



ENIAC – 1947

- 1st practical, electronic computer
- 400 calculations/s
- 17,468 vacuum tubes
- 60,000 lbs.
- 150 kW of power



iPhone6 2014

- 800 million calculations/second
- 2 billion gates
- 0.5 watts
- \$600

Computers	DNA
Silicon based	Carbon based
Limited diversity	Large diversity
14-24 nanometer (at present)	2 nanometer
Energy inefficient	Energy efficient
Not self reproducible (but possible)	Self reproducible
Stores and processes information	Stores and processes information
Rapid and relatively precise transfer of information between compute nodes ("individuals)	Slow and imprecise transfer of information between individuals
Transfers information nearly precisely across generations	Constrained, permuted transfer of information from one generation to the next
Allows for the construction of globally linked network of nodes and the "Internet of Things"	Processing nodes and sensors are individual-based with weak sharing between individuals
Adaptability: The hardware does not learn and modify itself	Adaptability: The hardware learns and modifies itself (both at the individual and the species level)

Disruptive technologies

- Processors that learn
 - Hybrid chips (standard processors + FPGAs)
 - Machine learning
 - AI
- FPGA processors in memory