the Church or the Roman state – would control the region. Caught in the middle, Hypatia was brutally murdered by a mob of Christian fanatics in 415 CE.



(Above) Artist's impression of the murder of Hypatia. Illustration by Louis Figuier, 1866. (Portrait) by Jules Maurice Gaspard, 1908.

Eleny Ionel
(Romania, b. 1969)

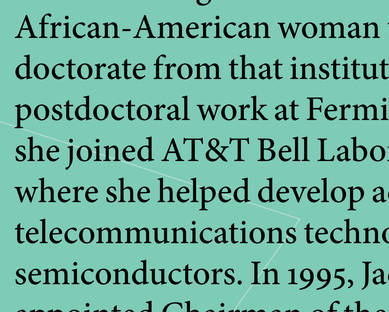
Born in Romania, Eleny Ionel was exposed at a young age to academic life through her family. After her undergraduate studies in Romania, she obtained a PhD at Michigan State University (USA), where she specialised in topics within the field of algebraic geometry. Her current interests involve symplectic geometry; a branch of differential geometry sometimes called the "mathematical language" for Hamiltonian mechanics. A former Sloan Research Fellow (one of the most prestigious awards for early-career researchers), she is now a professor of mathematics at Stanford University and was the Department Chair from 2016–2019. Ionel has authored a number of papers in the most distinguished modern mathematics journals, including *Annals of Mathematics*, *Inventiones mathematicae*, and the *Duke Mathematical Journal*. In recognition of her achievements, Ionel was named a Fellow of the American Mathematical Society in 2020 for "contributions to symplectic geometry and the geometric analysis approach to Gromov-Witten Theory".



Visualisation of the *Hopf fibration* in differential topology. The fibration is a useful method of mapping the four dimensional hypersphere into three dimensional space.

Shirley Ann Jackson
(USA, b. 1946)

Born in Washington D.C., Shirley Ann Jackson earned a B.S. in theoretical physics at MIT in 1968. During her undergraduate studies, Jackson advocated for outreach to students of colour and in 1968 co-founded the Black Students' Union. In 1973, she received a PhD in nuclear physics – also from MIT – and in doing so became the first African-American woman to earn a doctorate from that institution. After postdoctoral work at Fermilab & CERN, she joined AT&T Bell Laboratories where she helped develop advances in telecommunications technology and semiconductors. In 1995, Jackson was appointed Chairman of the US Nuclear Regulatory Commission (becoming both the first woman and first African-American to hold that position). There, she spearheaded the use of computer modelling for the management & assessment of risk in American nuclear power plants. In 2009, President Obama appointed Jackson to the President's Council of Advisors on Science and Technology. She was awarded the 2014 National Medal of Science in recognition of her contributions to physics & scientific public policy.



Jackson receiving the National Medal of Science from President Barack Obama in May 2016.

Poster sources Germain: Wikipedia, agnesscott.edu, *Sophie Germain: Revolutionary Mathematician* by Dora Musielak, Springer (2020). Hypatia: Wikipedia, mathshistory.st-andrews.ac.uk, britannica.com, *Hypatia: Life, Death, and Works* by Alan Cameron, in "Wandering Poets and Other Essays on Late Greek Literature and Philosophy", 2016. Ionel: Wikipedia, math.stanford.edu, ncatlab.org/nlab. Jackson: Wikipedia, MIT Technology Review: *The Remarkable Career of Shirley Ann Jackson* by Amanda Schaffer (2017), president.rpi.edu/president-biography.

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