Women in Mathematics in the 1800s

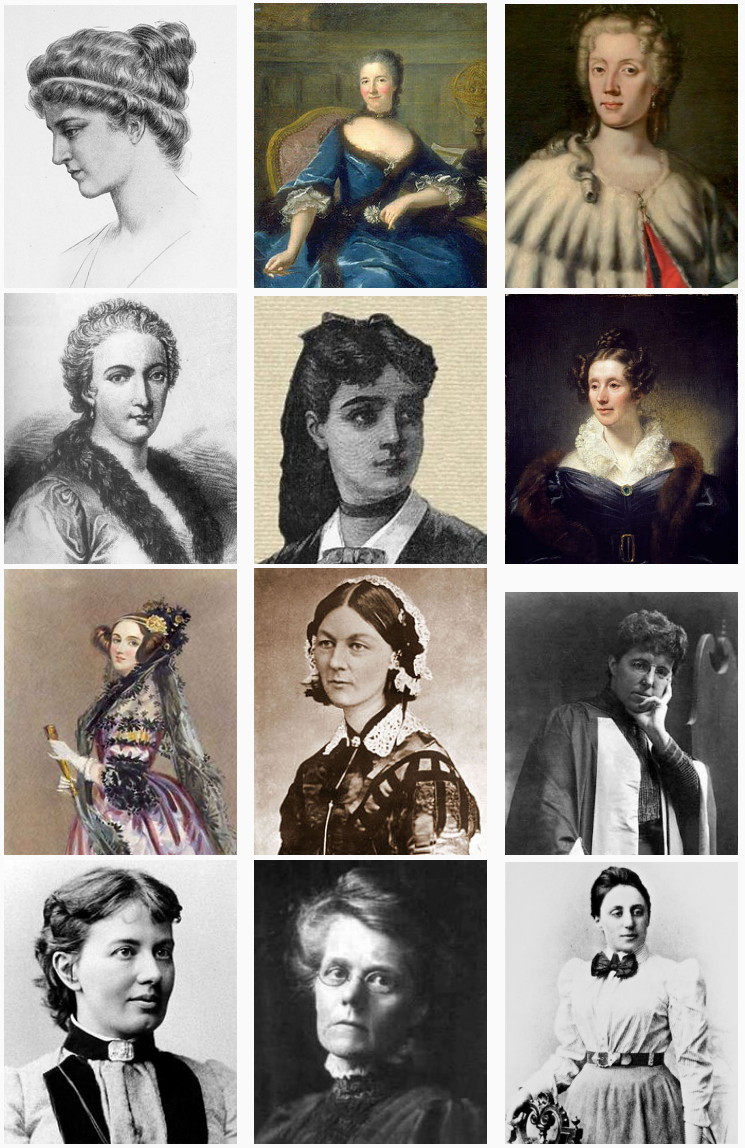
Fall 2020 - R. L. Herman





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)



Émilie du Châtelet (1706-1749)

- Gabrielle-Émilie Le Tonnelier de Breteuil
- Father - official at the Court of Louis XIV at Versaille
- 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, propagation of fire.
- Translation of the *Principia* into French.

Figure 1: Émilie du Châtelet

Marie Sophie Germain (1776-1831)

- Self-taught, French revolution
- 1794 - École Polytechnique - for men
  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: $5 = 2(2)+1$, $7 = 2(3)+1, 9 = \cancel{2(4)+1}$

Figure 2: Sophie Germain

- Fermat's Last Theorem
- Chladni Plates.

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 3: 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 first computer programs.

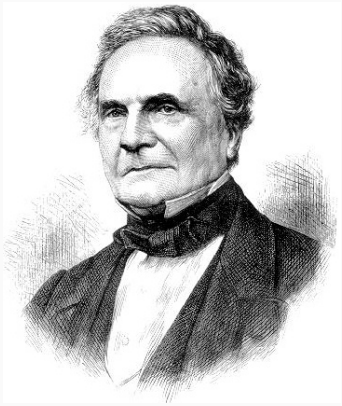
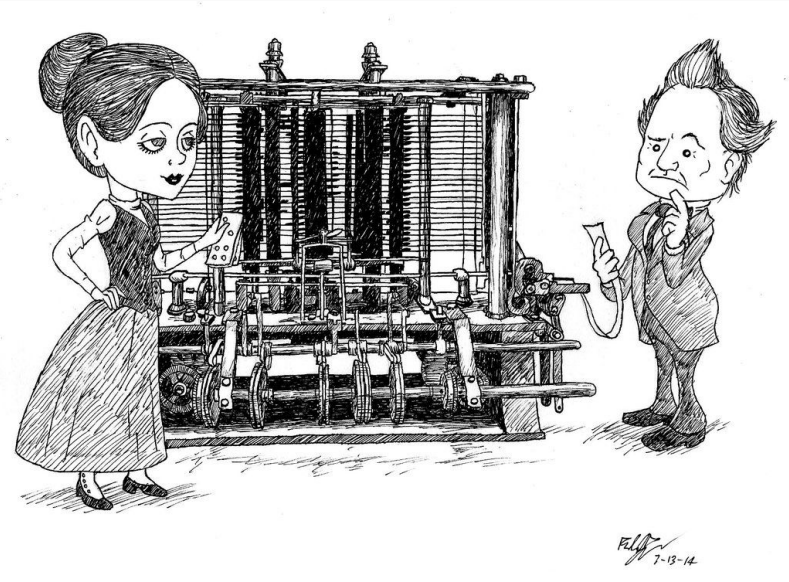


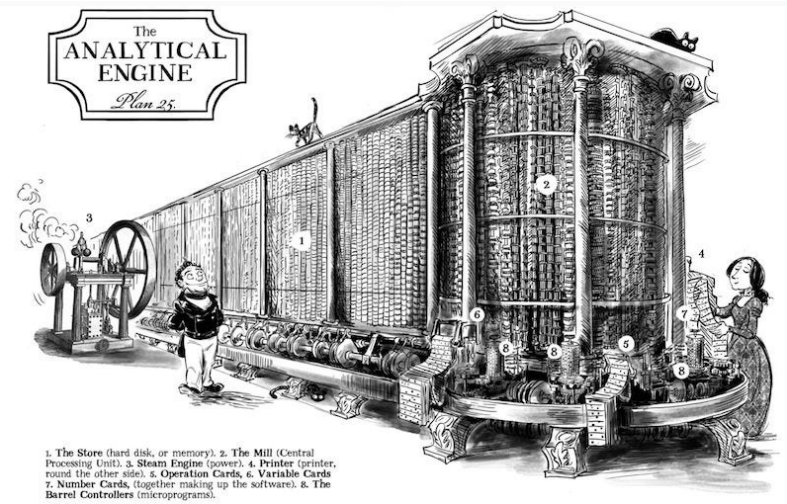
Figure 4: Charles Babbage

Figure 5: 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.
- 1842-1843, Translated an article Luigi Menabrea on the engine. added notes containing first computer program.
- Ada, programming language.





Florence Nightingale (1820-1910)

- Crimean War (1853-1856)
- Supervised nurses.
- Studied under famous mathematicians.
- Used statistics - mortality rates
- Pioneer in data visualization.
- National heroine, 1883 recipient of the Royal Red Cross, and later others.

Figure 6: Florence Nightingale

Sofia Kovalevskaya (1850-1891)

- Born Sofya Vasilyevna Korvin-Krukovskaya in Moscow.
- Education in Europe.
- Weierstrauss (1874) 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 7: Sofia Kovalevskaya

Laura Bassi and Marie Agnessi

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

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

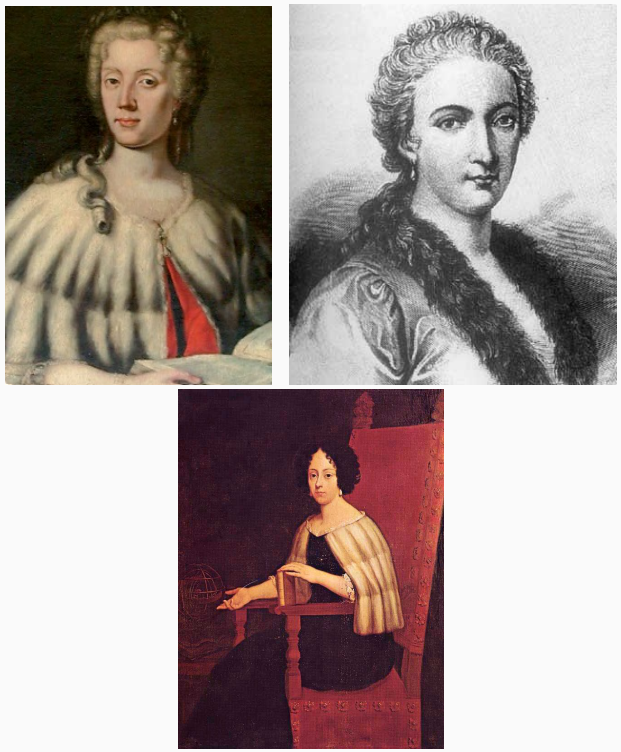


Figure 8: Bassi, Agnessi, Piscopia.

Back to Sofia Kovalevskaya (1850-1891)

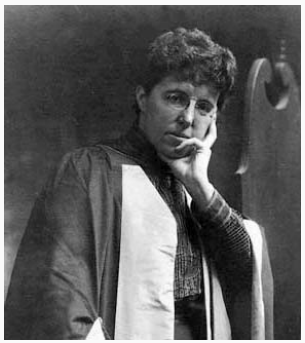
- Light waves, tops, wrote books.
- 1886 - French Competition - spinning tops.
- 1889 - Swedish Academy of Science Prize
  Chebyshev got her membership in Imperial Academy of Sciences
- 1891 - On vacation, Influenza - pneumonia.
- Cauchy–Kowalevski theorem
- Kowalevski top

Figure 9: Sofia Kovalevskaya

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