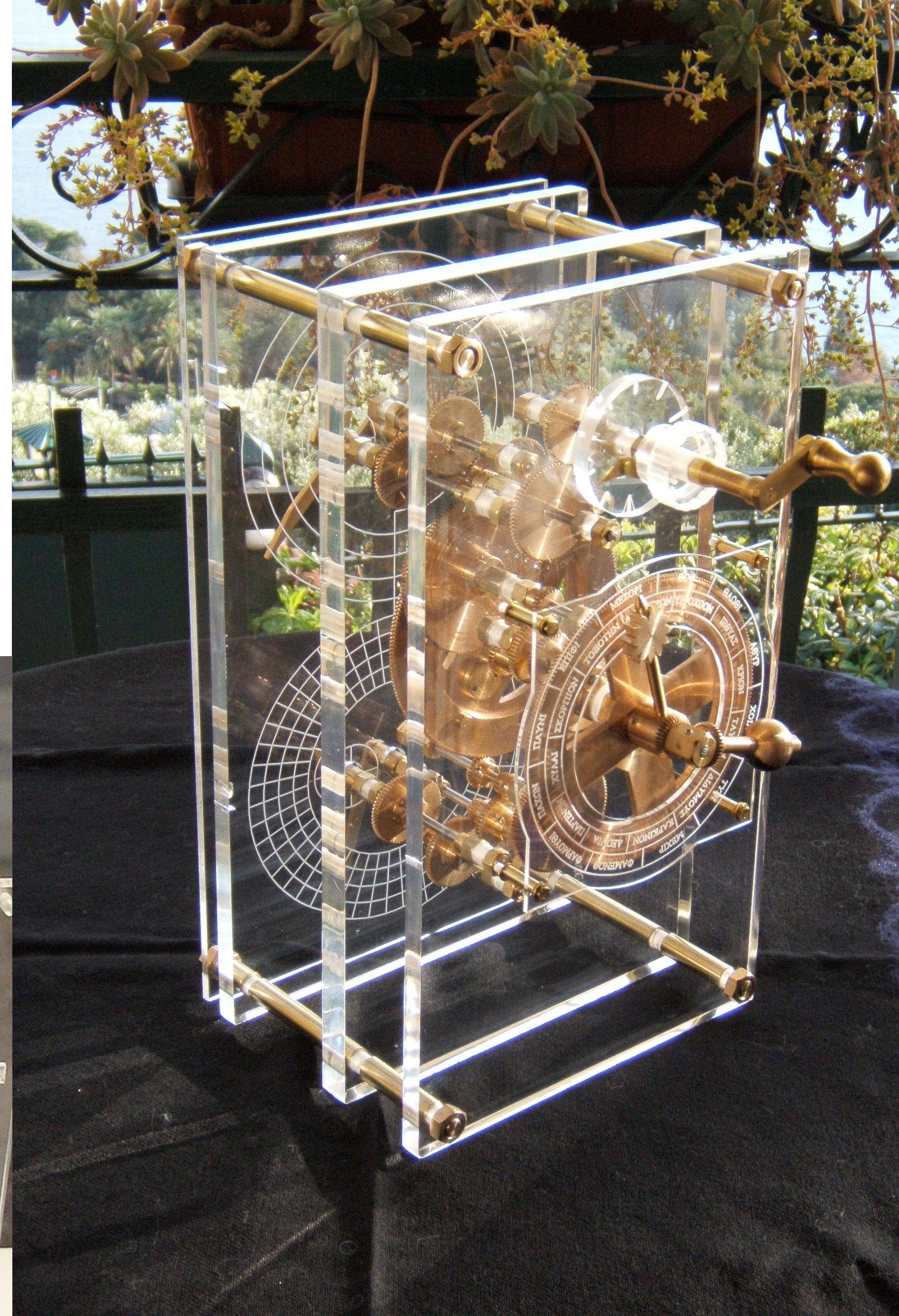


Introdução à Física Computacional

História dos computadores

Computadores analógicos

- Variação contínua de algum fenômeno físico é usada para modelar o problema.
- Exemplo: Mecanismo Antikythera.
- Circuitos mecânicos?

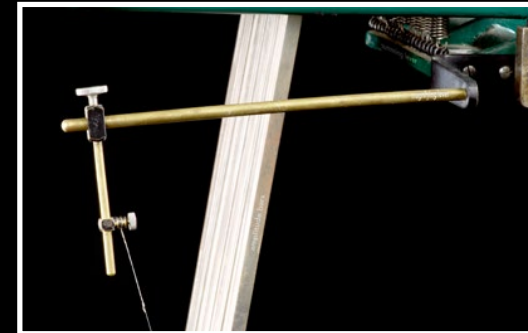


Albert Michelson

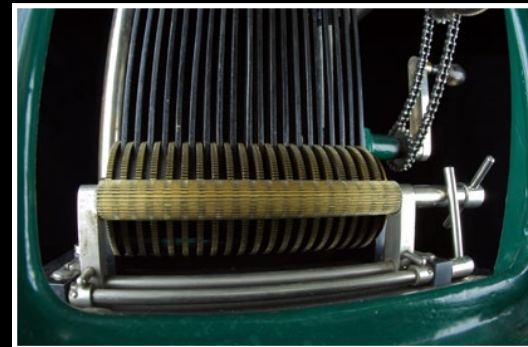
Analísador Harmônico

(século 19)

magnifying
lever p. 46



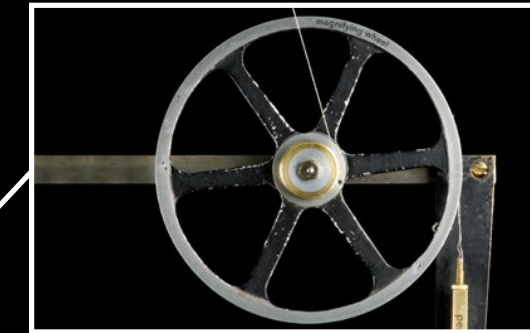
pinion gear p. 66



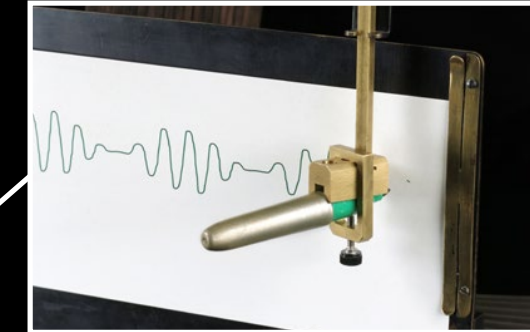
provenance p. 70



magnifying
wheel p. 50



platen
and pen p. 54, 64



translational
gearing p. 56



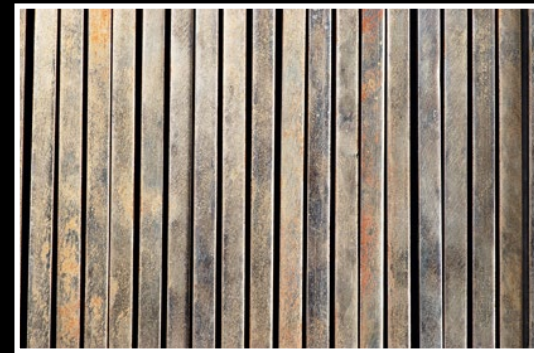
crank p. 12



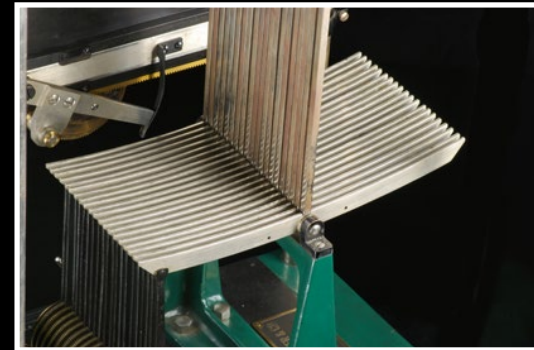
engineerguy

counter
spring
p. 44

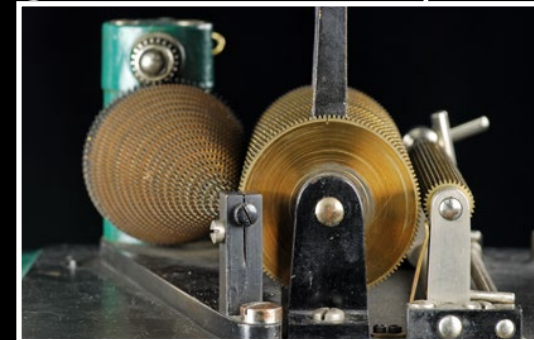
amplitude bars p. 30



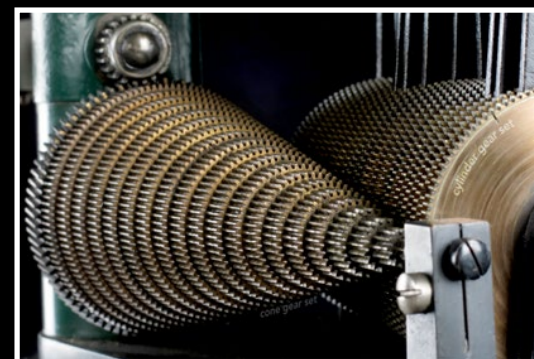
rocker arms p. 26



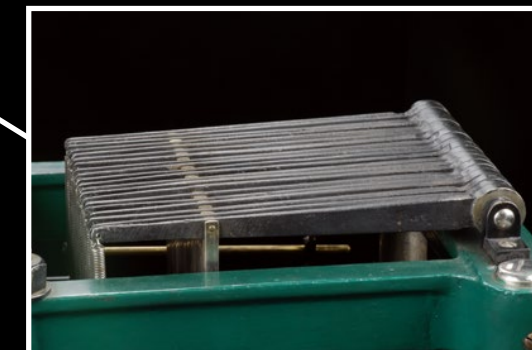
cylinder
gear set p. 22



cone gear set p. 16



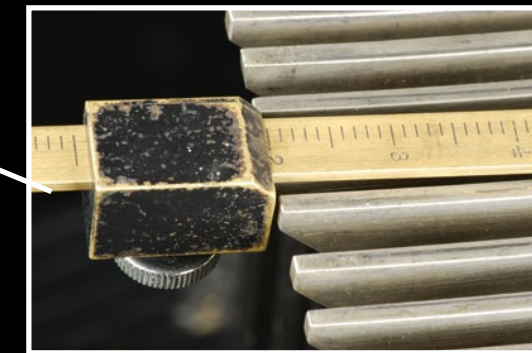
springs
and levers p. 38



summing lever p. 42

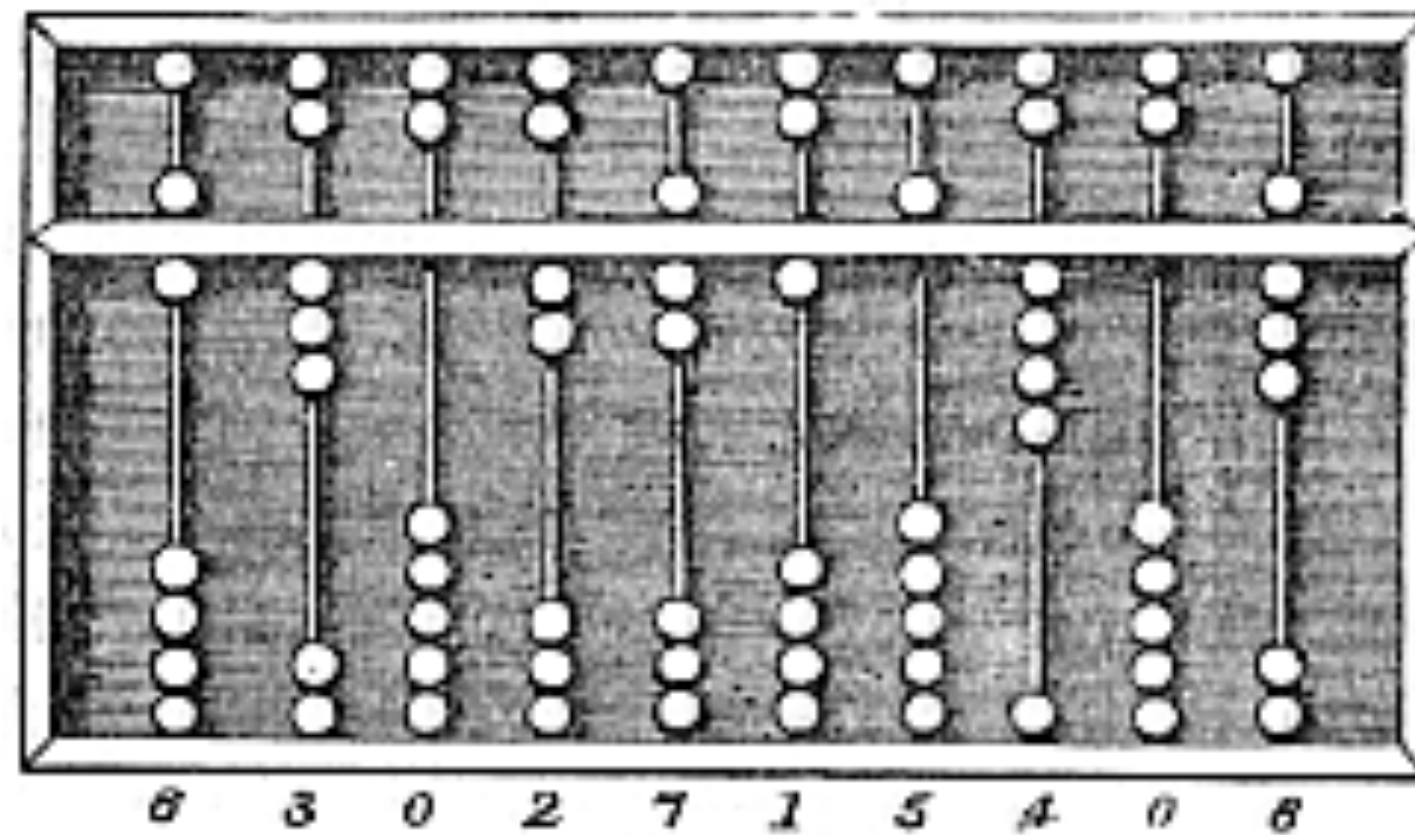


measuring stick p. 34



Computadores digitais mecânicos

- Números armazenados como dígitos decimais.
- Operações mecânicas discretas.
- Economizar tempo e esforço humano em cálculos aritméticos.
- Calculadoras!

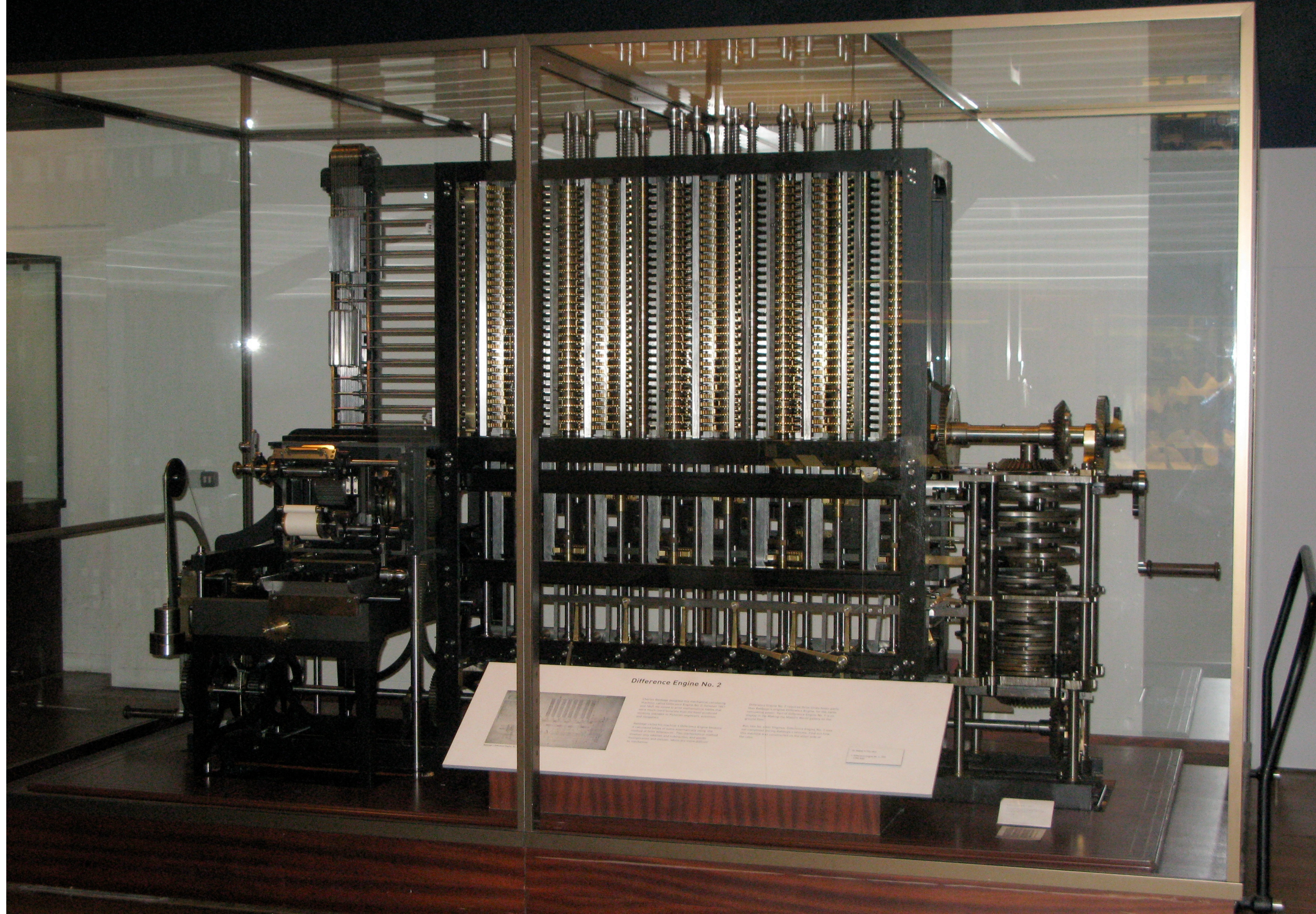


6,302,715,408 representado
em um suanpan (China)



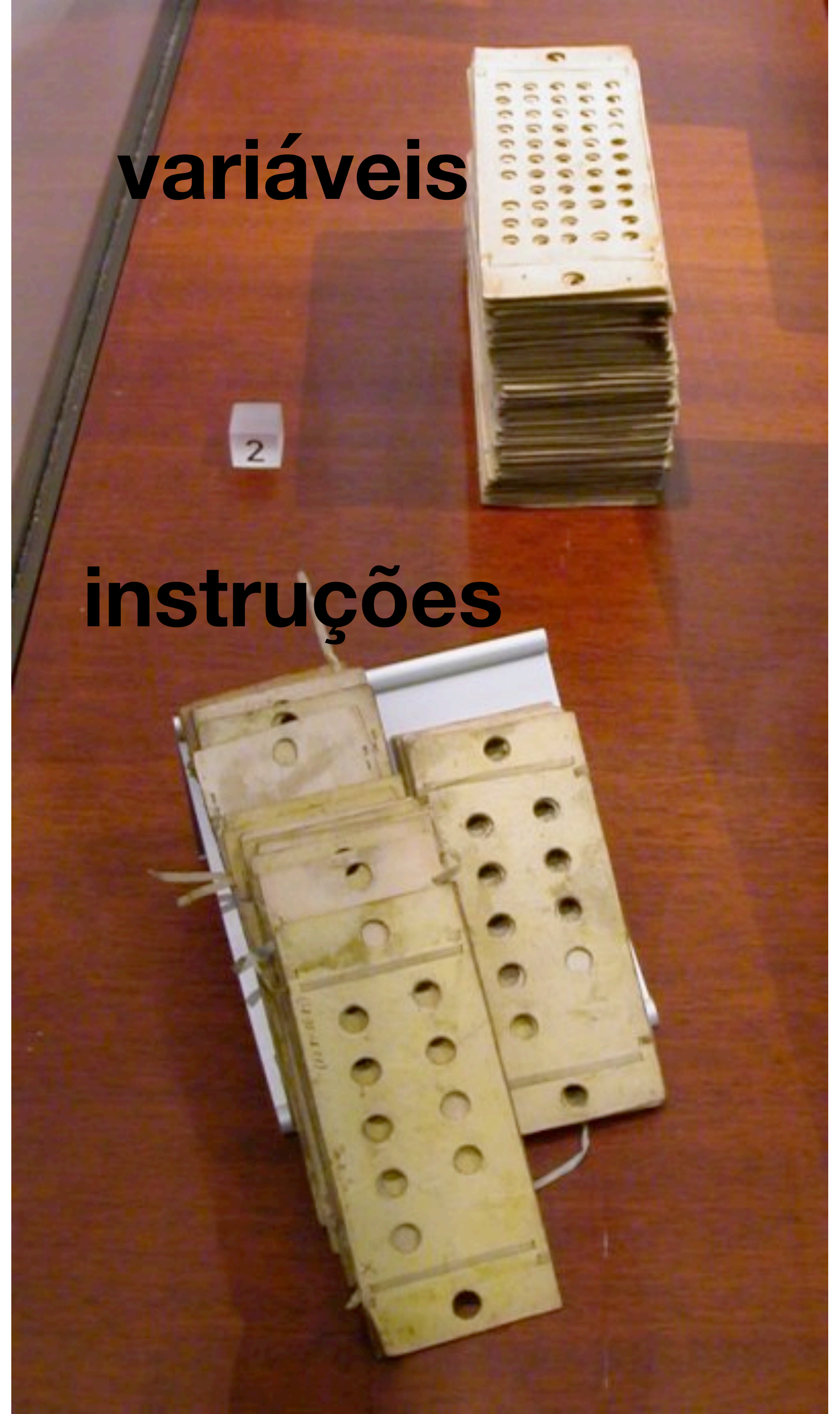
Charles Babbage

Máquina diferencial (1833)



Charles Babbage

Máquina Analítica (1837-)



variáveis

instruções



Ada Lovelace

Primeiro algoritmo publicado para um computador

Anotação "G": Algoritmo para

calcular números de Bernoulli (18

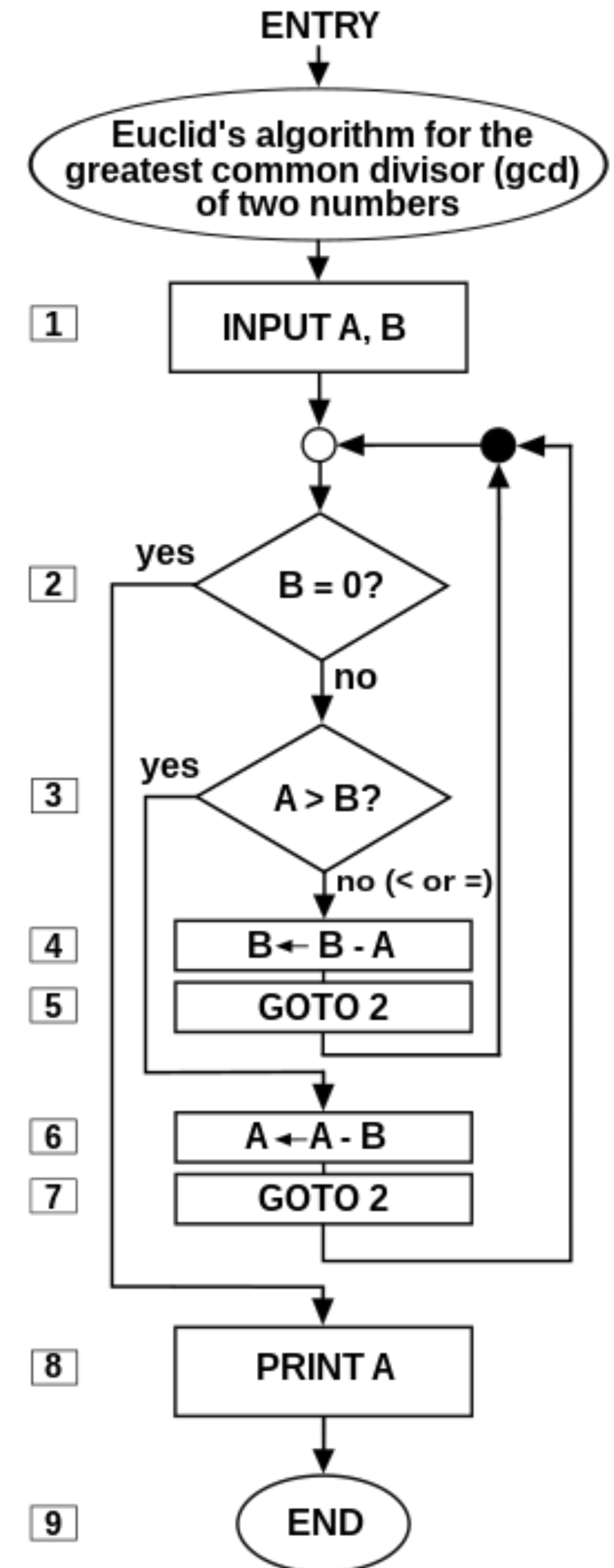
Diagram for the computation by the Engine of the Numbers of Bernoulli. See Note G. (page 722 *et seq.*)

Number of Operation.	Nature of Operation.	Variables acted upon.	Variables receiving results.	Indication of change in the value on any Variable.	Statement of Results.	Data.											Working Variables.				Result Variables.			
						1V_1	1V_2	1V_3	0V_4	0V_5	0V_6	0V_7	0V_8	0V_9	${}^0V_{10}$	${}^0V_{11}$	${}^0V_{12}$	${}^0V_{13}$	${}^1V_{21}$	${}^1V_{22}$	${}^1V_{23}$	${}^0V_{24}$		
						$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 1 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 2 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 4 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$	$\begin{matrix} \bigcirc \\ 0 \\ 0 \\ 0 \end{matrix}$					
						$\begin{matrix} \boxed{1} \\ \end{matrix}$	$\begin{matrix} \boxed{2} \\ \end{matrix}$	$\begin{matrix} \boxed{n} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$	$\begin{matrix} \boxed{} \\ \end{matrix}$					
1	\times	${}^1V_2 \times {}^1V_3$	${}^1V_4, {}^1V_5, {}^1V_6$	$\left\{ \begin{array}{l} {}^1V_2 = {}^1V_2 \\ {}^1V_3 = {}^1V_3 \end{array} \right\}$	$= 2n$	...	2	n	2n	2n	2n												
2	$-$	${}^1V_4 - {}^1V_1$	2V_4	$\left\{ \begin{array}{l} {}^1V_4 = {}^2V_4 \\ {}^1V_1 = {}^1V_1 \end{array} \right\}$	$= 2n - 1$	...	1	...	...	2n - 1											
3	$+$	${}^1V_5 + {}^1V_1$	2V_5	$\left\{ \begin{array}{l} {}^1V_5 = {}^2V_5 \\ {}^1V_1 = {}^1V_1 \end{array} \right\}$	$= 2n + 1$	...	1	...	...	2n + 1											
4	\div	${}^2V_5 \div {}^2V_4$	${}^1V_{11}$	$\left\{ \begin{array}{l} {}^2V_5 = {}^0V_6 \\ {}^2V_4 = {}^0V_4 \end{array} \right\}$	$= \frac{2n - 1}{2n + 1}$	...	...	...	0	0	...										
5	\div	${}^1V_{11} \div {}^1V_2$	${}^2V_{11}$	$\left\{ \begin{array}{l} {}^1V_{11} = {}^2V_{11} \\ {}^1V_2 = {}^1V_2 \end{array} \right\}$	$= \frac{1}{2} \cdot \frac{2n - 1}{2n + 1}$	...	2	...	...	...	...									
6	$-$	${}^0V_{13} - {}^2V_{11}$	${}^1V_{13}$	$\left\{ \begin{array}{l} {}^2V_{11} = {}^0V_{13} \\ {}^0V_{13} = {}^1V_{13} \end{array} \right\}$	$= -\frac{1}{2} \cdot \frac{2n - 1}{2n + 1} = A_0$	...	...	...	...	...	...							
7	$-$	${}^1V_3 - {}^1V_1$	${}^1V_{10}$	$\left\{ \begin{array}{l} {}^1V_3 = {}^1V_3 \\ {}^1V_1 = {}^1V_1 \end{array} \right\}$	$= n - 1 (= 3)$	...	1	...	n	...	...											
Here follows a repetition of Operations thirteen to twenty-three.																								
24	$+$	${}^4V_{13} + {}^0V_{24}$	${}^1V_{24}$	$\left\{ \begin{array}{l} {}^4V_{13} = {}^0V_{13} \\ {}^0V_{24} = {}^1V_{24} \end{array} \right\}$	$= B_7$	...	...	...	...	...	...	...	...	...	...	...	...	...	B ₇
25	$+$	${}^1V_1 + {}^1V_3$	1V_3	$\left\{ \begin{array}{l} {}^1V_1 = {}^1V_1 \\ {}^1V_3 = {}^1V_3 \end{array} \right\}$	$= n + 1 = 4 + 1 = 5$	1	...	n + 1	...	...	0	0										
				by a Variable-card. by a Variable card.																				

Computador x Calculadora?

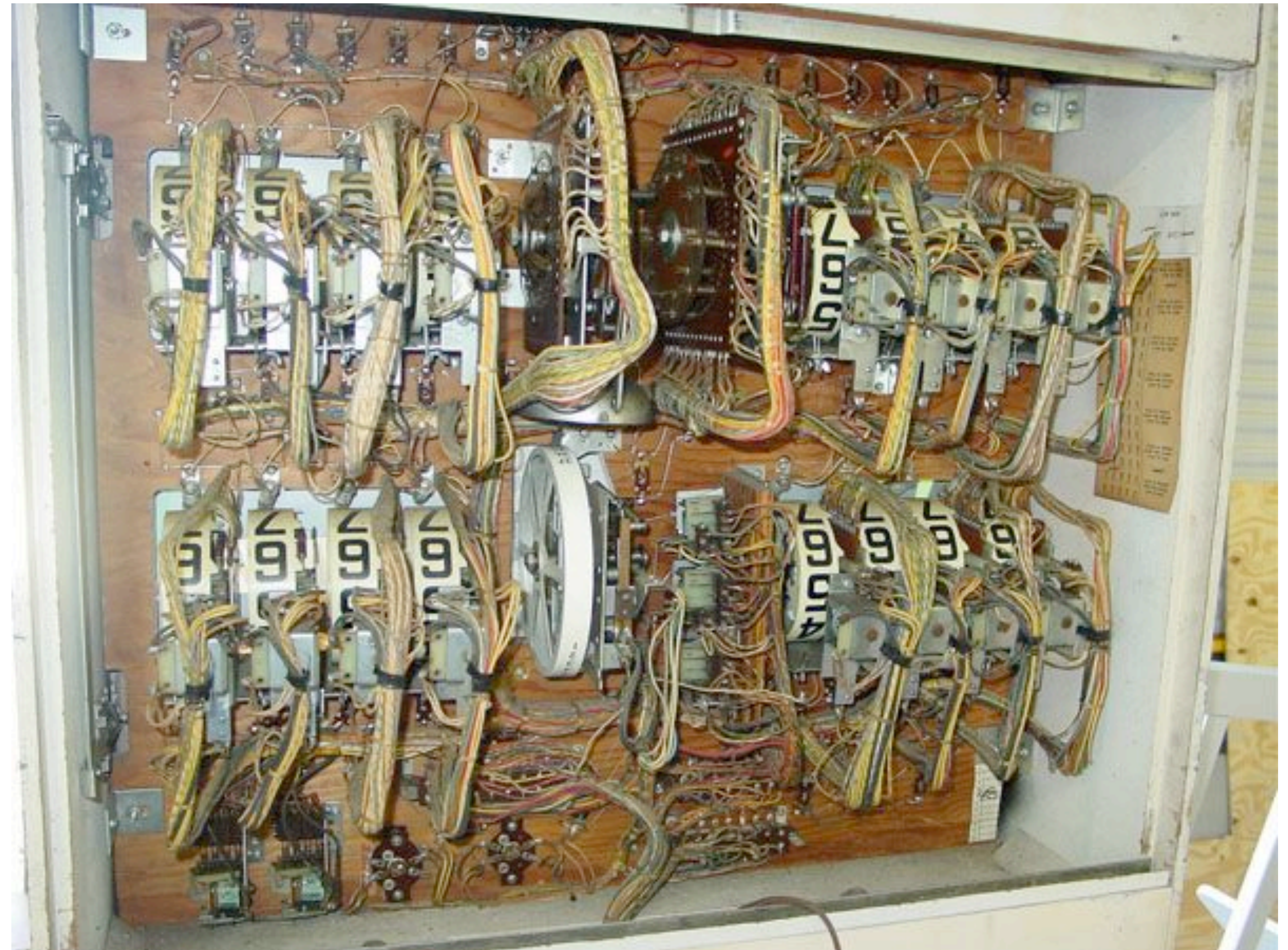
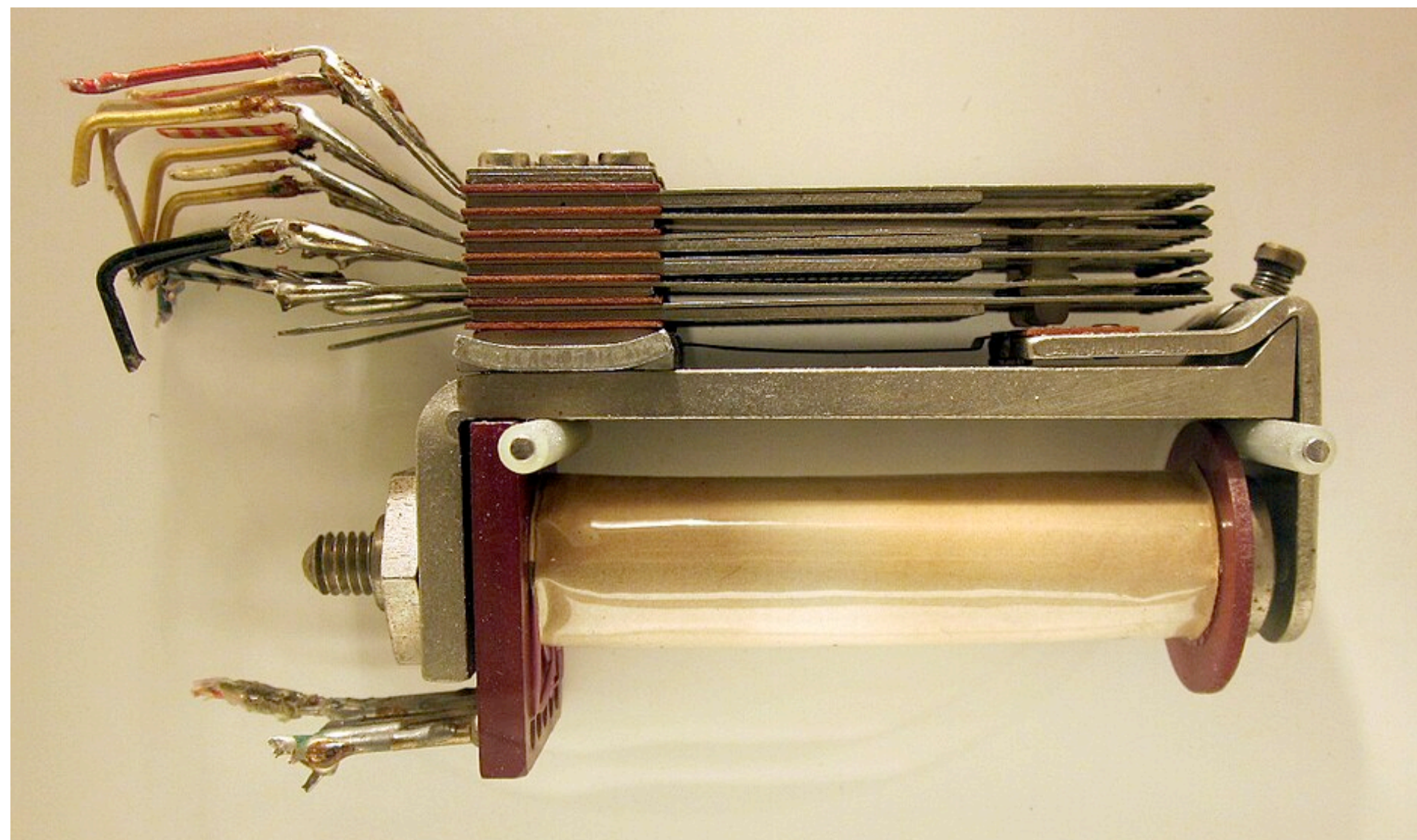
Algoritmos!

- Calculadoras executam sempre as mesmas operações.
- Alan Turing (1936) definiu uma linguagem formal, operando em máquinas hipotéticas (Máquinas de Turing), que poderia em princípio computar qualquer operação matemática que possa ser expressa em um algoritmo.



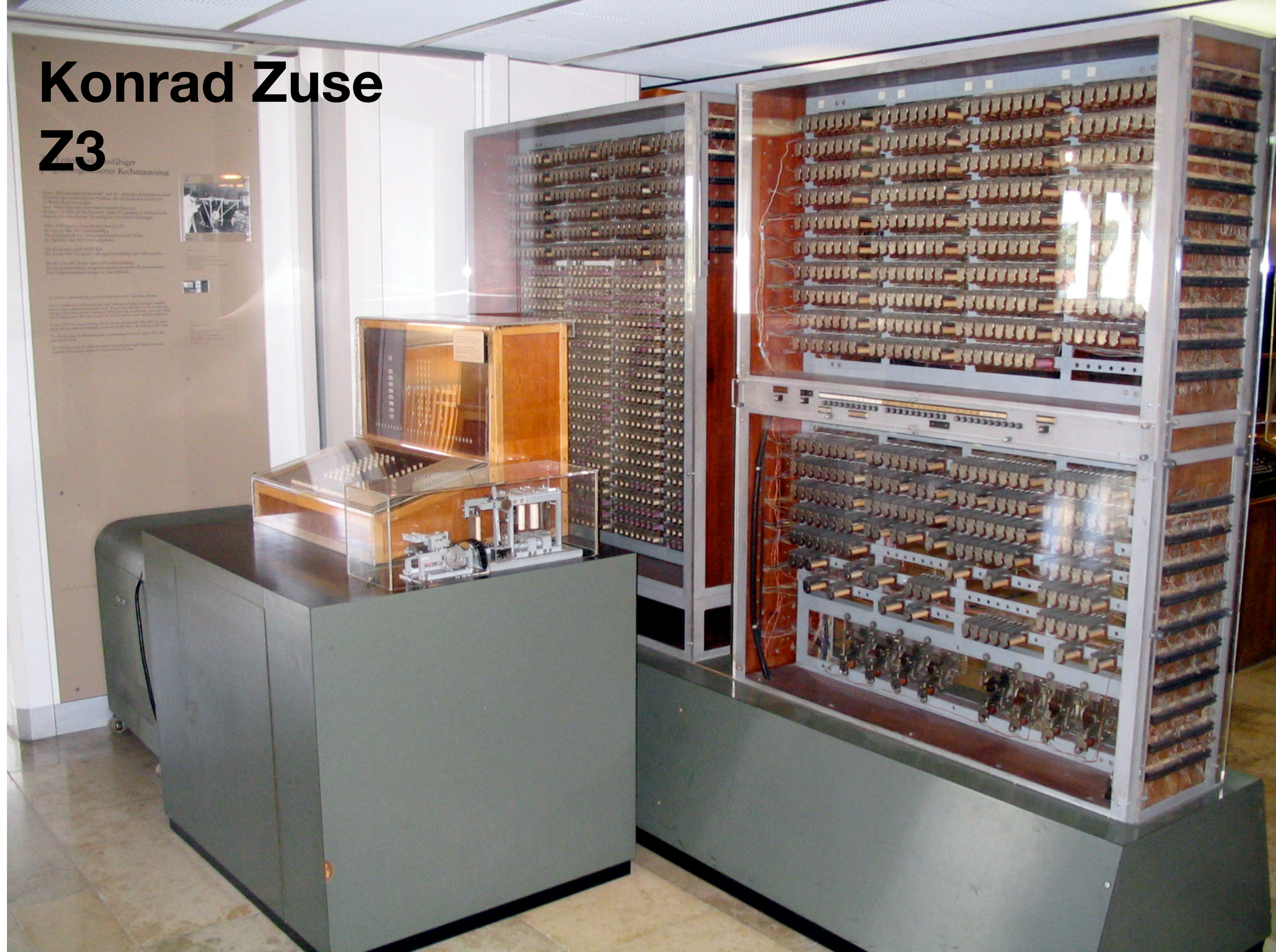
Computadores digitais eletro-mecânicos

- Representação de números no sistema binário (base 2).
- Uso de relés, solenoides, motores e chaves.



Konrad Zuse

Z3



Computadores digitais eletrônicos

Válvulas termiônicas - Veritasium



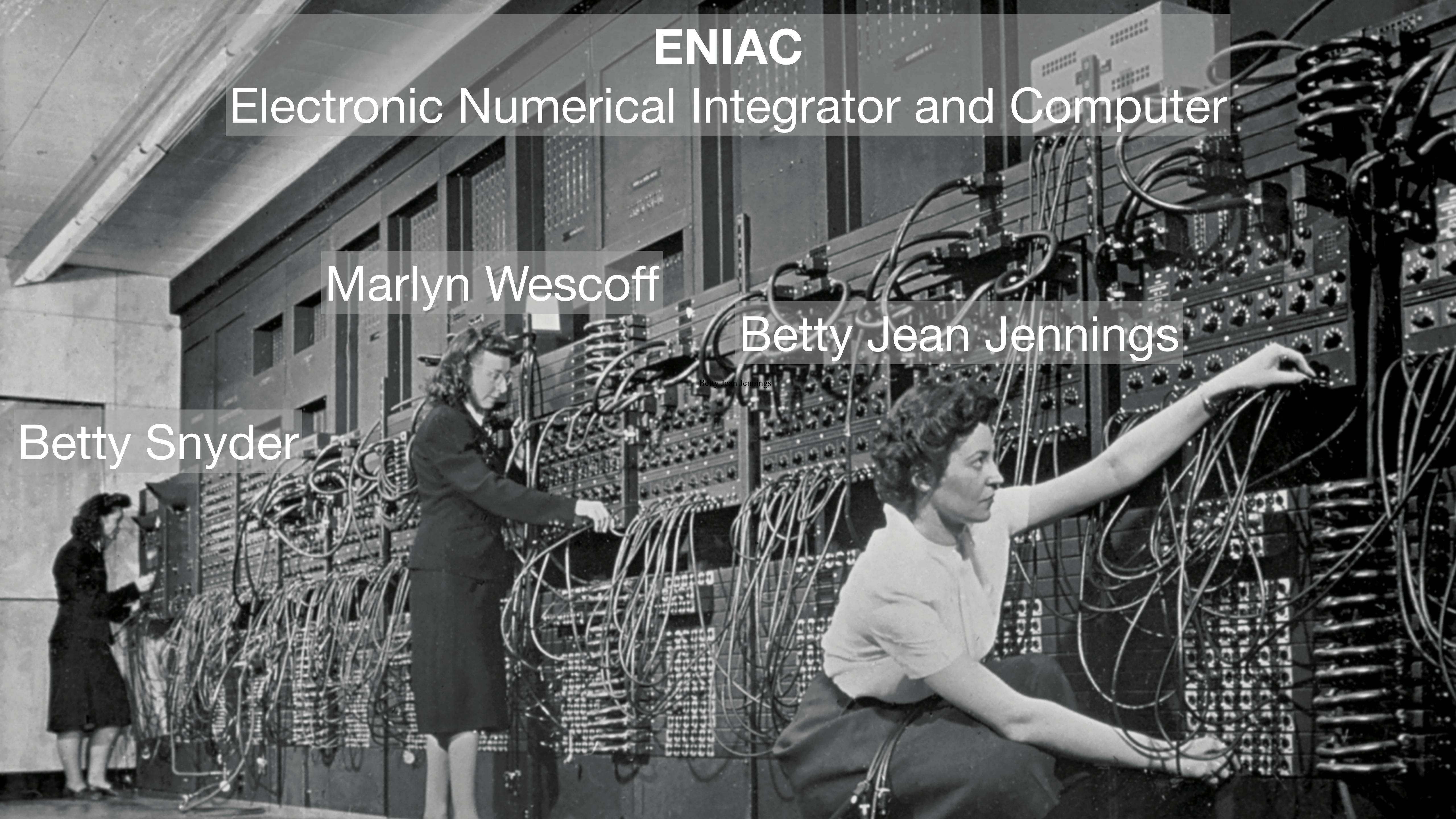
ENIAC

Electronic Numerical Integrator and Computer

Marlyn Wescoff

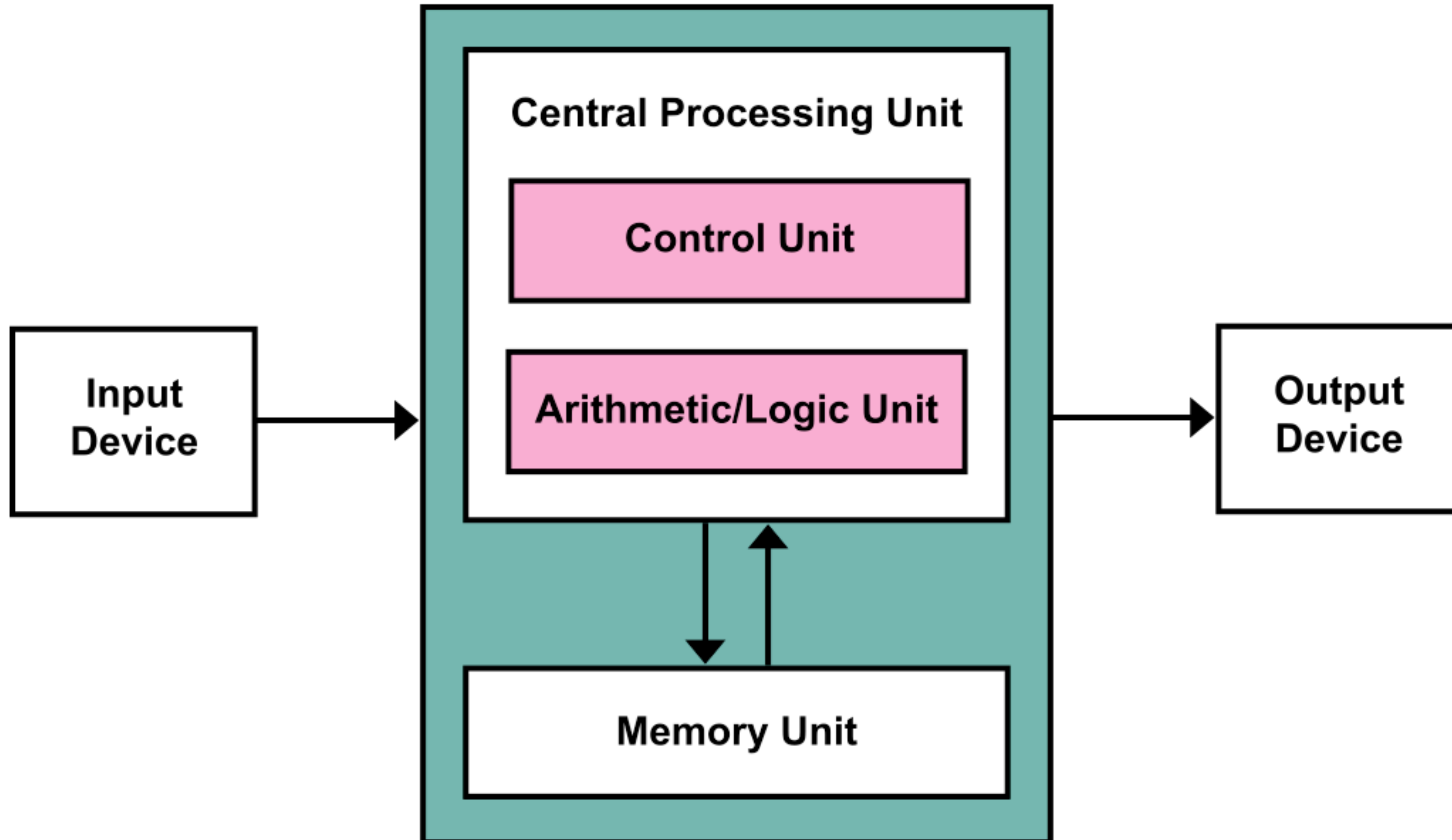
Betty Jean Jennings

Betty Snyder



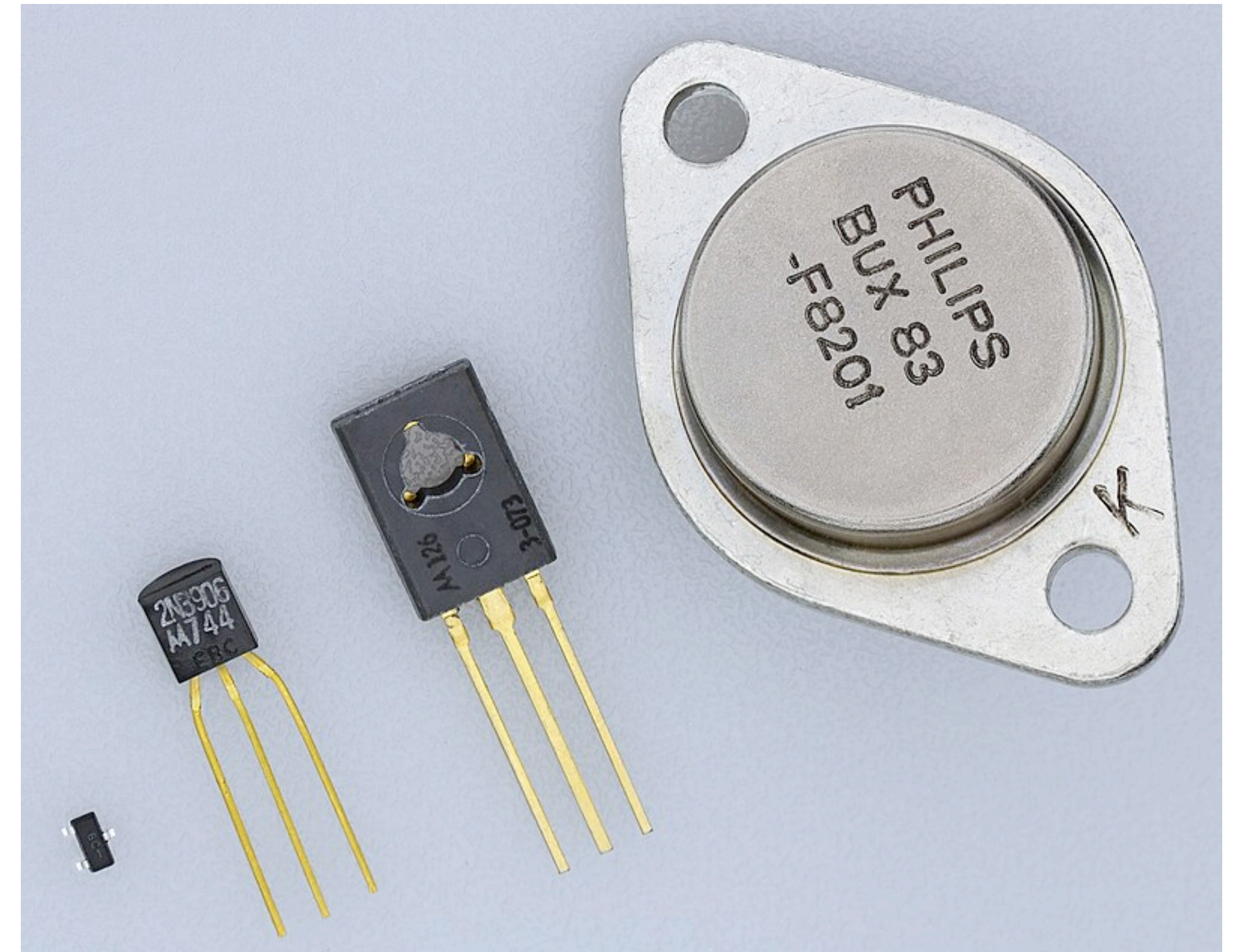
Arquitetura de von Neumann

Stored-program computer



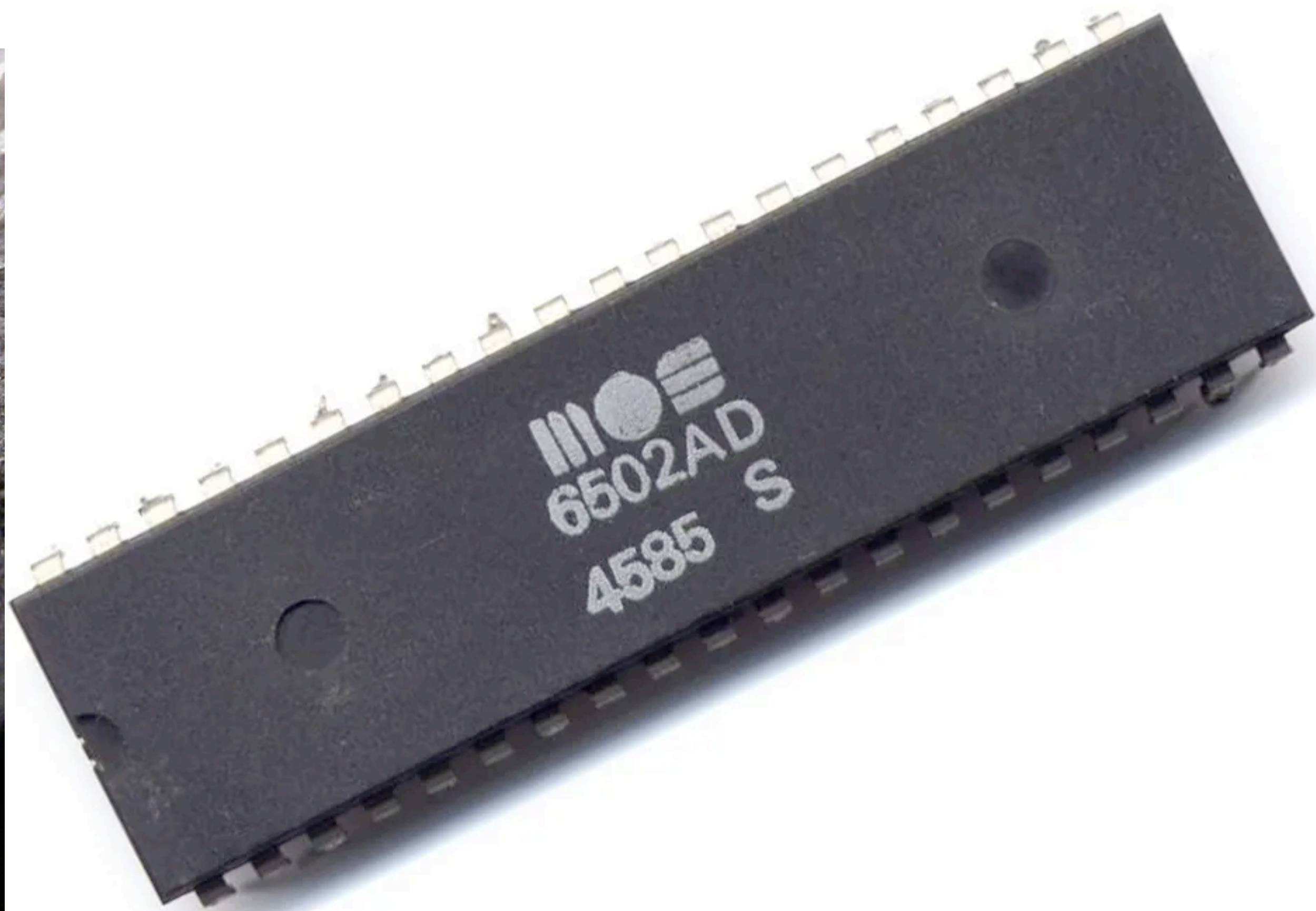
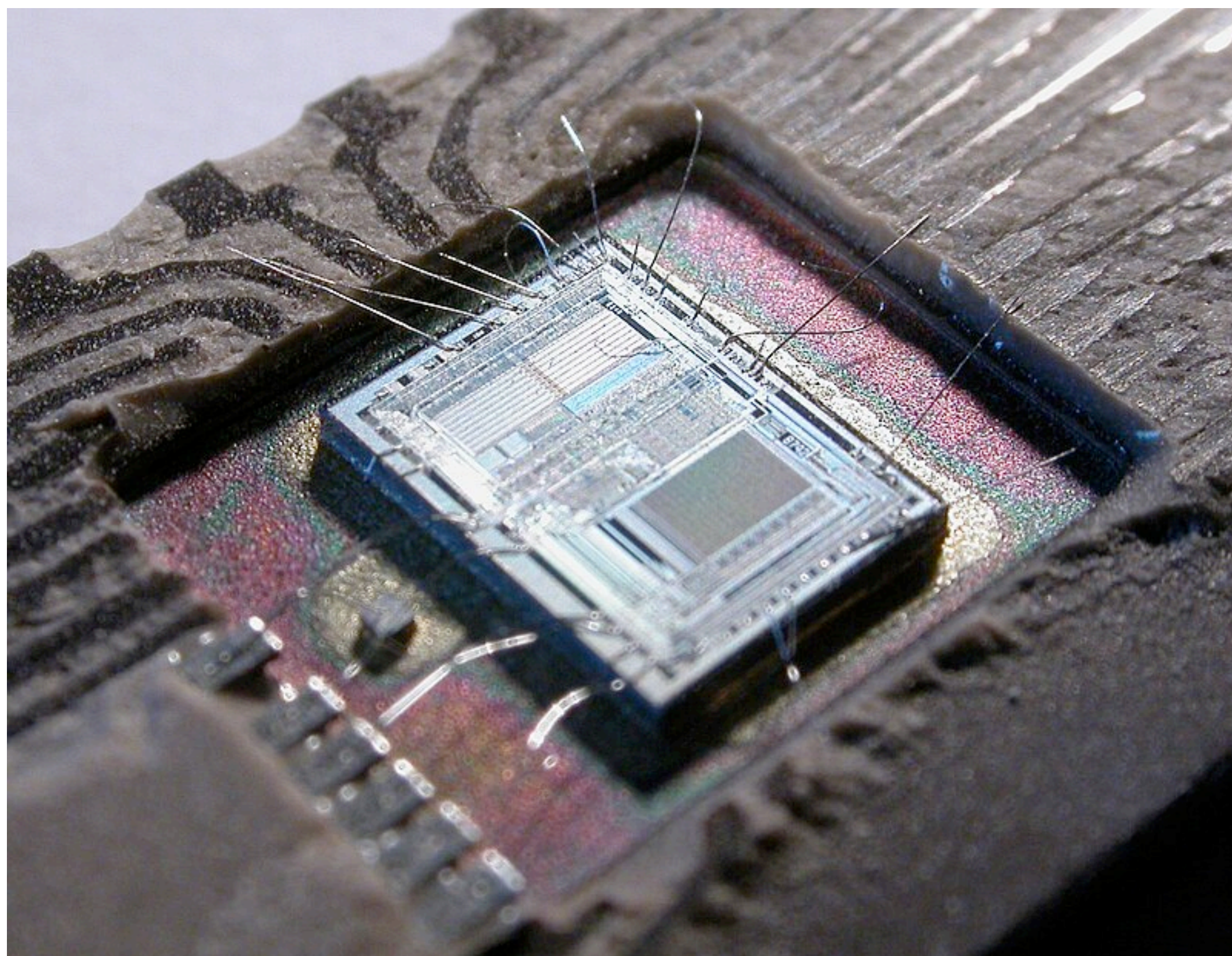
Computadores digitais eletrônicos

Transistor - Karen from Element14



Computadores digitais eletrônicos

Circuitos integrados e microprocessadores



MEMÓRIA
RAM

MEMÓRIA
ROM

CPU
Z8400AB1
Z8C A CPU
28627

ENTRADA / SAÍDA
Z8420AB1
Z80API0
28341-ITALY

24/12 1987

Tekno
Lógica

MARGARETTI - P

Tekno
Lógica
Controle de
Qualidade
Resp.: *W*

Computadores pessoais: 8-bit



Computadores pessoais modernos

