## History of Computing

- When was the first computing device invented?
  - Depends what is meant by "Computing Device"
    - Abacus (2400 BC)
    - Napier's Bones (1615)
    - Slide Rule (1630)
  - Automatic Computers

## History of Computing

- The history of computing is usually divided into generations:
  - Mechanical Era / Generation 0 (1623-1945)
  - First Generation (1937-1953)
  - Second Generation (1954-1962)
  - Third Generation (1963-1972)
  - Fourth Generation (1972-1984)
  - Fifth Generation (1984-1990)
  - Sixth Generation (1990-????)

## Mechanical Era (1623-1945)

- Analog Machines
- Digital Machines

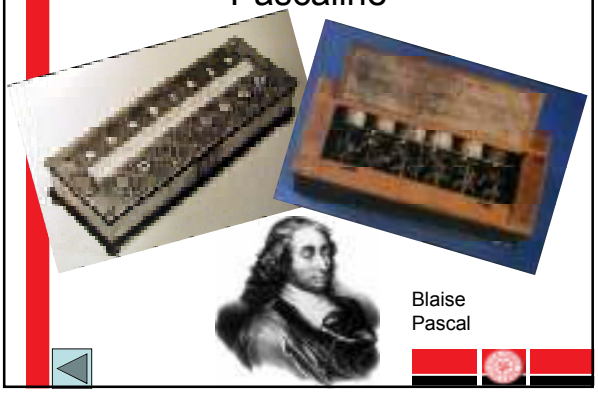
## Mechanical Era (1623-1945)

- Analog machines
  - Shafts and Gears
    - Pascaline (1642)
    - Analytical Engine (1842)
      - First programmable machine
  - Shafts and gears lead to *accumulation of error.*

## Mechanical Era (1623-1945)

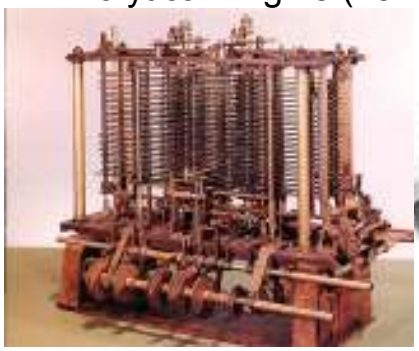
- Digital Machines
  - Electromechanical Relays
    - Computing based on switches turning on and off.
      - Eliminates accumulation of error.
      - Basis for all modern computing.
    - Harvard Mark I (1944)
  - Programming:
    - Punch Cards and Paper Tapes

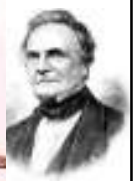
## Pascaline



Blaise Pascal

## Analytical Engine (1842)





Charles Babbage

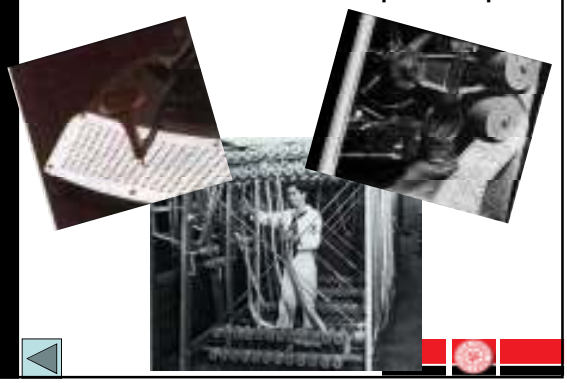
## Harvard Mark I

Howard Aiken

Grace Hopper

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

## Punch Cards and Paper Tape



## First Generation (1937-1953)

- Vacuum Tubes
  - Exactly the same functionality as a relay
    - Fully electronic
      - No moving parts
      - Faster than relays
    - EDVAC (1948)
      - Stored Program

## EDVAC

John von Neumann

## Second Generation (1954-1962)

- Discrete transistors
  - Same functionality as a vacuum tube
    - Smaller, faster, cheaper, more reliable
  - First commercial computers
    - IBM (1954)
  - High Level Programming Languages
    - Fortran (1955) / Cobol (1959)

## First Transistor (1947)

John Bardeen
Walter Brattain
William Shockley

## More Generations

- Third Generation (1963-1972)
  - Integrated Circuits (10-1000 transistors / chip)
- Fourth Generation (1972-1984)
  - Very Large Scale Integration (VLSI = 1k to 100k transistors / chip)
  - Personal Computing
- Fifth Generation (1984-1990)
  - Improved VLSI (100k to 1M transistors / chip)
  - Parallel processing / Networking
- Sixth Generation (1990-????)
  - Ultra LSI (10M to 100M transistors / chip)
  - Multiprocessors / Internet

## Apple I Computer (1976)

Steve Jobs
Steve
Wozniak

## Moore's Law

- "the density of silicon chips doubles every 18 months."
  - Intel Founder, Gordon Moore (1965)