

Amazing Women Scientists

(that you probably haven't heard of!)

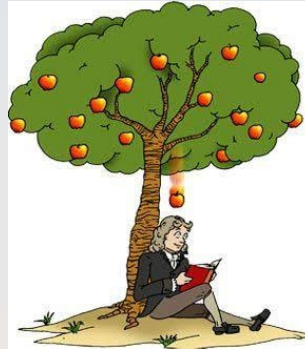


LINDA WINSLOW
OLLI, FALL 2026
Week 1

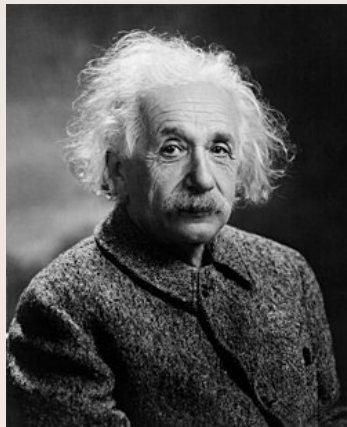


Famous Scientists you probably *have* heard of:

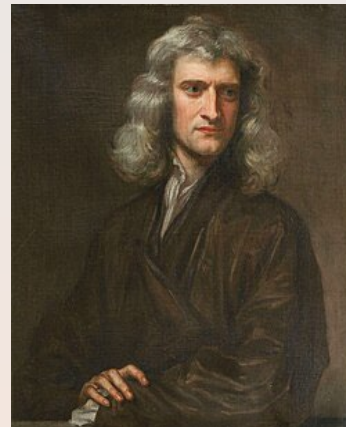
$$E = mc^2$$



88	Ra
	Radium
226	
84	Po
	Polonium
209	



Albert Einstein
1879 –1955



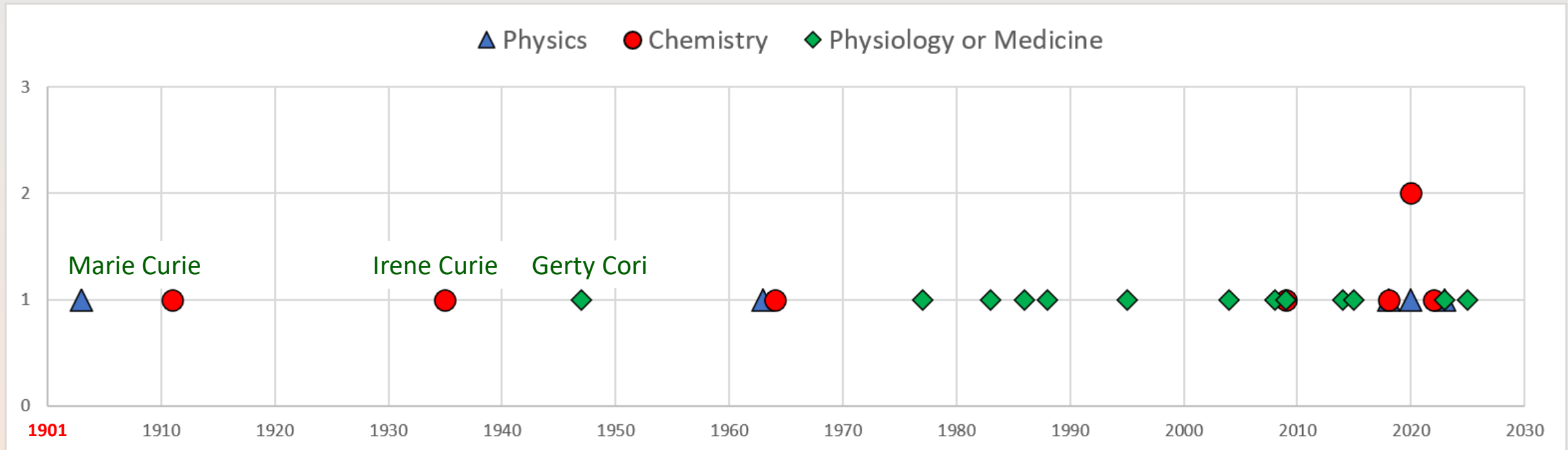
Isaac Newton
1642-1727



Marie Curie
1867-1934

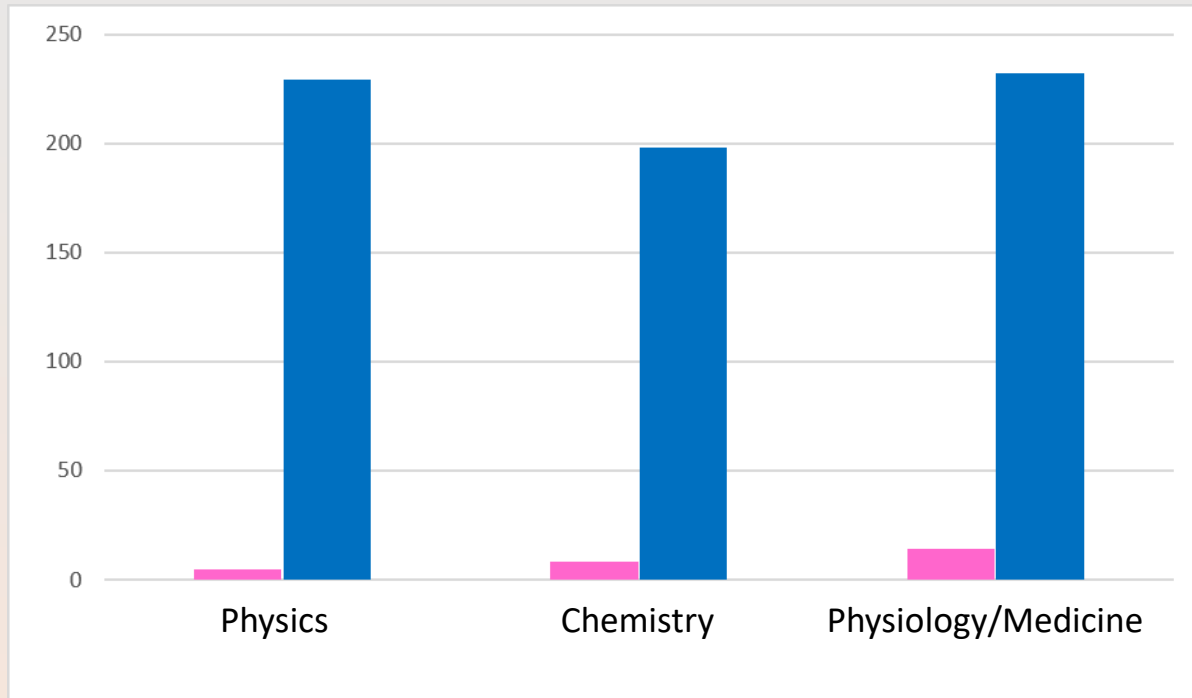
Women have won 27 Science Nobel Prizes!

- 5 in Physics
- 8 in Chemistry
- 14 in Physiology or Medicine

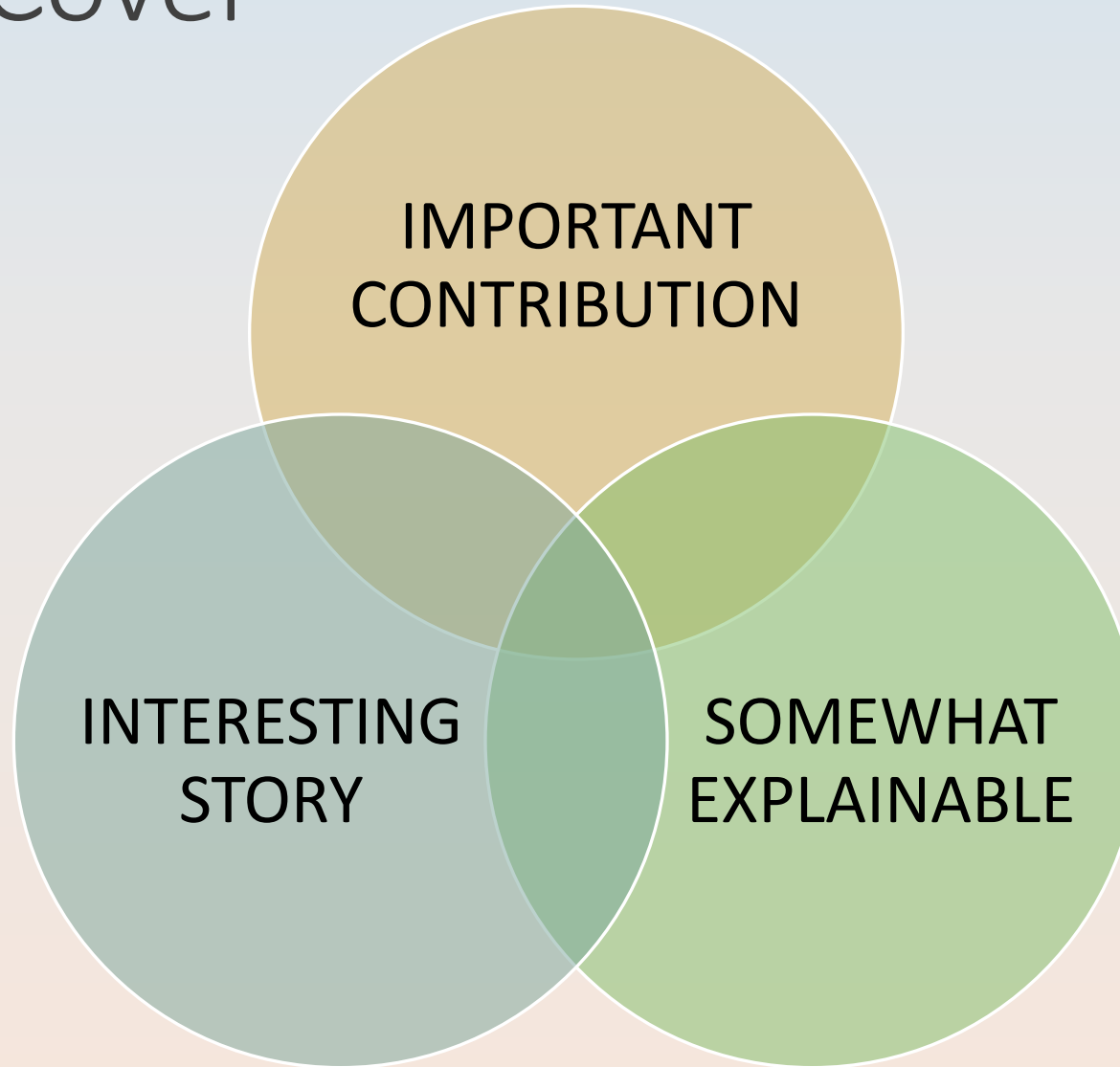


Women have won 27 *(of 659)* Science Nobel Prizes

- 5 in Physics *(of 229)*
- 8 in Chemistry *(of 198)*
- 14 in Physiology or Medicine *(of 232)*



What We'll Cover



Let's get started A March Through Time

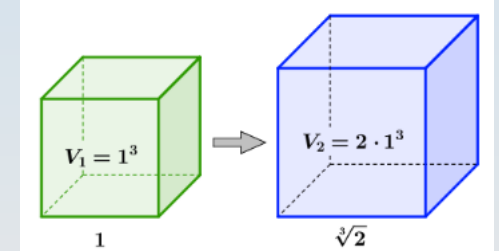




<https://www.youtube.com/watch?v=UarillqRvNM&t=11s>

Pandrosion

Mathematician



- **Earliest known female mathematician**
- Lived ~300-360 CE in Alexandria, Egypt (*part of the Roman Empire*)
- Developed an approximate **method for building a cube** with exactly double the volume of the original. (*an ancient geometric problem also known as the **Delian problem***). Her method also helped find cube roots.
- Found a correct and exact way to figure out the geometric mean, simpler than the currently used way
- Only documentation about her is in works by another mathematician, *Pappus*, (*who criticized her for not providing a proper mathematical proof*)
- For many centuries after her death she was thought to be a man, due to early mis-translations from Greek texts

Hypatia

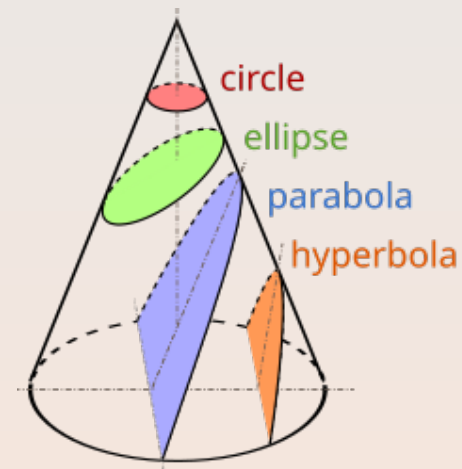
Mathematician, Astronomer, Philosopher



- 1st Female Mathematician *whose life is well recorded*
- ~355 – 415 CE, Alexandria
- Father was a mathematician who headed a school; Mother's identity is unknown to us;
 - *Her father taught her math and astronomy*
- She was known as a **Great Teacher**, and taught students from all over the Mediterranean
 - *Was admired by both Pagan (pre-Christian) & Christian students*
- She wrote in *Greek (the language of educated people)*

Hypatia

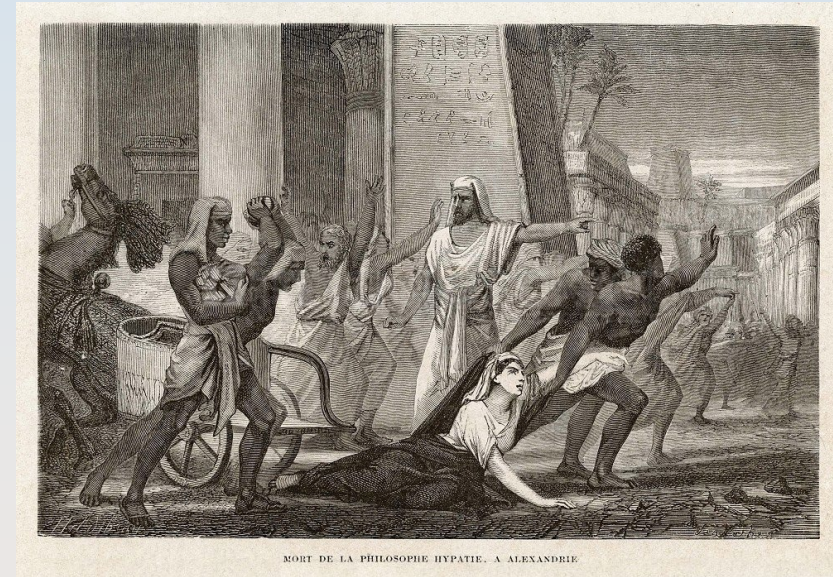
- **Edited Astronomy Source Books**, (*Ptolomey's Almagest*, 150 CE),
 - Added an improved method for **long division** (*needed for astronomical calculations*)
 - The *Almagest* was the leading resource for Astronomy in the West and in Arabic regions until the 16th century (*Copernicus*)
- **Wrote a commentary** on Diophantus' *Arithmetica* (13 volumes, 250 AD), which contained >100 mathematical problems
 - She proposed new solutions using **Algebra**
- **Wrote a commentary** on Apollonius of Perga's work on **Conic Sections** (*geometry*);
 - Divided cones into different parts by a plane
 - Developed the ideas of hyperbolas, parabolas, and ellipses.
- She **made the concepts easier to understand**, making the works survive through many centuries.
- She was ***Murdered by a mob, caught between the Church and the Government***
- Legacy: Descartes, Newton, and Leibniz later expanded on her work



Hypatia's Ever-Changing Legacy

Her legacy has been used through history sometimes in conflicting ways such as:

- 500 AD: **Anti-Christian** - Called a “Martyr for Philosophy”
- Middle Ages: A symbol of **Christian Virtue**
- Age of Enlightenment: A Symbol of **Opposition to Catholicism**
- 19th Century: Romanticized as the **last of the Hellenes** (Greek ethnic group)
- 20th Century: Icon for **Women's Rights**
- 2 feminist journals (Greece & U.S.), a UK Library are named after her
- Several books, Movie, and TV references.



The State of Medicine in the 12th Century:

- A woman wakes up experiencing **trouble breathing**.
*Her learned physician **knows immediately what is wrong**.*
- *Her uterus has wandered up into her chest cavity and is interfering with her lungs.*
- *He must drive the uterus back down where it belongs by coating her nose with foul-smelling substances and burning or boiling sweet-smelling ones down below.*
 - *The uterus, **has a sense of smell**, will be repelled by the foul-smelling compounds and attracted to the sweet ones, and will swim back to its proper place.*
- *Case closed. She's cured!*

<https://www.wisarchive.com/post/trota-of-salerno-and-the-problem-of-medieval-women-s-medicine>

Trota of Salerno

Physician, Instructor, Author of Medical Texts

- A famous authority on medical topics including obstetrics and a renowned Midwife
- 12th Century Italy (*Salerno*)
 - A time of Feudalism, Normans, Crusades, and the Holy Roman Empire
- One of the first women physicians who studied medicine in medieval Italy at the **first medical school to admit women** in Europe (*Schola Medica Salernitana*)
- She was respected in her time, and was referred to as a “**Magistra**” or Master, a term typically used only for men (Magistri)
- Her fame even extended into Northern Europe during her lifetime
- Wrote "**Practical Medicine According to Trota**"
- Only a handful of copies of her works survive.



"Practical Medicine According to Trotta"

- Covered a **wide range of topics**: Internal diseases, fevers, wounds, snakebites, Infertility, how to deal with difficult births, menstrual disorders, etc.
 - Very helpful for male doctors: *Previous works on the female body were written by men*
- Some of her Ideas were **Radical for the Times**
 - Both men and women could be responsible for failure in conception
 - Women should not suffer horrendous pain during childbirth
 - Advocated for the use of opiates (*produced by plants*) to dull the pain of labor
- But **she still was a woman “of her time”**
 - Women who are too cold should be treated with "hot" herbs (*laurel, juniper, etc.*)
Women suffering from excess heat should be given "cold" herbs (*roses, violets, etc.*)
- Her work was **Falsely accredited to men** over time
 - 16th Century- an editor changed the name to Eros (male) and edited the text to masculine grammar forms.
 - 1773- A scholar denied Trotta was the author and referred to an unknown male author instead



<https://www.wisarchive.com/post/trotta-of-salerno-and-the-problem-of-medieval-women-s-medicine>

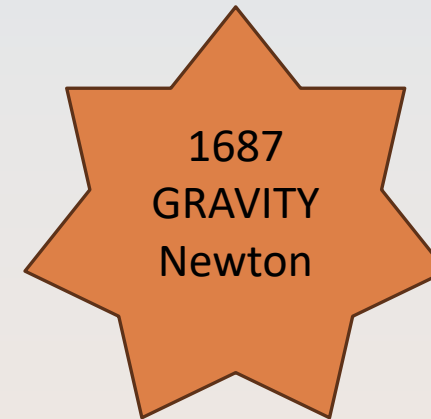
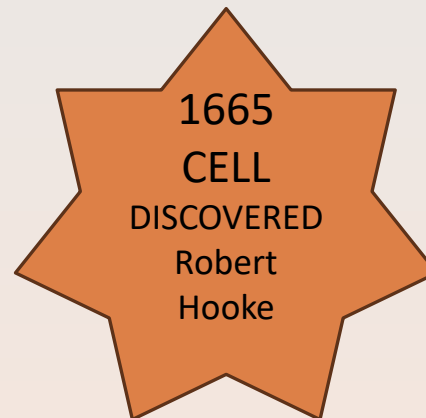
Let's Jump Ahead to the "Enlightenment Period" (17th & 18th Centuries)

Jean-Jacques Rousseau (1712-1778)
"Enlightenment" Philosopher



The education of women should always be **relative to that of men**. **To please, to be useful to us**, to make us love and esteem them, to educate us when young, to take care of us when grown up, to advise and console us, and **to render us life easy and agreeable**—these are the duties of women at all times, and what they should be taught in their infancy."

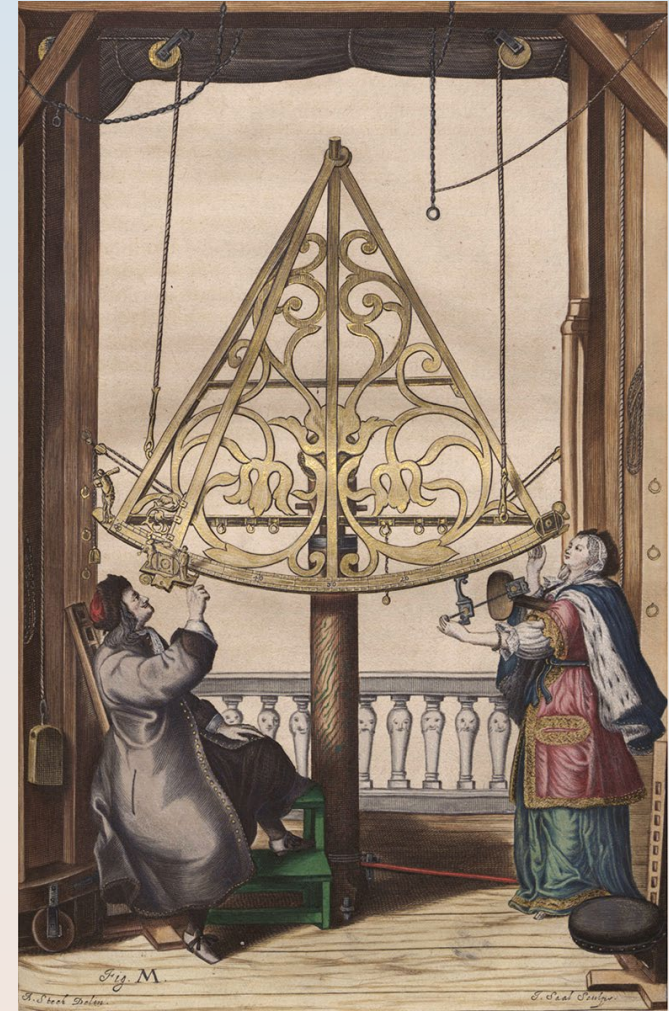
What was going on in 17th Century Science?



Elisabeth Koopmann-Hevelius

Astronomer

- One of the first female astronomers
- 1647 –1693, Danzig (*now Poland*)
- From a wealthy merchant family
- She received a broad education, including Languages and Natural Sciences
- Fascinated by Astronomy as a child
 - She approached Hevelius, a famous local Astronomer, who told her to come back when she was older
- Age 15, she returned to Hevelius. They were married a year later (*he was 52*) and had 3 daughters



Elisabeth Koopmann-Hevelius

Astronomer

- Elisabeth and her husband both worked as Observers, measuring positions of stars
- Was good with the large sextants and quadrants instruments used
- She was called “*The Mother of Moon Charts*”
- She published 3 Astronomy books (Atlases and Catalogs) based on their work
 - The Star Catalog was only half finished when he died
 - “*Prodromus Astronomiae*” catalogued **1,564 stars** and their positions
- A minor planet and a Venus crater are named after her



Caroline Herschel

Astronomer



- **First known Professional Female Astronomer**
- 1750-1848, Born in Germany, worked in England
- Youngest of 8 children, father was a professional musician
- Had typhus at age 10, so she only grew to 4'3" tall and lost vision in one eye; Smallpox had scarred her face
.... *So she was trained to be a house servant*
- Moved to be with her brothers in England (*Bath*) after her father died, to avoid the cruelty of her oldest brother and mother.
- She was very close with her brother William
 - William urged her to come to England to pursue singing (*he was a composer*)
 - When William turned to astronomy, Caroline did too.
- First woman to:
 - Receive a Gold Medal of the Royal Astronomical Society
 - Hold a government position in England

Caroline Herschel

- Collaborated with her brother William (*well-known Astronomer and Court Astronomer to King George III*)
 - Started by polishing mirrors, mounting telescopes, copying Astronomical Catalogues, recording and organizing William's observations
 - He built world-class telescopes that could clearly show new objects.
- **1782**- started her first own record book
- **1783**- 1st discovery- a **new Nebula** (*gas/dust cloud*) and a **new Galaxy**
- William then decided to look for nebulae, then realized it was difficult, and turned it back over to Caroline.
- Caroline discovered **8 comets** (*while her brother was away and she could use his telescope*)
 - *There were only ~32 known comets at the time*
- William gave her credit and presented it to the royal family as “My Sister’s Comet”
- **1798** - published a Catalogue of Stars; 20 months *work that William didn’t want to do*
- William’s marriage in 1788 likely led to her being more independent



Caroline Herschel



<https://www.youtube.com/watch?v= JsSqxbfqLE&t=403s>

Caroline Herschel

She runs about the town with me and skips up her two flights of stairs as wonderfully fresh at least as some folks I could name who are not a fourth of her age. (1832, age 82)
-John Herschel

- She later worked with and mentored her nephew John Herschel, son of William
- **1828** - Awarded the Gold Medal by the Royal Astronomical Society.
 - First to a woman and not again until Vera Rubin in 1996 (*more on her later*)
- Died at age 98, and buried with a lock of William's hair.

➤ LEGACY

- Asteroid 281 Lucretia discovered 1888, named after her (middle name)
- Crater C. Herschel on the moon
- Open Star Clusters – “Caroline’s Cluster” and Caroline’s Rose
- Satellite “Caroline” launched into space (2020)
- Herschel Museum of Astronomy, in former home in Bath, England (also for William)
- Poems, Artworks, Songs...

➤ <https://herschelmuseum.org.uk/about/history/>

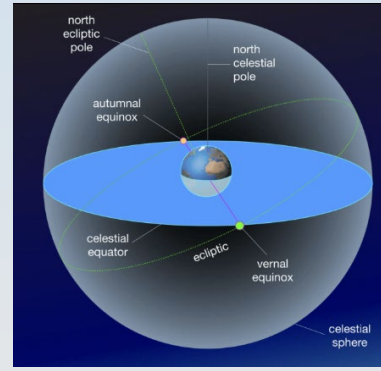




Eli Whitney
1765 – 1825

Wang Zhenyi (王贞仪)

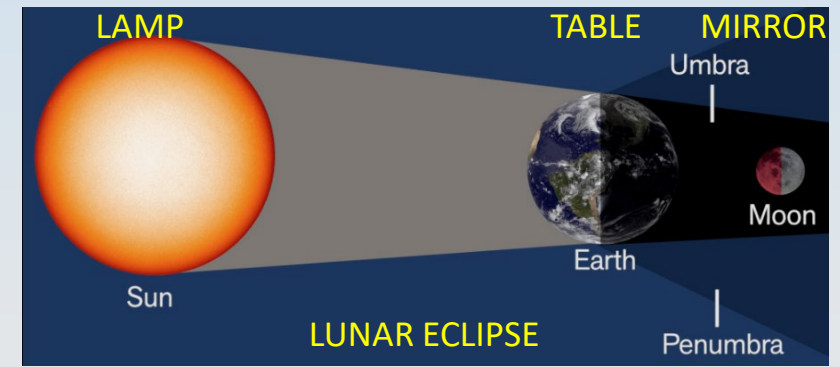
Astronomer, Mathematician, Poet



- Groundbreaking contributions to astronomy, including precise calculations of equinoxes and eclipses through experimental methods
- 1768-1797 (*age 29*), China, *also known as Jinling*
- **From a scholarly family**, Raised by her Grandparents and Father, Married at 25.
- Grandfather taught her Astronomy, Grandmother- Poetry, Father-Medicine, Geography, Math
- Overcame **feudal Chinese cultural barriers** of women's access to education
- Most of her original work is lost.
 - She entrusted her works to a friend when she was gravely ill, later published by her nephew
- After her death male critics ridiculed Wang's accomplishments in poetry and science, but she has since been redeemed

Wang Zhenyi

- Analyzed the causes of Lunar & Solar Eclipses, based on **experiments** with a mirror, a lamp, and a globe.
 - Eclipses were thought to be *omens or messages from the gods*.
- Explained how equinoxes (*when the Sun is over the Equator*) occur and **how to calculate/predict them**
- Studied Astronomical Calendar Calculations, which was considered *inappropriate for women* to study. She authored several books on it.
- Published a paper on the Pythagorean Theorem
- Published “**Theory of the Earth’s Roundness**” - **disputing the idea of a flat earth with a round sky**.
- **LEGACY**
 - Taught women and men and advocated for education for all.
 - Crater on Venus was named after her (1994)
(*All craters on Venus are named after famous women or female first names*)



Sophie Germain

Mathematician, Physicist, Philosopher



- Pioneer of elasticity theory, foundational work on Fermat's Last Theorem
- 1776-1831, French
- From a middle class family, – so **no access to math/science education**
- Learned from books in her father's library while *forced to stay indoors during the French Revolution*
- Parents initially did not support her scholastics
 - *She secretly studied at night so they removed her candles*; She hid them instead.
- Inspired by a story about Archimedes, who according to legend was so absorbed in geometry that he ignored approaching Roman soldiers and was killed
- **Taught herself** Latin and Greek so she could study classic works (Newton, Euler, etc.)

Sophie Germain



- Women were not allowed to study at the new Ecole Polytechnique
 - But she obtained lecture notes by **using a fake man's name (*Monsieur LeBlanc*)**
- Sent commentary to Joseph-Louis Lagrange (famous French mathematician), also as *Monsieur LeBlanc*
 - **Had to come out as a woman when Lagrange wanted to meet her.** (*He didn't mind.*)... became her mentor and friend
- Worked Independently, but Unable to make a career of math because she was a woman
- Intervened to save the famous German mathematician **Gauss** during the Napoleonic Wars.
- Current thought is that she had inherent “mathematical brilliance” but her lack of formal training limited her accomplishments.

Sophie Germain

➤ The Sophie Germain Theorem

- Developed while working on a proof of a famous Math Theorem (*Fermat's Last Theorem – which was not solved until 1994*)
 - A statement about the divisibility of solutions to the equation $x^p + y^p = z^p$ of Fermat's Last Theorem for odd prime p

➤ Sophie Germain Prime Number – a prime number where $2p+1$ is also a prime number

➤ Several of her results were attributed to male collaborators (*eg Poisson*)

➤ Won the Paris Academy of Sciences Prize contest to solve a mathematical theory on **elasticity**

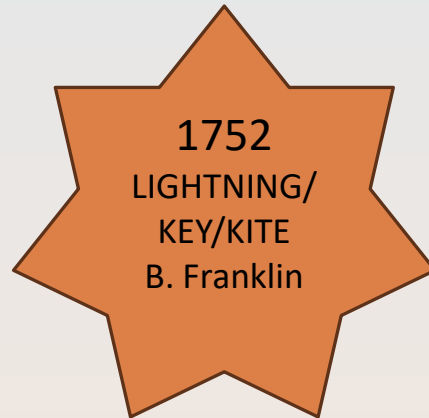
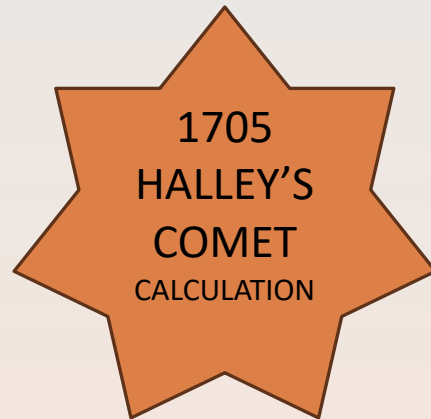
- (*how objects deform and recover their original shape when external forces or temperature changes are applied*)
- **First woman to win a prize from the Academy**
- She was *still barred* from the Academy's sessions as a woman

➤ LEGACY

- Her biography was published in 1870's; A Musical on her life in 2019 (*"The Limit"*)
- Satellite, Girls School, French Academy of Sciences Prize, Paris Street, etc. named after her
- Proposed to be added to the list of names on the Eiffel Tower with 72 other women in STEM (to be added to the 72 men) (2026)



What was going on in 18th Century Science?



Mary Somerville

Astronomer, Mathematician



- **Brilliant Science Writer who made Astronomy and Mathematics broadly accessible**
- 1780-1872 (*92 years!*), Scottish
- Mother from a prominent family, Father was a Vice-Admiral
- “Wasted” her time reading instead of sewing, **taught herself Latin, Greek**
- **Had a conscience:** she refused to use sugar in her tea to protest slavery in the West Indies
- Had the tutor hired for her younger brother purchase Algebra & Geometry books for her

Mary Somerville



- First marriage (*to a cousin*)- 1804, 2 children, he *discouraged her intellect*, years
 - Inheritance allowed her to pursue her interests in Astronomy & Math
- **Corresponded with leading Mathematicians and Astronomers**
- Solved math problems in math journals, awarded a Silver Medal in 1811
- **Age 33 Purchased a library of scientific books**, including Poisson, Lagrange, Euler, etc.
- Second marriage (*to a cousin*)- (1812), 4 children; *Encouraged her scientific pursuits*
- Her books provided needed income for the family

Mary Somerville

- First studied **light and magnetism**, published papers
- Wrote and published many highly praised and successful books
 - **Translated and expanded a 5-Volume treatise on Gravitational Mathematics** – made it understandable
 - **“On the Connexion of the Physical Sciences”** (1834) – Astronomy, Physics, Geography, Meteorology
 - a *“best-seller”*, 9 editions, several translations, considered one of the first popular science books
 - A review of the book first used the term **“Scientist”** as an alternative to “Man of Science”
 - **First English textbook on Physical Geography**, won the Victoria Gold Medal for it, her most popular book
- Wrote on the difficulties of calculating the position of Uranus, suggesting an undiscovered planet (*Neptune*)
- **LEGACY**
 - Was a tutor to Ada Lovelace (*she’s next*)
 - First female Honorary Member of the Royal Astronomical Society (1835)
 - Elected to the American Geographical & Statistical Society (1857) and Italian Geographical Society (1870)
 - First signer of the 1866 petition to UK Parliament for women’s suffrage
 - College, Island, Asteroid, Satellite, etc. named after her
 - On the 2017 Scottish £10 note



Ada Lovelace

Mathematician



- **“The First Computer Programmer?”**
- 1815-1852, England
- Daughter of Lord Byron but raised by her mother Anne Milbanke and grandmother
 - Her mother was very interested in mathematics
 - She was taught mathematics from an early age *counter-act any inherited traits* from Lord Byron
 - Sickly as a child, bedridden for a year after having the measles
 - Tried to build a flying machine at age 12
- Was a popular ‘Belle of the Season’ and was a regular at Court
 - Died young, probably of uterine cancer

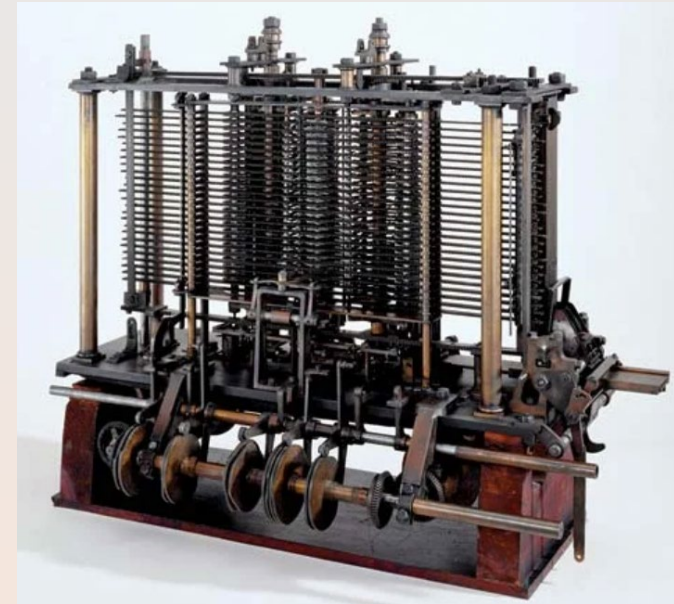
Ada Lovelace

- *“Friends with Mary Somerville, English mathematician; who introduced her to **Charles Babbage***
- Married a Baron (1835) , who was named Earl of Lovelace in 1838, making her *Ada the Countess of Lovelace*
 - She was not allowed into libraries so **Her husband copied articles for her**
- Often had interest in scientific fads such as mesmerism, phrenology (*personality traits linked to bumps on the head*) and new fandangled machines
- 3 children, rumors of extra-marital Affairs, Drinking, and Gambling (*husband*) problems; May have been bipolar
 - Died young, probably of uterine cancer

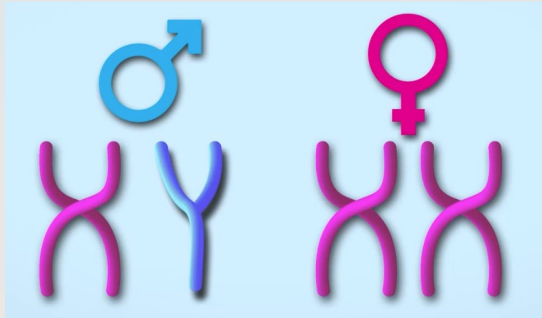


Ada Lovelace

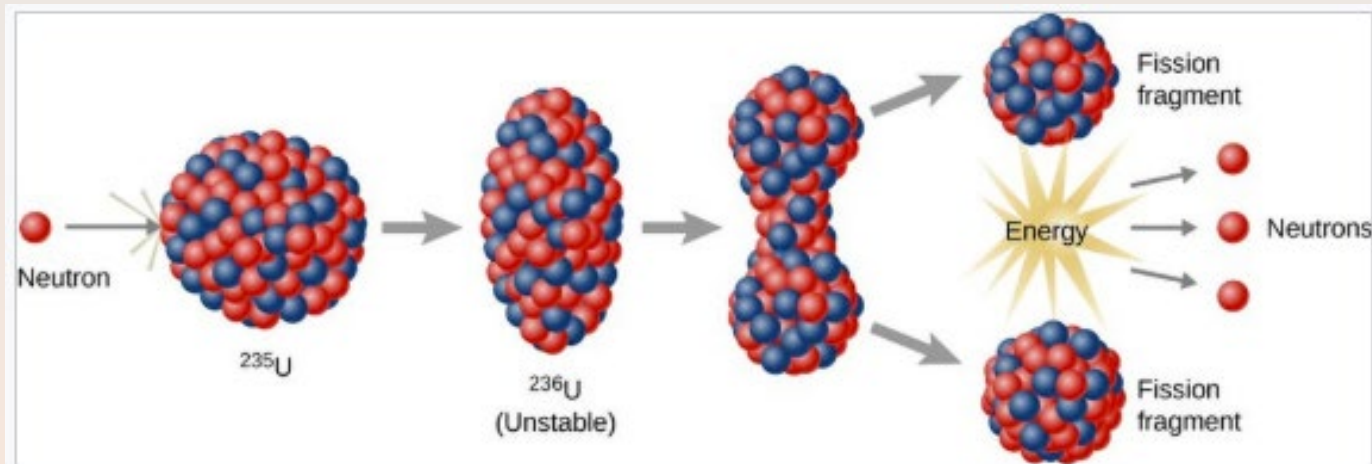
- 1843 - Proposed a step-by-step way (*aka an **algorithm or Computer Program***) using punch cards for computing a special number sequence (*Bernoulli numbers*) with Charles Babbage's Analytical Engine (*a steam-driven Calculator*).
 - Considered the **first published algorithm ever specifically made for use on a computer**.
(*The engine was never completed, so her program was **never tested**.*)
- The first person to propose using the Analytical Engine to do more than numerical calculations (*e.g. processing musical notes, letters/words, and images*)
 - *The difference between a **Computer** and a Calculator!*
- Wrote a computer program **a century before** the first real computer was built.
- **LEGACY**
 - Programming language ADA (1980)
 - LOVELACE MEDAL – given by the British Computer Society
 - ADA LOVELACE DAY – 2nd Tuesday of October
 - British Passports include an illustration of Lovelace and Babbage
 - Micro-satellite launched in her honor (2018)
 - Buildings, Awards, Artworks, Museums, Novels, plays, poems, TV, video games



Next time...



88	84
Ra	Po
Radium	Polonium
Alkaline Earth Metal	Metalloid



And much more!

Sources

“Women in Science- 50 Fearless Pioneers Who Changed the World” by Rachel Ignatofsky

“Headstrong: 52 Women Who Changed Science – And the World” by Rachel Swaby

“In Our Time” Podcast: <https://www.bbc.co.uk/programmes/b006qykl>

“Science Friday” Podcast: <https://www.sciencefriday.com/science-friday-podcasts/>

Internet sources, including:

- <https://www.nobelprize.org/>
- Wikipedia (*cross-checked with other sources*)