

# History of Computers – Early Hardware

- Abacus – as early as 2400 B.C
- Slide rule
- Mechanical Calculators
- Programmable loom
- Charles Babbage and Ada Lovelace
  - Analytical Engine
  - Difference Engine

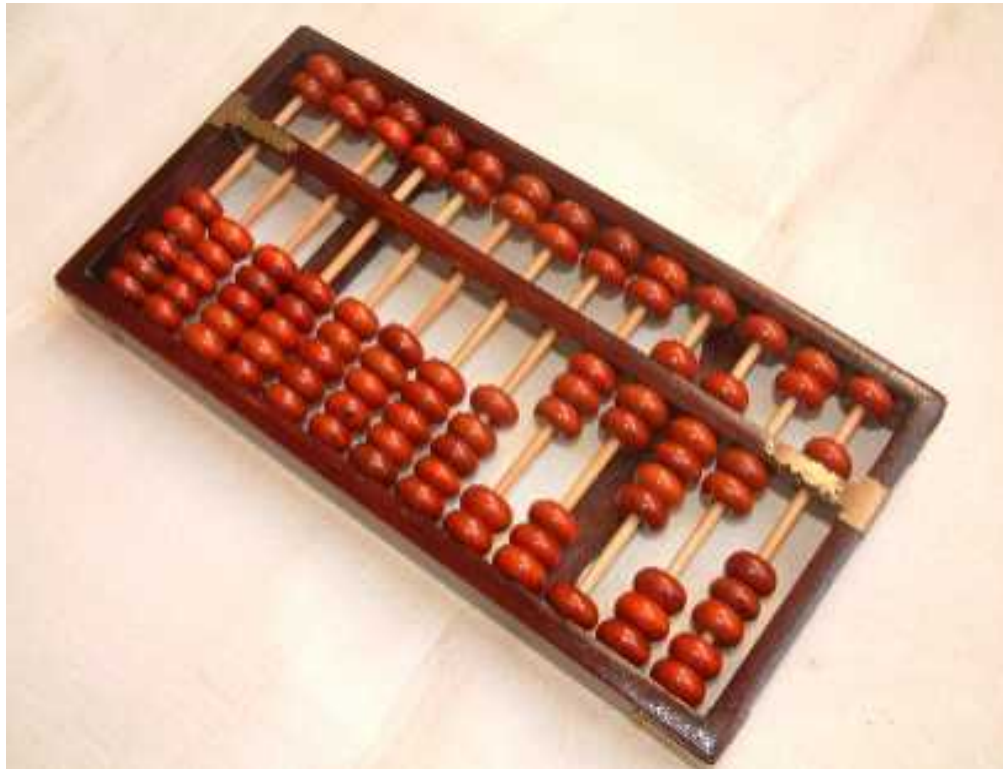
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# Abacus

- Also known as counting frame.
- Used for performing arithmetic processes.
- Was in use as early as 2400 BC in Mesopotamia.
- Used all over the world.
- Trained users can work as fast as people with pocket calculators.
- People trained to use the visual image of an abacus to perform calculations.

# Abacus



<http://en.wikipedia.org/wiki/File:Boulier1.JPG>

# Napier's Bones

- An abacus created by John Napier.
- Used for calculating the products and quotients of numbers.
- Converted multiplication into addition operations and division into subtraction operations.
- Calculating square roots is also possible.

# Napier's Bones



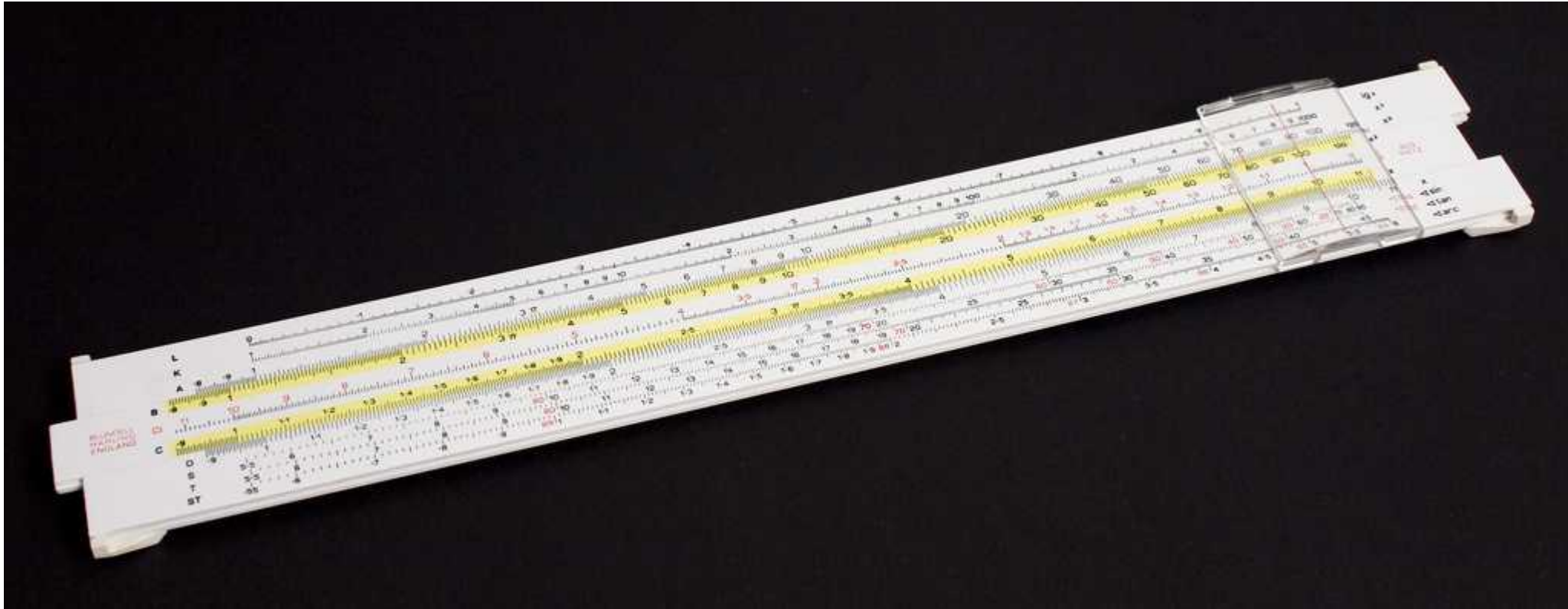
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# Slide Rule

- Mechanical Analog computer.
- Useful for multiplication and division
  - In addition to functions such as roots, logarithms and trigonometry, but not used for addition or subtraction.
- Developed in 17<sup>th</sup> century based on the emerging work on logarithms.
- Linear, Circular and Cylindrical.
- Was popular with scientists and engineers till the advent of pocket calculators in 1970s.

# Linear Slide Rule





# Mechanical Calculators

- Invented by Blaise Pascal.
  - Pascaline – addition and subtraction directly, multiplication and division by repetition.
- Later calculators were much more sophisticated.
- Continued to be developed till late 1970s until they were replaced by electronic calculators.

# Pascaline Calculator



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# Programmable Loom

- The Jacquard loom is a mechanical loom
  - Invented by Joseph Marie Jacquard in 1801
  - Simplifies the process of manufacturing textiles with complex patterns
  - The loom is controlled by punched cards with punched holes, each row of which corresponds to one row of the design. Multiple rows of holes are punched on each card and the many cards that compose the design of the textile are strung together in order.

# Jacquard Loom



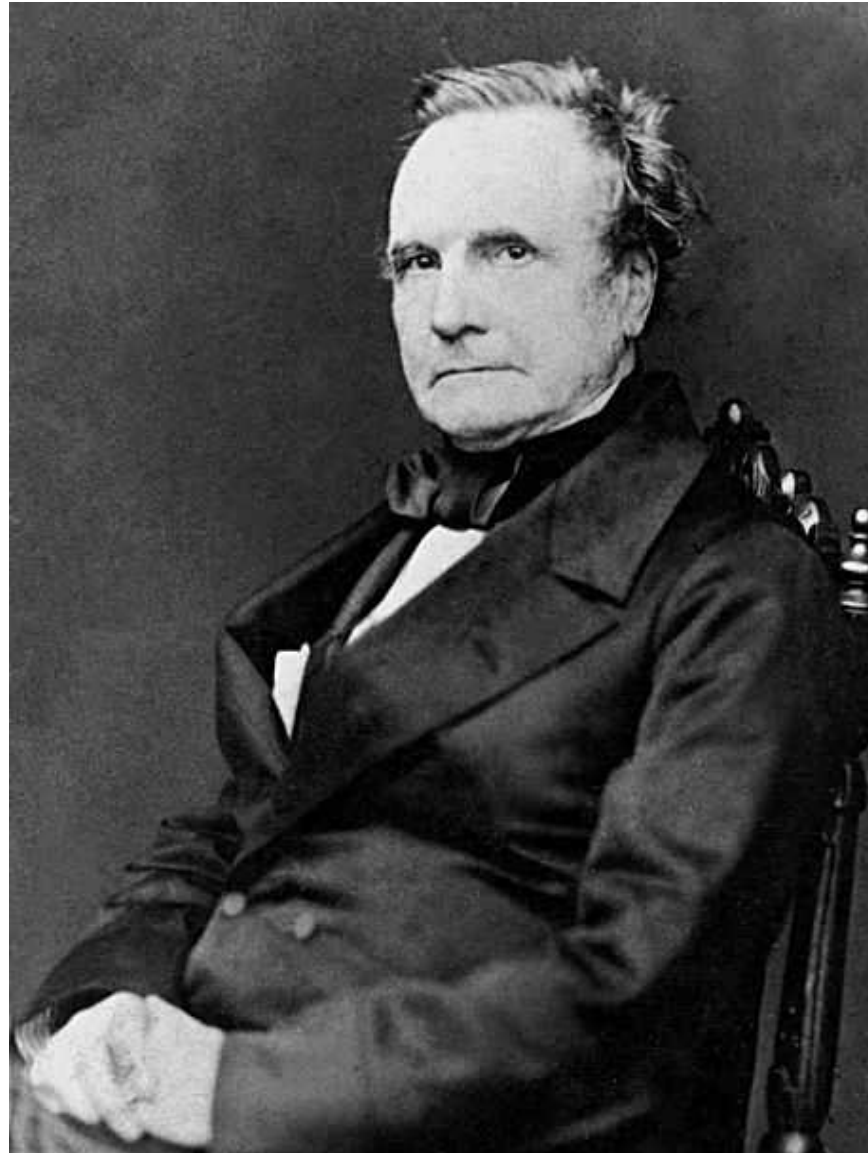
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[http://en.wikipedia.org/wiki/File:Jacquard\\_Loom\\_-\\_geograph.org.uk\\_-\\_2326269.jpg](http://en.wikipedia.org/wiki/File:Jacquard_Loom_-_geograph.org.uk_-_2326269.jpg)

# Charles Babbage

- English Mathematician (26 December 1791 – 18 October 1871)
- Father of the Computer.
- Idea -- calculation of logarithm tables could be done by machinery quicker than humans.
- Designed mechanical calculators which followed principles which are used in modern computers.
- His designs – Difference Engine and Analytical Engine were not built to completion due to lack of technology.

# Charles Babbage



[http://en.wikipedia.org/wiki/File:Charles\\_Babbage\\_-\\_1860.jpg](http://en.wikipedia.org/wiki/File:Charles_Babbage_-_1860.jpg)

# Ada Lovelace

- Augusta Ada King, Countess of Lovelace (10 December 1815 – 27 November 1852) was an English writer known for her work on Charles Babbage's machines.
- 'World's First Computer Programmer'.
- Published notes on Babbage's Analytical Engine.
- The notes contained an algorithm for the analytical engine to compute Bernoulli numbers – it was the first computer program.



# Ada Lovelace



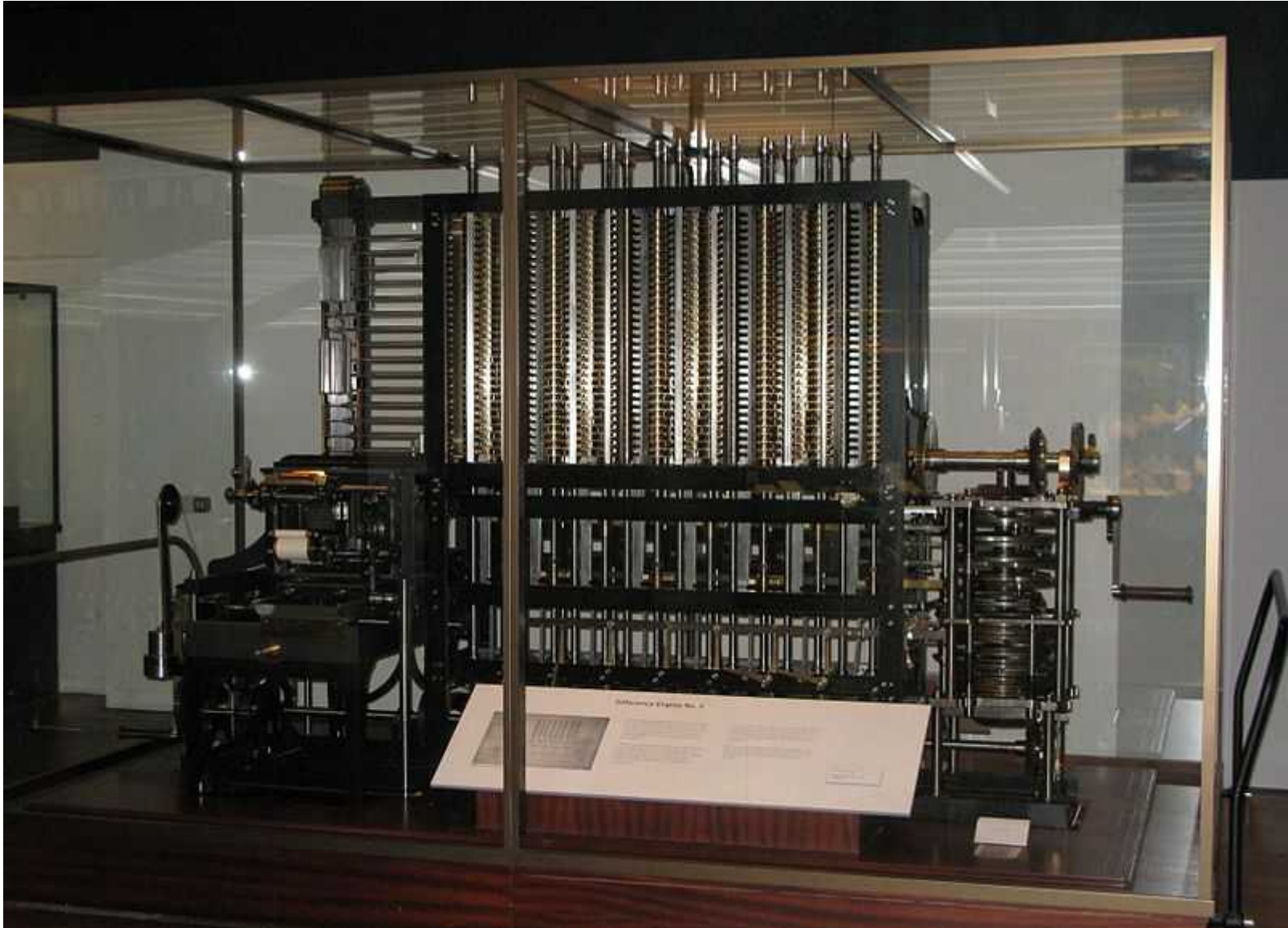
[http://en.wikipedia.org/wiki/File:Ada\\_lovelace.jpg](http://en.wikipedia.org/wiki/File:Ada_lovelace.jpg)



# Difference Engine

- A Difference Engine is an automatic, mechanical calculator designed to tabulate polynomial functions.
- Both logarithmic and trigonometric functions can be approximated by polynomials, so a difference engine can compute many useful sets of numbers.
- Babbage's design was not built during his lifetime due to insufficient advances in machining.
- Machine based on his design built in 1991.

# Difference Engine – modern reconstruction



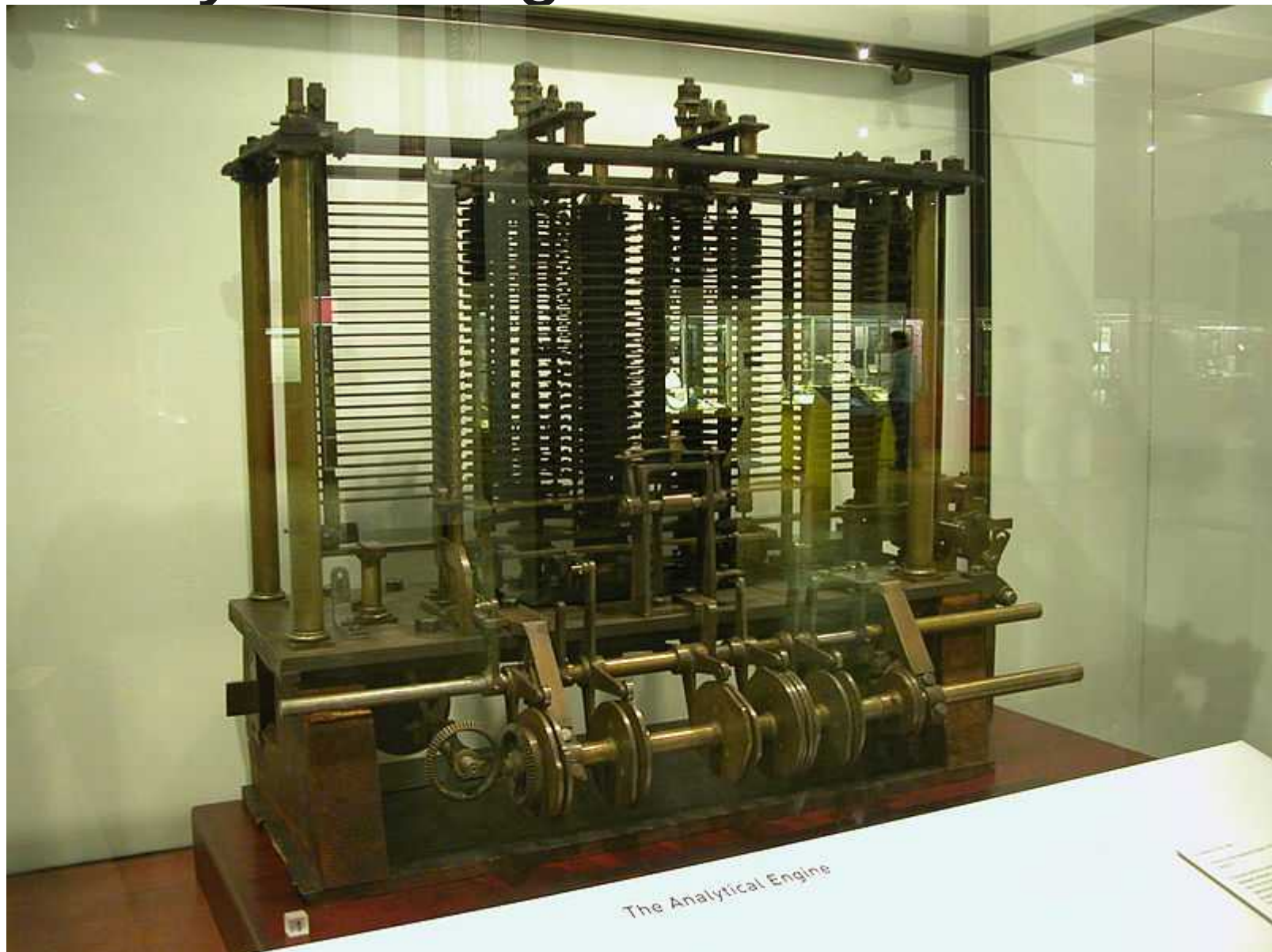
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# Analytical Engine

- The Analytical Engine – a design for a mechanical general-purpose computer -- Charles Babbage – 1837.
- It incorporated an arithmetical unit, control flow in the form of conditional branching and loops, and integrated memory, making it the first Turing-complete design for a general-purpose computer.
- Never built completely.

# Analytical Engine – a trial model



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Thank You