UNIVERSITI TENAGA NASIONAL

# CHAPTER 2
# COMPUTER EVOLUTION

## CMPD223 COMPUTER ORGANIZATION

- A long time ago, human are using their fingers, stones etc to do calculation.
- At the same time, they are trying to create an apparatus that could facilitate the calculation process.
- After a few trial, finally the complex and advance calculation system has been produced and it is known as a computer.

- The History & Evolution Of Computer Basically, the history of computer development is divided into 2 parts :

**before 1940 & after 1940 .**

# BEFORE 1940

# Abacus Counting Device

- Created on 3000 B.D. at Babylonia.
- Was the first mechanical counting device in the world.
- Able to execute addition and subtraction operation .

# John Napier's Bone

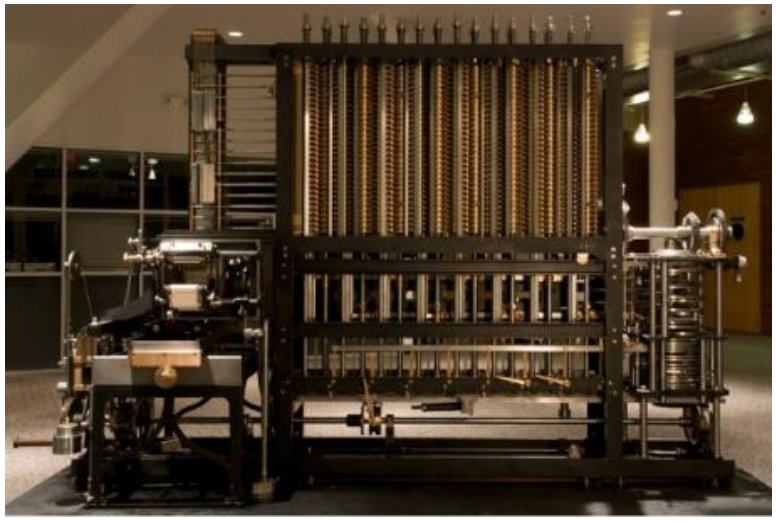

- Created on 1614 by John Napier.
- Facilitate multiplication and division processes – faster & easier.
- The first logarithm table has been created.

# Pascaline Machine

- Created on 1642 by Braise Pascal.
- Was the first mechanical machine or calculator in the world.
- Able to execute addition and subtraction processes.

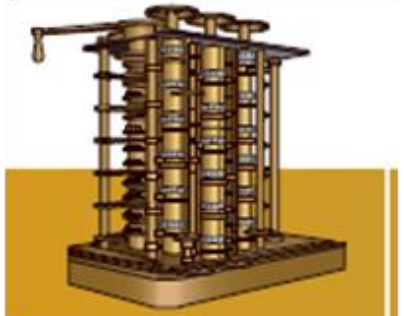
# Babbage Differentiation Machine

- Created by Charles Babbage on 1821.
- Was the first mechanical machine which is used the steam power.
- Able to do a calculation and printing the output automatically.



# Babbage Analytical Engine

- It has five (5) main parts :
  - Input unit
  - Output unit
  - Processing Unit
  - Control unit
  - Memory unit
- His invention has became a theory model for today's computer technology. Because of that, Charles Babbage has been known as The Ancestor of A Modern Computer



***1834***
Babbage's Analytical Engine designed but never built, with similar ideas to the modern computer: sections for input, processing and output

# After 1940

# Evolution

## First Generation

MARK 1 → ENIAC → Von Neumann Machine → UNIVAC → IBM

## Second Generation

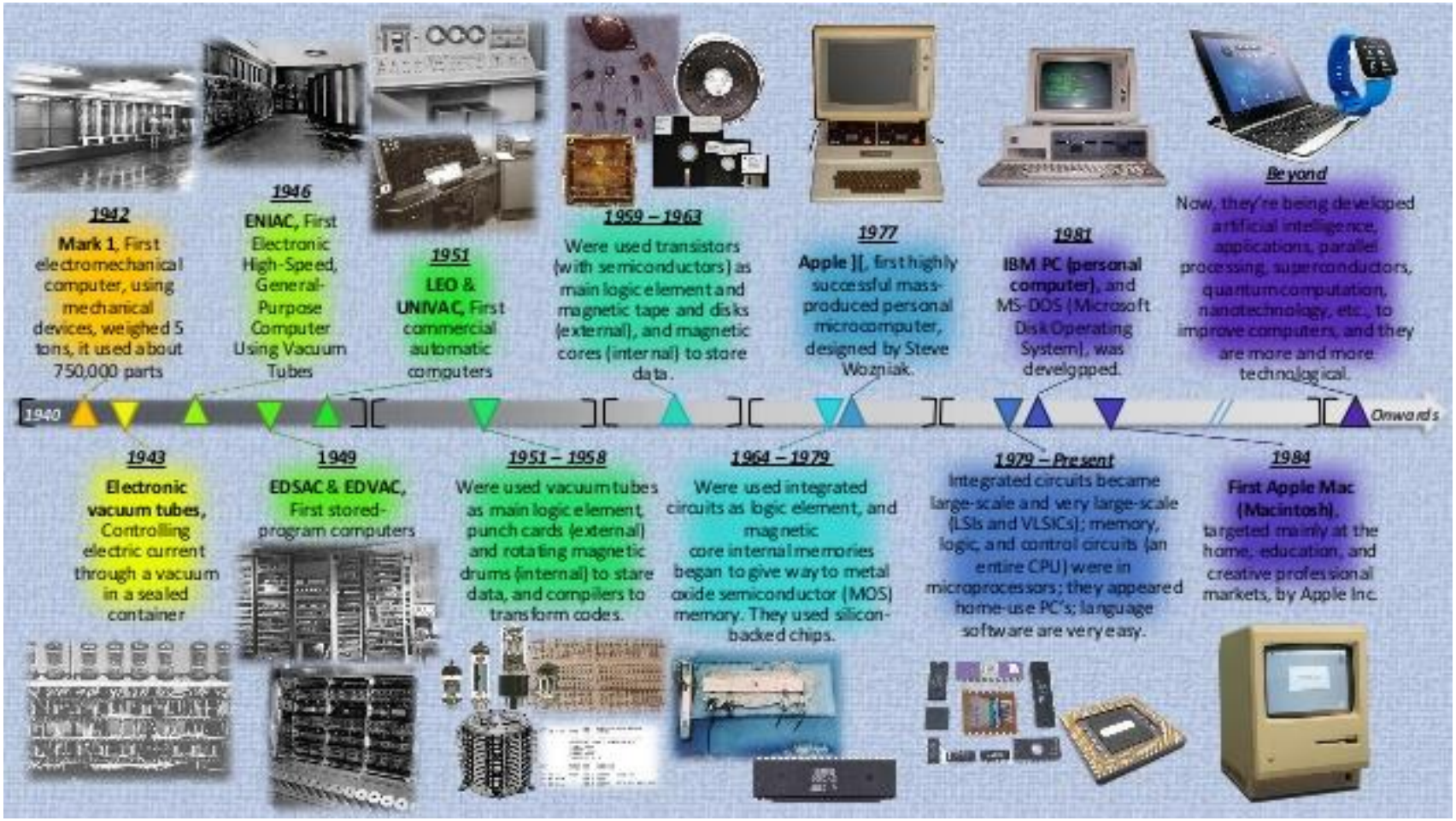
Transistors

## Third Generation

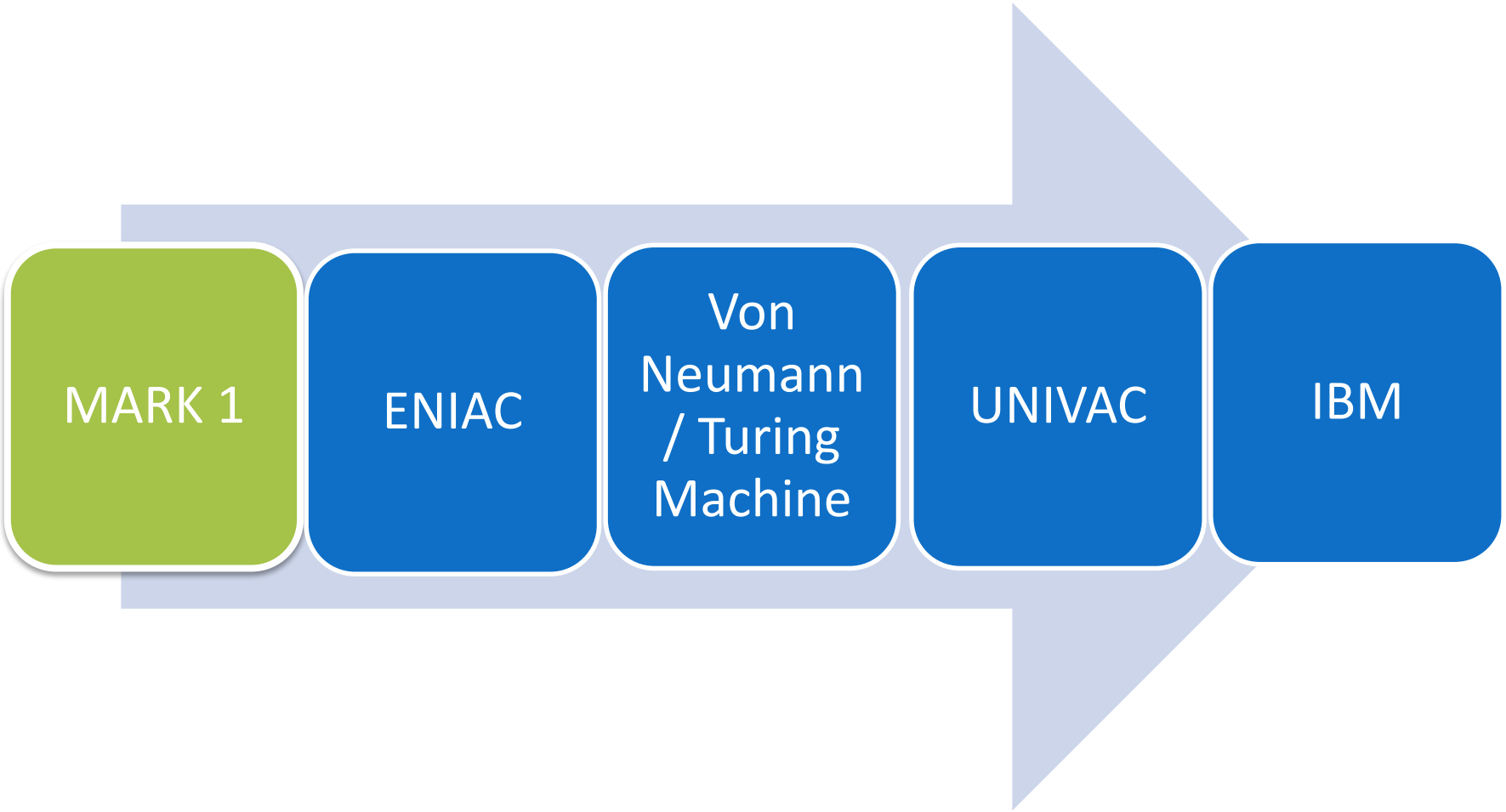
Integrated Circuit

## Later Generation

Microprocessor



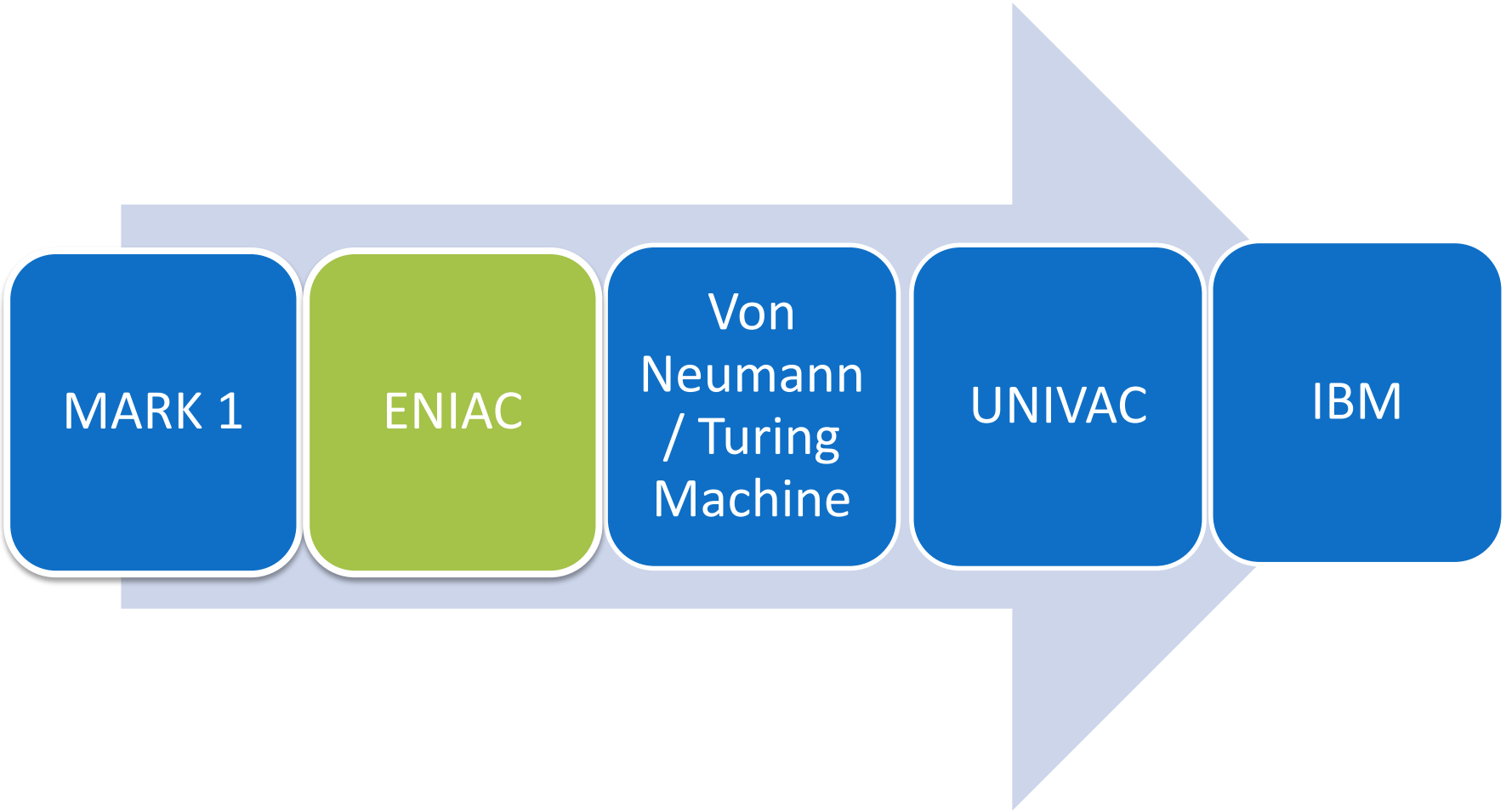

http://www.slideshare.net/CarmenBI98/4-in-fbuenocarmentimeline


MARK 1
ENIAC
Von Neumann / Turing Machine
UNIVAC
IBM

# Mark 1

- Created on 1941 by Dr. Howard Aikern in conjunction with IBM.
- Was the first electro-mechanical computer.
- Size : 55 feet long, 8 feet height and connected with 800 km of wire.

Age of computers-The trilogy(ii) - www.boddunan.com

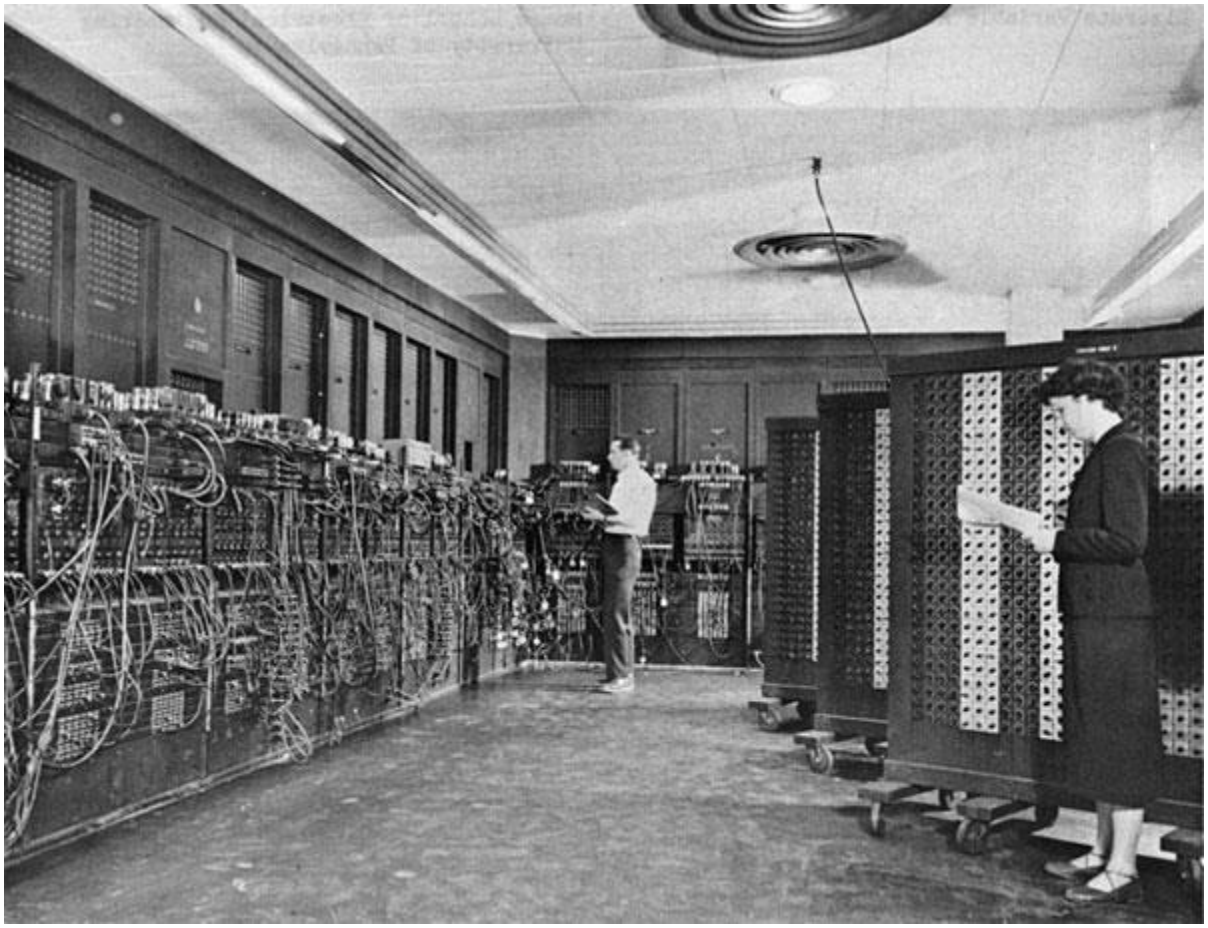

MARK 1
ENIAC
Von Neumann / Turing Machine
UNIVAC
IBM

# ENIAC

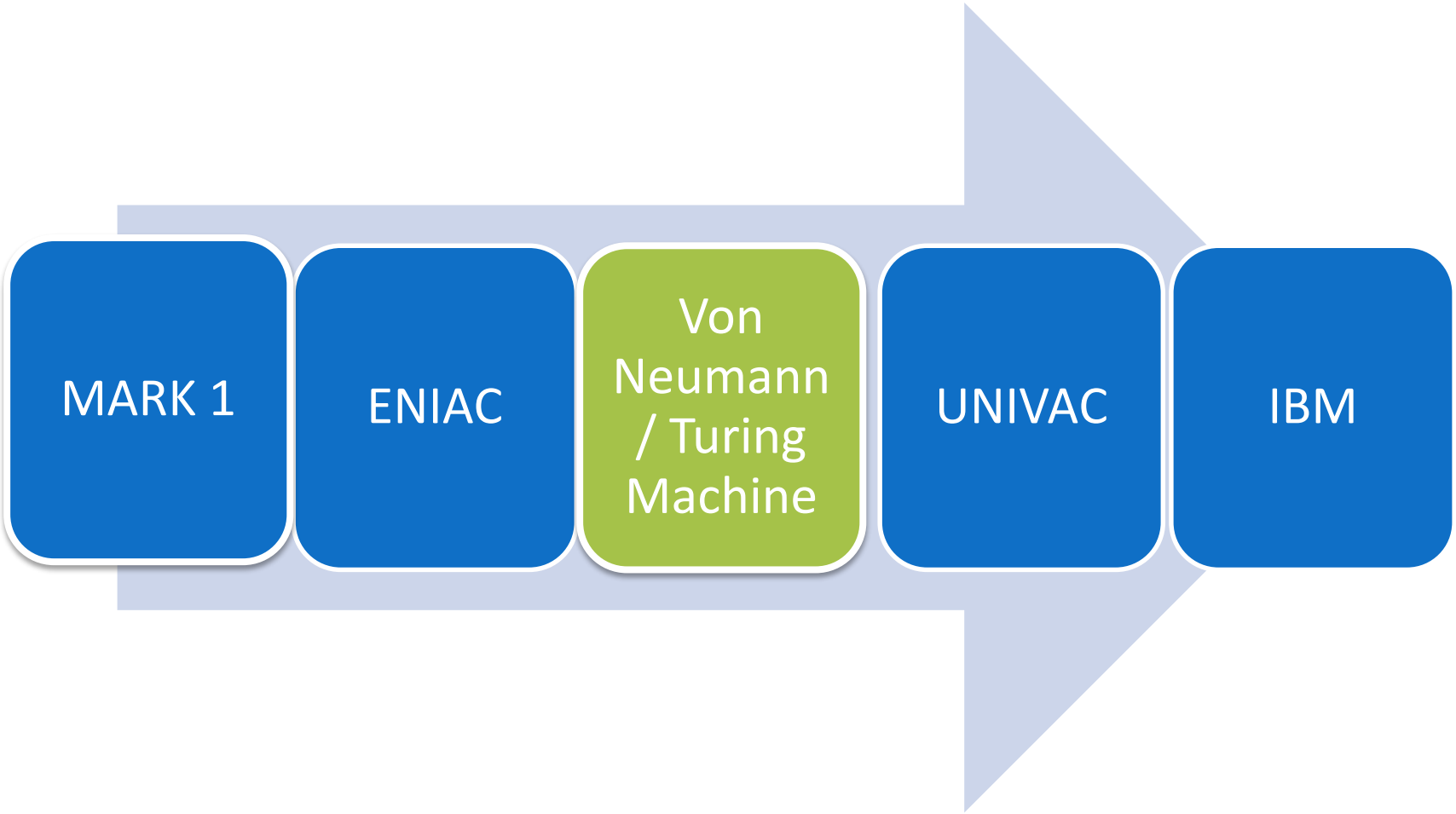
- Electronic Numerical Integrator And Computer
- Eckert and Mauchly
- University of Pennsylvania
- Trajectory tables for weapons
- Started 1943
- Finished 1946
  - ENIAC was created to help with the war effort against German forces.Used until 1955

# ENIAC

- Decimal (not binary)
- 20 accumulators of 10 digits
- Programmed manually by switches
- 18,000 vacuum tubes
- 30 tons
- 15,000 square feet
- 140 kW power consumption
- 5,000 additions per second
- 1000 times faster than Mark 1.



*http://www.computerhope.com/jargon/e/eniac.htm*


MARK 1
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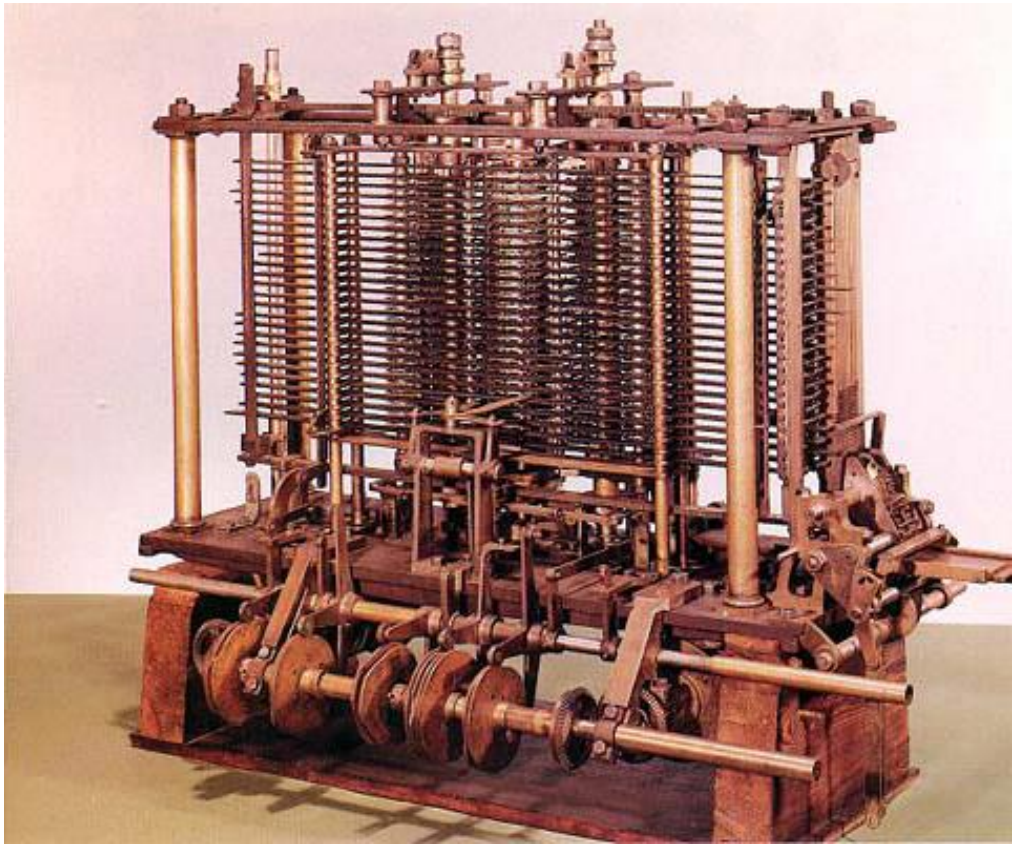
UNIVAC
IBM

# Von Neumann / Turing Machine

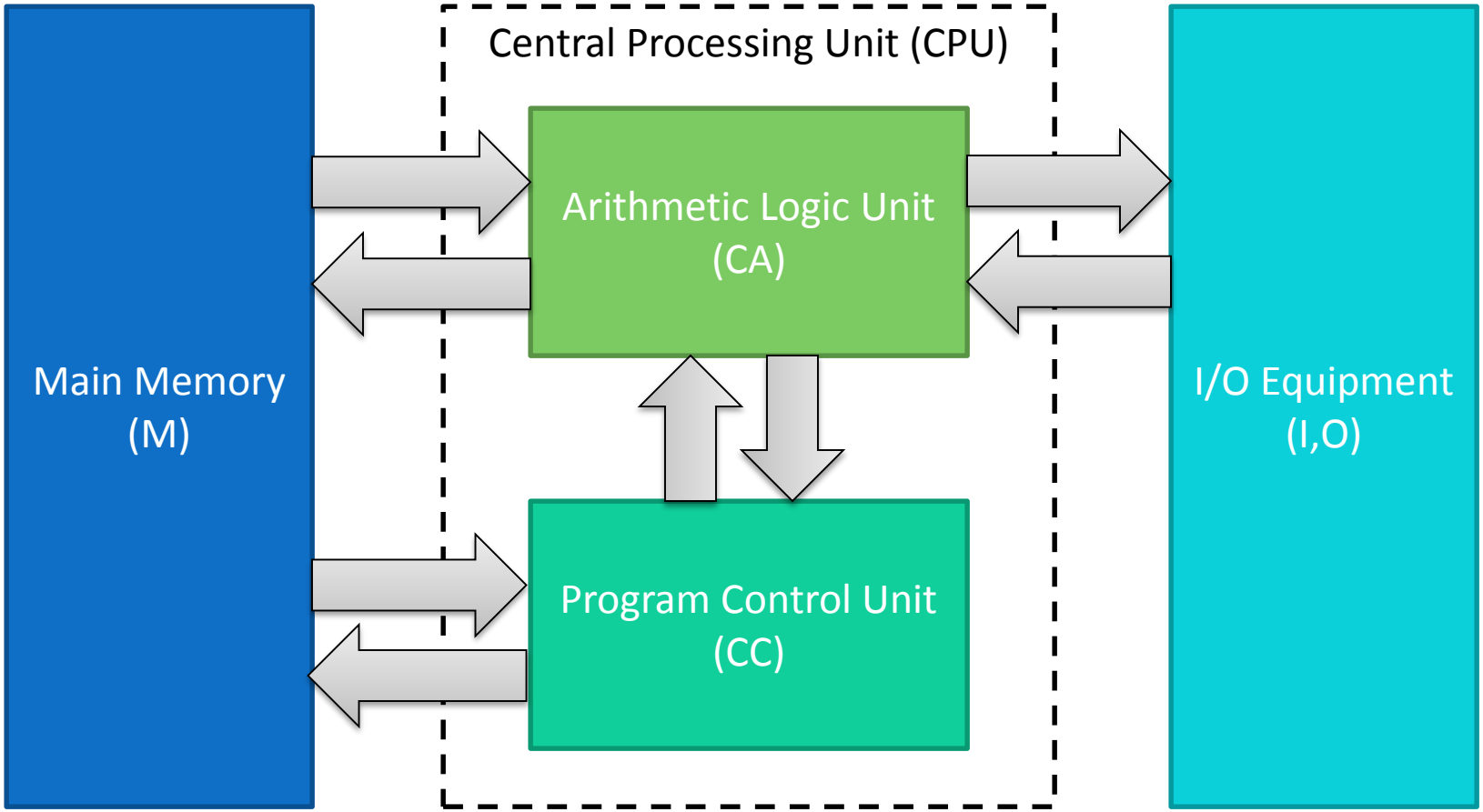
- Stored Program concept
  - Main memory storing programs and data
  - ALU operating on binary data
  - Control unit interpreting instructions from memory and executing
- Input and output equipment operated by control unit

# Von Neumann / Turing Machine - Example



http://www.arcadefire.com/wp/wp-content/uploads/2010/10/turing11.jpg

# Von Neumann Machine - Structure



# Von Neumann / Turing Machine (2)

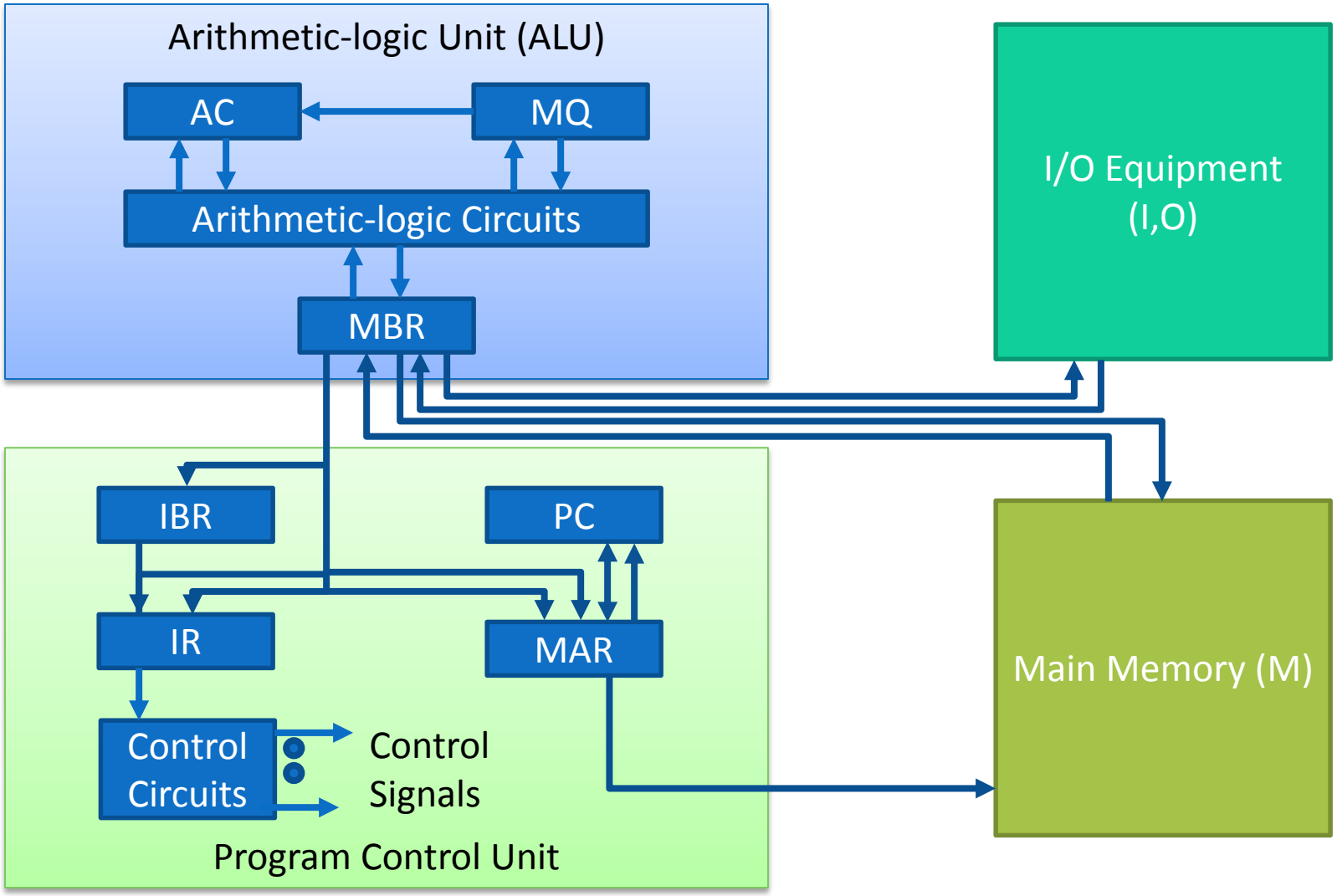
- Princeton Institute for Advanced Studies
  - IAS
- Completed 1952

# IAS

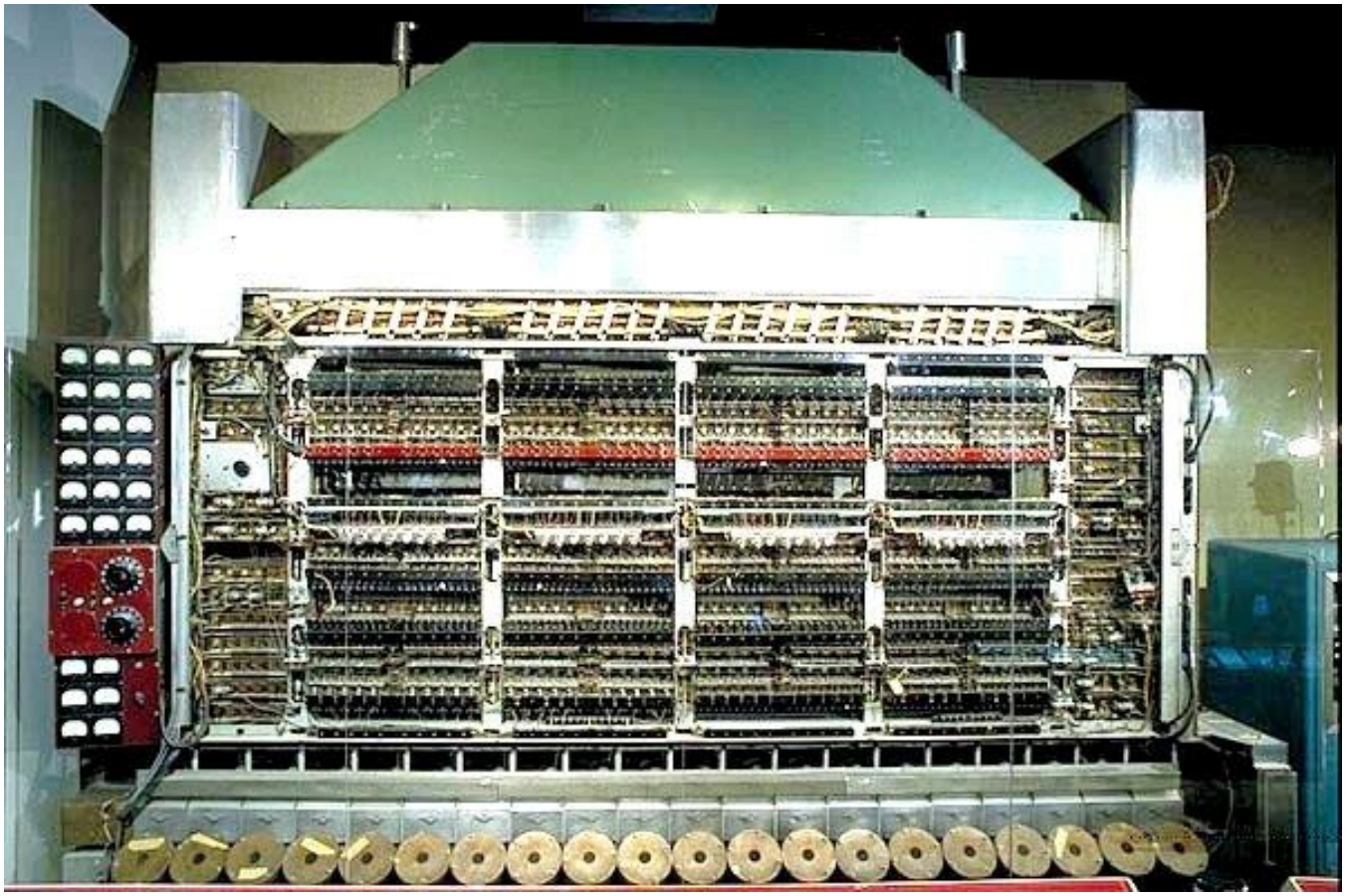
- 1000 x 40 bit words
  - Binary number
  - 2 x 20 bit instructions
- Set of registers (storage in CPU)
  - Memory Buffer Register – contains word to be stored/received from in memory or sent to i/o unit.
  - Memory Address Register – specifies the address in memory of the word to be written from or read into MBR.
  - Instruction Register - contains 8-bit operation code instruction being executed.
  - Instruction Buffer Register – to hold temporarily the instruction
  - Program Counter – contain address of the next instruction.
  - Accumulator
  - Multiplier Quotient

} hold temporarily operands and result of ALU operation.

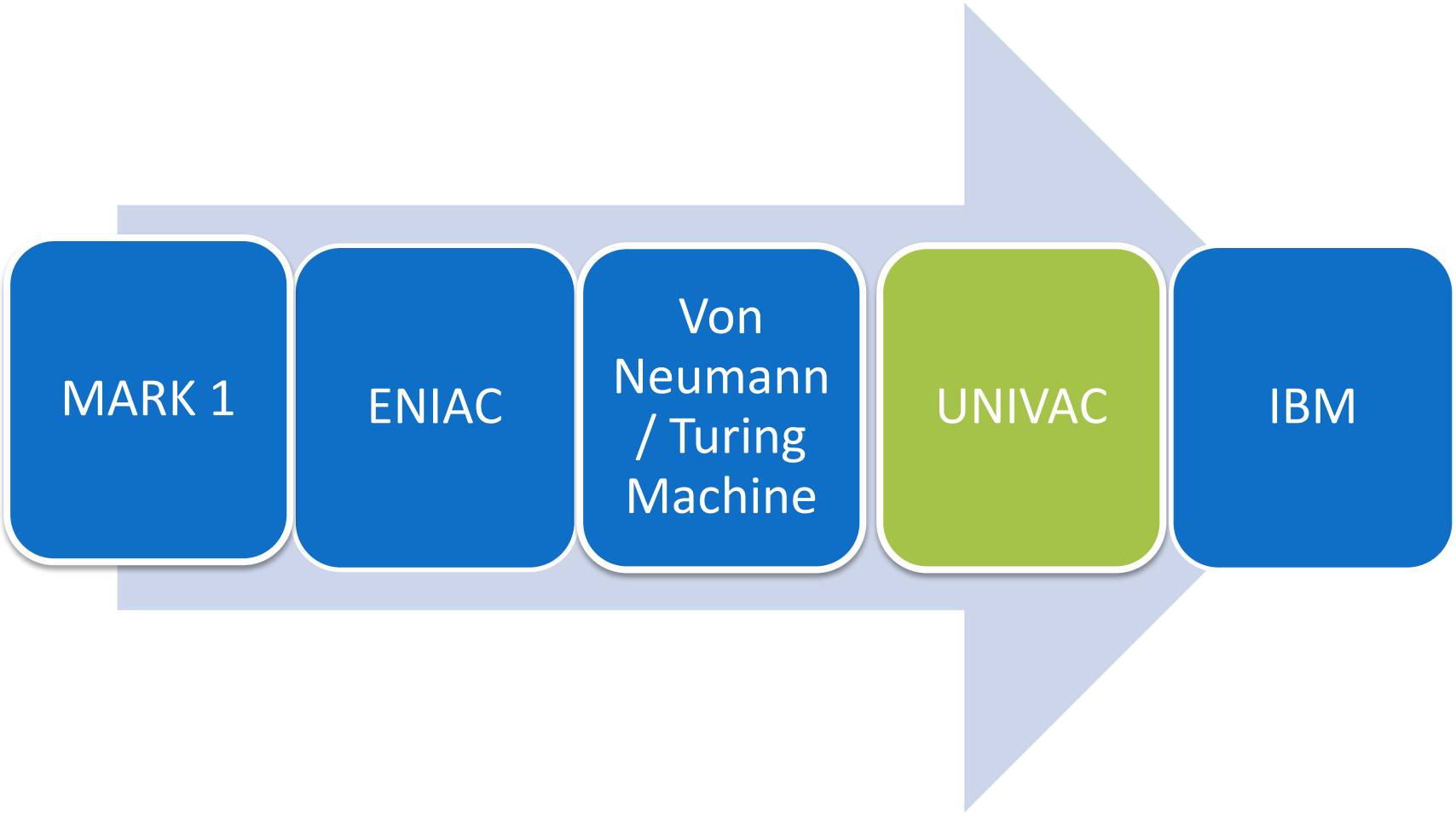
# IAS – Structure



# IAS Computer - Example



http://www.comsci.us/history/images/ias.jpg


MARK 1
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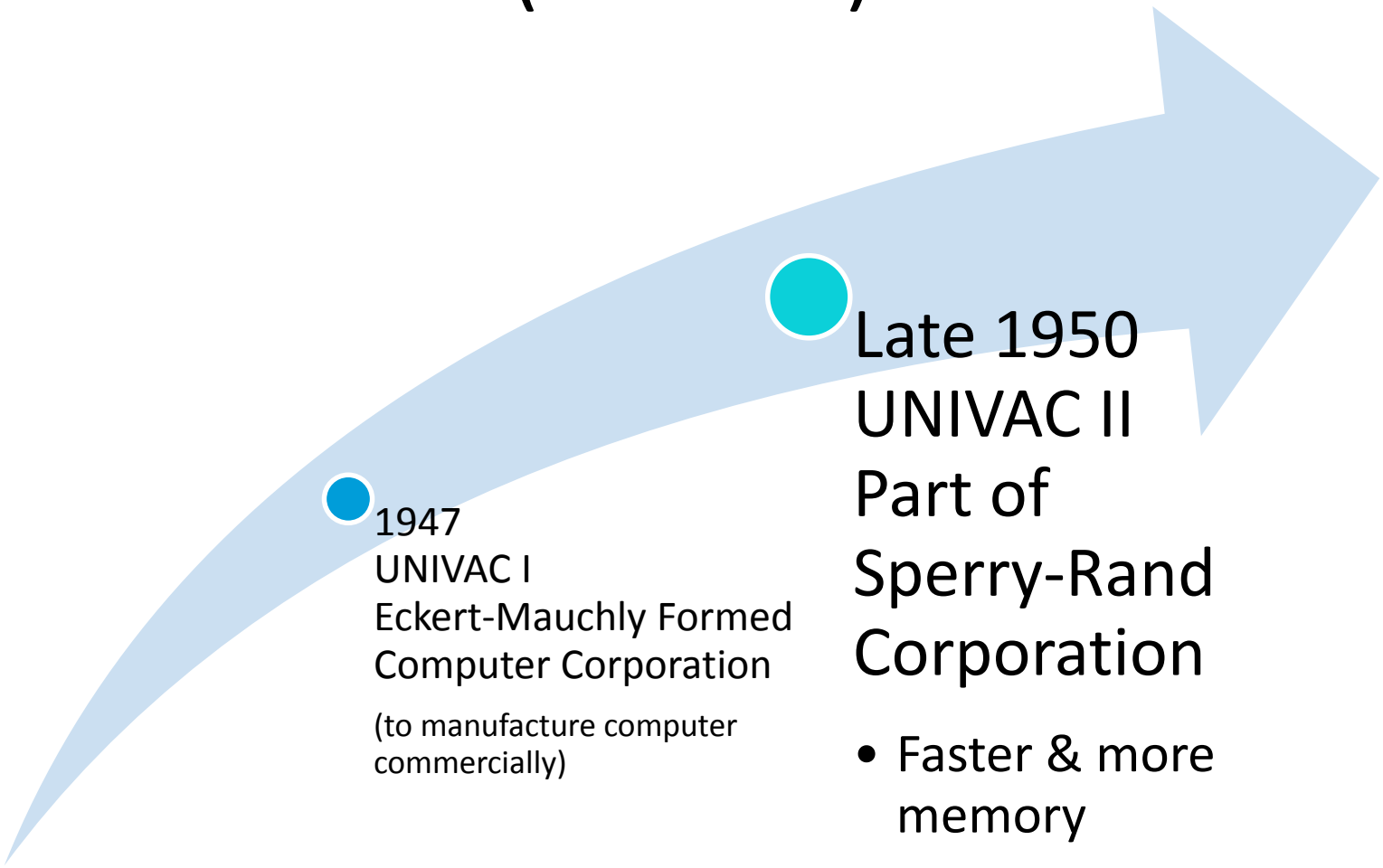
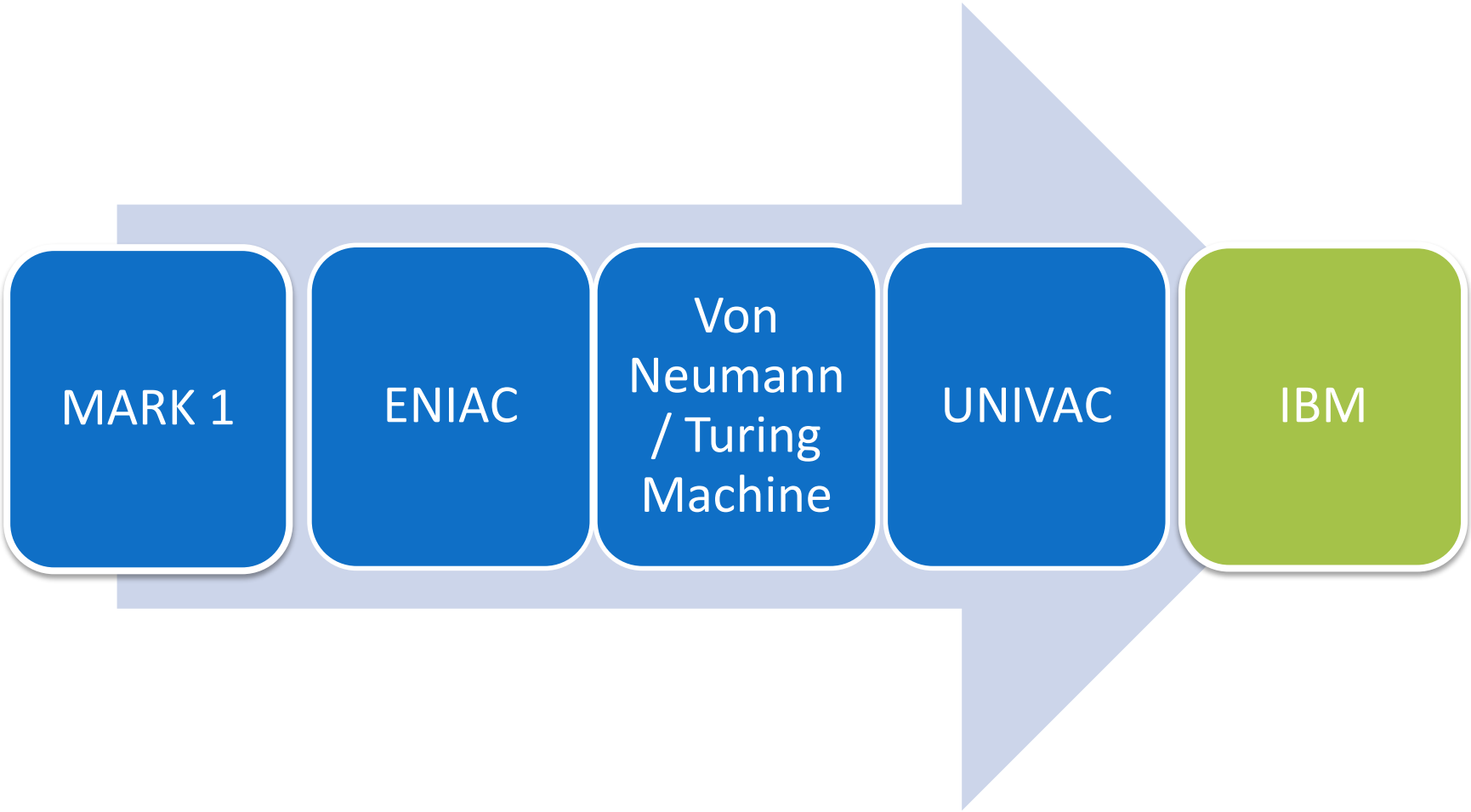
# Universal Automatic Computer (UNIVAC)



# UNIVAC - Example


http://archive.computerhistory.org/resources/still-image/UNIVAC/Univac_1.charles_collingwood.1952.102645279.lg.jpg


MARK 1
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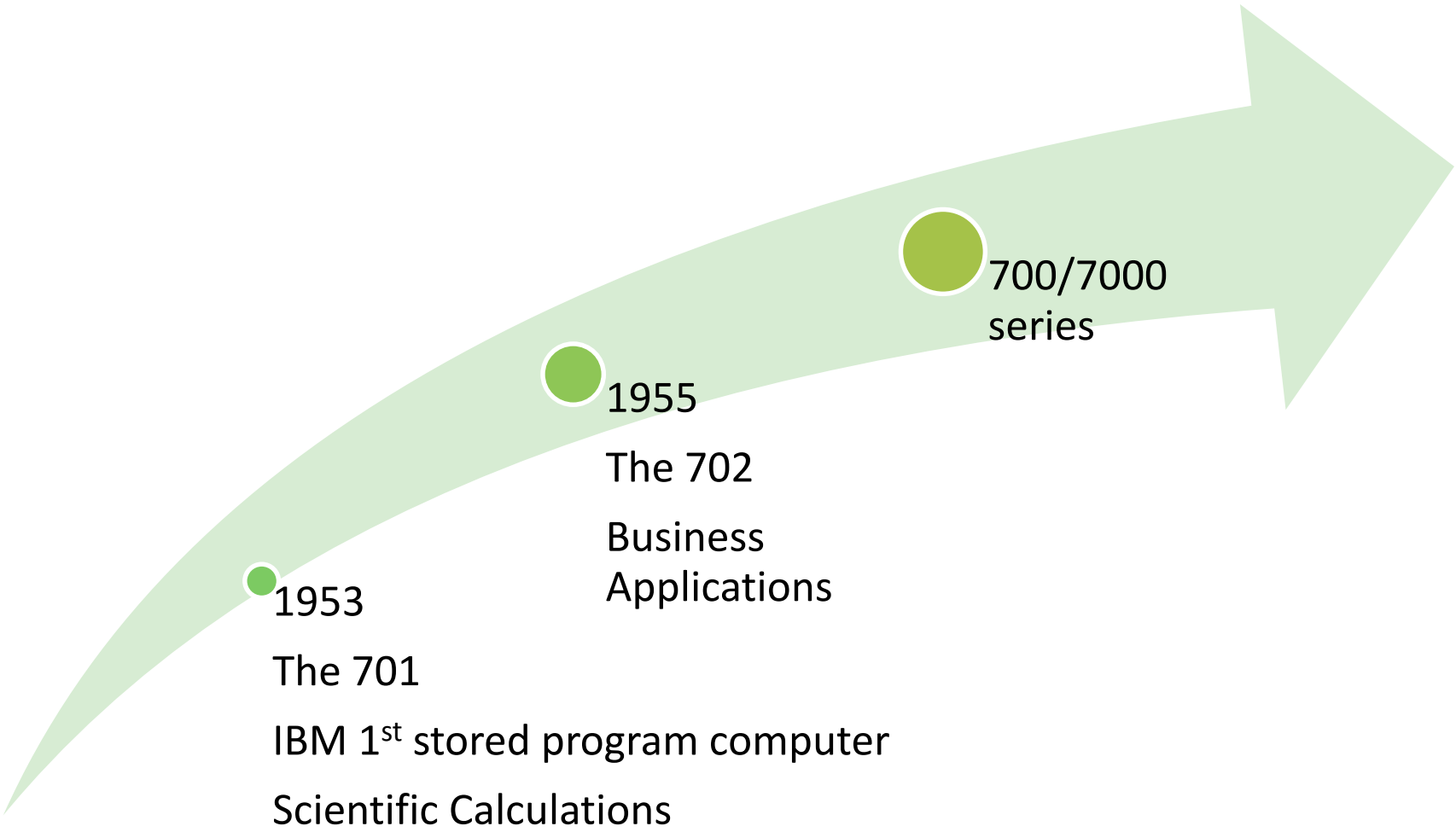
# IBM


700/7000 series
1955
The 702
Business Applications
1953
The 701
IBM 1st stored program computer
Scientific Calculations

# IBM 701

http://www-03.ibm.com/ibm/history/exhibits/701/images/141511_Large.jpg

# IBM 702


http://www.ed-thelen.org/comp-hist/BRL61-0396.jpg

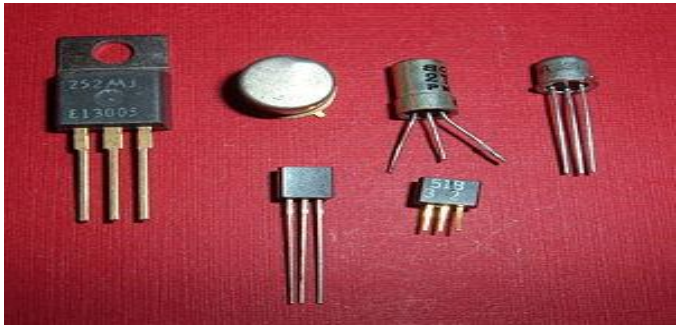
# IBM 700/7000

https://upload.wikimedia.org/wikipedia/commons/thumb/b/b9/NASAComputerRoom7090.NARA.jpg/280px-NASAComputerRoom7090.NARA.jpg

# Second Generation Machine

# Transistors

- Made from Silicon (Sand)
- Invented 1947 at Bell Labs
- William Shockley et al.
- Replaced vacuum tubes: wires, metal plates, glass capsule and vacuum.
- Solid State device made from silicon.

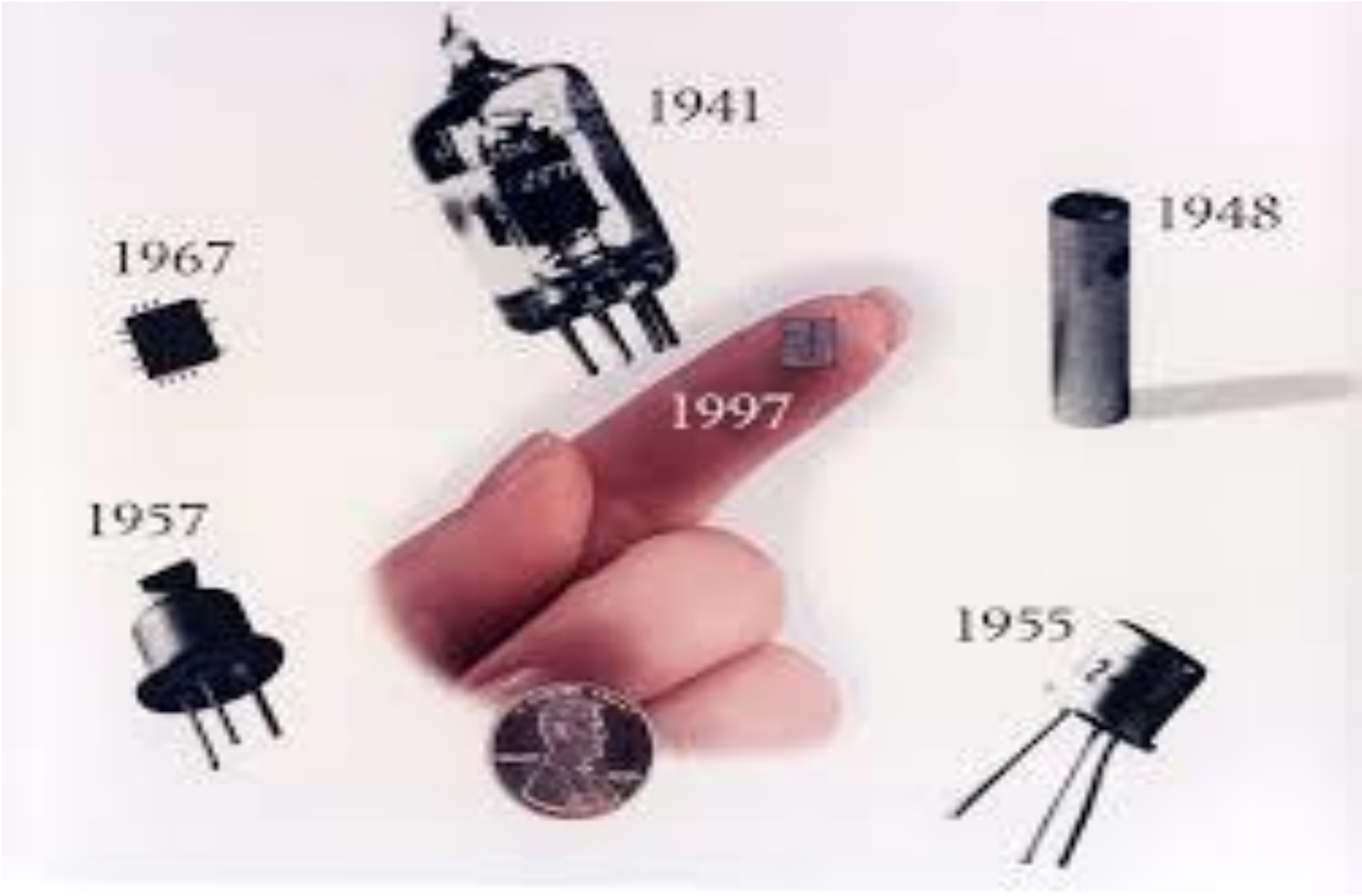


# Advantages of Transistors

- Smaller
- Cheaper
- Less heat dissipation

# Transistors Based Computers

- Second generation machines
- NCR & RCA produced small transistor machines
- IBM 7000
- Digital Equipment Corporation(DEC) - 1957
  - Produced PDP-1 – first mini computer phenomenon.


1941
1948
1967
1997
1957
1955

# Third Generation Machine

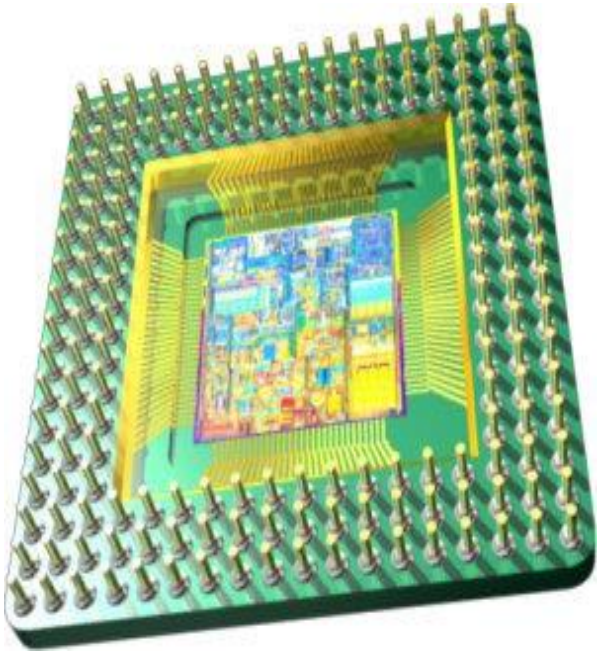
# Integrated Circuit/Microelectronics

- Literally - “small electronics”
- Transistors were replaced by integrated circuits(IC)
- One IC could replace hundreds of transistors
- This made computers even smaller and faster.


# Later Generation Computers

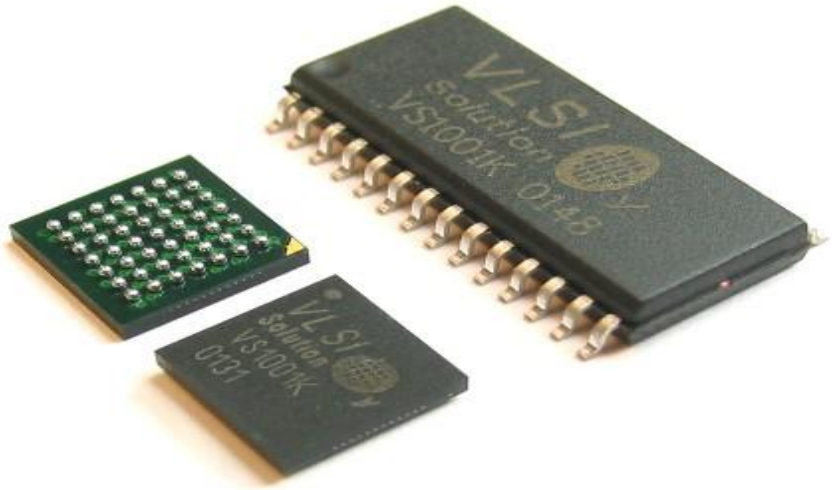
# Later Generation Computers

- In 1970 the Intel Corporation invented the Microprocessor: an entire CPU on one chip
- This led to microcomputers-computers on a desk



# Later Generation Computers

- This transformation was a result of the invention of the ***microprocessor***.
- A microprocessor (uP) is a computer that is fabricated on an integrated circuit (IC).
- Computers had been around for 20 years before the first microprocessor was developed at ***Intel*** in 1971.



# Intel

| Year | Computer Name | Description |
|---|---|---|
| 1971 | 4004 | • First microprocessor<br>• All CPU components on a single chip<br>• 4 bit |
| 1972 | 8008 | • 8 bit<br>• Both designed for specific applications |
| 1974 | 8080 | • Intel's first general purpose microprocessor |

# Additional Reference

- William Stallings, Computer Organization and Architecture: Designing for Performance, 8th. Edition, Prentice-Hall Inc., 2010

# Apple 1 - 1976