Computer Components

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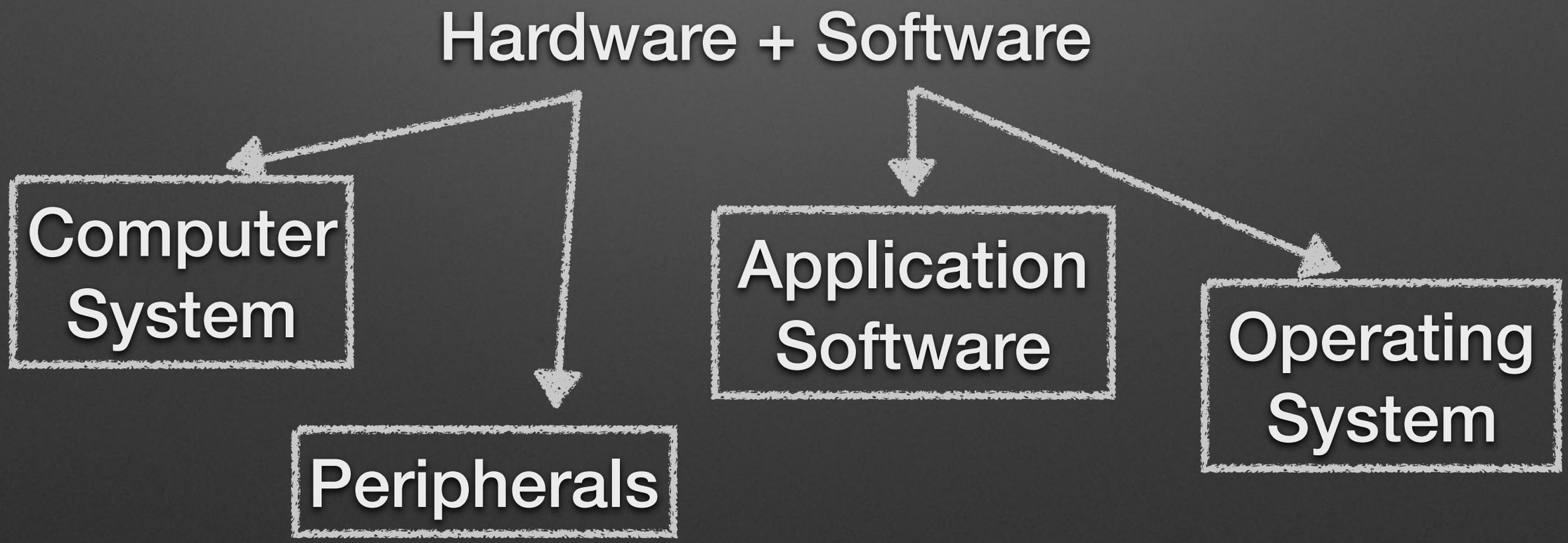
What makes a computer work?



Hardware + Software

Hardware + Software is important to think about. When the first personal computers were being built in the 70s, people weren't thinking about the software. Steve Jobs and Steve Wozniak (founders of Apple) created an amazing personal computer, but they didn't have the software to go with it. Meanwhile, researchers at Xerox Park developed a really awesome graphical operating system (along with ethernet, laserjet printers - it was only dot-matrix printers prior to that, laptops, object-oriented programming languages…the list goes on and on, but Xerox didn't know what to do with this technology so they did nothing with it, which I'm sure still upsets them to this day). Steve Jobs saw the operating system and thought it would be great to add to their computer, but they still needed software. Steve Jobs invited Bill Gates (and other developers) known for their software to Apple to see what Apple was doing and to write some software for them, which Gates did. Gates then hired one of the Xerox researchers to build the graphical operating system for his company, Microsoft. Beginning the Microsoft/Apple feud that still exists today.

Here’s some more about the history of this - tying into Who’s Who in Computing

Altair BASIC

March 1975

- Ed Roberts built the MITS Altair 8800 from previous versions…it was a glorified calculator

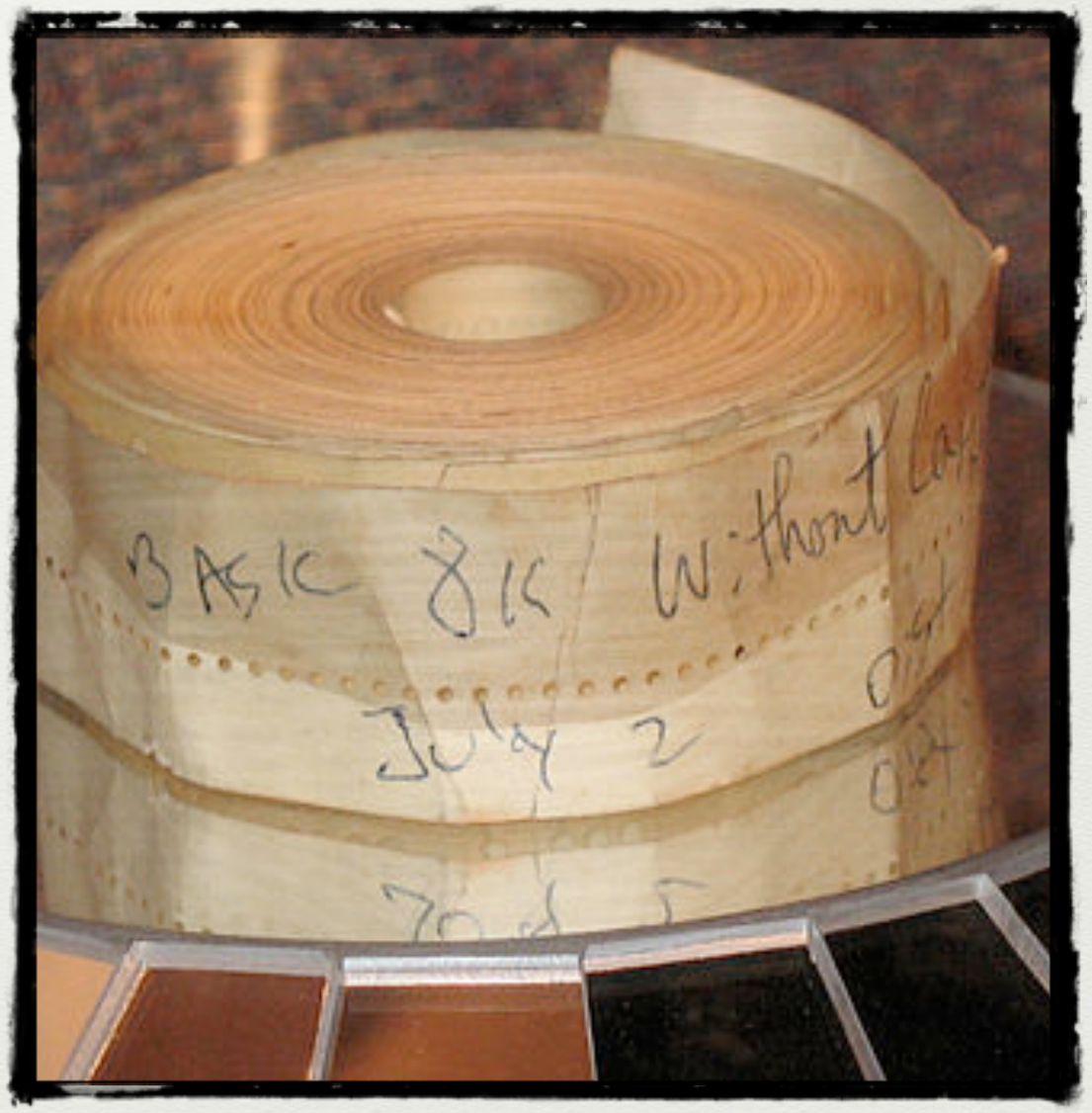
- Bill Gates and Paul Allen had the idea to run BASIC programs on it, but the Altair needed an interpreter

- Pitched the idea and within a few weeks created an interpreter without ever having the hardware

Altair BASIC

March 1975

- Floating point routines written by Monte Davidoff (Harvard)
- "Borrowed" Harvard computer, bought computer time, but never tested on an Altair
- Final version written on tape (4kb!)
- Needed bootstrap to load the tape into Altair's memory… wrote at the last minute - Allen and Gates competed to see who could write it faster, Allen won



Homebrew Computer Club

March1975 - December 1986

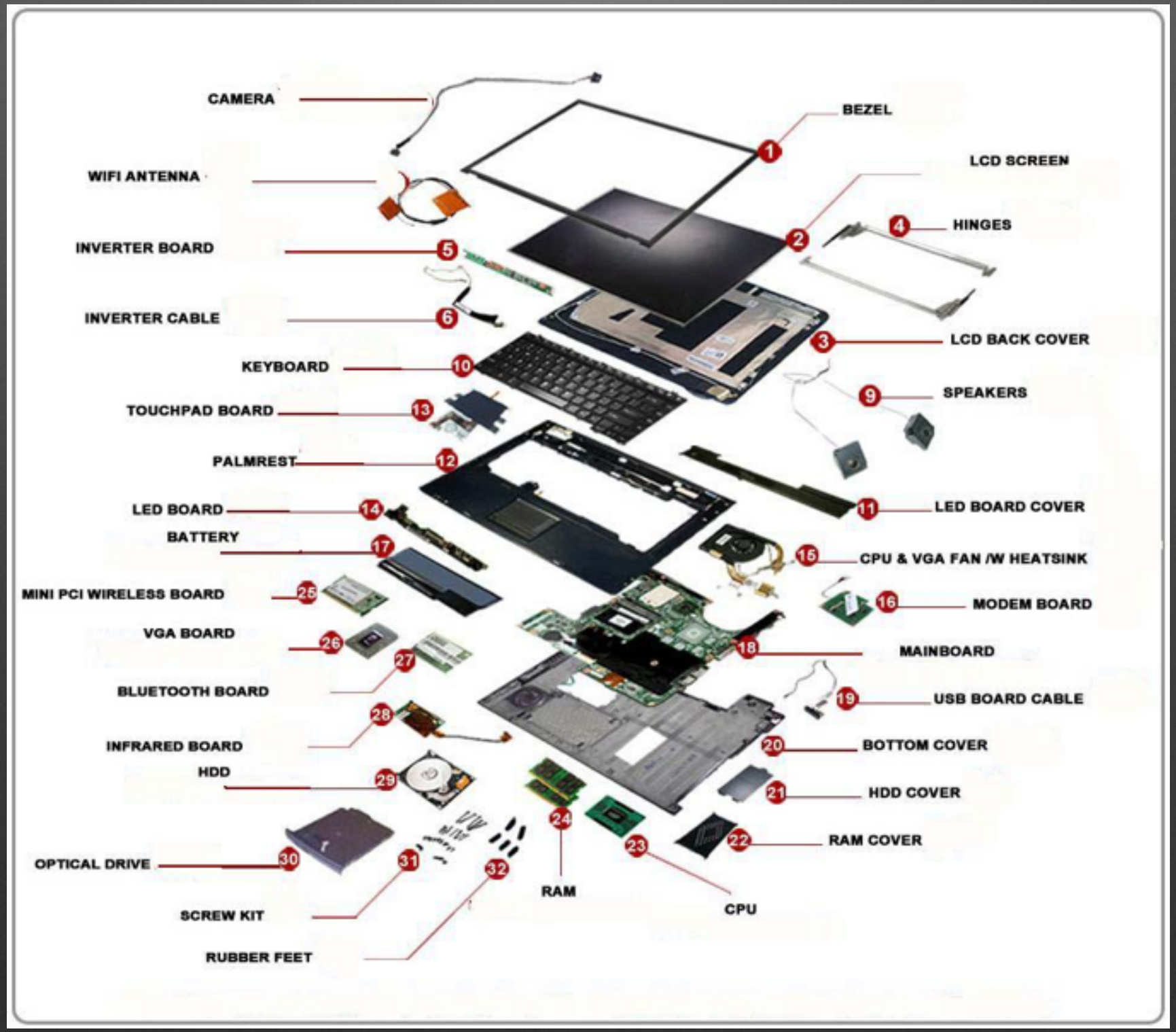
- Club for hobbyists wanting to build computers.
- Gordon French (pictured here) founded the club with Fred Moore
- They created the 8008 Homebrew Microcomputer
- Watch the below video for some more info!
- http://www.computerhistory.org/revolution/personal-computers/17/312/2311

Back to Hardware - watch this series of videos from Khan Academy and code.org
They explain it really well:
https://www.khanacademy.org/computing/computer-science/how-computers-work2/v/khan-academy-and-codeorg-introducing-how-computers-work

Anatomy of a Desktop

http://wp.teknicalservices.com/the-components-of-a-computer/

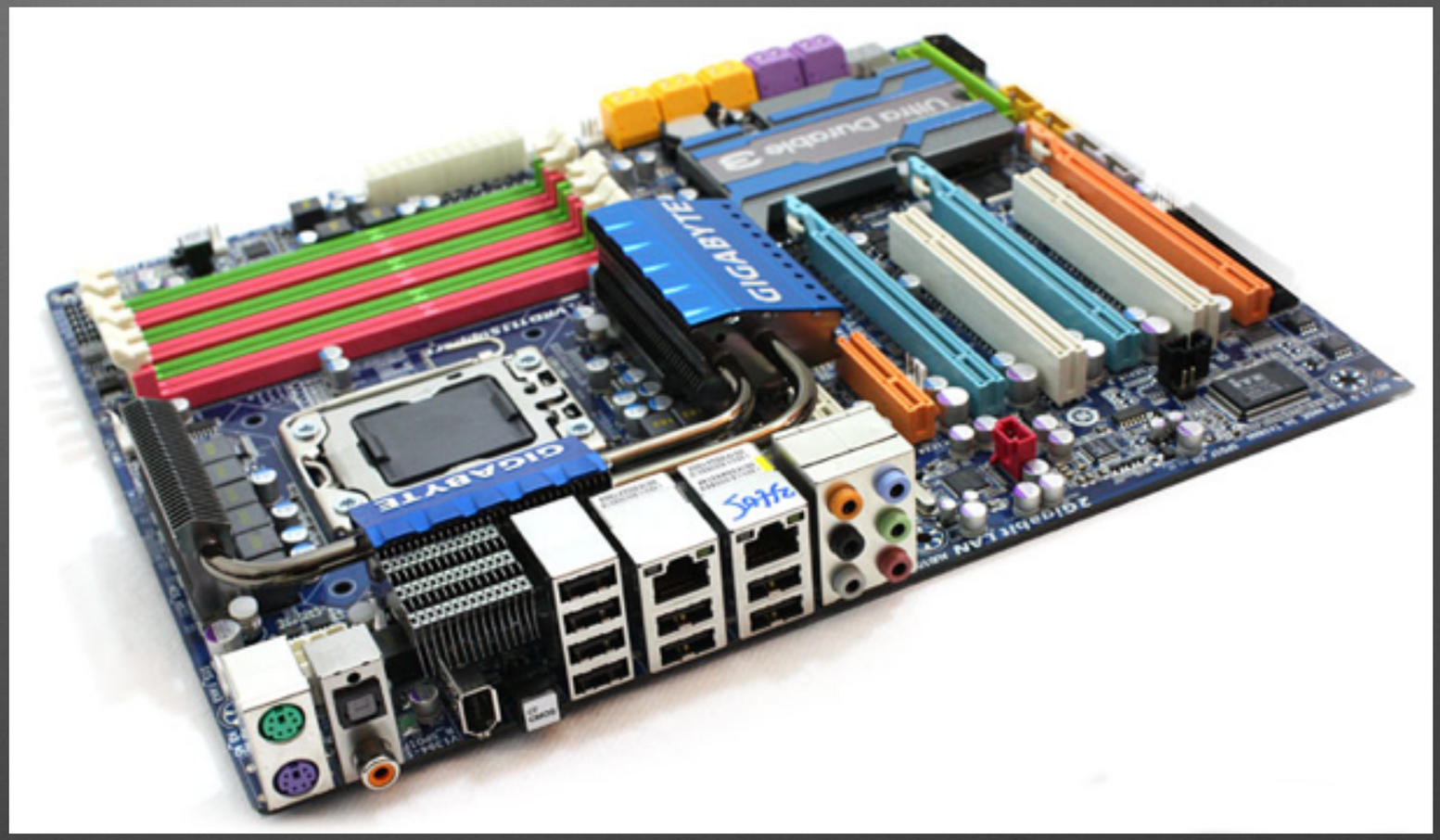
Anatomy of a Laptop



https://i.pinimg.com/originals/c8/eb/99/c8eb992930841fae06329ba7c256c7ea.jpg

Motherboard

- Main board/foundation
- Hub for all components' communication
- Expansion slots (orange, blue, and white)
- RAM slots (pink and green)
- CPU slot



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CPU

- Central Processing Unit - carries out the instructions of a computer program by performing various operations - Measured in GHz
  - Arithmetic Logic Unit (ALU): arithmetic and logical operations
  - Control unit: handles fetching from memory and input/output
- To give you an idea of the progression of technology…
  - Intel 8080 1970s - 8-bit
  - Windows 3.1 1992 - 16-bit
  - AMD 2003 - 64-bit desktop
  - Smartphone 2014 - 64-bit Apple A7

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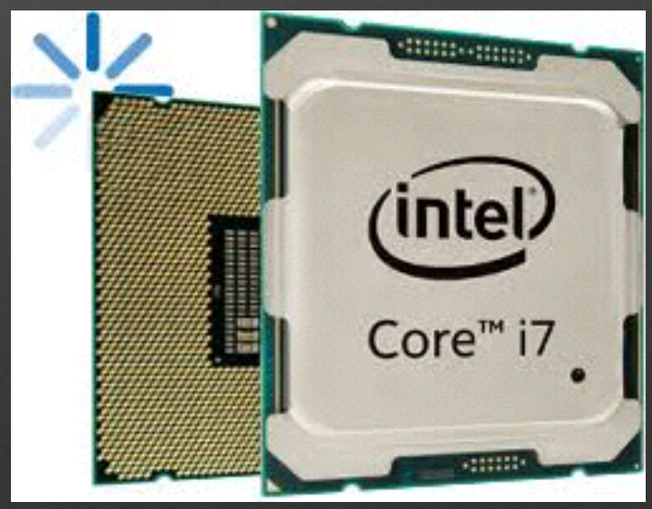
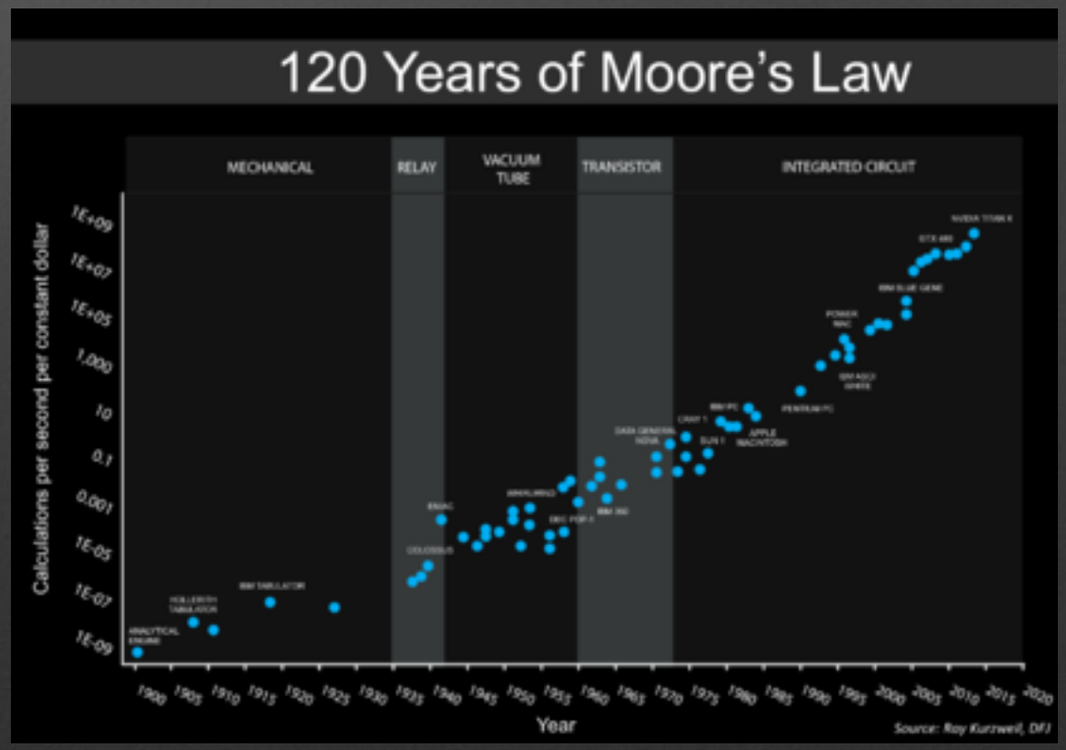
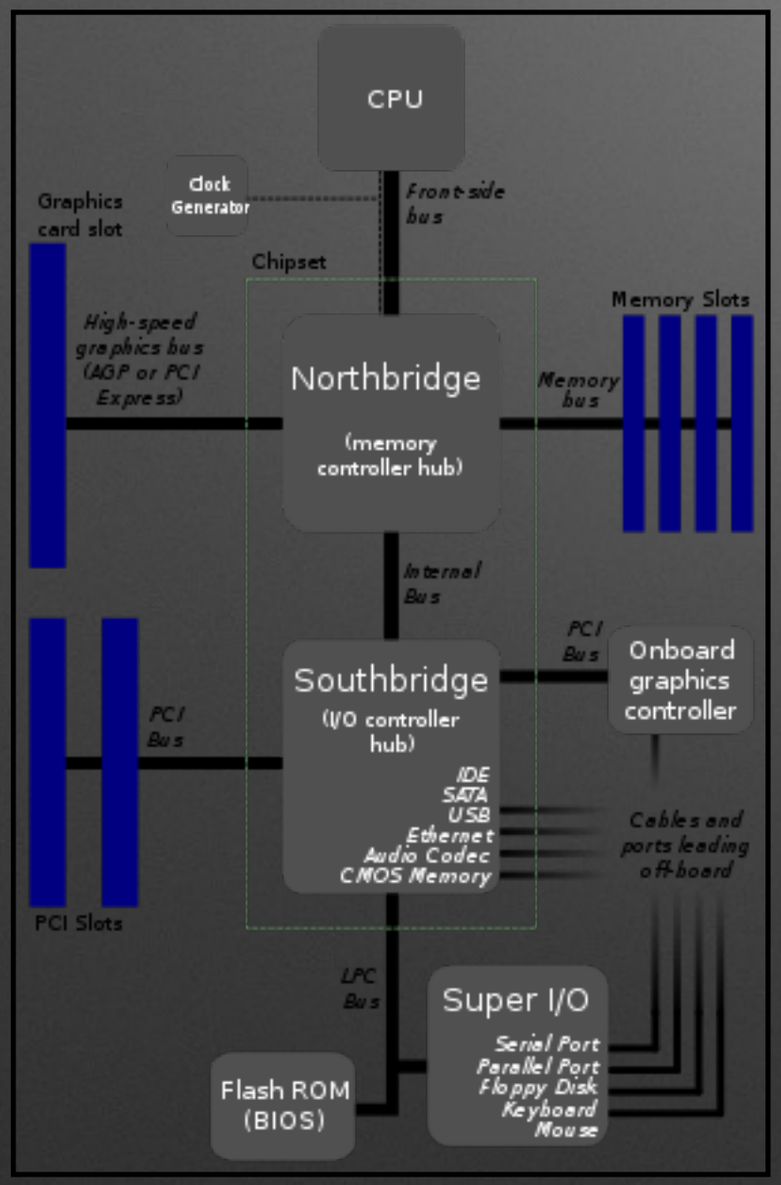


Moore’s Law

- Gordon Moore: Businessman, Co-Founder of Intel
- 1965: number of components per integrated circuit doubles every year
- 1975: revised to every two years (18 months)
- 2015: revised to 2.5 years limited at the atomic level
- Nanotechnology: deals with dimensions and tolerances of less than 100 nanometers



32-bit vs 64-bit



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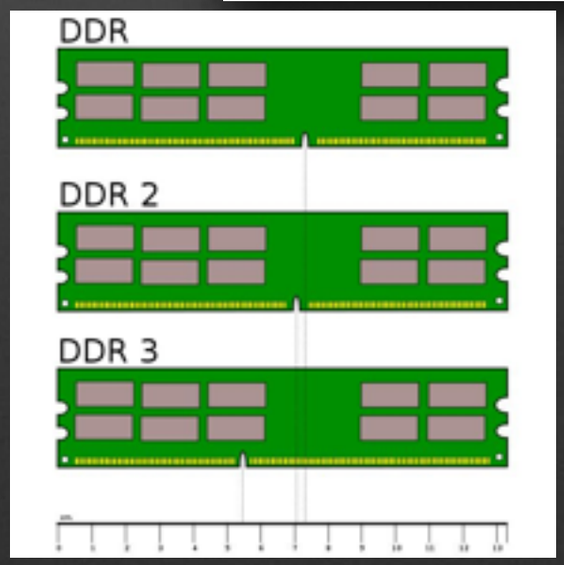
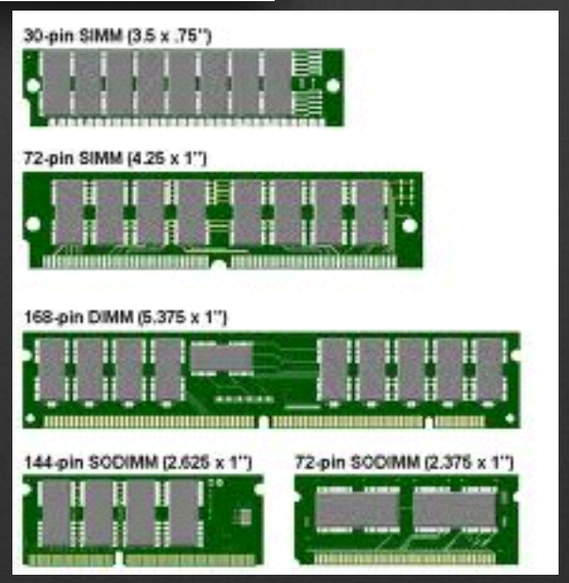
- Processes more information faster
- 32 lane highway versus a 64 lane highway
- Think about 2^{32} versus 2^{64}

RAM

- Random-access Memory
- Quick memory storage for instructions
  - Information does not need to travel as far
- Generally, more RAM means faster computer
- Can be volatile
- Measured in GB





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Hard Drive

- Read Only Memory
- Measured in GB or TB
- All applications and files are stored on the hard drive
- They do fail

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RAID

- Created in 1987 to combat hard drive failure
- Redundant Array of Independent Disks
- Data storage virtualization technology that combines multiple physical disk drive components into a single logical unit - Wikipedia

Other Hardware

Optical Drive

Uses a laser to read CDs/DVDs hence the name optical

Fan

Helps keep airflow continuous across the hardware in order to keep the temperature down. Think about it like a radiator in your car.

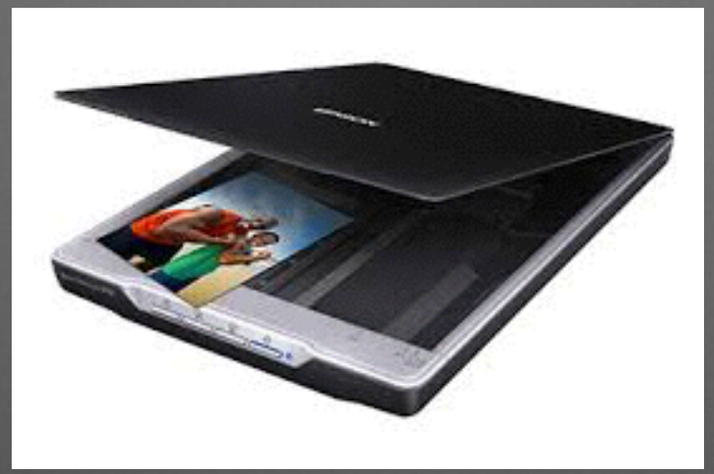
Power Supply

Kind of important ;)

Input/Output Devices

Often called peripheral devices

Mouse



Scanner

Keyboard

Microphone

Camera, make sure you always turn it off - same for your laptop camera; it's actually better to cover up the camera in case someone hacks your computer and enables it themselves

Printer

Monitor

Computers Haven’t Changed Much

Since the creation of the personal computer, it hasn’t changed much. The technology has gotten smaller, faster, more powerful, but it still works in the same way. George Dyson (PBK guest speaker from the Spring - https://en.wikipedia.org/wiki/George_Dyson_(science_historian) made the comment that he thought the original inventors, including John von Neumann, would be disappointed. Not many people are researching how to change the computer - only how to make it smaller, faster, more powerful, and what we can do with it. I wonder if that’s because what we have really is the best…

John von Neumann

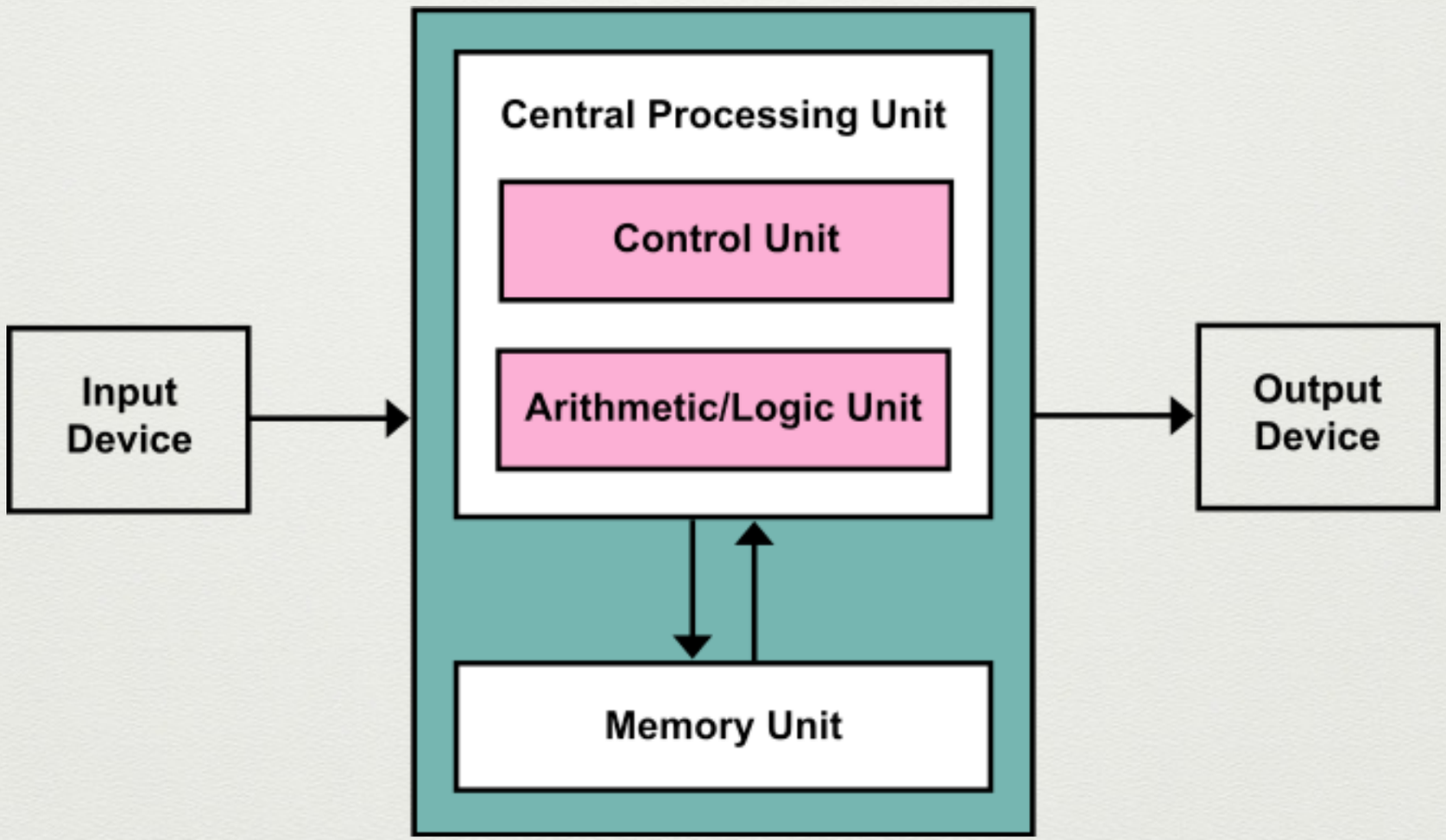
December 1903 - February 1957

- Mathematician (pure and applied), Physicist, Inventor
- Contributions to many fields including nuclear physics (thermonuclear reactions and the hydrogen bomb)
- Computing: Von Neumann architecture, linear programming, self-replicating machines, stochastic computing

https://en.wikipedia.org/wiki/John_von_Neumann

von Neumann Architecture

This is how computers still work today.



https://en.wikipedia.org/wiki/Von_Neumann_architecture

Assignment #3

- Go to the site below and work together to build a custom PC
- You decide the type of computer you wish to build
- Write a few sentences about the type of computer you built and explain why you configured it the way you did (did you have a purpose such as gaming or day-to-day?)
- https://www.pcczone.com/pc-builder