Women in Mathematics in the 1800s

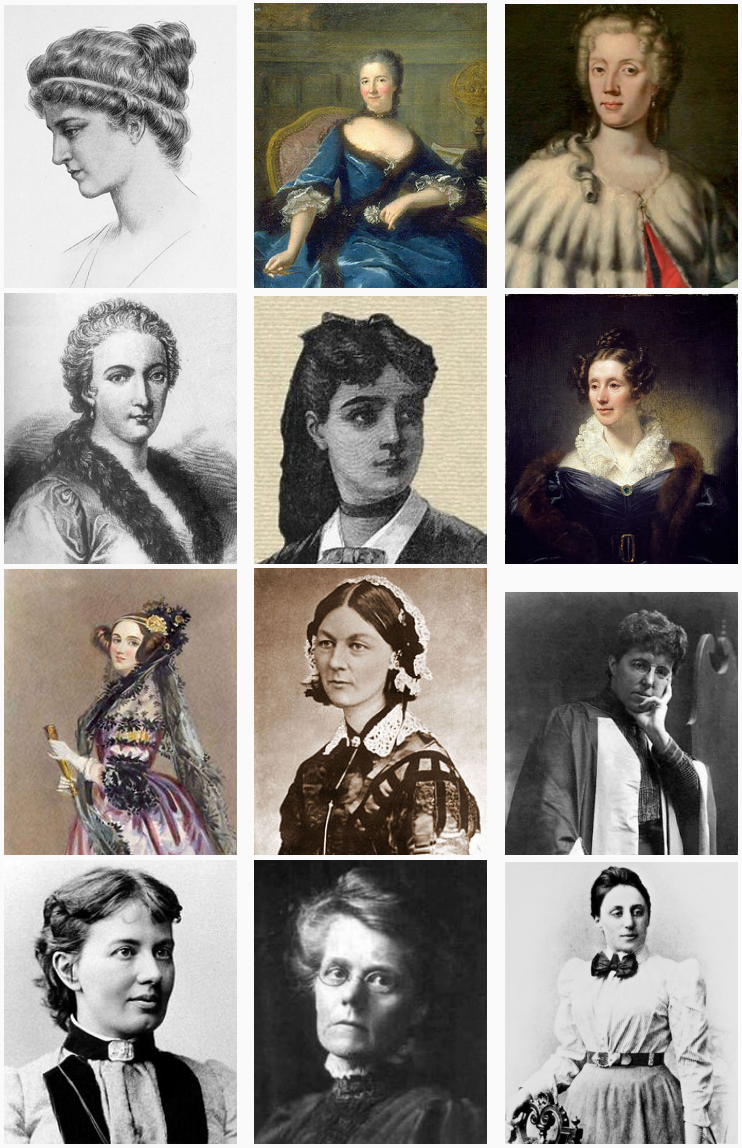
Fall 2025 - R. L. Herman





Famous Women Mathematicians Before 1900

- Hypatia of Alexandria (c. 350-415)
- Émilie du Châtelet (1706-1749)
- Laura Bassi (1711-1788)
- Maria Agnesi (1718-1799)
- Sophie Germain (1776-1831)
- Mary Fairfax Somerville (1780-1872)
- Ada Lovelace (1815-1852)
  (Augusta Byron, Countess of Lovelace)
- Florence Nightingale (1820-1910)
- Charlotte Angas Scott (1848-1931)
- Sofia Kovalevskaya (1850-1891)
- Alicia Boole Stott (1860-1940)
- Amalie 'Emmy' Noether (1882-1935)



Pandrosion (4th c. CE) and Hypatia (c. 350–370 – 415 CE)

Pandrosion, Alexandria

- Earliest *documented* woman mathematician on record (from Pappus's *Collection*);
- Active as a teacher in Alexandria.
- Pappus criticized her students' method for *doubling the cube*.
- Associated with a construction of a *mean proportional*.
- Misidentified for centuries: due to editorial errors;
- Recent philological work confirms feminine address and name.

Hypatia, Alexandria

- Neoplatonist *philosopher, astronomer, and mathematician*;
- Father was Theon.
- Led a respected teaching circle.
- Produced *commentaries* (e.g., *Diophantus's Arithmetica*, *Apollonius's Conics*);
- Public intellectual and civic advisor;
- *Murdered in 415 CE*, later symbol of intellectual independence and vulnerability to sectarian violence.

Context: Pandrosion predates Hypatia as the earliest recorded woman mathematician; Hypatia remains the first whose intellectual life is well attested.

Émilie du Châtelet (1706-1749)

- Gabrielle-Émilie Le Tonnelier de Breteuil
- Father - official at the Court of Louis XIV at Versailles.
- Husband - Marquis Florent-Claude Chastellet, military man, governor of Semur-en-Auxois in Burgundy.
- Lovers: Pierre Louis Moreau de Maupertuis (1698-1759), Alexis Clairaut (1713-1765) and François-Marie Arouet (Voltaire) (1694-1778).
- Wrote on Newton, Leibniz, and the propagation of fire.
- Translation of the *Principia* into French.
- Debated Euler and others over *vis viva*, "living force," or kinetic energy Σmv^2.

Figure 1: Gabrielle Émilie Le Tonnelier de Breteuil Marquise du Châtelet [Émilie du Châtelet]

Laura Bassi and Marie Agnessi

Both promoted by Pope Benedict XIV (Prospero Lambertini).

- Laura Bassi (1711-1788)
  - 1st female physics professor.
    Studied Newton, electricity.
    Student Galvani, Volta's Ph.D.
  - Second in the world: Ph.D., 1732.

    1st - philosopher Elena
    Cornaro Piscopia, 1678.
  - 1st woman: doctorate in science.
- Maria Agnessi (1718-99).
  - 1st woman: math handbook.
  - 1st woman math professor.
  - First book on both differential and integral calculus.
  - Witch of Agnesi curve.

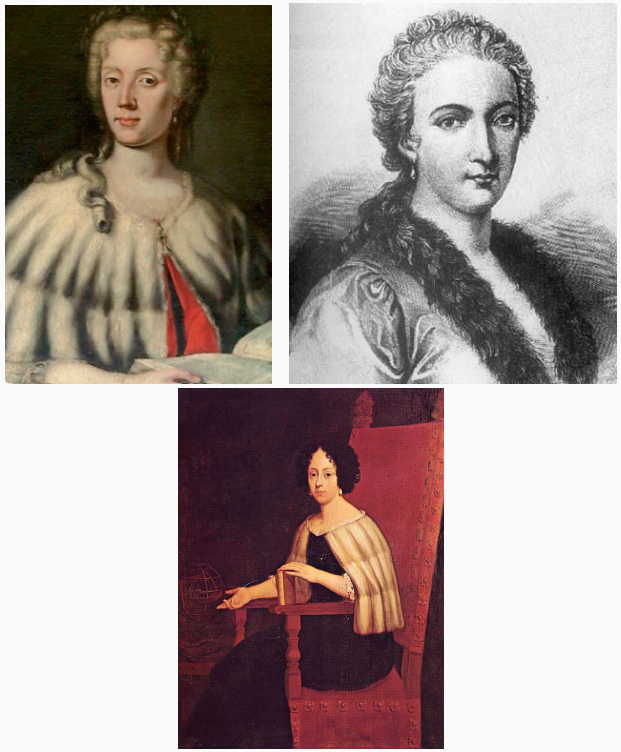


Figure 2: Bassi, Agnessi, Piscopia.

Marie Sophie Germain (1776-1831)

- Self-taught, French revolution.
- 1794 - École Polytechnique opened - for men, obtained .notes
  Signed HW - Monsieur Le Blanc.
- Joseph-Louis Lagrange (1736-1813).
- Adrien-Marie Legendre (1752-1833).
- Gauss (1777-1855)
  - letters 1804-12; saved his life.
- Germain Primes -
  If p is prime, then so is $2p+1$
  Ex: $5 = 2(2)+1$, $7 = 2(3)+1$,
  $9 = 2(4)+1$, $11 = 2(4)+1$.
- Elasticity work did not get her name on **Eiffel Tower**.

Figure 3: Sophie Germain

- Fermat's Last Theorem.
- Chladni Plates, elasticity.
- Competitions 1811, 1813, 1815.

Mary Fairfax Somerville (1780-1872)

- Mathematics and astronomy.
- Wrote books
- Jointly - the first female member of the Royal Astronomical Society with Caroline Herschel.
- First to sign petition to Parliament to give women the right to vote.
- Experiments to explore the relationship between light and magnetism.
- Translated/expanded Laplace's work, 1831, *The Mechanism of the Heavens*.
- First Geography text, 1848.

Figure 4: Mary Sommerville.

Ada Lovelace (1815-1852)

- Daughter of Lord Byron, (poet, died 1824) and
- Mathematician Anne Isabelle Milbanke, self-named as "princess of parallelograms."
- She wrote papers and the first computer programs.

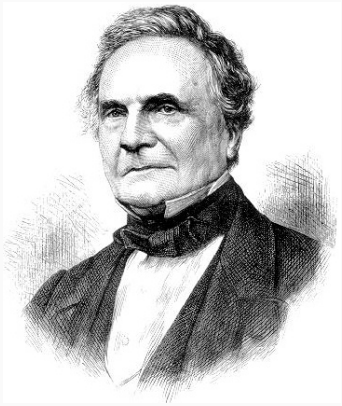
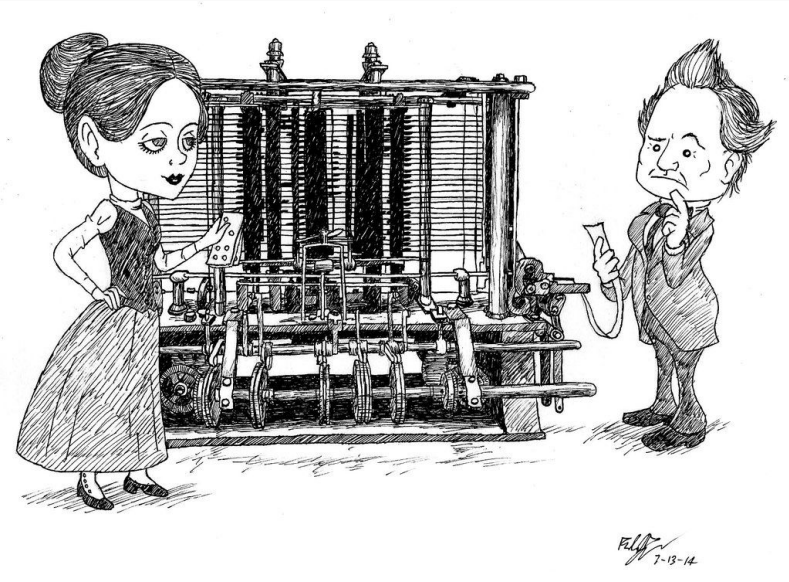


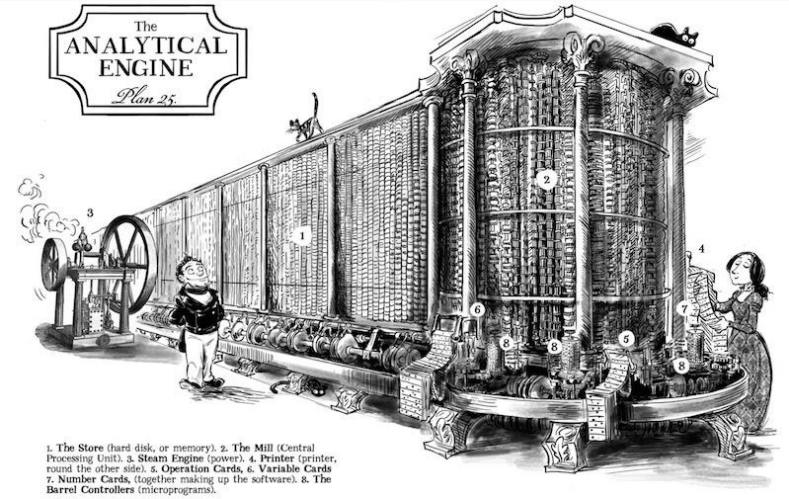
Figure 5: Charles Babbage

Figure 6: Augusta Ada King, Countess of Lovelace [Augusta Ada Byron]

Ada Lovelace and Charles Babbage

- Charles Babbage (1791-1881)
  - English mathematician, philosopher, engineer.
  - 1833 Difference Engine.
  - 1844 Analytical Engine.
  - Designed, never Built.
- Lovelace first algorithm for a machine.
- Translated Luigi Menabrea's article on the engine (1842-1843). Added notes containing first computer program.
- Loops, recursion - Bernoulli numbers, systems of linear equations.
- 1980's - Ada, programming language.





Florence Nightingale (1820-1910)

- Born in Florence, Tuscany, Italy.
- Studied under famous mathematicians.
- Crimean War (1853-1856), Britain was at war with Russia.
- Supervised 38 nurses.
- Used statistics - mortality rates
- Pioneer in data visualization, polar area diagrams.
- National heroine, 1883 recipient of the Royal Red Cross, and later others.

Figure 7: Florence Nightingale

Sofia Kovalevskaya (1850-1891)

- Born Sofya Vasilyevna Korvin-Krukovskaya in Moscow.
- Education in Europe.
- Teachers - Hermann von Helmholtz, Gustav Kirchhoff and Robert Bunsen.
- Advisor - Weierstrass (1874) - 3 papers PDEs, elliptic integrals, Saturn's rings.
- 1st woman to get doctorate in math outside Italy. - not enrolled! 1874.
- 1883 Teaching position, U. Stockholm.
- 1889 1st to hold chair in European university since Laura Bassi and Maria Agnessi.

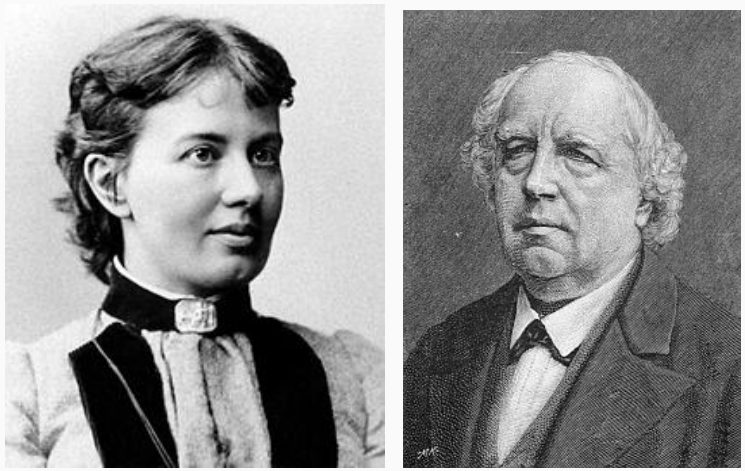


Figure 8: Sofia Kovalevskaya and Karl Weierstrass (1815-1897).

Sofia Kovalevskaya (1850-1891)

- Light waves, tops, wrote books.
- 1886 - French Competition - spinning tops.
- 1889 - Swedish Academy of Science Prize Chebyshev got her membership in Imperial Academy of Sciences.
- 1891 - On vacation, Influenza - pneumonia.
- Cauchy–Kovalevskya Theorem: local existence and uniqueness theorem for Cauchy problem in PDEs.
- Kowalevski top - a symmetric top with a particular ratio of the moments of inertia: $I_1 = I_2 = 2I_3$.

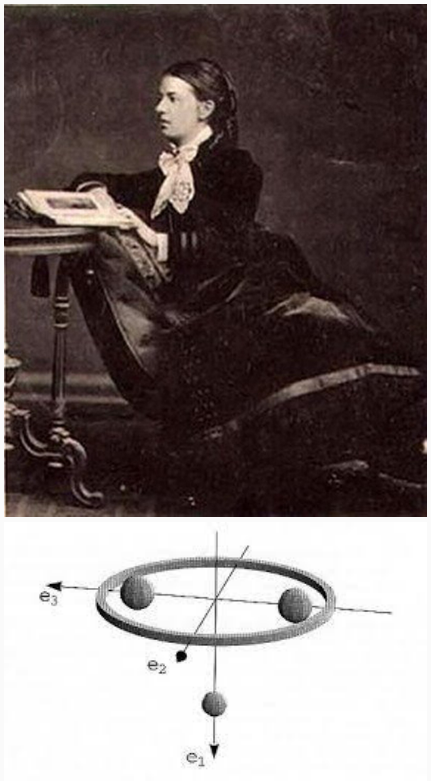
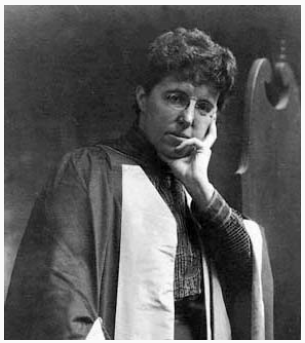


Figure 9: Sofia Kovalevskaya and her top.

Turn of Century - Charlotte Scott and Alicia Stott

Charlotte Angas Scott (1848-1931)

- One of 1st woman to obtain a doctorate in England.
- Studied under Arthur Cayley.
- Algebraic curves of degree higher than two.
- 1885 - 1st mathematician at Bryn Mawr College, dept head.
- A founder of AMS.



Alicia Boole Stott (1860-1940)

- Parents: George Boole (1815-1864) and Mary Everest Boole (1832-1916).
- Four-dimensional polytopes.
- Exactly six regular polytopes in four dimensions
- Worked with Harold Coxeter,(1907–2003).

Amalie 'Emmy' Noether (1882-1935)

- German mathematician
- Abstract algebra - theories of rings, fields, and algebras.
- Noether's theorem - connects symmetry and conservation laws.
- Mathematical Institute of Erlangen, 1908–1915 - without pay.
- University of Göttingen, 1915-1933, First four years lecturing under Hilbert's name.
- Bryn Mawr - 1933-5.
- Lectured at Institute for Advanced Study in Princeton.

Figure 10: Emmy Noether

That's *Not* All Folks! (Click on the Names)

- Elizaveta Fedorovna Litvinova (1845-1919)
- Christine Ladd-Franklin (1847-1930)
- Ellen Amanda Hayes (1851-1930)
- Helen Abbot Merrill (1864-1949)
- Grace Chisholm Young (1868-1944)
- Ada Isabell Maddison (1869-1950)
- Mary Frances Winston Newson (1869-1959)
- Mary Emily Sinclair (1878-1955)
- Anna Johnson Pell Wheeler (1883-1966)
  - Marion Cameron Gray (1902-1979)
    Gray codes, telegrapher eqn, p 34, Herman, 2025.
- Pauline Sperry (1885-1967)
- Women in the AMS before 1900