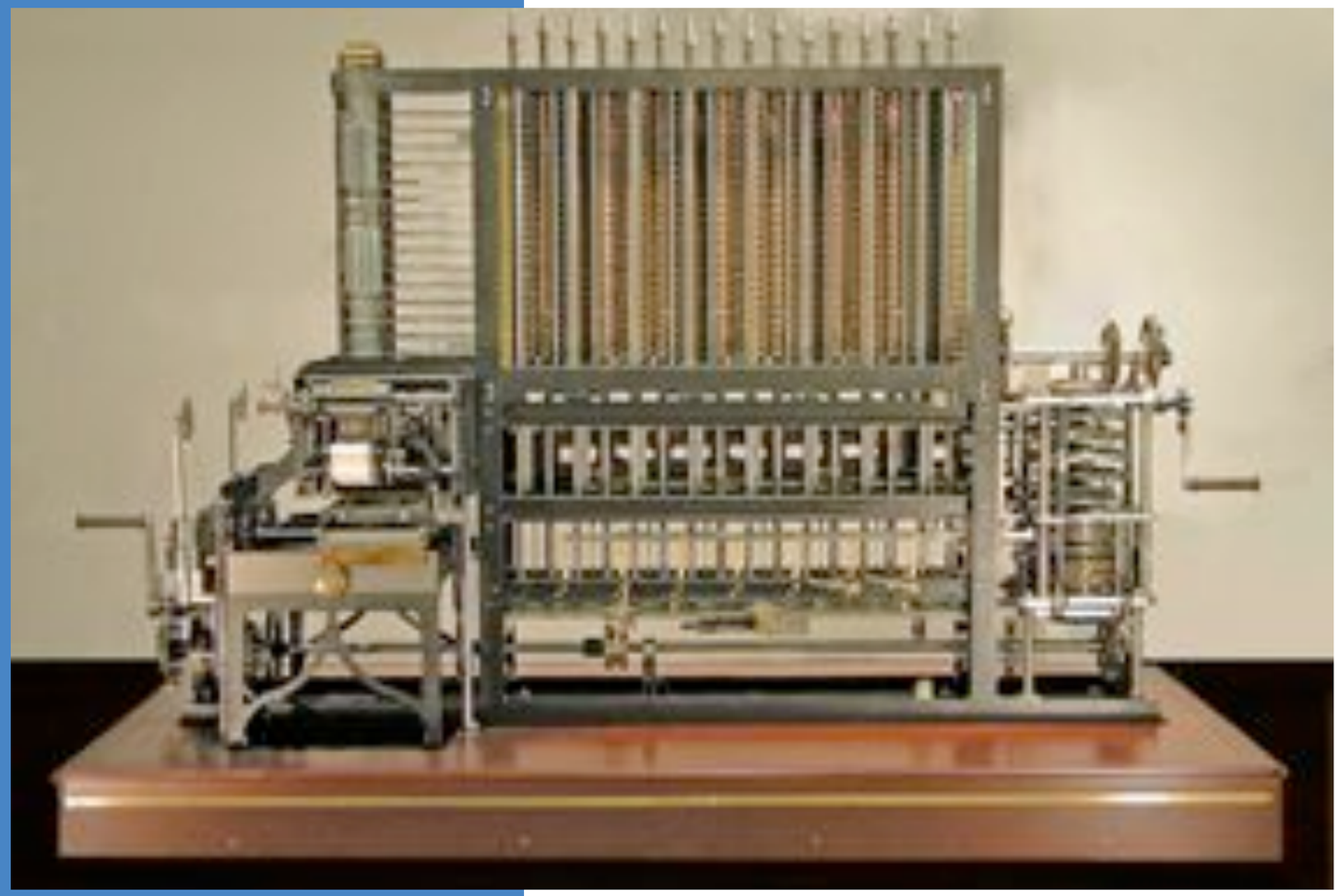
advent of the computer

History of Information



April 16, 2009

determinism again?

what determines technology?

business

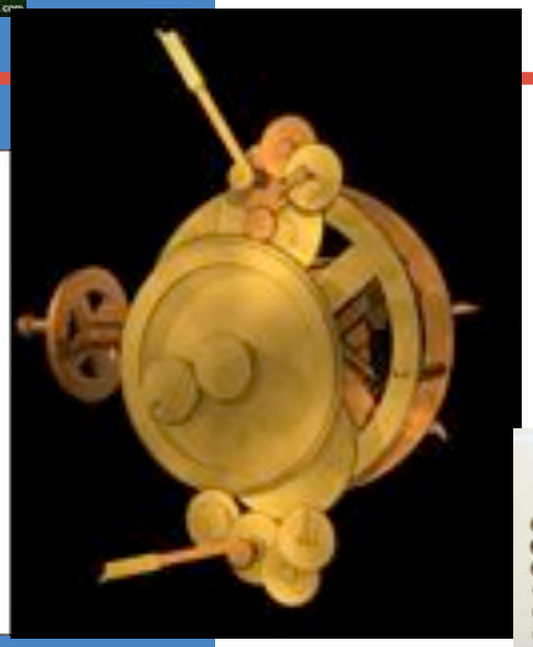
government

military

science

pre-pre-history

Stonehenge
c 3100 bce



antikythera
c 200 bce

Schickard
1623

Pascal
1642

Leibniz
1671

calculating

John Napier
1550-1617

Charles Babbage
1791-1871

John Napier
Mirifici Logarithmorum
Canonis Descriptio, 1614

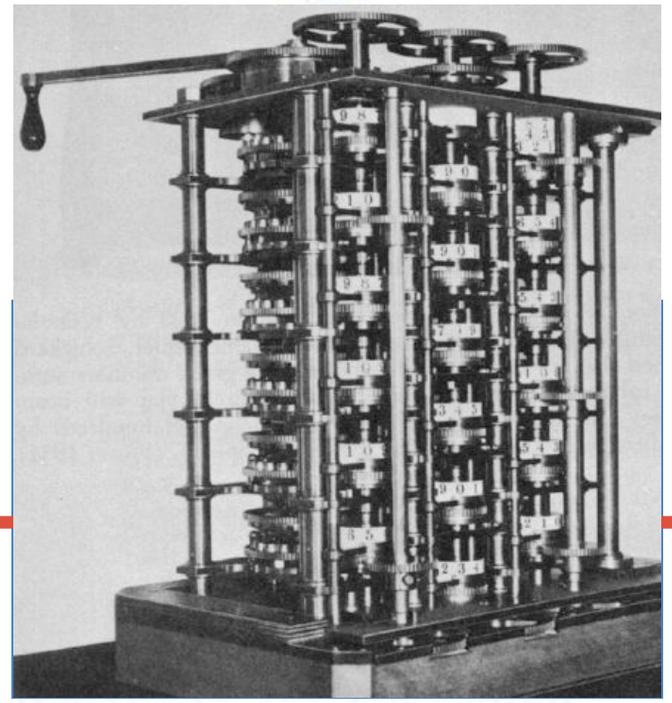
Charles Babbage
Table of Logarithms
from 1 to 108000
1827

"I wish to God these calculations had been executed by steam"

1821

on the economy of machines and manufactures

chapters

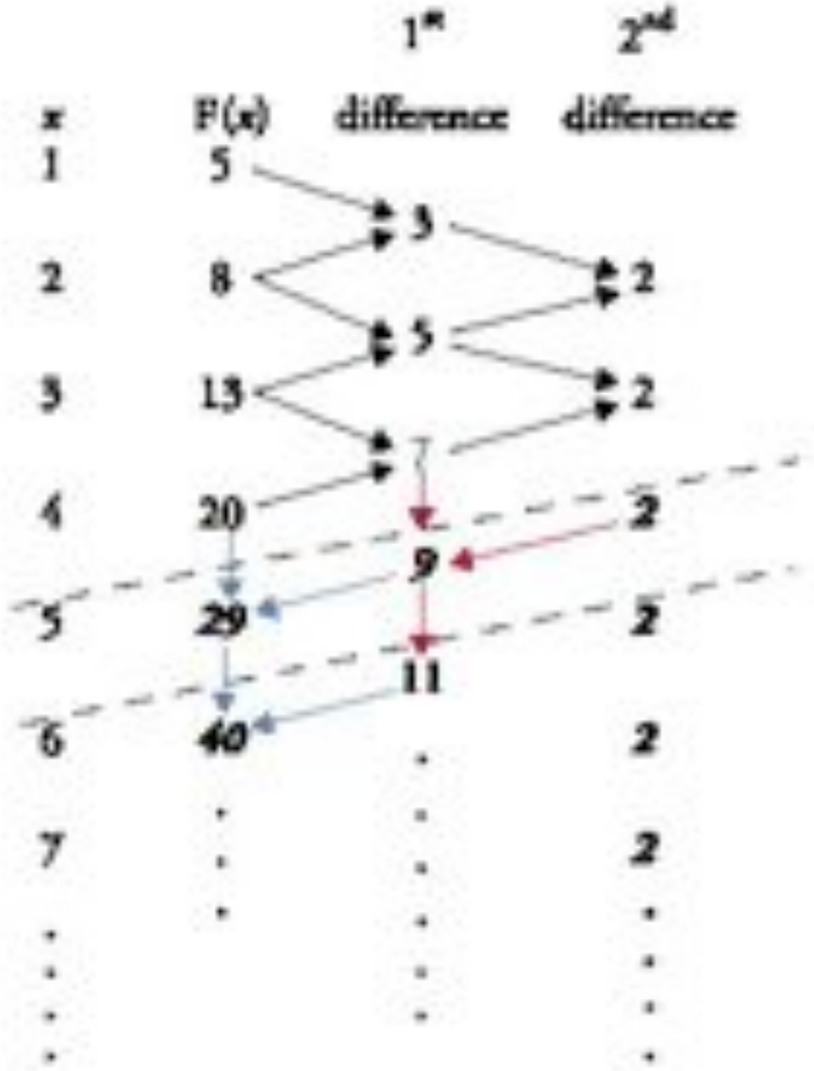


200 ON THE DIVISION OF MENTAL LABOUR.

Repetitions of Process	Movements.	Class A. Head set to I.	Class B. Head set to III.	Class C. Head set to II.
1	Pull A.	A. strikes 1	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 1 division . .	B. strikes 1	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1
2	Pull A.	A. strikes 4	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 4 divisions . .	B. strikes 4	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 4 divisions . .	C. strikes 4
3	Pull A.	A. strikes 9	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 9 divisions . .	B. strikes 9	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 9 divisions . .	C. strikes 9
4	Pull A.	A. strikes 16	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 16 divisions . .	B. strikes 16	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 16 divisions . .	C. strikes 16
5	Pull A.	A. strikes 25	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 25 divisions . .	B. strikes 25	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 25 divisions . .	C. strikes 25
6	Pull A.	A. strikes 36	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 36 divisions . .	B. strikes 36	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 36 divisions . .	C. strikes 36

functioning

$$f(x) = x^2 + 4$$



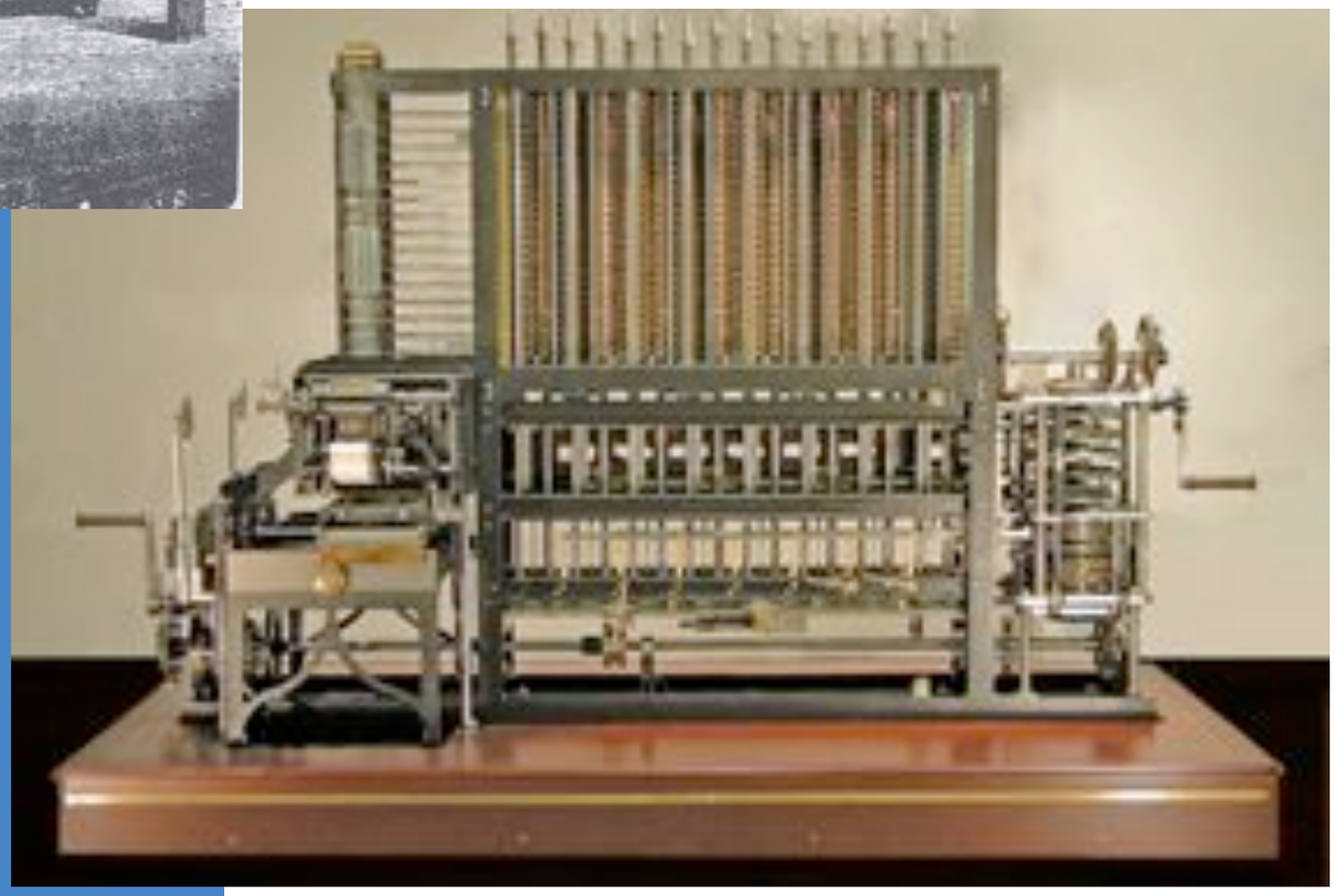
analytical engine

general purpose machine

programmable

looping

branching



Ada Lovelace

Ada Lovelace
1815-1852

Augusta Byron,
Countess of Lovelace

"a machine that not only would have foresight, but could act on that foresight"

"I want to put in something about Bernoulli's Number, in one of my notes, as an example of how an explicit function, may be worked out by the engine, without having been worked out by human head and hands first"
Lovelace to Babbage, 1843

"Analytical Engine *weaves algebraical patterns* just as the Jacquard loom weaves flowers and leaves'
-Taylor, *Scientific Memoirs*, 1843

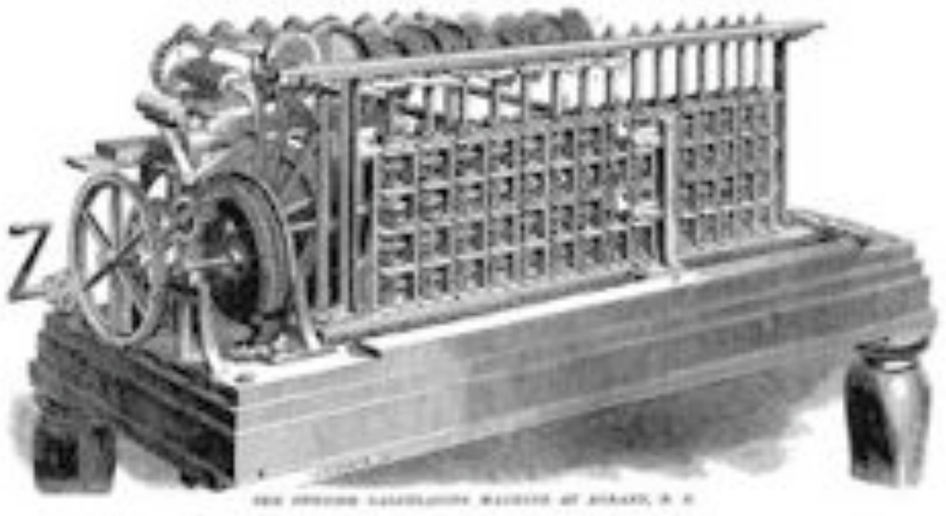
difference engines

George & Edvard Scheutz

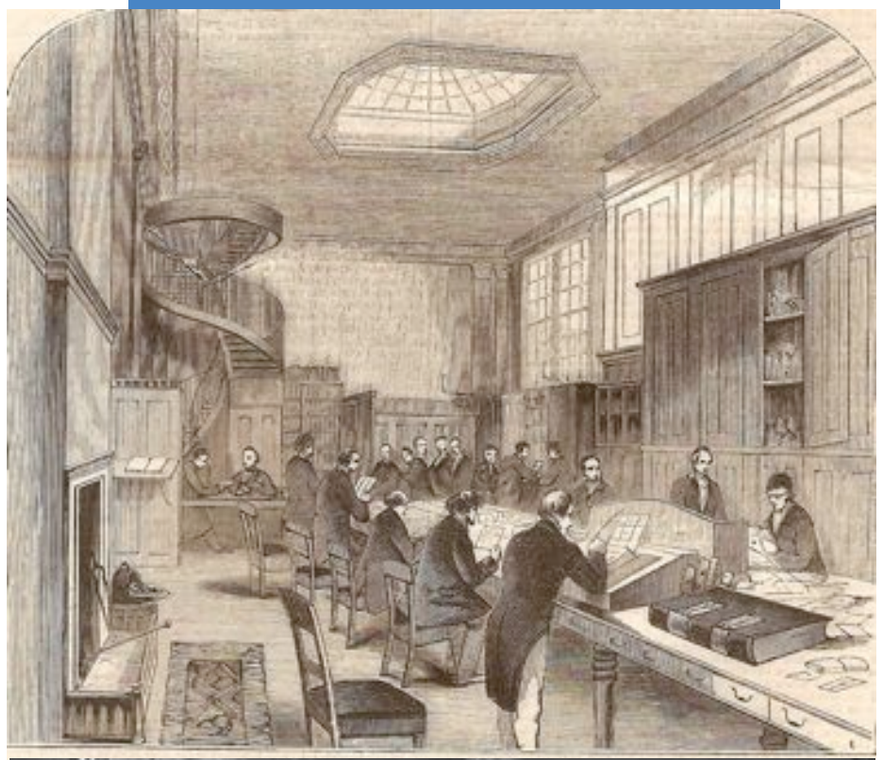
Scheutz Difference Engine, with printer
c 1853

Dudley Observatory, Schenectady

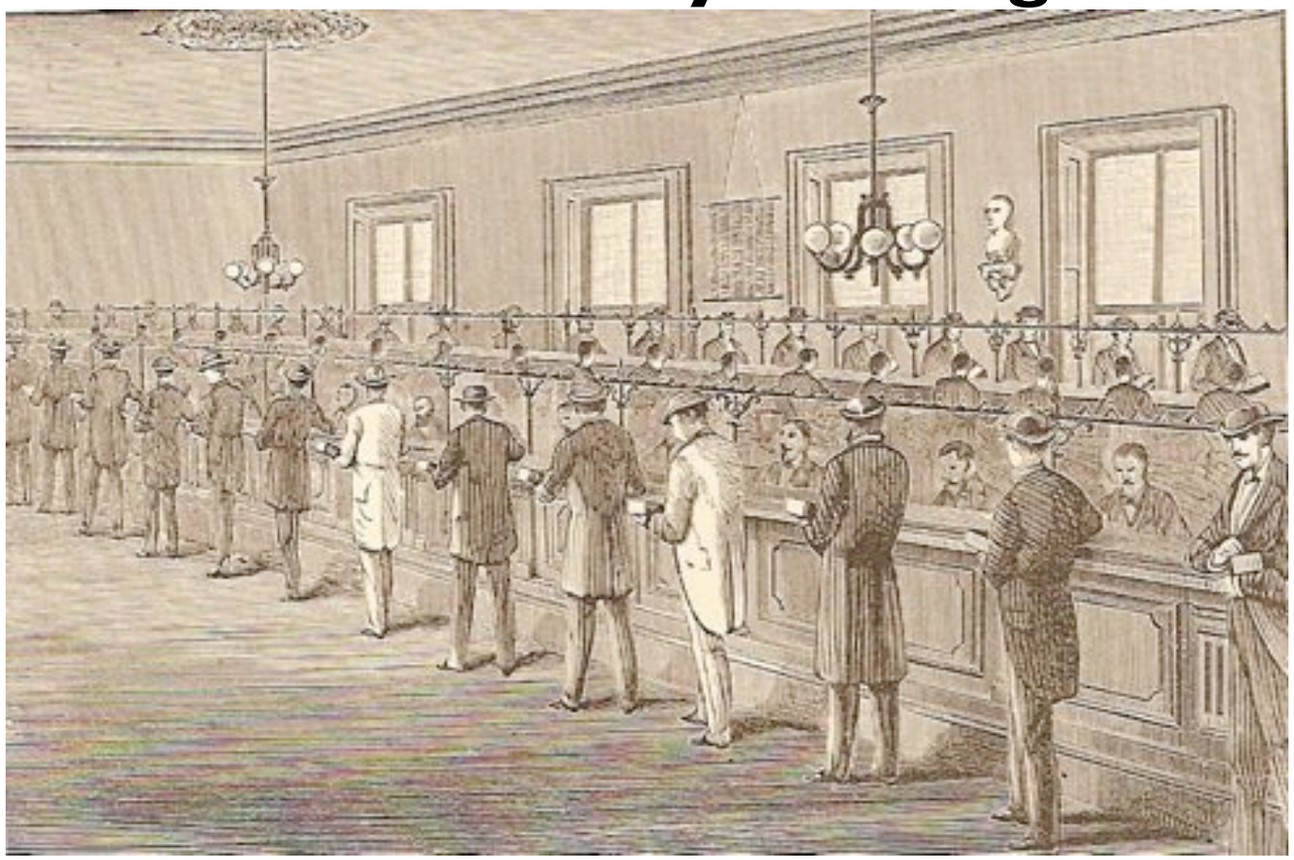
British Government, actuarial calculations



business computing



the railway clearing house



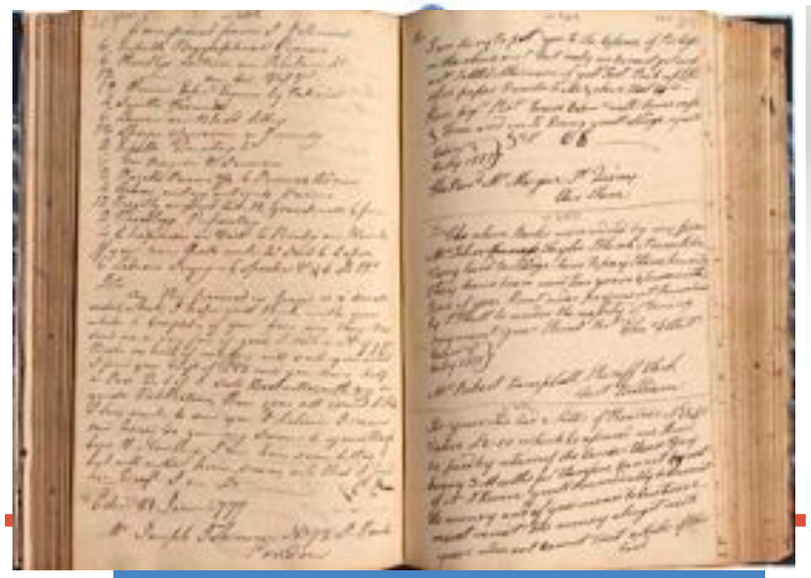
"1839, £954 million was cleared--$250 billion in today's money." --Campbell-Kelly & Aspray

information workers

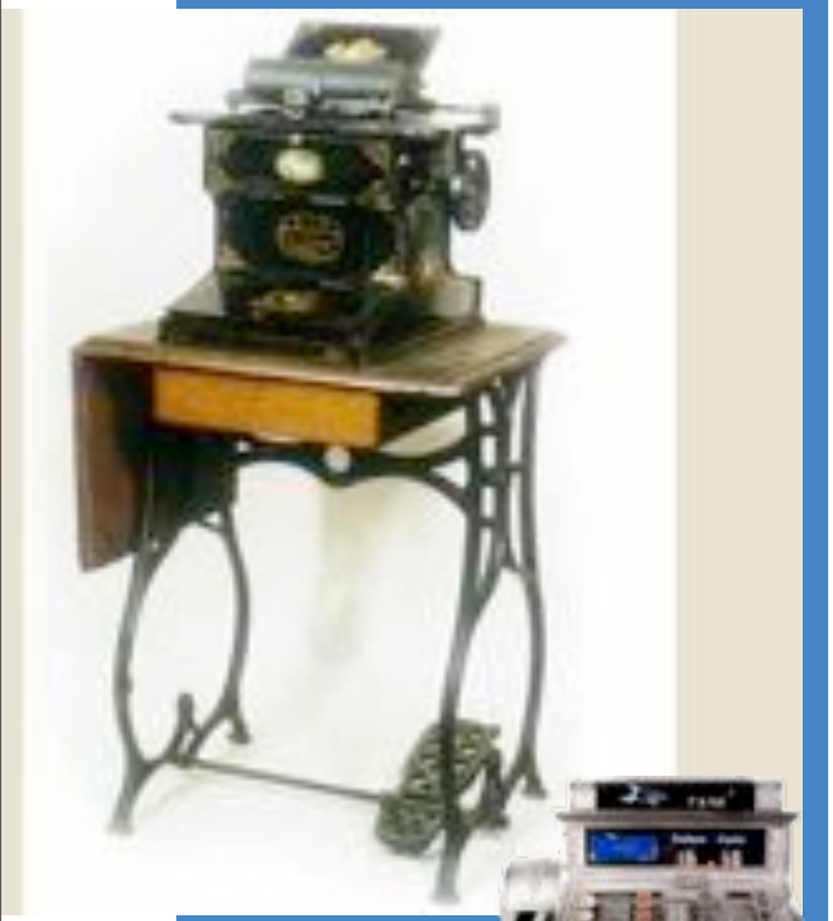
clerks (UK)
1871: 262,100
1891: 534,622
1911: 918,186

female clerks
1891: 17,859
1911: 117,057
1921, women 46% of all clerks

typewriter girls
1931, 212,296 female typists
5,155 male typists



information technology



carbon paper
Wedgewood, 1806

typewriter
Remington, 1874

calculator
Burroughs, 1892

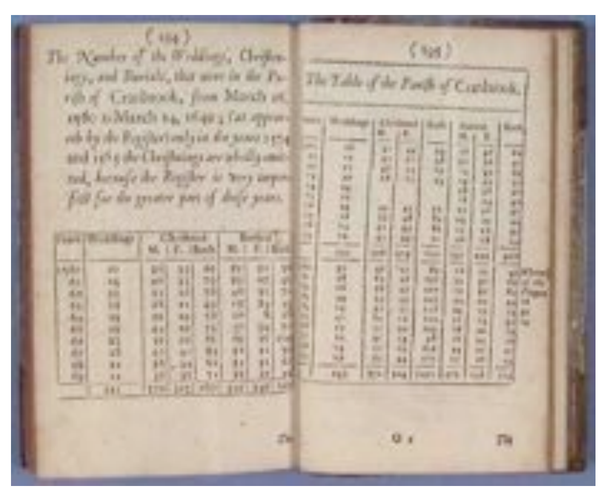
cash register
mechanical register, 1884

"No simple economic explanation
... America was gadget happy"
--Campbell-Kelly and Aspray, *Computer*, 1996

government processing: statistics and the state

Statistics: a word lately introduced to express a view or survey of any kingdom, country, or parish

Encyclopaedia Britannica, 1797



bills of mortality

births & marriages

parish members

population

population

Spain, 1787

US, 1790

"Vulgar and arithmetical"

Edinburgh Review, 1818

Census

"[An] Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct."

				clerks
1900	76,212,168	13,232,402	21.0	
1890	62,979,766	12,790,557	25.5	2000
1880	50,189,209	11,630,838	30.2	1495
1870	38,558,371	7,115,050	22.6	483
1860	31,443,321	8,251,445	35.6	
1850	23,191,876	6,128,523	35.9	
1840	17,063,353	4,202,651	32.7	28
1830	12,860,702	3,222,249	33.4	
1820	9,638,453	2,298,572	33.1	
1810	7,239,881	1,931,398	36.4	
1800	5,308,483	1,379,269	35.1	
1790	3,929,214	-	-	

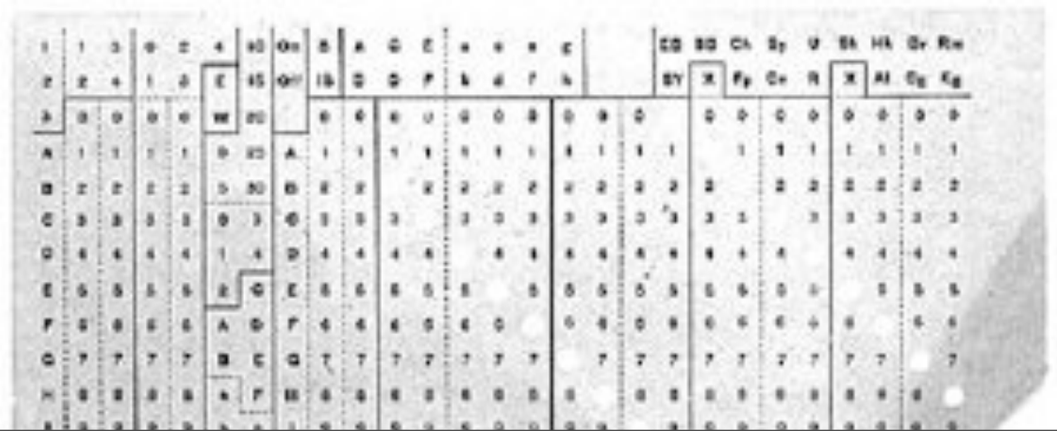
tabulating

Herman Hollerith
1860-1929

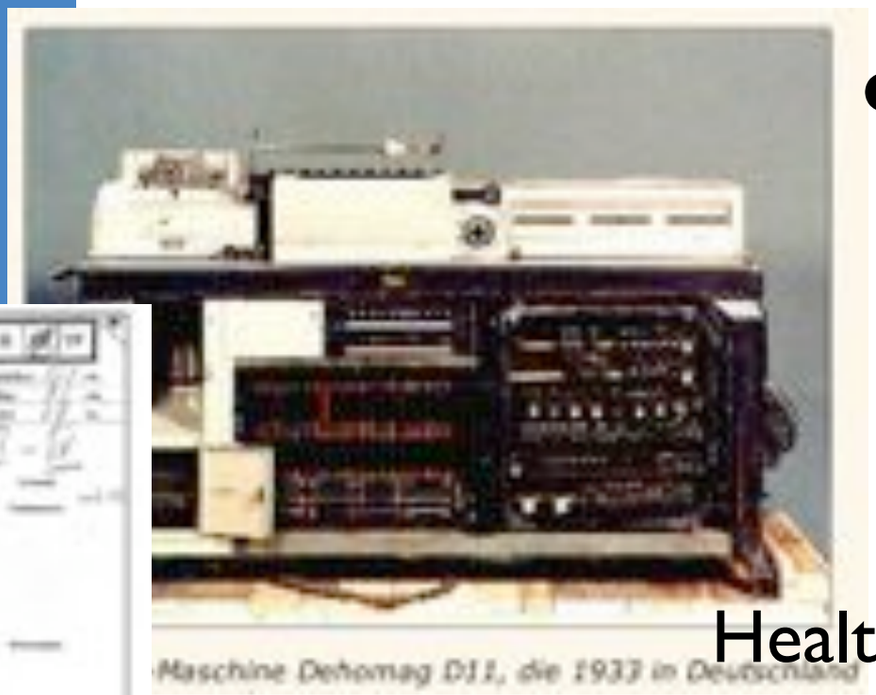
Hollerith
Electronic
Tabulating
Machine

1890 Census

the punch card
"do not fold,
spindle or
mutilate"



controlling numbers

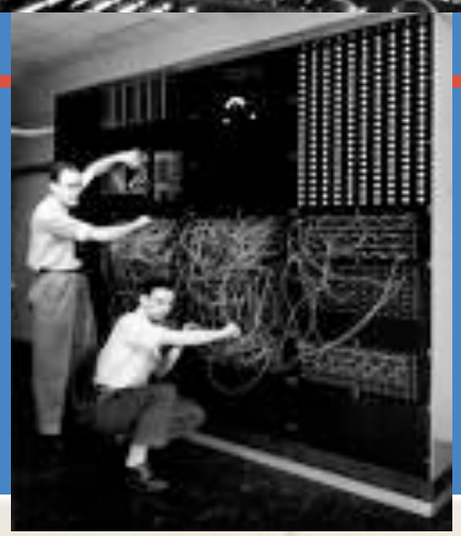


controlling people

"the Nazi census"
--Aly & Roth, 2004

IBM D11

Census, 1933, 1939
Labor Book, 1935
Health Pedigree book, 1936
Registry of the Populace, 1939
Blood (high, average, acceptable inferior), 1940
Personal Identification Number, 1944



military processing

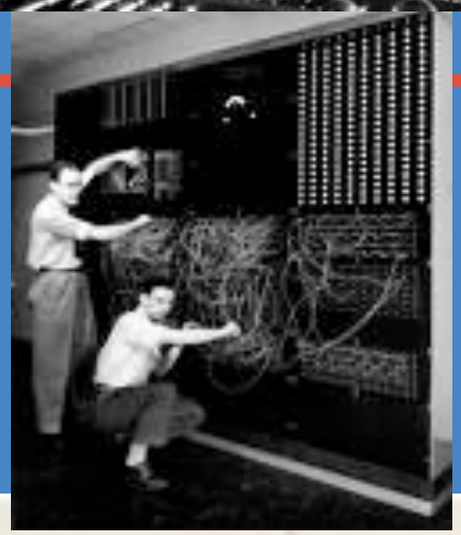
ballistics "firing tables"
human computers

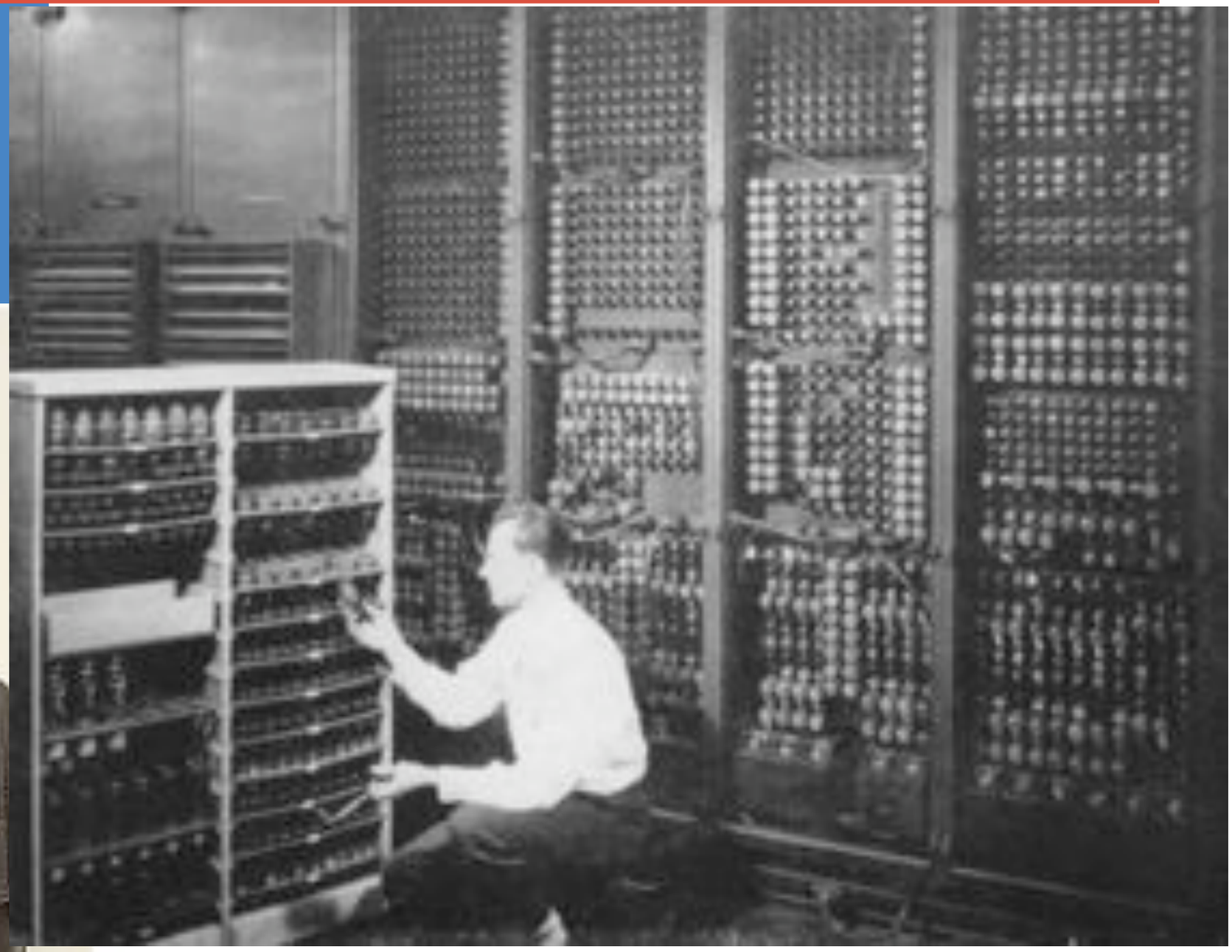
Vannevar Bush
1935, Differential Analyzer

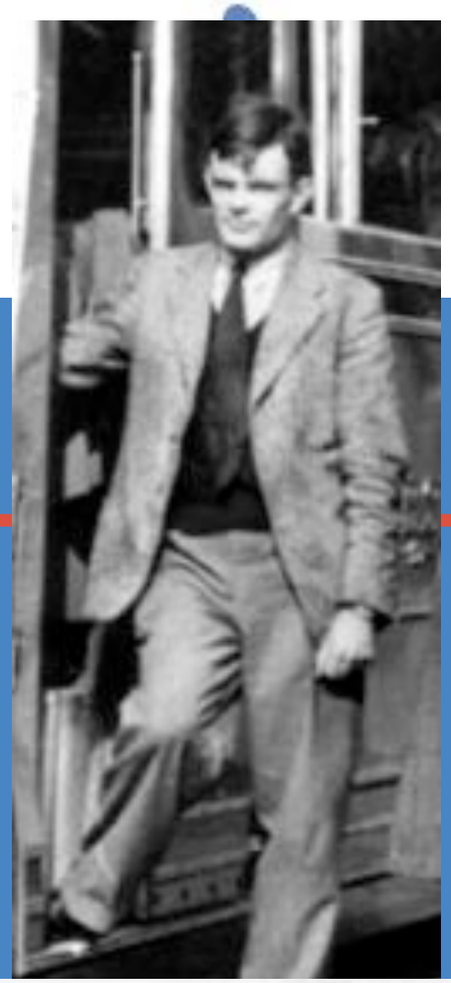
1939-43: Harvard Mark I
(IBM Automatic Sequence Controlled Calculator)

Eckert & Mauchly, Moore School
1945, ENIAC,
(**Electronic** Numerical Integrator Computer)
18,00 vacuum tubes, 70, 000 resistors,
10,000 capacitors, 6,000 switches, 1,500 relays

military processing

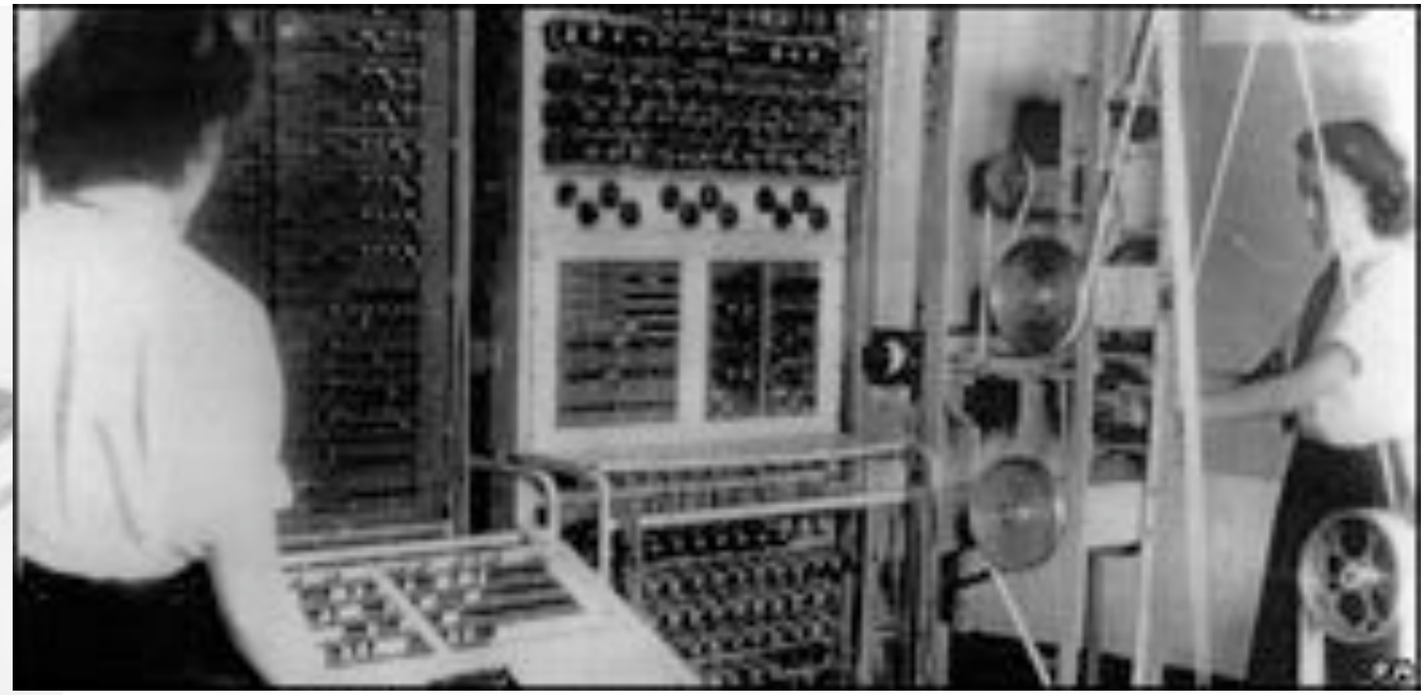






decoding

1943, Colossus



LEO

John Simmons
Lyons & Cambridge (1947)
ENIAC
EDVAC
UNIVAC
EDSAC

CLEO
1954
from payroll to baking

pros & cons?
LCL to ICL to IBM

onward ...

1947 transistor
(Bell Labs Bardeen, Brattain, Schockley)

1958 integrated circuit

(Texas Instruments: Jack Kilby)

(Fairchild: Robert Noyce)

1965-1969 , Packet switching,
Davies (NPL), Baran (RAND)

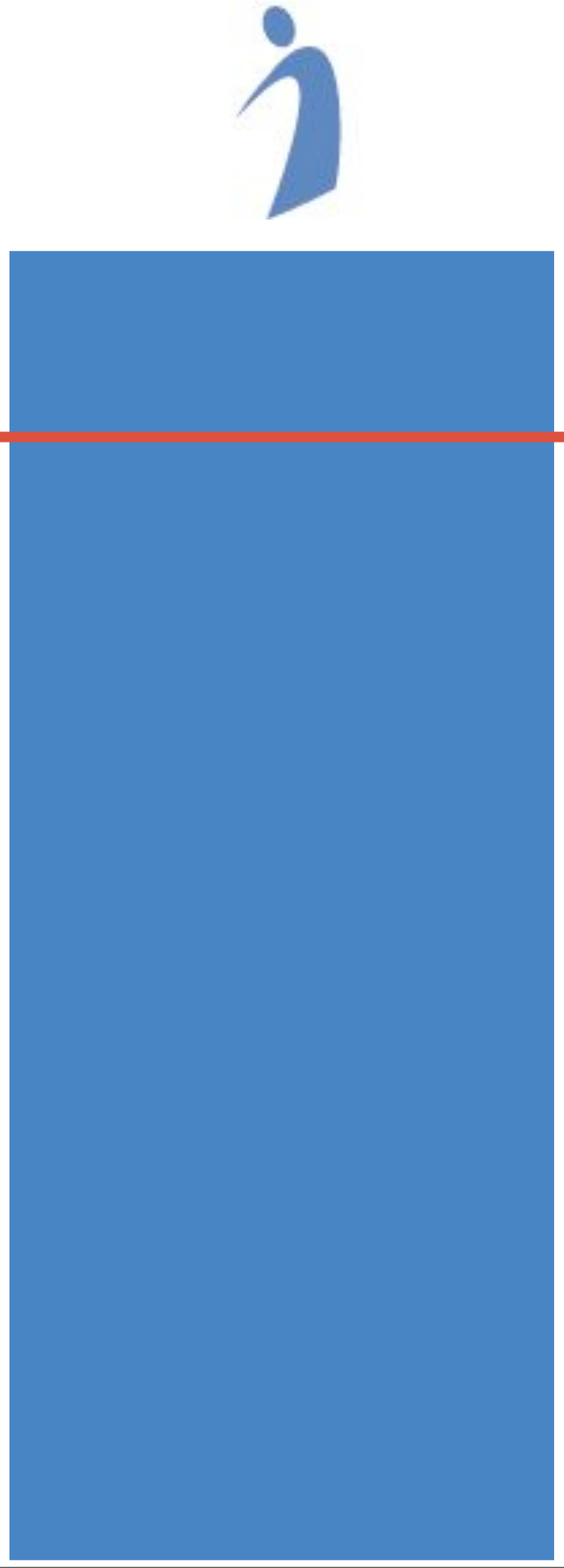
1968 HP 911A

1969 Xerox PARC

1975 Altair

1976 Apple I

1981 IBM PC



the story so far

registering

predicting

calculating

controlling

***coming up*, communicating**