



INSTITUTE OF
TECHNOLOGY
DEVELOPMENT
OF CANADA

Introduction to Computers

ICR100

Fall Semester

Today's Outline - Session 1

Lecture: Computer Types and Components

- Information Systems Concepts
- Historical Overview of Computers
- Computer Types
- Basic Components of Computers
- Input device, Memory, CPU and Output devices

Introduction to computers

Your goals for this course:

- Understand how a computer works: hardware, software
- Analytical thinking: learn which language a computer speaks

- Brief history of computers & types of computer
- Basic hardware components of a computer
- Peripherals: storage, input/output devices
- Information System concepts (IS)
- Storage: temporary and permanent
- Computer language: the binary code
- Printers and laser printers
- Computer connections & backups

Computer history

What is a computer?

An **electronic** computer is:

“A programmable electronic device designed to accept data, perform prescribed mathematical and logical operations at high speed, and display the results of these operations.”

–dictionary.com

An **analog** computer is:

“A computer that represents data by measurable quantities, as voltages or, formerly, the rotation of gears, in order to solve a problem, rather than by expressing the data as numbers.”

–dictionary.com

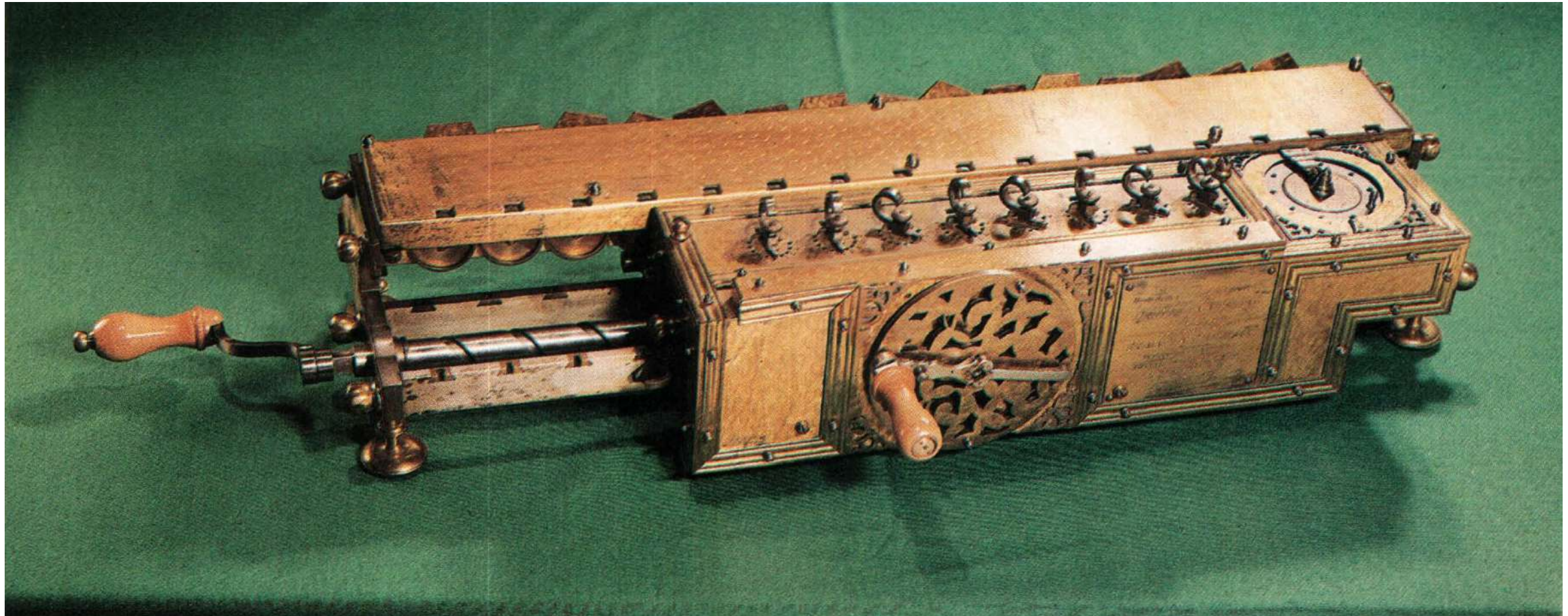
The Antikythera Mechanism

- About 87 BC (2,000 years old)
- Greece, Greek scientists
- Used to predict astronomical positions and eclipses and to track the cycle of the ancient Olympic Games.



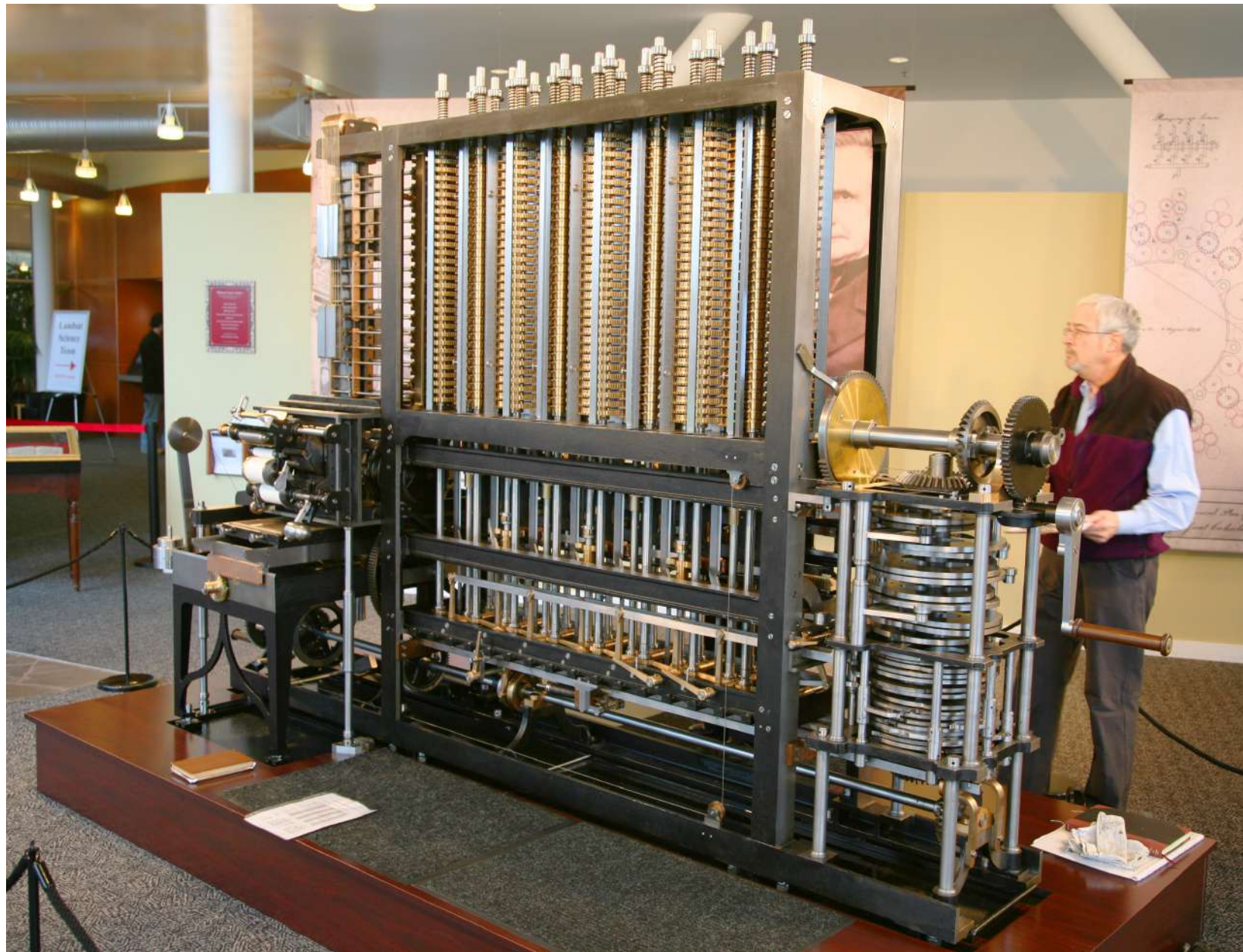
The Stepped Reckoner

- 1694
- Germany, Gottfried Wilhelm von Leibniz
- First calculator that could perform all four arithmetic operations.



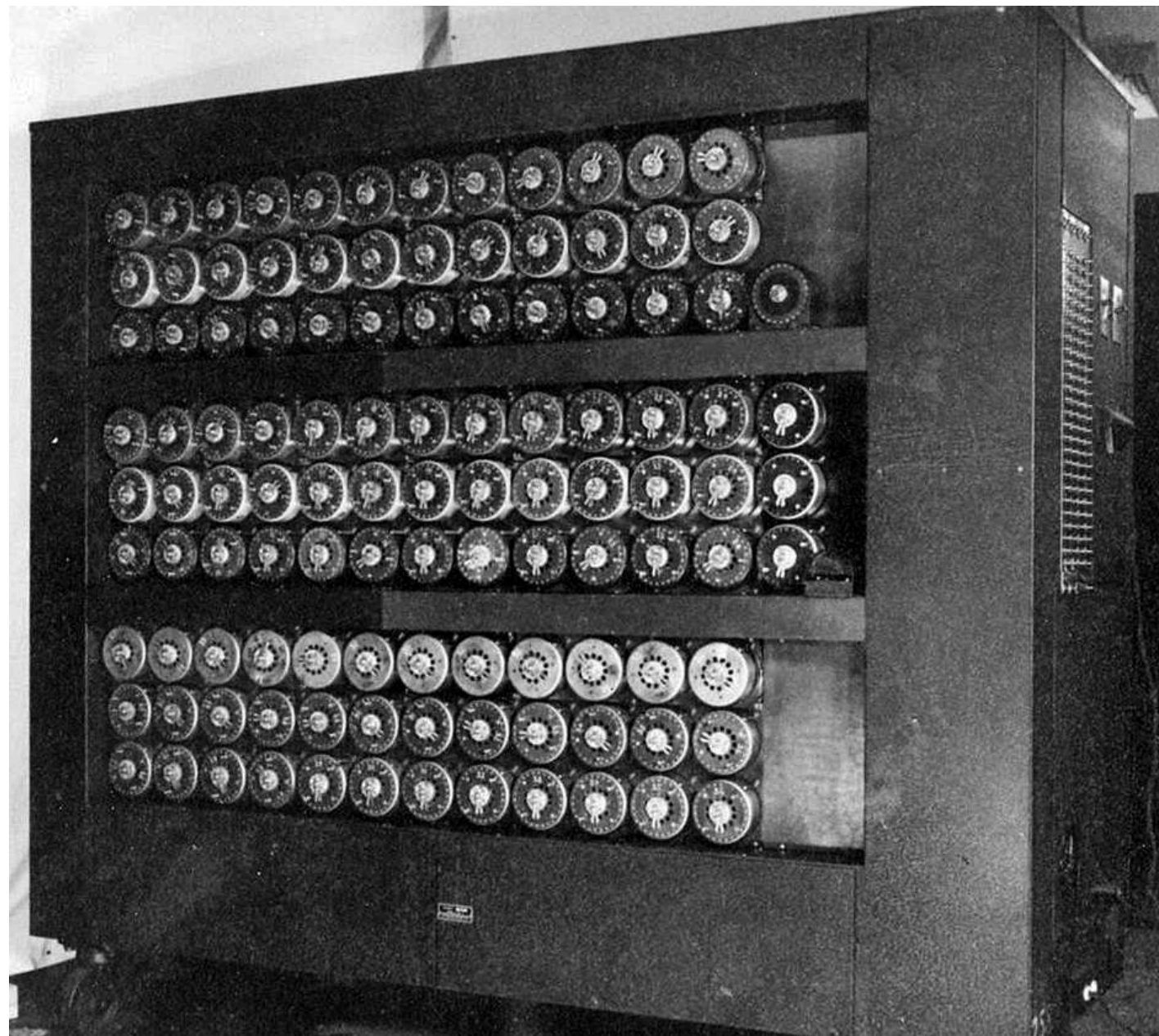
The Difference Engine

- 1822 (Difference Engine 0), 1842 (Difference Engine 1, incomplete), 1849 (Difference Engine 2)
- England, Charles Babbage
- Babbage introduced the concept of a digital programmable computer. The *Difference Engine* was an analog machine designed to calculate and print out tables of numbers for use in navigation, insurance, and astronomy.



Bombe

- 1939
- England, Bletchley Park's mathematicians with the help of Alan Turing
- Built to decipher the encrypted secret messages of the German Nazi's Enigma machine, made by Arthur Scherbius



Alan Mathison Turing

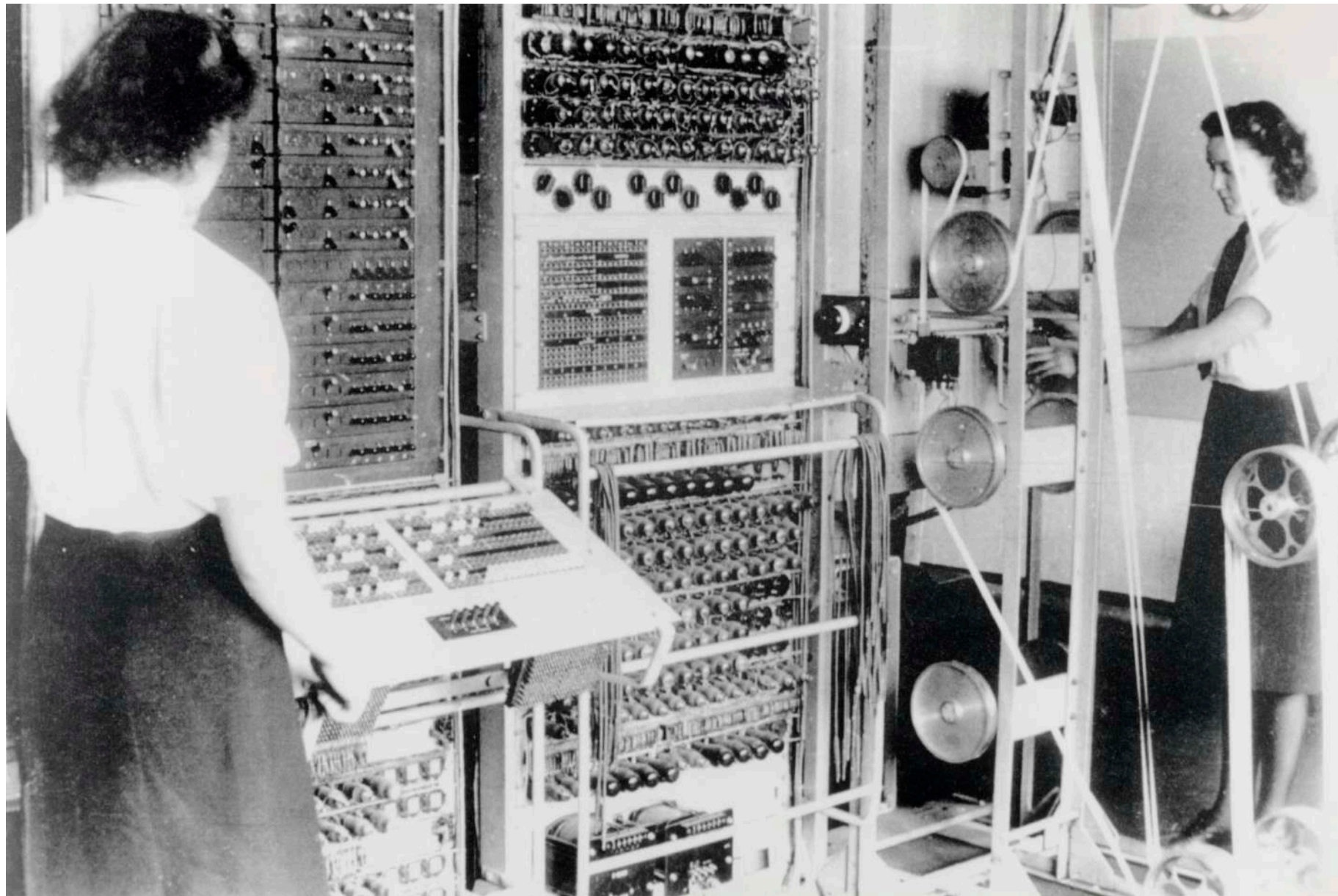
- The father of the theoretical **computer science**
- Inventor of the **Turing machine**:
- a mathematical, abstract model of a hypothetical computing machine which can use a predefined set of rules to determine a result from a set of input variables.



- The Turing machine is a **concept**, not a real machine.
- It's a formalisation of the notion of **computation** created to answer two questions:
 - what is computable?
 - what is *efficiently* computable?
- ANY problem that is computable, is Turing-computable.

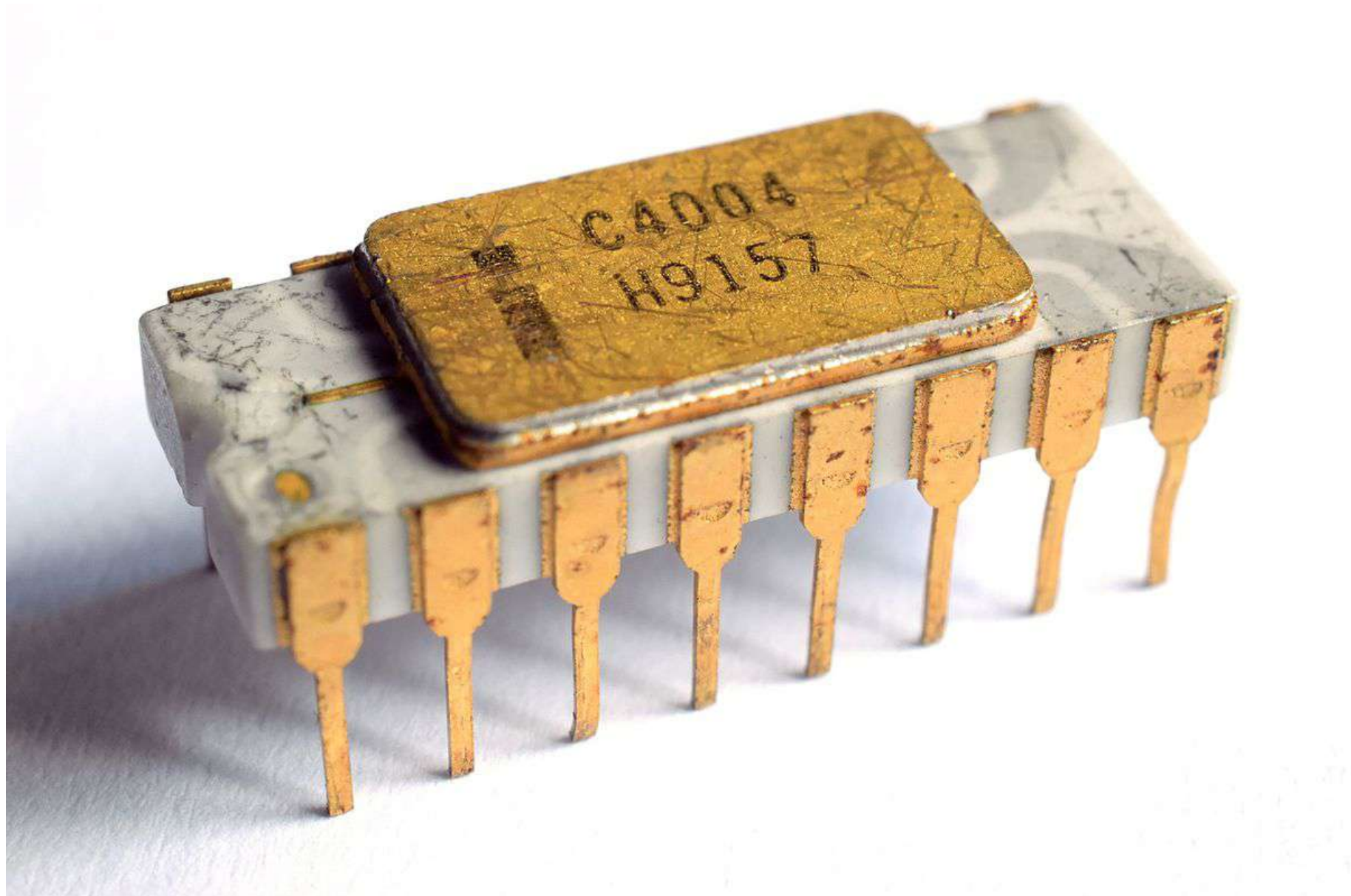
Colossus

- 1944
- England, designed by the mathematician Max Newman and built by Tommy Flowers
- First programmable, electronic computer of the history - based on the *Bombe* machine and created to decipher the Nazi's Lorenz SZ40/42 cipher.



Intel 4004

- 1971
- California, Marcian “Ted” Hoff, Stanley Mazor, Federico Faggin, Masatoshi Shima at a young start-up called **Intel**
- First **microprocessor** of the history. It allowed the advent of *microcomputers*: computers for personal use.



Xerox Alto

- 1973
- California, Xerox Corporation (Xerox PARC)
- First computer of the history using a graphic interface and a **mouse**.



Apple I

- 1976
- California, Steve Wozniak and Steve Jobs at the **Apple Computer**, today known as **Apple**
- One of the first **personal computers** of the history, first Apple computer ever.



Apple II

- 1977
- California, Apple Computer
- The first computer really *user-friendly*, with programs for text writing, games, and the capacity of displaying color graphics.



Apple II



IBM 5150

- 1981
- New York, IBM
- IBM implements in it the revolutionary concept of *open architecture*: producers are encouraged to add, upgrade, swap their own components easily.



Osborne 1

- 1981
- California, Osborne Computer Corporation
- First portable computer - *laptop* - of the history based on a prototype called *NoteTaker* from Xerox PARC. It weighs 10.7 kg!



Macintosh 128k

- 1984
- California, Apple
- Considered a revolutionary computer, during that period, because of its innovative graphic interface which inspired other systems made of windows, such as **Windows**.



Simon

- 1994
- New York, IBM
- First smartphone of the history, a mobile phone with Personal Digital Assistant (PDA) functions.



LG KE850 (LG Prada)

- May 2007
- South Korea, LG Electronics
- First smartphone with a **capacitive** touchscreen (technology still in use for the smartphones).



iPhone 2G (iPhone EDGE)

- June 2007
- California, Apple
- Designed with an extremely simple UI and a software & hardware interplay, not just a phone with features but a device which combines media (iPod), internet and phone communication.



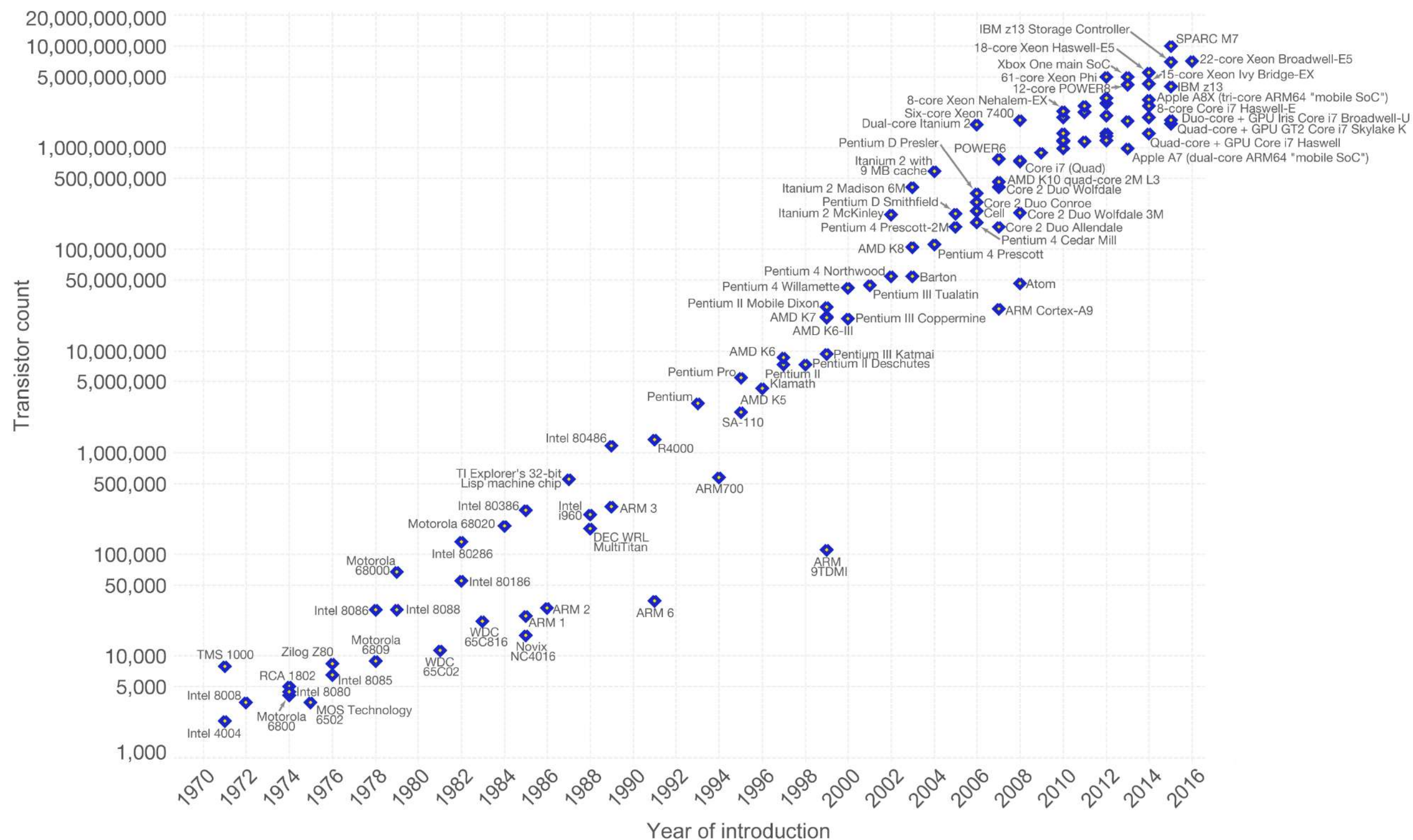
Moore's Law

- 1965, **Gordon Moore**
- Moore defined this law when he observed that the number of transistors in an integrated circuit doubles every two years, because their size and cost decreases proportionally in the same period.



Moore's Law – The number of transistors on integrated circuit chips (1971-2016)

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are strongly linked to Moore's law.



Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)

The data visualization is available at [OurWorldinData.org](https://ourworldindata.org). There you find more visualizations and research on this topic.

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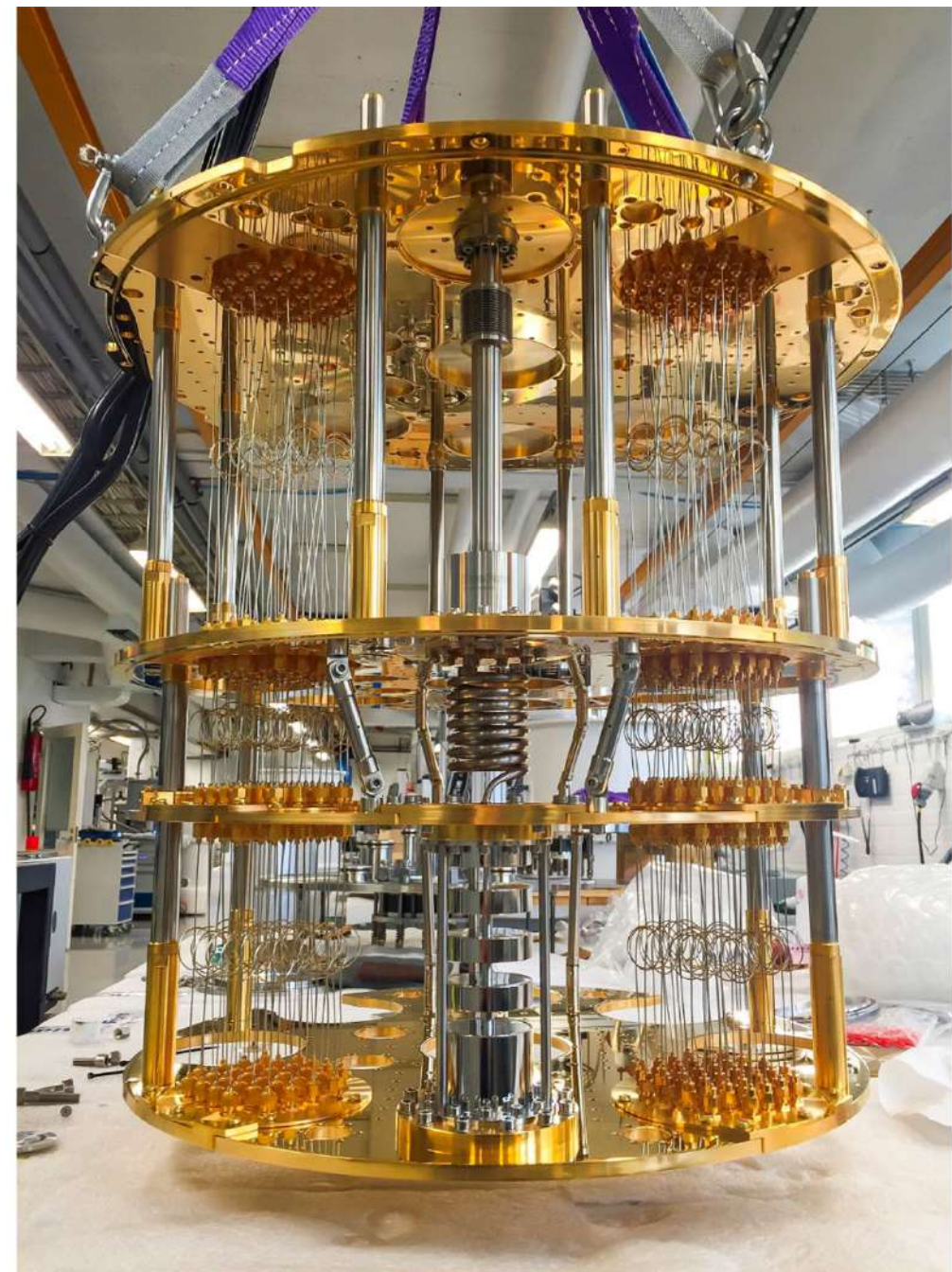
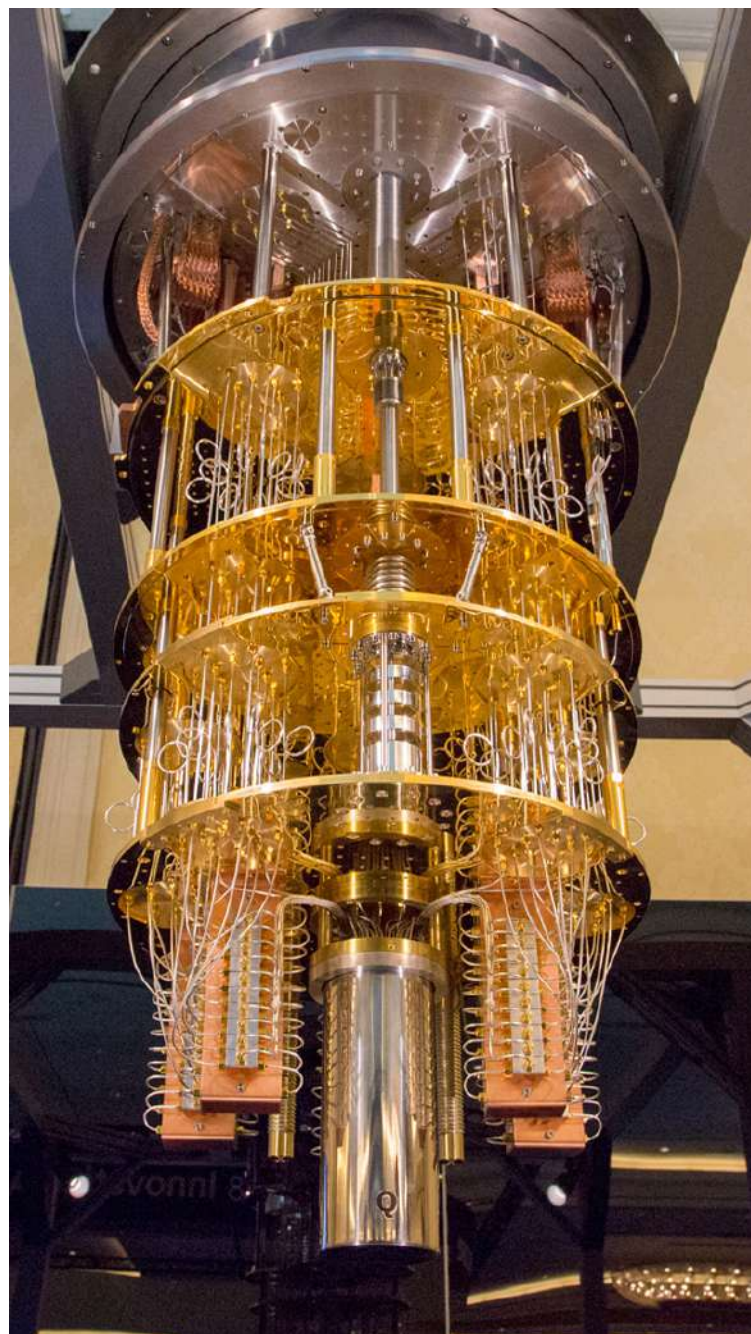
- Moore's Law has been valid for decades, but now lots of people believe it's **dead** - or it will be soon.
- **Why?** Because it's becoming impossible to continuously reduce the size of transistors.
- **Intel** is mass-producing **14 nanometers** transistors (14nm stands for the size of the *gate*).
- They are built in silicon: 1 silicon atom is 0.21nm, which means that a 14nm transistor's gate is **67 atoms**.
- Experts believe that **5 nanometers** is the smallest size possible to let transistors work: this is the end of Moore's Law.

Some interesting facts:

- A 14nm transistor is just **14 times wider than DNA molecules.**
- The **HIV virus** is **120nm.**
- A human hair is almost **80000 nm.**

Quantum Computers

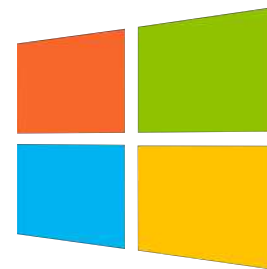
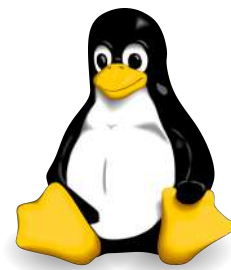
- Work in progress
- It uses **quantum mechanics**. Basically, it opens the doors to an entire world of amazing discoveries.



Computer types

Types of software:

- **System software:** the operating system, the principal software of a computer. It manages all the resources of a computer system and provides an interface that the user can work with.

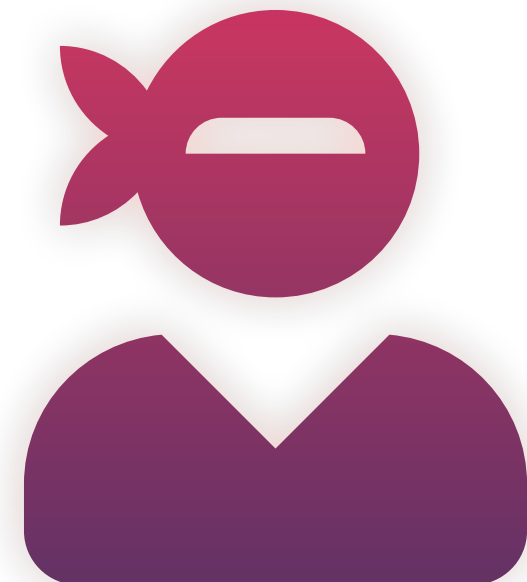
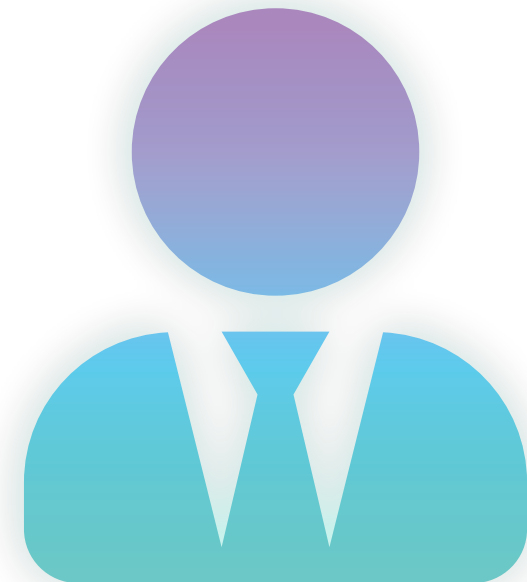


- **Application software:** applications designed to help end users with their work.



Types of users:

- **End users:** people who use information systems or their information outputs to work. These are the majority of the users.
- **Professional information system personnel:** programmers, operators, system analysts, etc.



PERSONAL COMPUTER

- A **personal computer** is a *microcomputer* designed to be used by one person at a time.



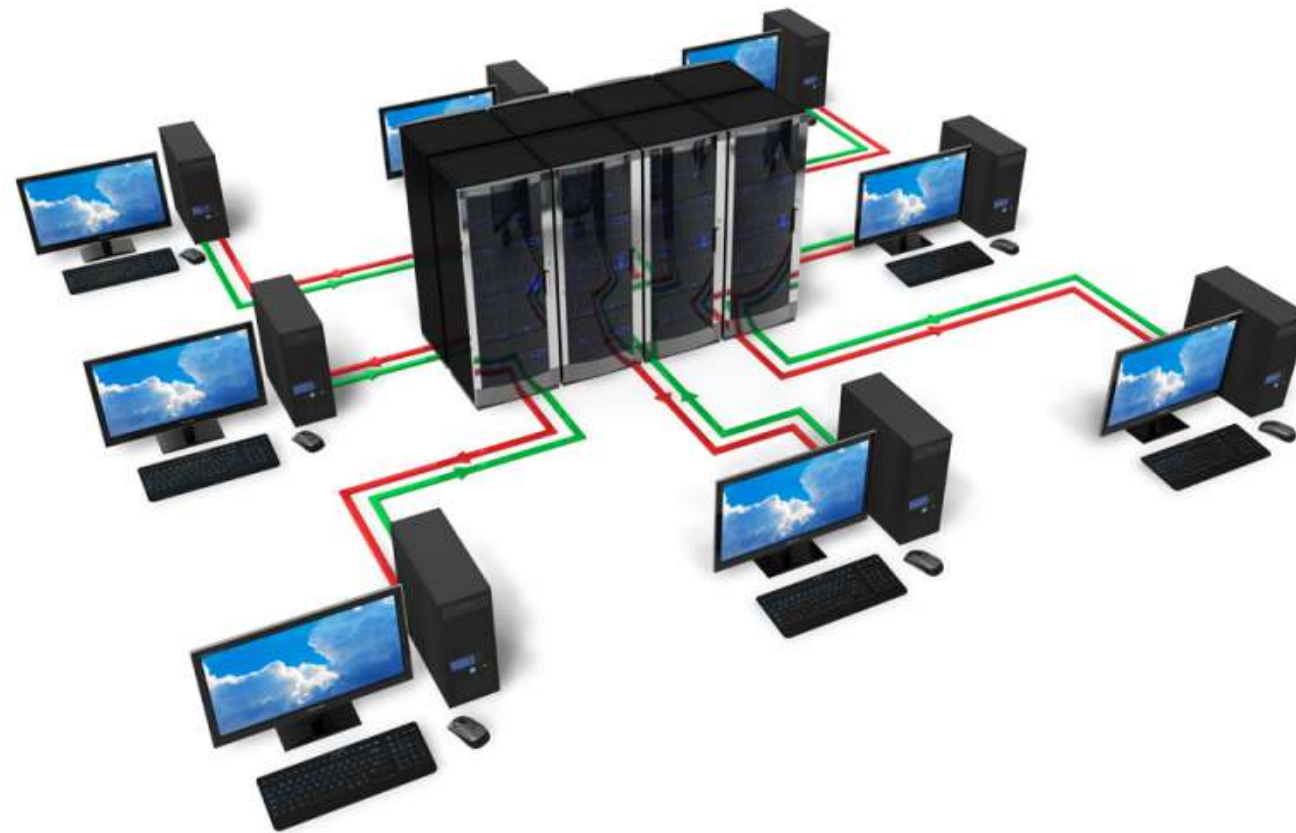
WORKSTATION

- A **workstation** is a computer intended for a single user but faster and more powerful than a personal computer.



SERVER

- A **server** is a computer designed to provide services to other computers through a specific software. The other computers which are served are called **clients**.



SUPERCOMPUTER

- A **supercomputer** is a computer with a high-level performance. Typically used in research fields such as molecular modelling, climate research, spacecraft aerodynamics, etc.



THIN CLIENT

- A **thin client** is a lightweight computer built for remote access to the server. The server performs its computing, so a thin client can not work alone. An example are computers in public libraries.



FAT CLIENT

- A **fat client** - or *thick client* - is a computer which is heavily independent by the server. Anyway, it still requires at least periodic connections to a network or a central server. Most of PCs are fat clients.



Thank You,