Módulo I – Fundamentos Computacionais
Sessão 1 – Aula 1 – Introdução – História

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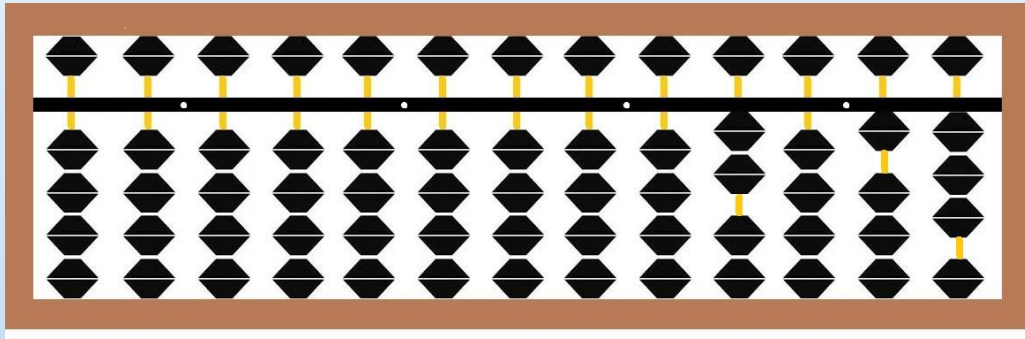
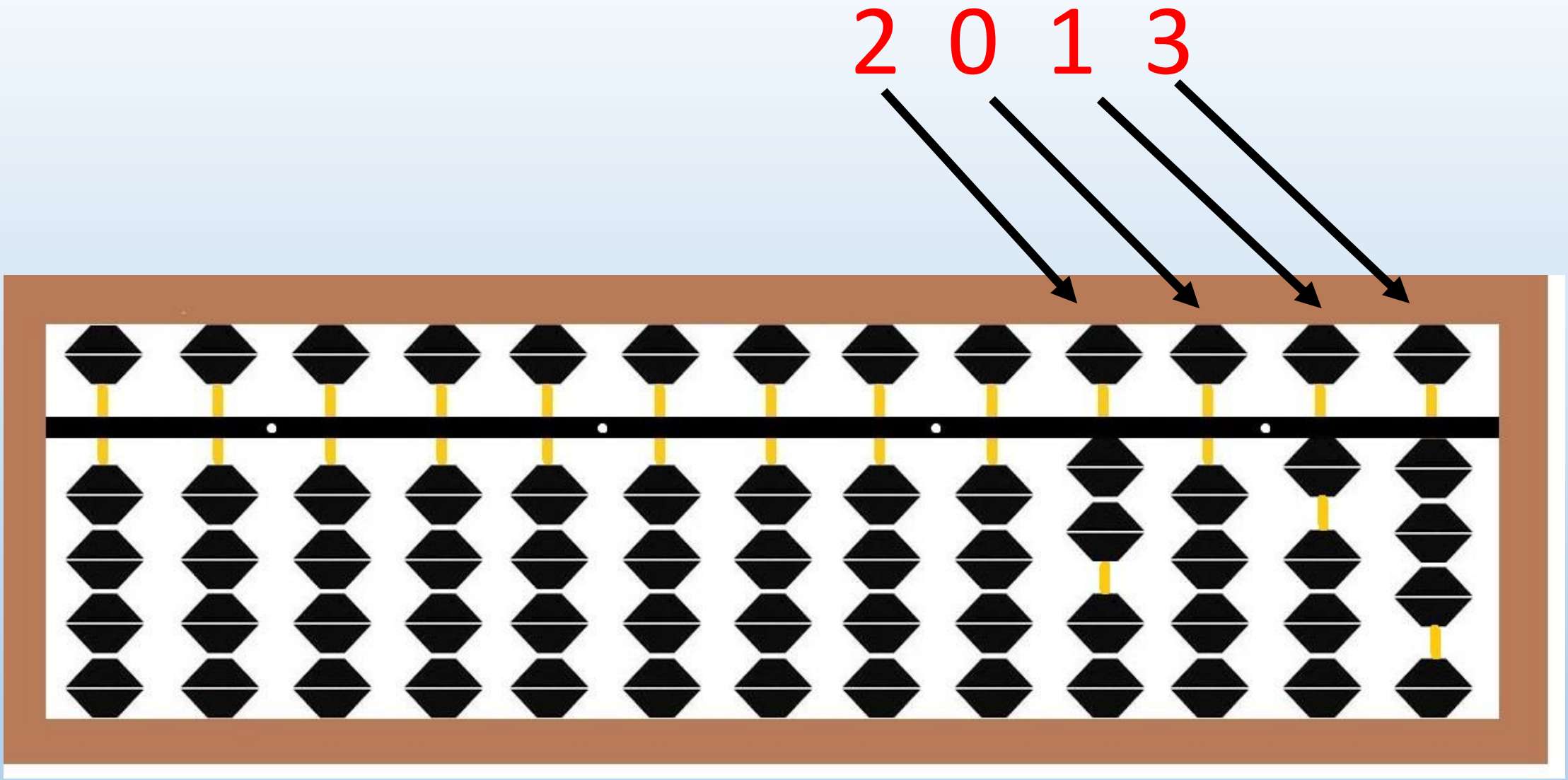
No princípio…

Possibilidades de **ampliação artificial da capacidade do** cérebro humano

- **Escrita** – 4000 BC (+ memória)
- **Ábacos** – 3500 BC (+ poder de cálculo)



- **Calculadoras** e **réguas de cálculo** – circa 1600 AD (ainda + poder de cálculo)
- **Computadores** – circa 1950 AD (muito + poder de cálculo e muito + memória + inteligência artificial + ***data science***)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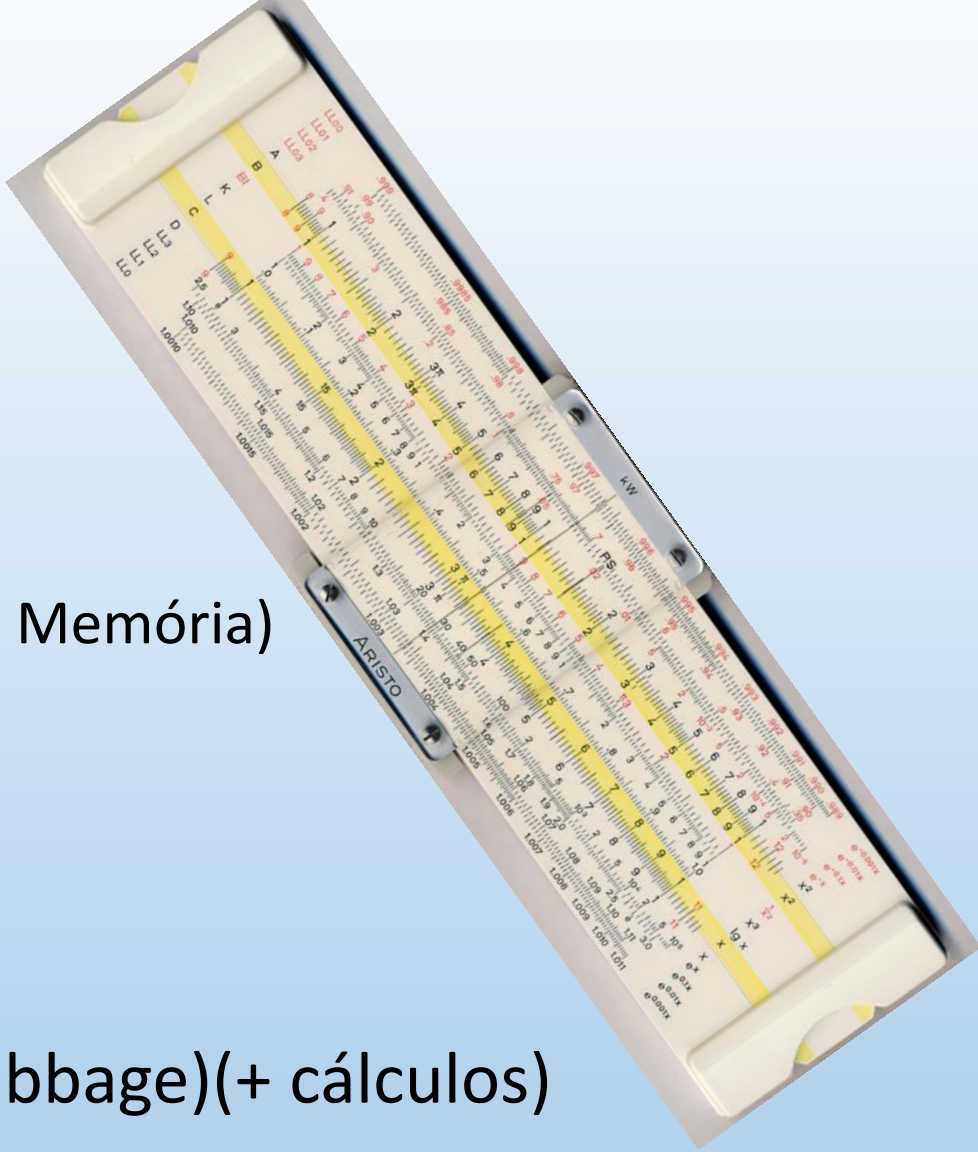
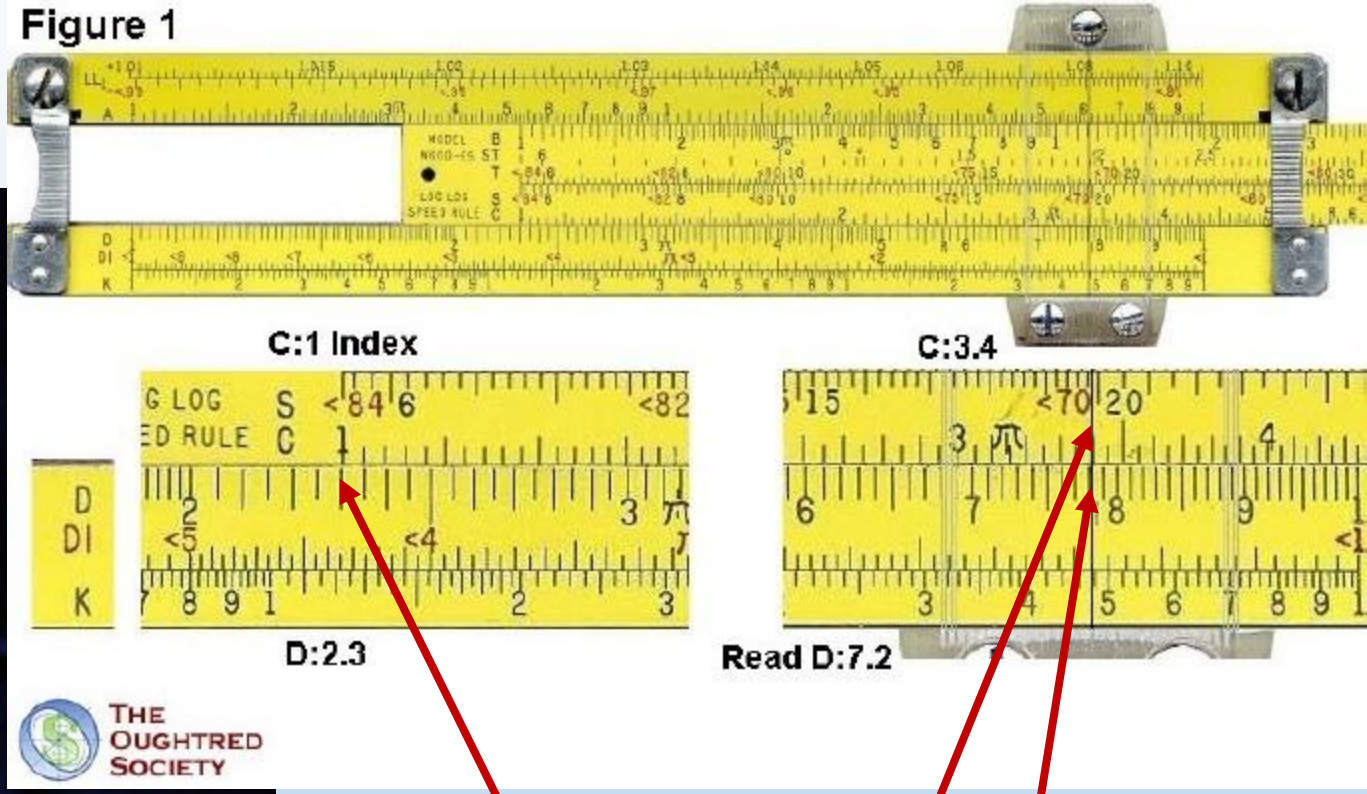
Introdução histórica



- Linguagem oral (humana) – 50000 BC (?)
- Linguagem escrita
  - Linguagem escrita – Sumérios – circa 4000 BC (+ Memória)
  - Egípcios
  - Chineses
  - Gregos/Romanos
- Ábacos (+ cálculos) – circa 3500 BC
- Calculadoras e réguas de cálculo (Pascal / Babbage)(+ cálculos)
- Computadores (Z1 / Eniac) (+ cálculos + memória + AI + ***data science***)
- Celulares (mobilidade) e IoT (ubiquidade)

PICKET SLIDE RULE

Figure 1



2.3 x 3.4 = 7.82

Ciência de Dados ou *Data Science*

- Obter conhecimento oculto em um conjunto de dados (Big Data)

- Conhecimentos necessários:

  - Negócio específico (*Business*)

  - Estatística/matemática aplicada

  - Computação aplicada: hardware e software


PVS A·
RITH
TICAE·
BOETIVS
RAS

Charles Babbage (1791 - 1871)

- Genial!
- Computadores mecânicos (Século XIX – Século da Mecânica)
  - Difference Engine
  - Analytical Engine
- Mais teórico do que prático
- Rico, nobre, filho de banqueiro
- Tecnologia e indústria não estavam prontas para a manufatura deste tipo de máquina que precisava de muita precisão mecânica e a energia de um motor de uma locomotiva a vapor para girar as engrenagens e alavancas do Analytical
- Professor Lucasian em Cambridge (como Isaac Newton e Stephen Hawkins)

Charle Babbage (1791-1871) – Século XIX

Charles Babbage was born on 26 December 1791, probably in London, the son of a banker. He was often unwell as a child and was educated mainly at home. By the time he went to Cambridge University in 1810 he was very interested in mathematics.

After graduation Babbage was hired by the Royal Institution to lecture on calculus. Within two years he had been elected a member of the Royal Society and, with his Cambridge friends, was instrumental in setting up the Astronomical Society in 1820, the first to challenge the dominance of the Royal Society. From 1828 to 1839, Babbage was Lucasian Professor of Mathematics at Cambridge.

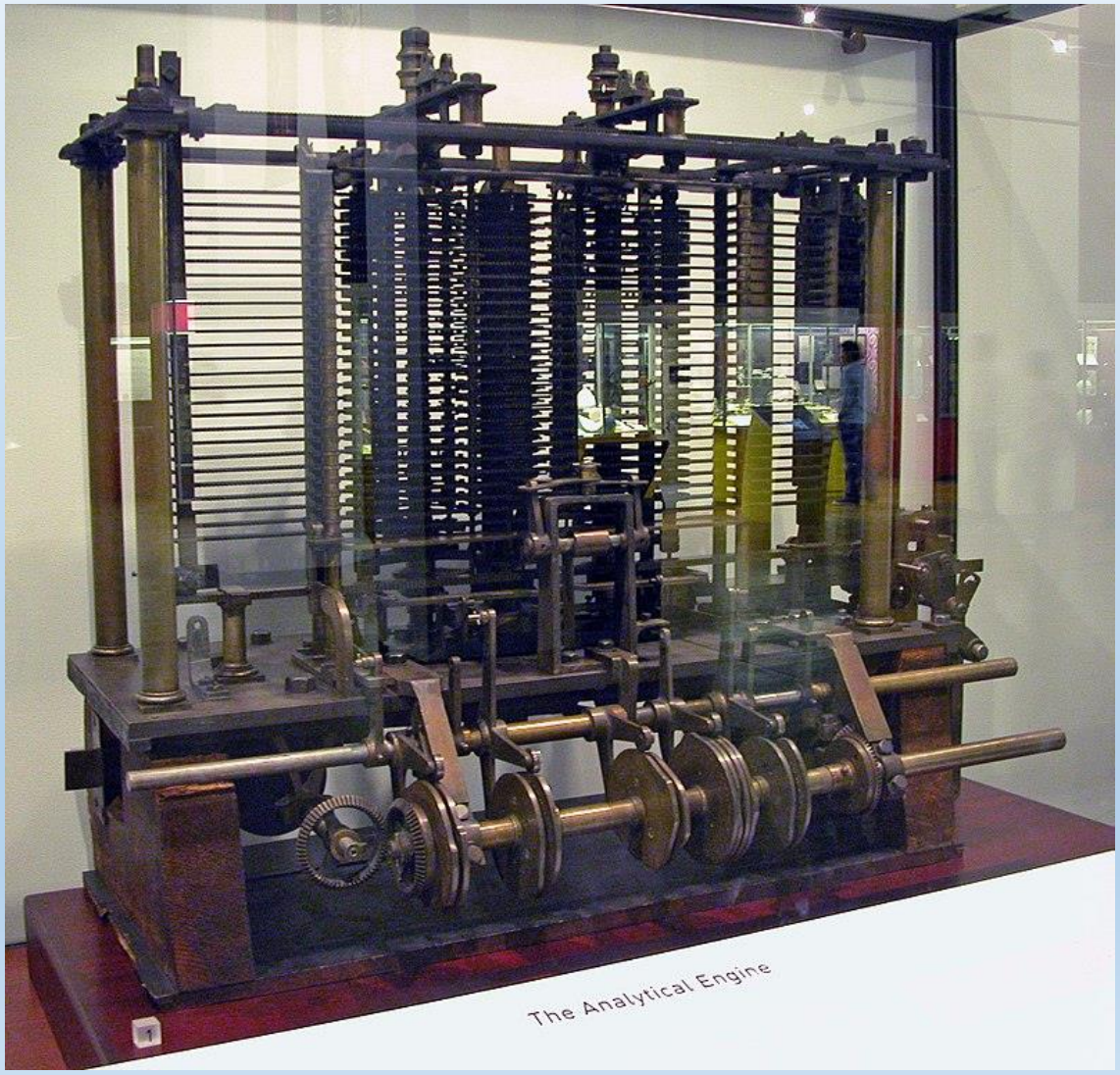
The 1820s saw Babbage work on his 'Difference Engine', a machine which could perform mathematical calculations. A six-wheeled model was initially constructed and demonstrated to a number of audiences. He then developed plans for a bigger, better, machine - Difference Engine 2. He also worked on another invention, the more complex Analytical Engine, a revolutionary device on which his fame as a computer pioneer now largely rests. It was intended to be able to perform any arithmetical calculation using punched cards that would deliver the instructions, as well as a memory unit to store numbers and many other fundamental components of today's computers. The remarkable British mathematician **Ada Lovelace** completed a program for the Analytical Engine but neither it, nor Difference Engine 2, were finished in Babbage's lifetime.

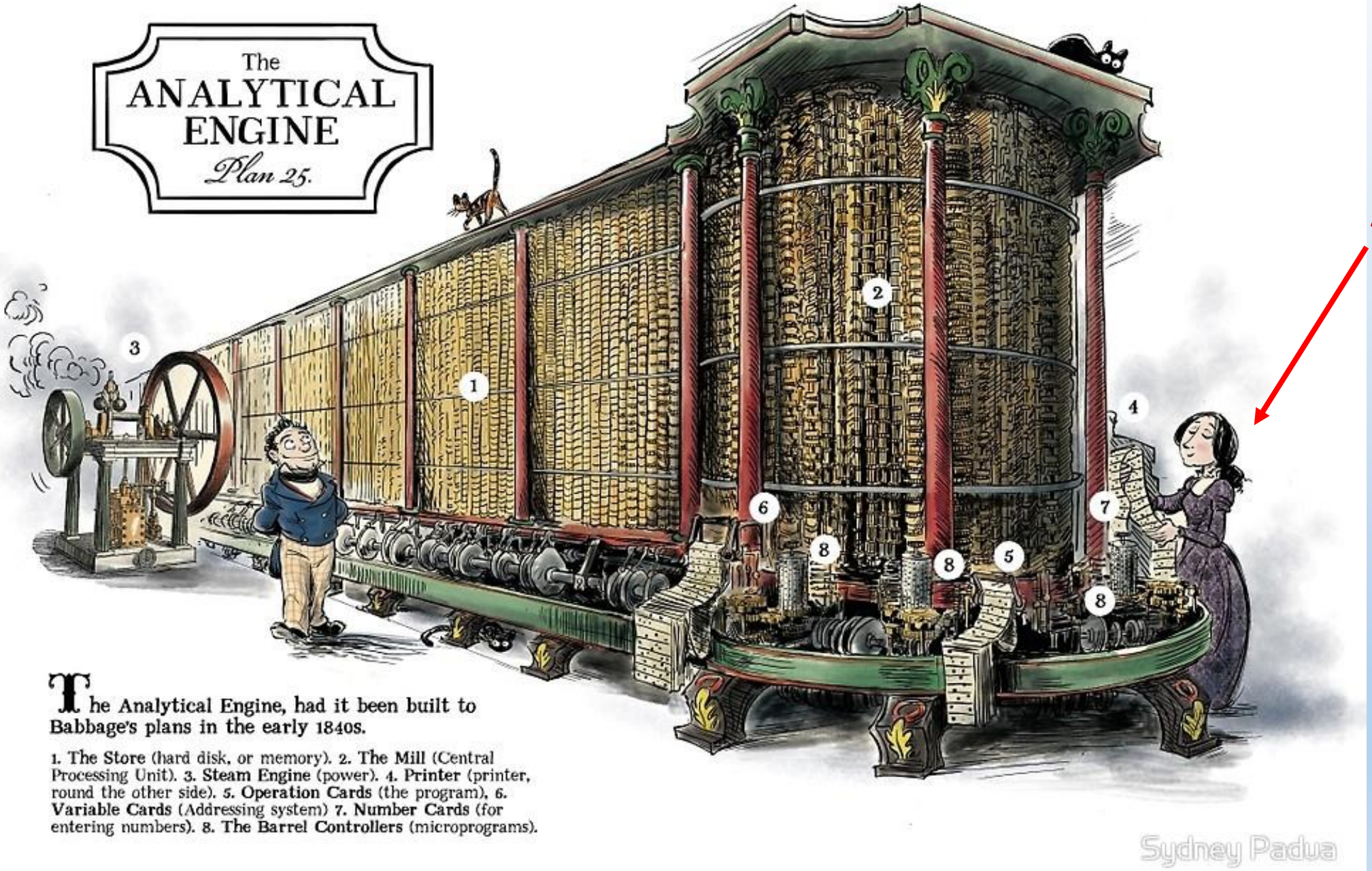
Babbage also worked in the fields of philosophy and code-breaking, as well as campaigning for reform in British science. He died at his home in London on 18 October 1871.

Características do Analytical Engine

- Mill (CPU), Store (Memória)
- Base 10, números com 50 casas decimais
- Cartões perfurados para: entrada de dados, programas, sequência de operações
- Impressora (linotipo de jornal)
- Objetivo: calcular tábuas de logarítmos
- Ver wikipedia (em inglês) para mais detalhes

Analytical Engine (part of it – it works!)

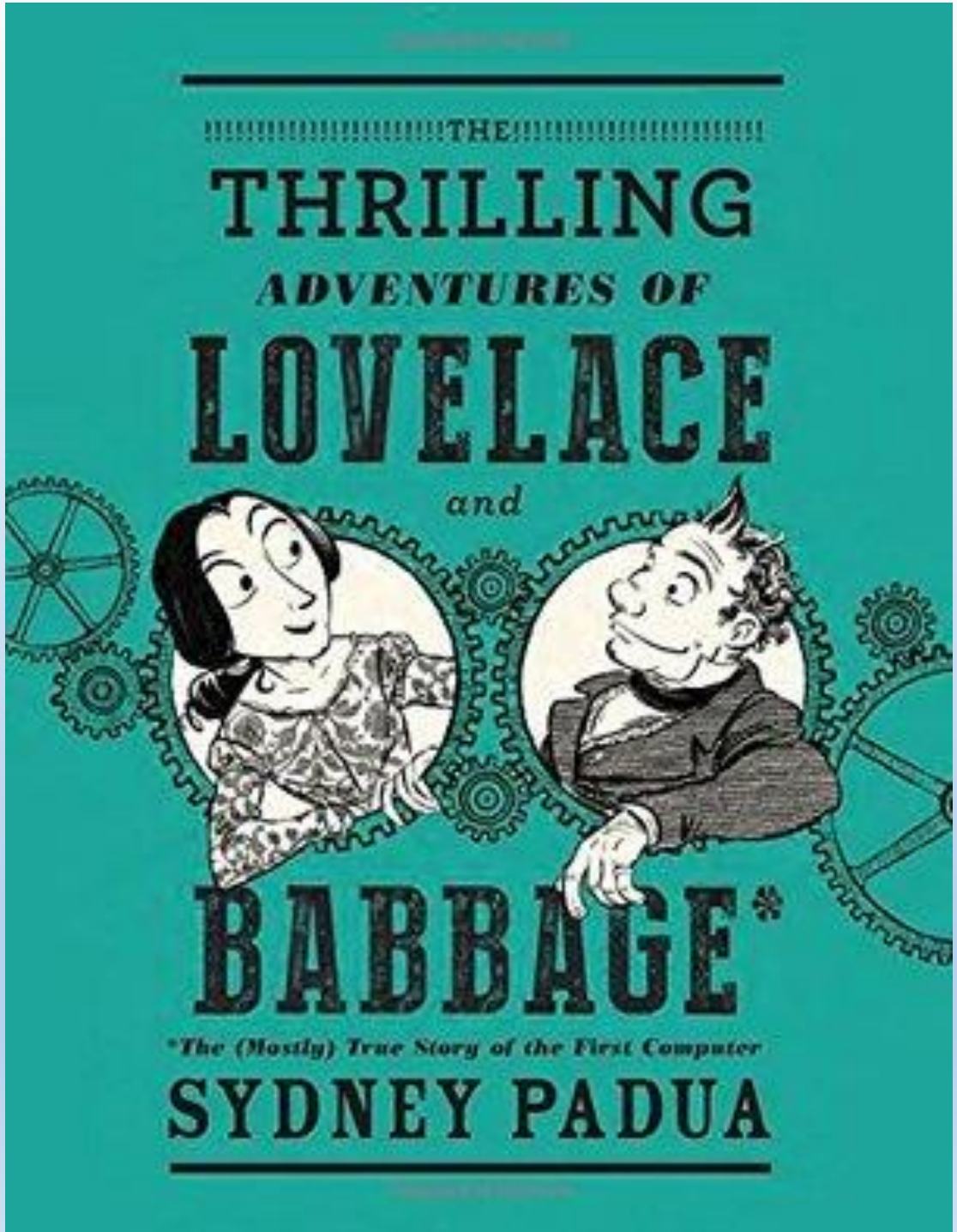




The Analytical Engine, had it been built to Babbage's plans in the early 1840s.

1. **The Store** (hard disk, or memory). 2. **The Mill** (Central Processing Unit). 3. **Steam Engine** (power). 4. **Printer** (printer, round the other side). 5. **Operation Cards** (the program). 6. **Variable Cards** (Addressing system) 7. **Number Cards** (for entering numbers). 8. **The Barrel Controllers** (microprograms).

ADA
LOVELACE

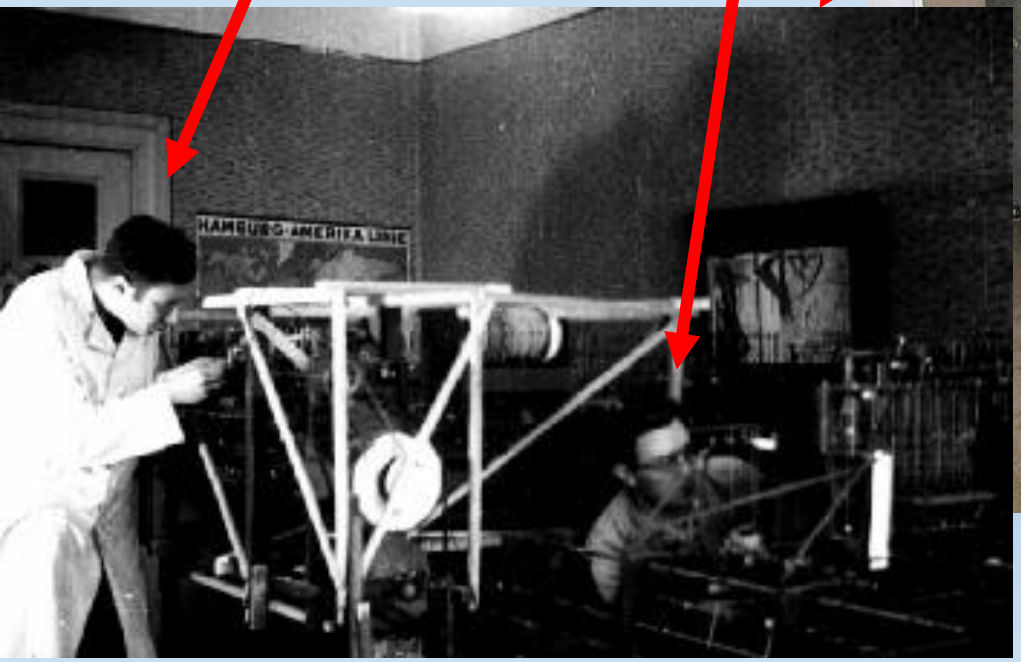

THE
THRILLING
ADVENTURES OF
LOVELACE
and
BABBAGE*
*The (Mostly) True Story of the First Computer
SYDNEY PADUA

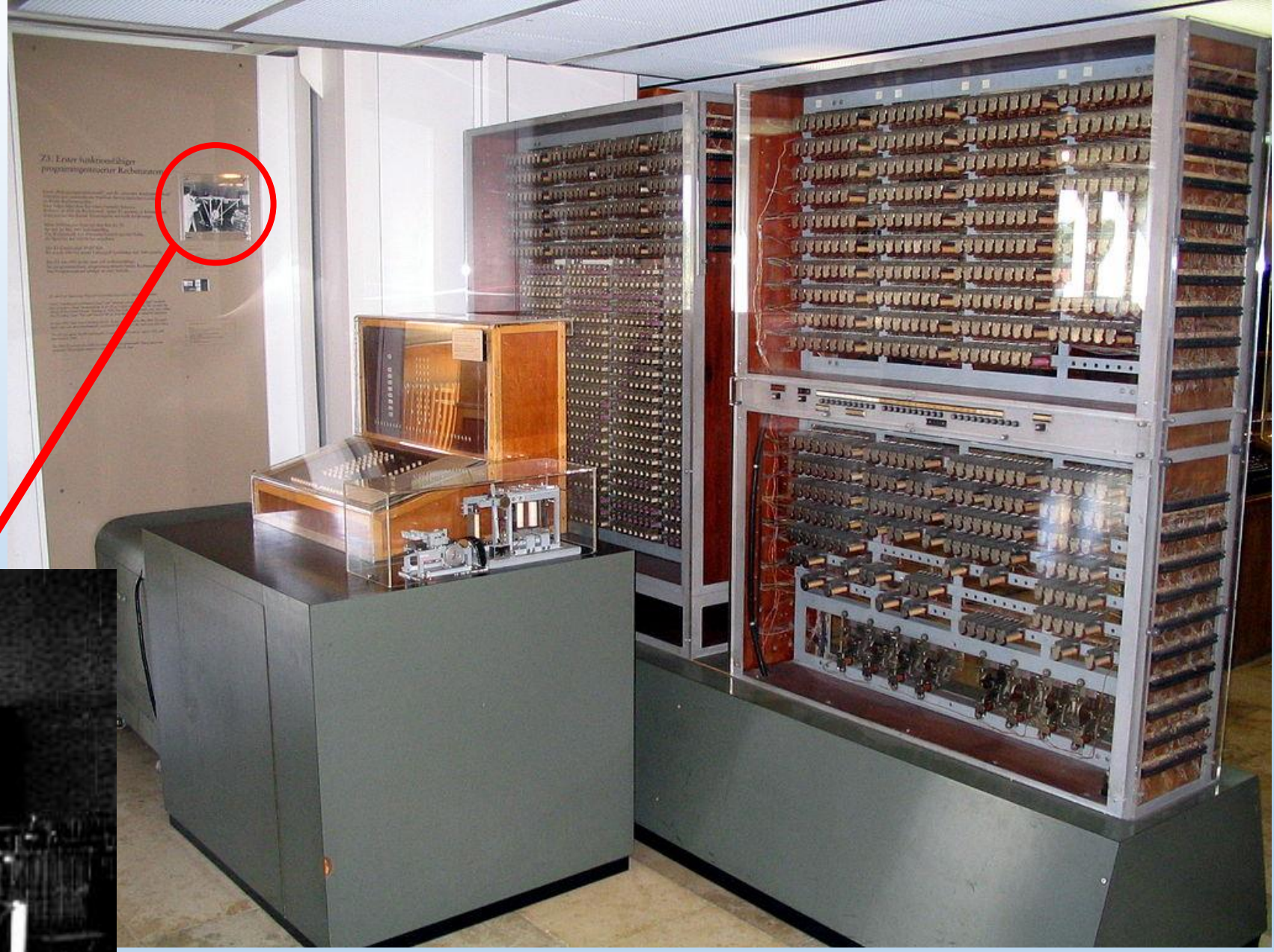
Z3, Bombe, IBM e ENIAC (circa 1940's)

- Z3 – Konrad Zuse and Helmut Schreyer
- Bombe – Alan Turing
- IBM – Mark 1 – Harvard – Howard Aiken, John von Neumann, Grace Hopper
- ENIAC – John Mauchly and J. Presper Eckert

Zuse Z3

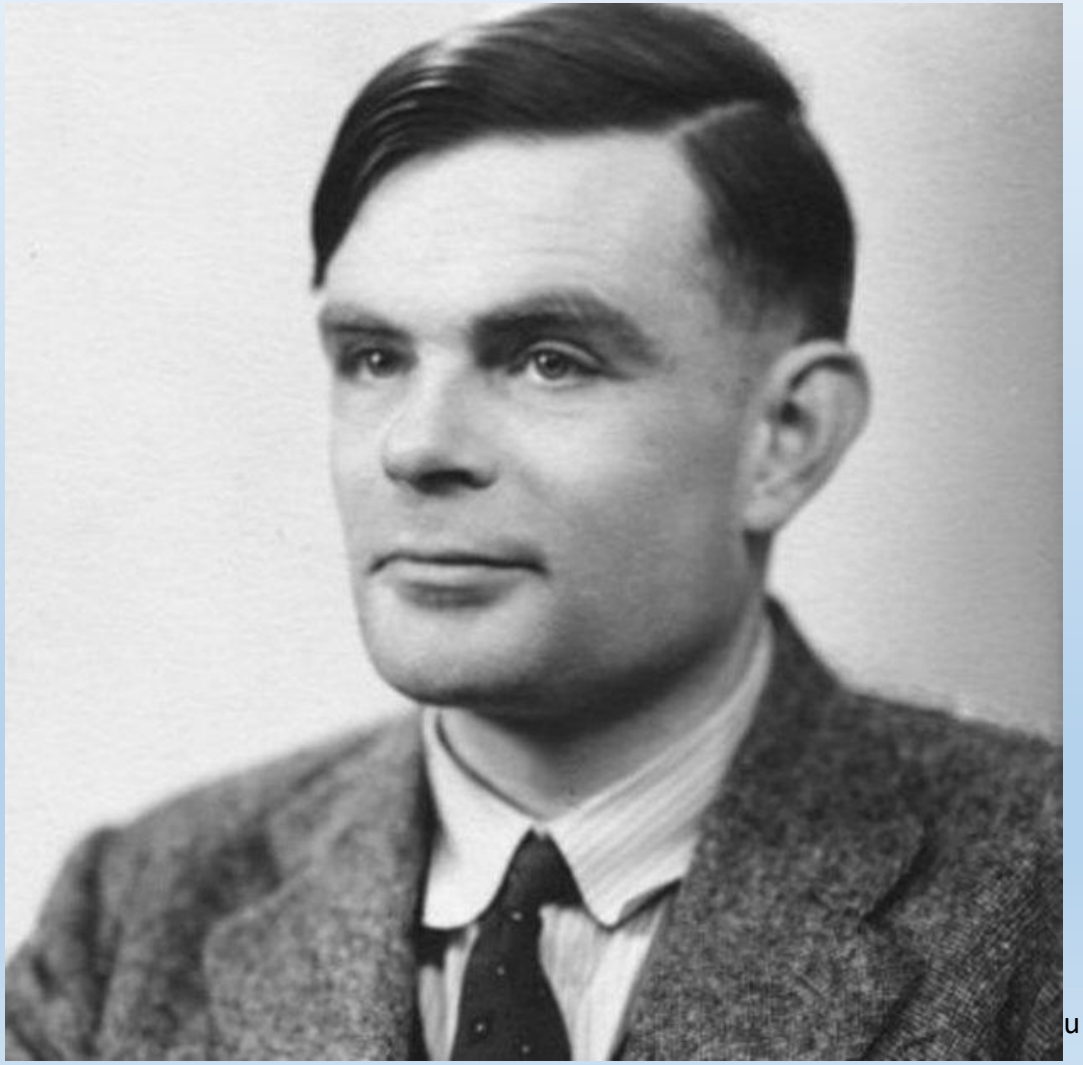
Helmut Schreyer und Zuse






BERLINER GEDENKTAFEL
In den kriegszerstörten Häusern
Methfesselstraße 10 und 7
entwickelte und baute Konrad Zuse von 1936 bis 1944
die programm-gesteuerten Rechenanlagen Z 1 bis Z 4
1941 ging der Rechner
ZUSE Z 3
als erster funktionsfähiger Computer
der Welt in Betrieb

Alan Turing –The Bombe or Collosus



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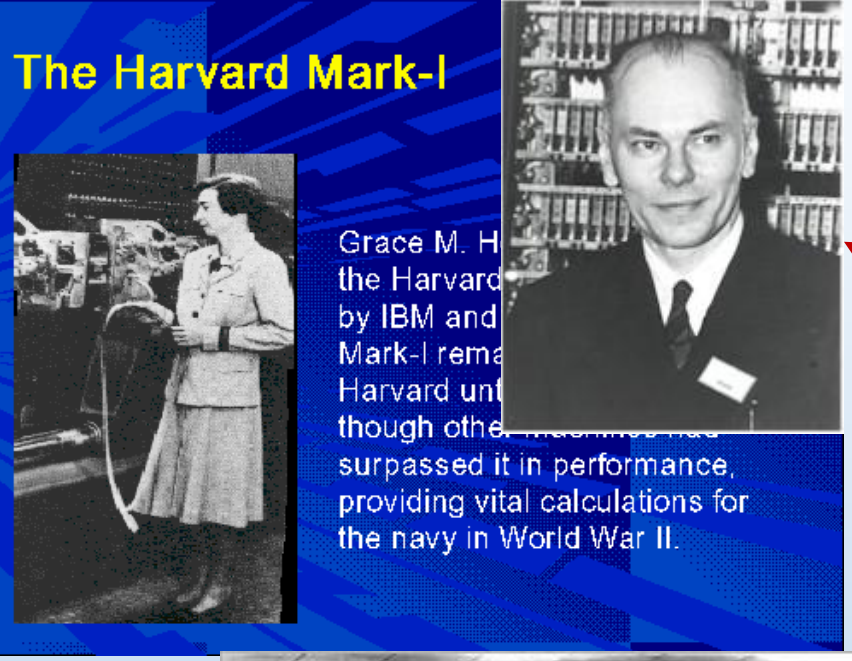
HARVARD

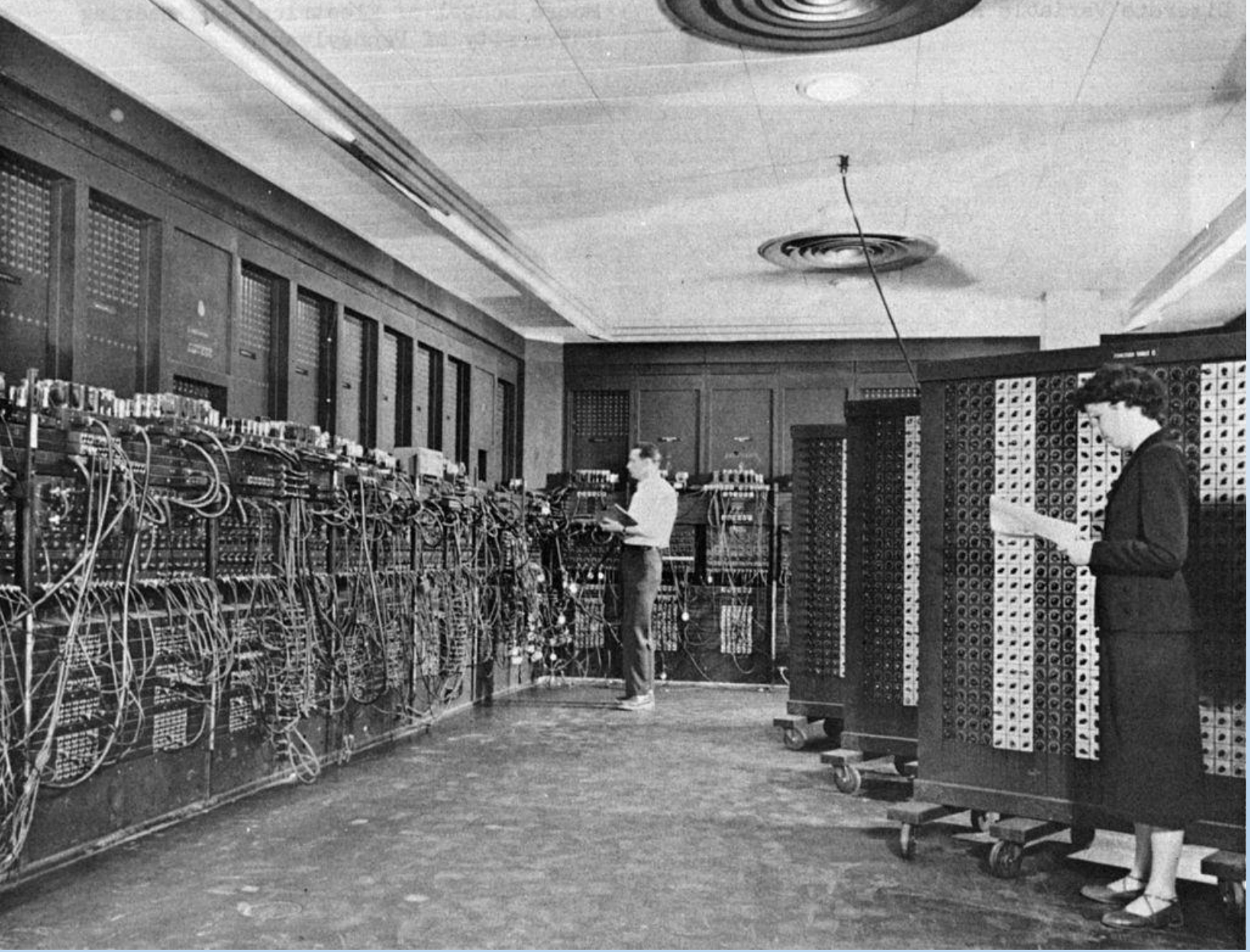
M

C



Howard Aiken and
Grace Hopper

The Harvard Mark I



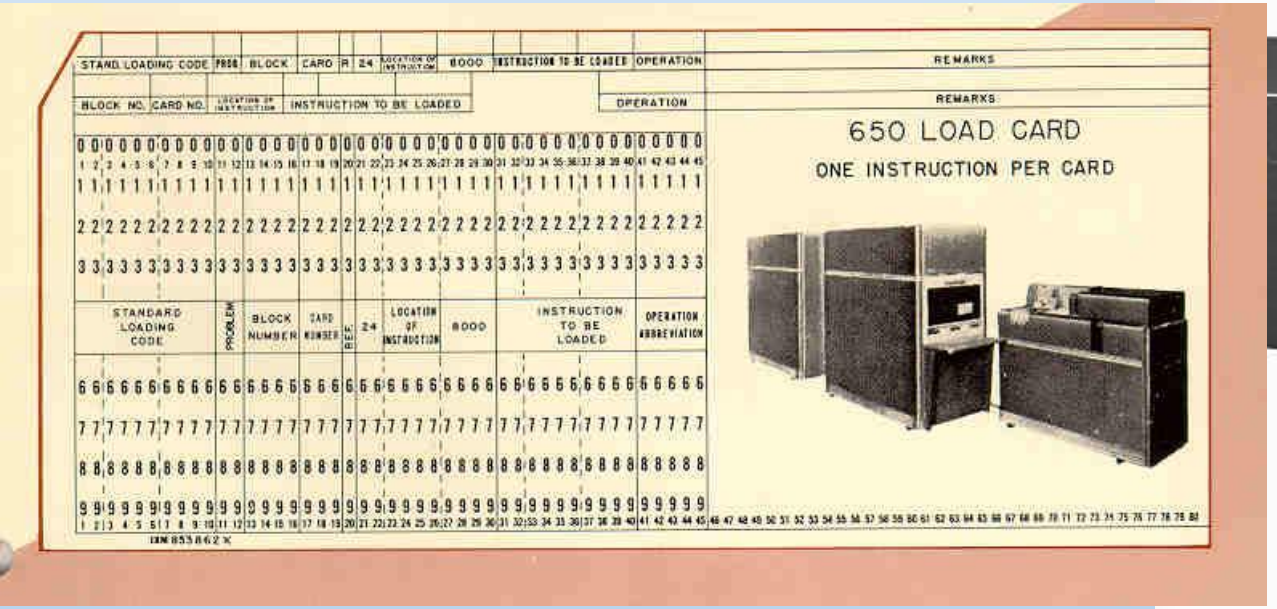
ENIAC -1946
(University of Pennsylvania)

-John Mauchly
-J. Presper Eckert

Robert Shaw (function tables)
Jeffrey C. Chu (dividers and square roots)
Thomas K. Sharpless (master programmer)
Arthur Burks (multiplier)
Harry Huskey (reader/printer)
Jack Davis (accumulators)

Business descobre a computação! IBM

IBM 650



Comparação entre os primeios computadores (1/2)

Name	First operational	Numeral system	Computing mechanism	Programming	Turing complete	Memory
Difference Engine	Not built until the 1990s	Decimal	Mechanical	Not programmable; initial numerical constants of polynomial differences set physically	No	Physical state of wheels in axes
Analytical Engine	Not yet built	Decimal	Mechanical	Program-controlled by punched cards	Yes	Physical state of wheels in axes
Bombe (Poland, UK, US)	1939 (Polish), March 1940 (British), May 1943 (US)	Character computations	Electro-mechanical	Not programmable; cipher input settings specified by patch cables	No	Physical state of rotors
Zuse Z3 (Germany)	May 1941	Binary floating point	Electro-mechanical	Program-controlled by punched 35 mm film stock	In principle	Mechanical relays

Comparação entre os primeiros computadores (2/2)

Atanasoff–Berry Computer (US)	1942	Binary	Electronic	Not programmable; linear system coefficients input using punched cards	No	Regenerative capacitor memory
Colossus Mark 1 (UK)	December 1943	Binary	Electronic	Program-controlled by patch cables and switches	No	Thermionic valves (vacuum tubes) and thyratrons
Harvard Mark I – IBM ASCC (US)	May 1944	Decimal	Electro-mechanical	Program-controlled by 24-channel punched paper tape (but no conditional branch)	No	Mechanical relays[40]
Zuse Z4 (Germany)	March 1945 (or 1948)[41]	Binary floating point	Electro-mechanical	Program-controlled by punched 35 mm film stock	Yes	Mechanical relays
ENIAC (US)	July 1946	Decimal	Electronic	Program-controlled by patch cables and switches	Yes	Vacuum tube triode flip-flops
Manchester Baby (UK)	1948	Binary	Electronic	Binary program entered into memory by keyboard[42] (first electronic stored-program digital computer)	Yes	Williams cathode ray tube

I don't know his exact age, but he speaks of having programmed an IBM 650 computer.

Data science

Business
OK

Estatistics/
Math - OK

Hardware
+ ou - OK

Software
NOK