where did computing come from?

why does it have the elements it has?

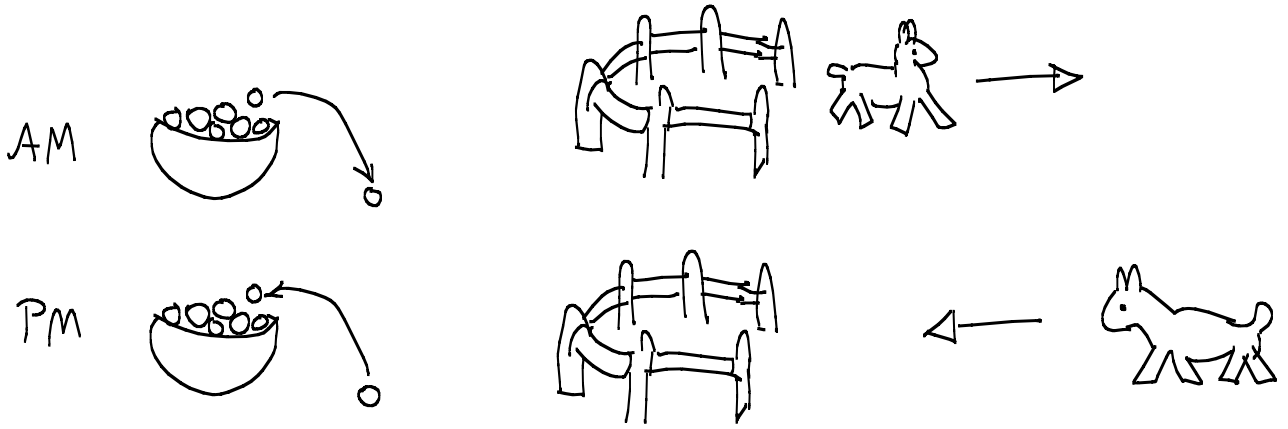
what is computing?

Is computer science, science? What does it study?

- Is that natural phenomena?
- what is information?

History

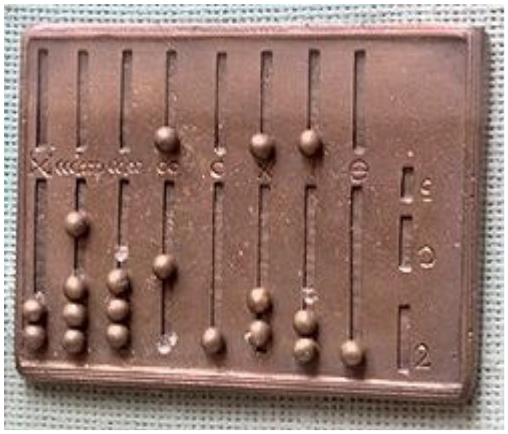
Aids/extensions of cognition?



Decision process: look for lost sheep?

- representation (essentially?)
- information (?)
- transformation/process (?)

Abacus, Sumerian, 2700 BCE



numbers base 60: divisible by 2, 3, 4, 5, 10, 12

base 16

Babylonia, Egypt, China, India, Maya, Inca,

...

Antikythera mechanism

Greek, 150 BC

Planetary positions

geared clockwork

— digital (?)

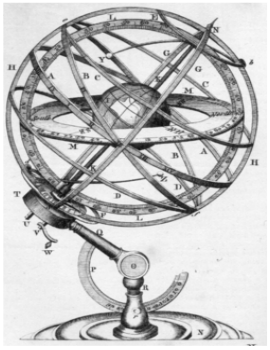
Greek Astrolabe

150 BC

Solar system calculations

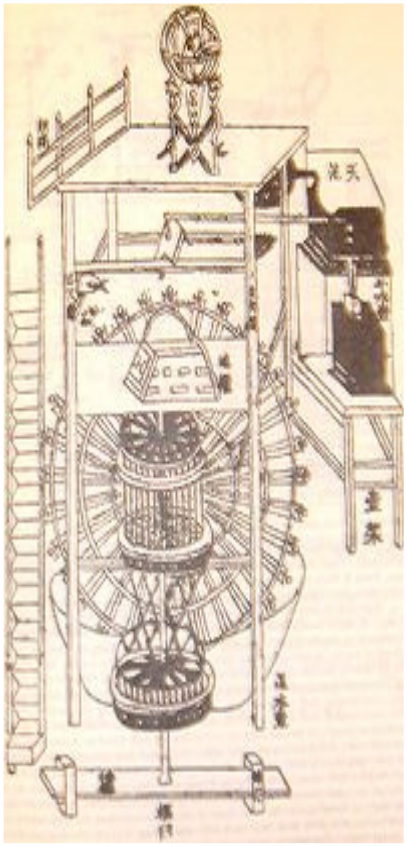
Time

analog



Chinese water-powered

Armillary, 750 AD

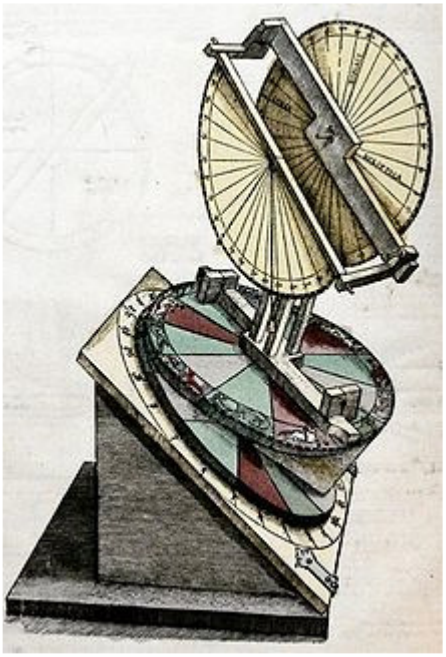


Chinese Water-tower Clock

1,000 AD

~1200 AD Islamic geared

Calender, Astrolabe



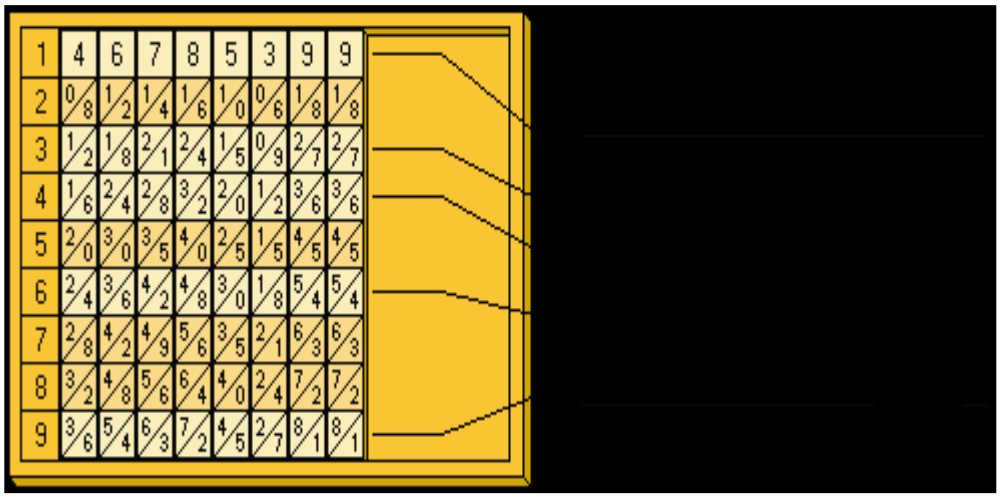
~1300 AD

Programmable analog calendar

1600

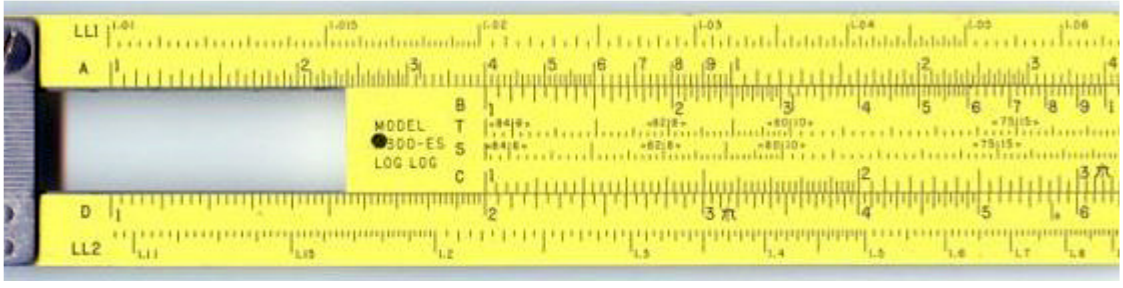
Napier's Bones

Multi / Div



1620

Slide Rule

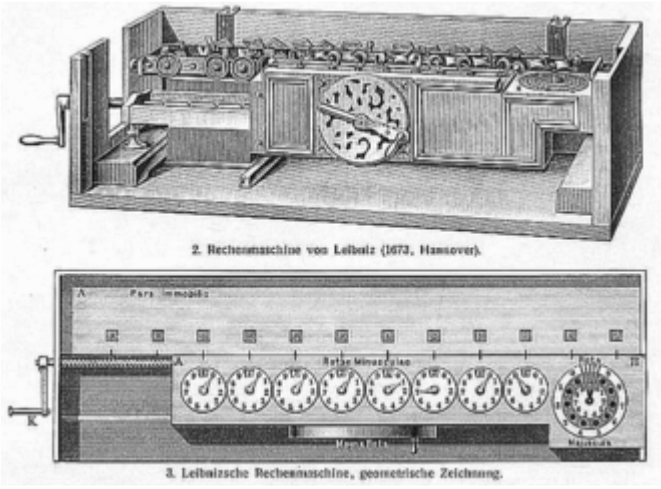


1642 Pascal's calculator

1672 Leibniz's

Stepped Reckoner

– digital



1801 Jacquard's

Programmable loom

– punched cards = program

1820 de Colmar's

Arithmometre

logs / exponential

Trigonometry

1835 Babbage's

Analytic Engine

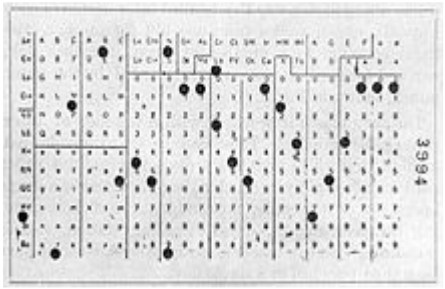
– programmable (branching, loops)

Lovelace → programs for Bernoulli Numbers

1889 Hollerith's

Punched-card info storage

Ekhart → differential eqn.s



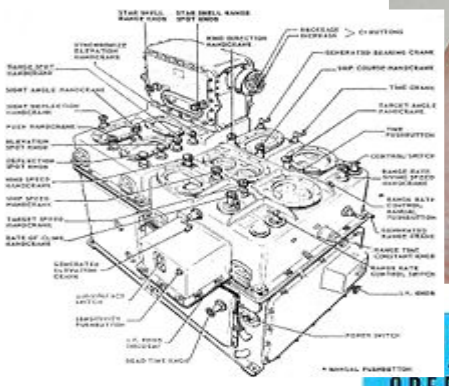
Census data compilation
Sorting / counting

(Von-Neumann → stored program arch.)

~ 1930s

Analog

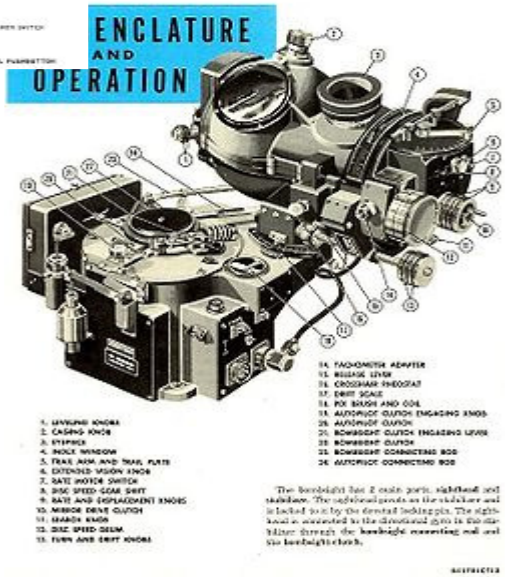
Mark I
Fire Control
Computer



~ 1930 Water Integrator, USSR

diff. eqn.

Norden
Bombsight



1836 – 1930 Differential Analyzer

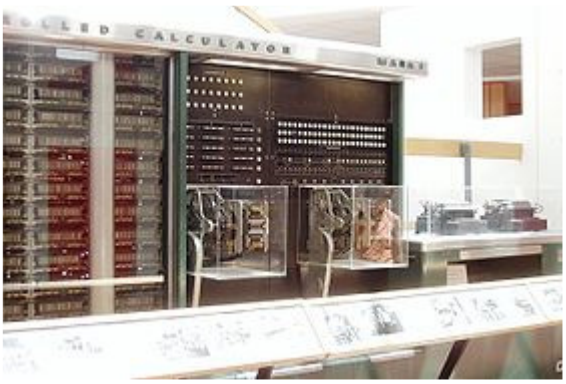
Coriolis
Thomason
Kelvin
Pollen
Bush

Integration
differentiation

1944 Aiken's electro-mechanical
IBM mark I

Grace Hopper → bugs

Artillery Gunnery Tables



1936 Turing ⇒ Mathematical Model of "Computation"

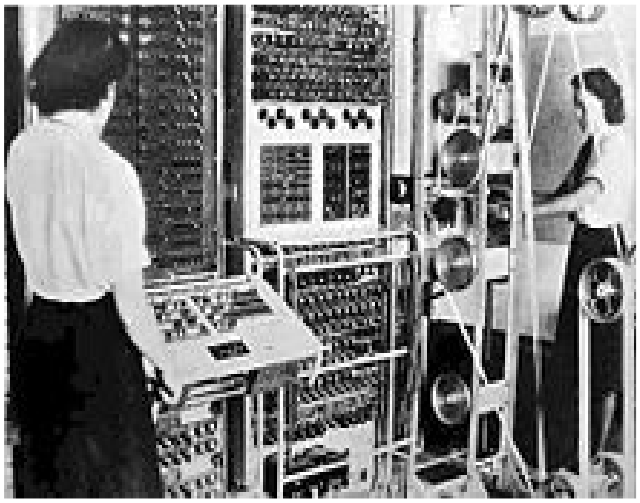
Church, Kleene, Post

– WWII Code Breaking
– Enigma EN/DE –coder

Zuse's
electro-mechanical

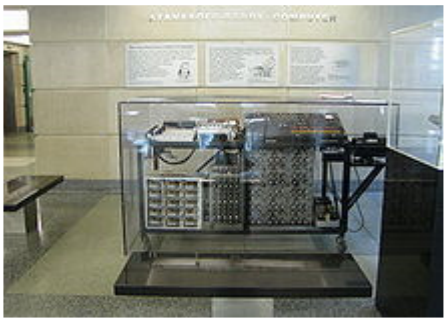
Binary, Floating Point

– Collossus
Electrical
w/ paper
Tape



Atanasoff-Berry Computer
1st electronic digital computer
300 vacuum tubes

Capacitor/drum storage



Shannon: applies Boolean Algebra

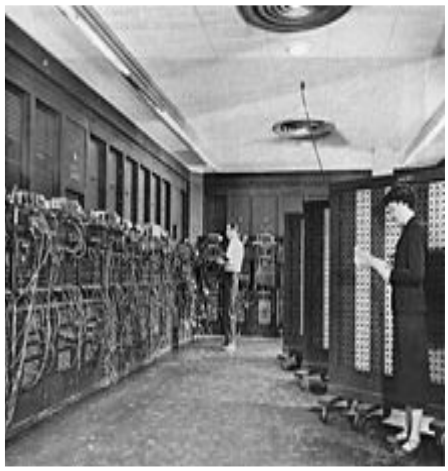
Stiblitz: remote control by telephone/Teletype

1945

Eckhart, Mauchly ⇒ ENIAC, EDVAC

1st Electronic, General Purpose

-- add/subtract 5000/s,
(1000 times faster than any other machine. Colossus couldn't add).
-- multiply, divide, and square root modules
-- High speed memory: 20 words (about 80 bytes)
-- 30 tons
-- 18,000 vacuum tubes



Patch-cable programming, Memory = mercury acoustic delay →

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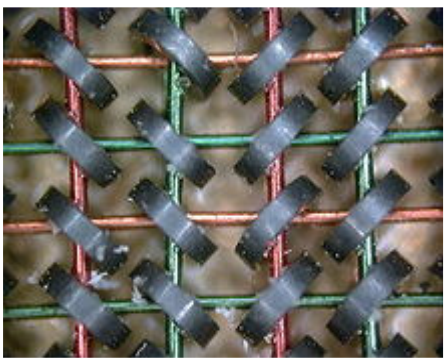
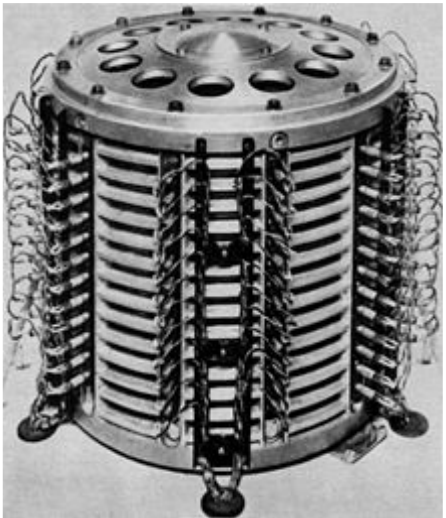
magnetic
Core memory





Manchester Mark I

magnetic drum storage

1947

Transistor ⇒ miniaturization

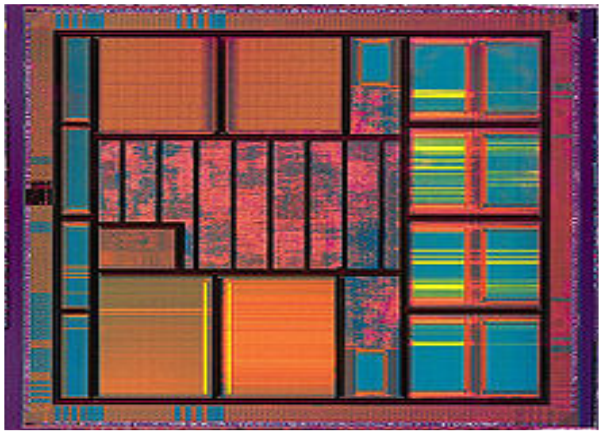
1954 Silicon Transistor

SSI

MSI

1970 VLSI

ATMEL System on a chip



Bigger/Smaller
Faster
cheaper
more reliable
less power
Valuable

⇒ makes CS interesting

Beyond Numerics | TM formal languages, proposition checking (Leibniz, Frege, Russell, Hilbert)

VOICE ENCODING ⇒ Video, audio, sonar, radar, .. signal processing (filters)

ENCRYPTION

networks, radio, optical, ...

embedded in machines of all types

Learning / parsing / translation / theorem proving / game playing

Machine control, robotics

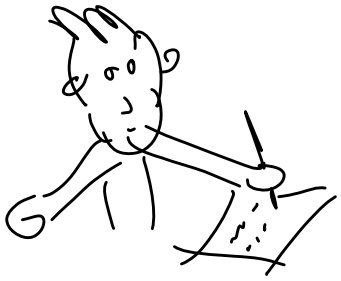
instrumentation: transform data to human accessible form

sensing, modeling

design, test

finance, banking, auctions, buying/selling, advertising

Web, data repositories, webs of connectivity, cooperative processes



feynman