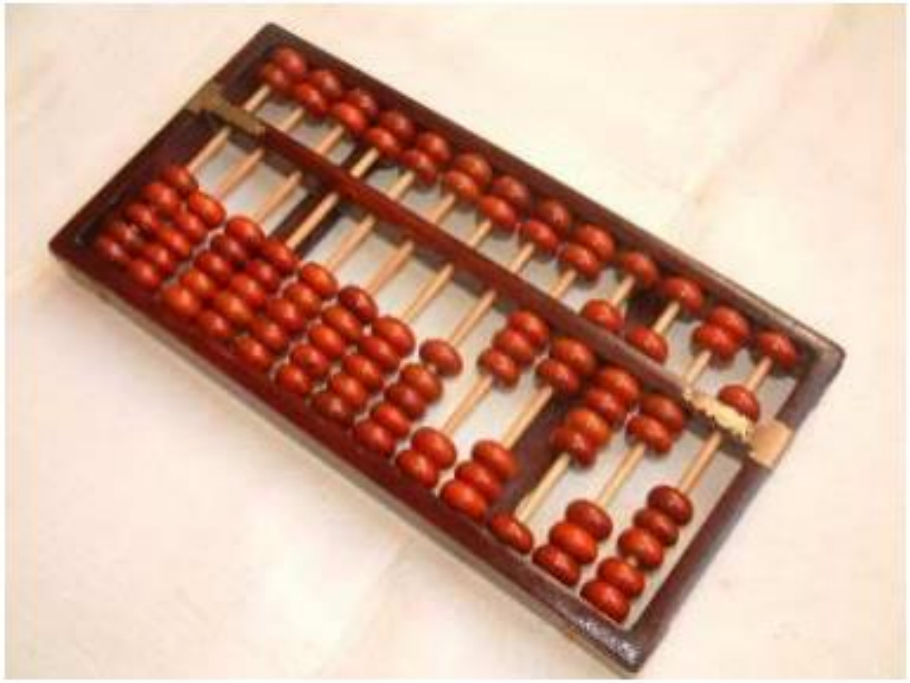
# MA144: Problem Solving and Computer Programming

## Lecture-2

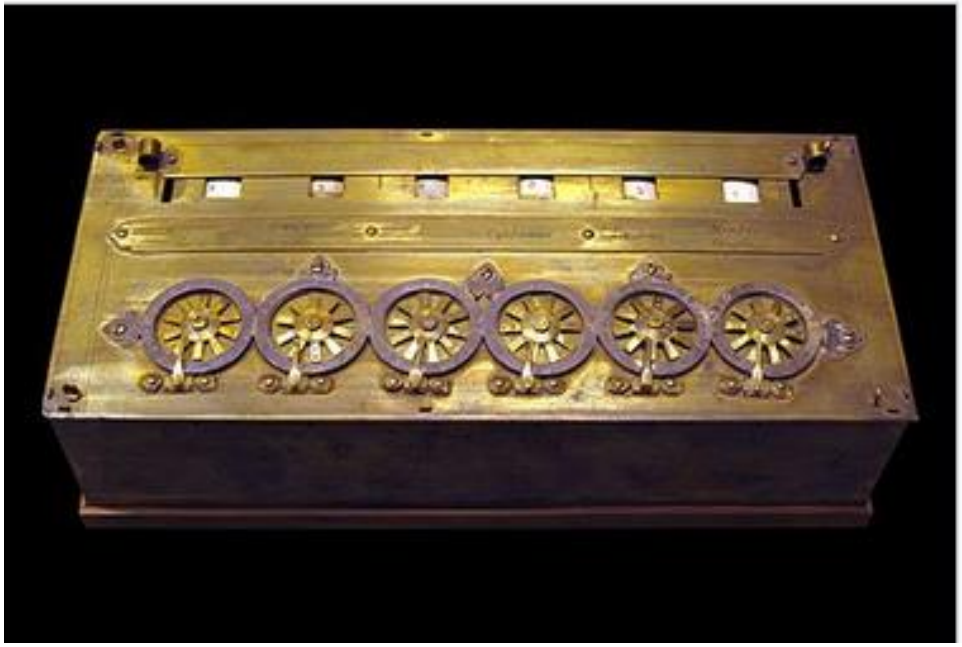
## History of Computers

# Abacus



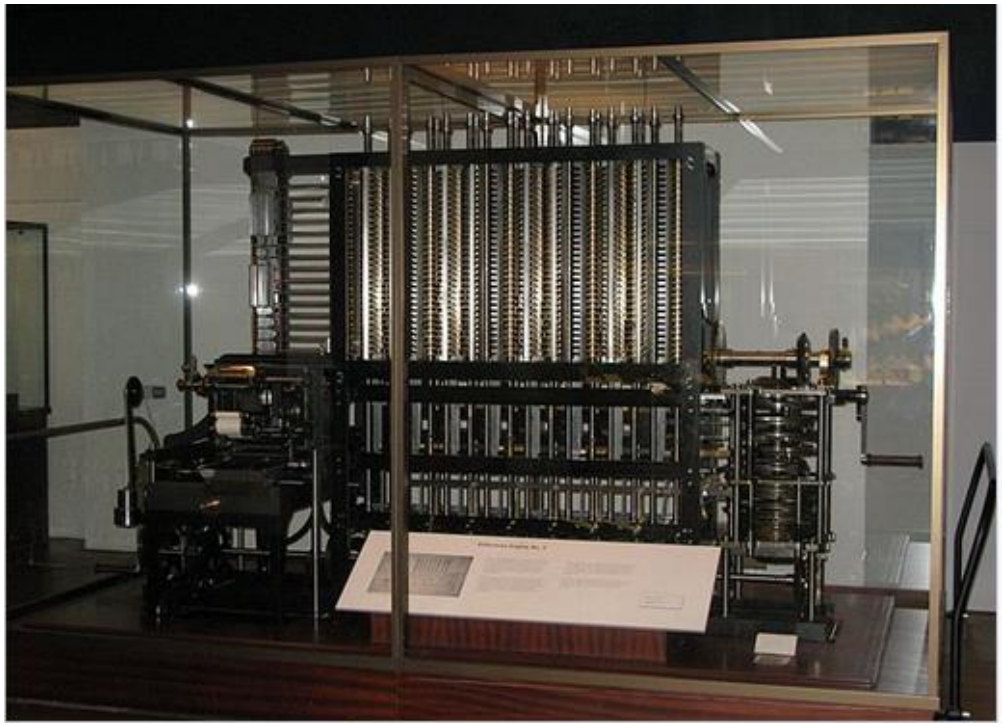
- Earliest known computing device
- May be invented in Babylon ca. 2700–2300 BC
- Used for counting
- Used also for simple operations like addition and subtraction

# Pascal's Calculator



- A mechanical calculator invented by Blaise Pascal in 1642
- Used to do arithmetic operations in decimal
- Handled automatic transfer of carry
- It could add and subtract two numbers directly and multiply and divide by repetition

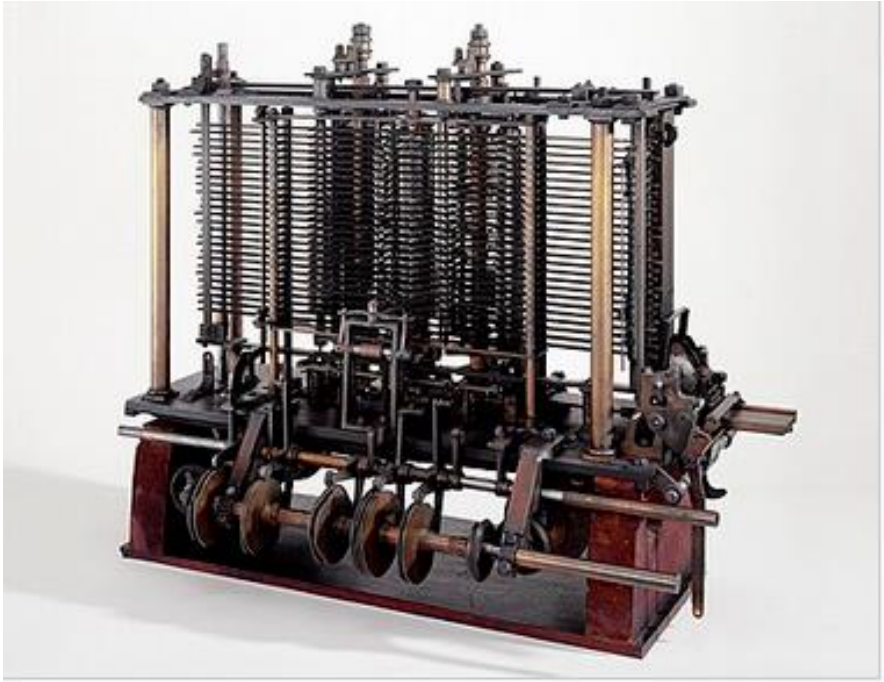
# Difference Engine



- It was first created by Charles Babbage in the 1820s
- It was an automatic mechanical calculator

  (or calculating machine)
- Used in polynomial computations

# Analytical Engine



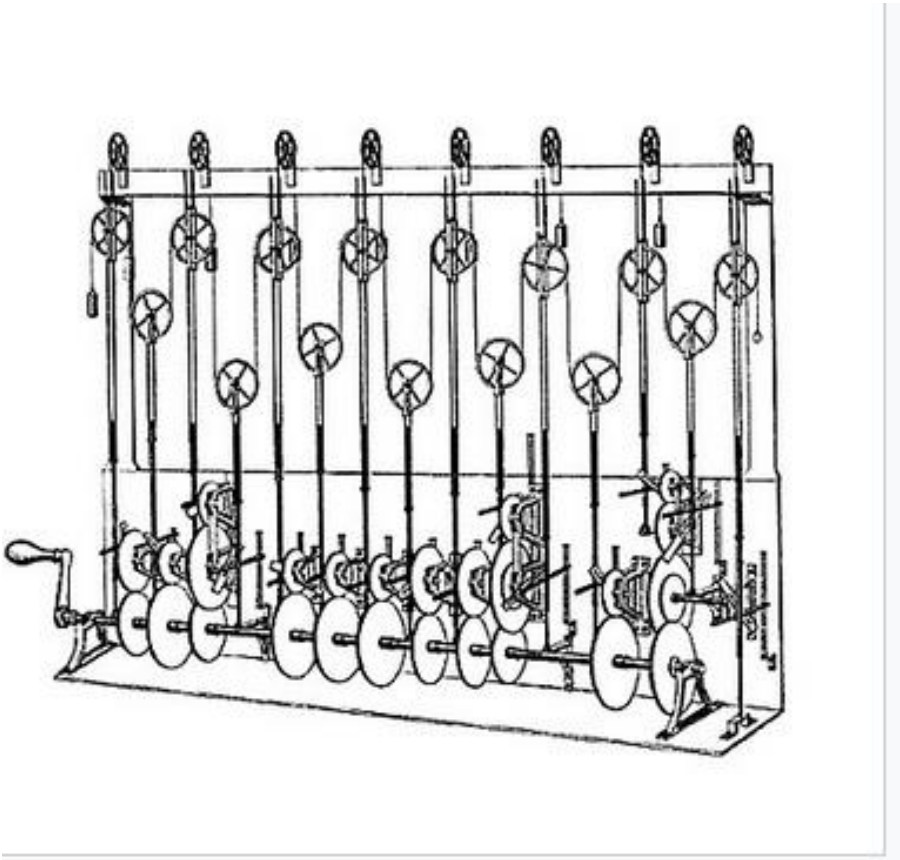
- Proposed by Charles Babbage in 1837 (the successor to Babbage's difference engine)
- Had arithmetic and logic unit and memory
- Could handle conditional branching and loops
- The first design for a general-purpose computer that could be described in modern terms as Turing-complete

# Desktop Mechanical Calculators

- Various desktop mechanical calculators used in the office from 1851 onwards.
- Each one has a different user interface.

# Tide-Predicting Machine

- First modern mechanical analog computer
- Designed by Sir William Thomson



Thomson's design for the third tide-predicting machine, 1879-81

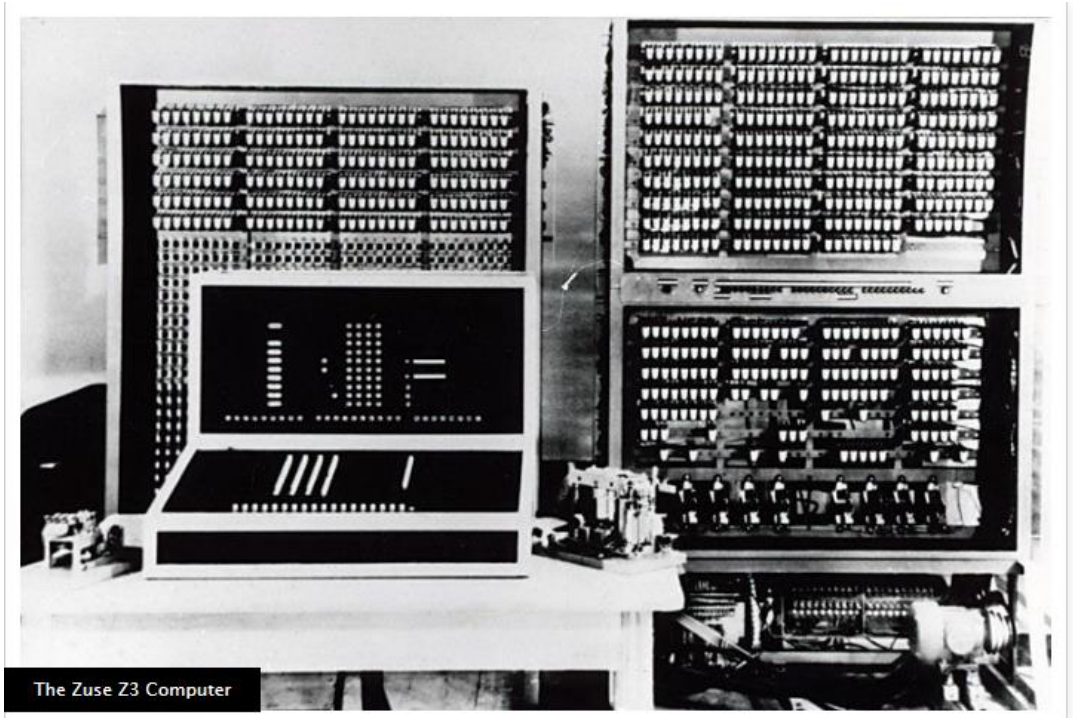
# The Complex Number Calculator (CNC)

- In 1939, Bell Telephone Laboratories completes this calculator, designed by scientist George Stibitz.
- Performed calculations remotely on the CNC (located in New York City) using a Teletype terminal connected to New York over special telephone lines.
- This is likely the first example of remote access computing.

# The Age of Digital Computers

- First conceptualized by Alan Mathison Turing in 1936
- John von Neumann proposed a popular architecture for stored-program computers in 1945
- Based on Boolean algebra (George Boole, 1854) which is connected to computation by Claude Shannon and Victor Shestakov in 1930s
- Initial designs were electromechanical
- Superseded by electrical devices (valves or vacuum tubes)
- Eventually, valves were replaced by electronic devices (transistors and diodes)
- Advent of VLSI (very large scale integration) technology helped to dramatically reduce the size of computers

# Z3 Computer


The Zuse Z3 Computer

- Built by German engineer Konrad Zuse (1941)
- Performs floating point binary arithmetic,

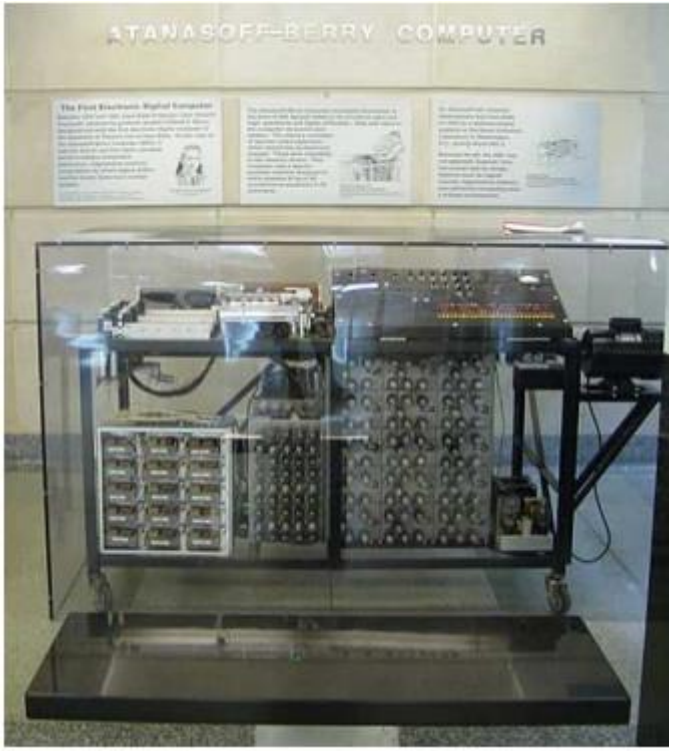
  and has a 22-bit word length
- Used for aerodynamic calculations
- Destroyed in a bombing raid on Berlin in 1943

# Bombe

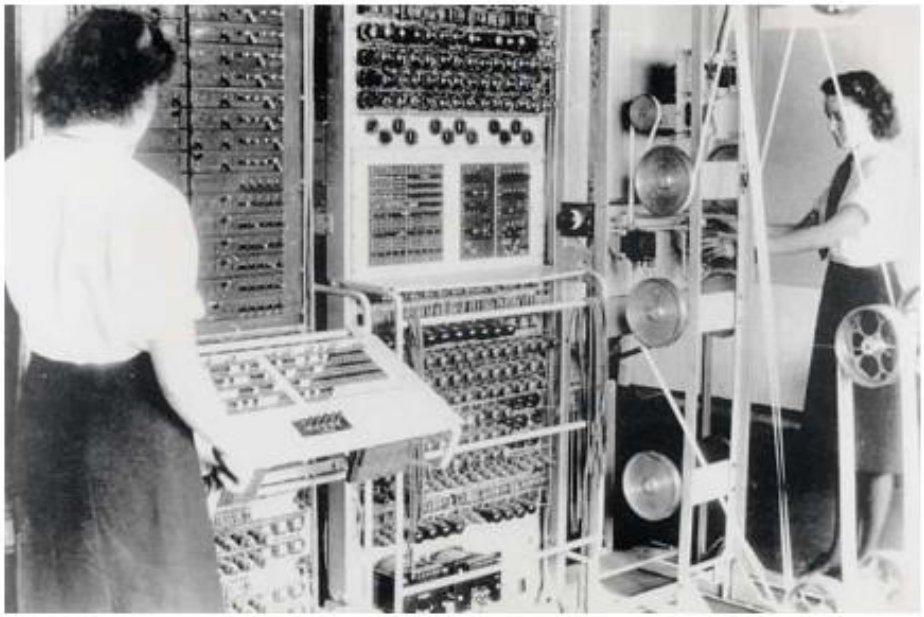
- Initial design by Alan Turing in 1939, built by Harold Keen
- Electromechanical device used to decrypt German messages encrypted by Enigma during WWII

# Atanasoff–Berry Computer (ABC)

- First automatic electronic digital computer
- Designed by John Vincent Atanasoff and Clifford Berry in Iowa State College in 1942
- Used only to solve systems of linear equations
- Not programmable

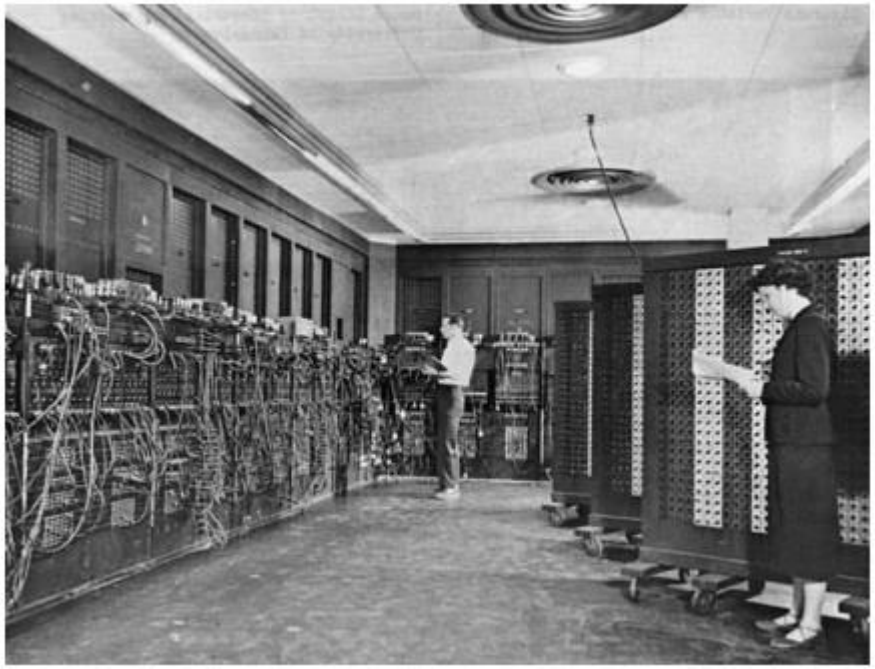


# Colossus



- World's first programmable, electronic, digital computer
- Programmed by switches and plugs
- Designed by Tommy Flowers in 1943
- Used by British code-breakers during 1943–45 for the cryptanalysis of the Lorenz cipher

# ENIAC: Electronic Numerical Integrator and Computer



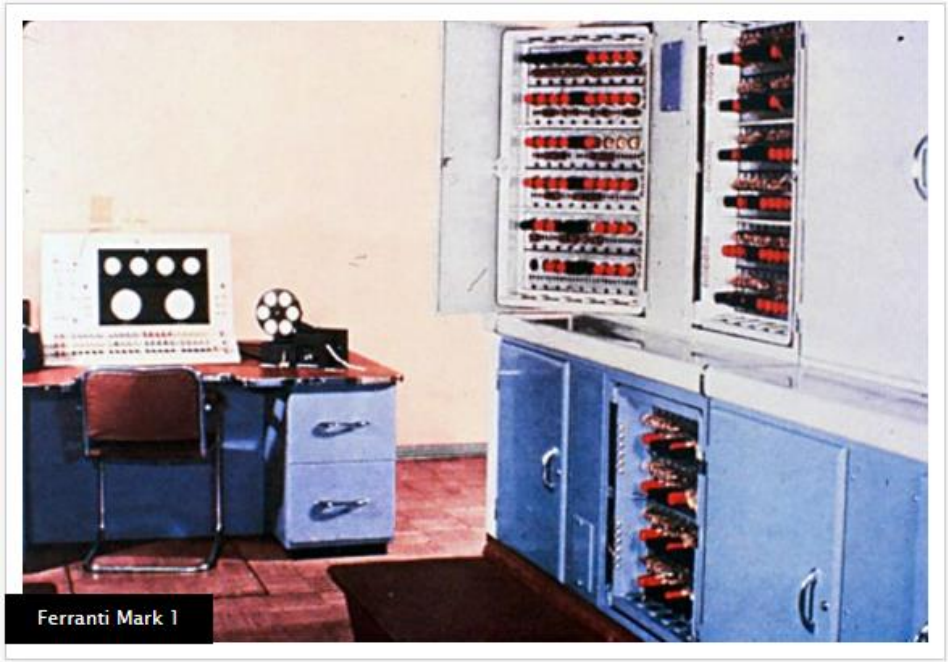
- First electronic programmable computer
- Built during 1943–45 by John Mauchly and J. Presper Eckert of University of Pennsylvania, funded by US Army
- Programmed by cables and switches

# Manchester Baby

- Small-Scale Experimental Machine
- World's first stored-program computer
- Built by Frederic C. Williams, Tom Kilburn and Geoff Tootill in Victoria University of Manchester
- First program ran on 21 June 1948

# Ferranti Mark 1 (Manchester Electronic Computer)

- World's first commercial general-purpose electronic computer
- Designed at the University of Manchester by Freddie Williams and Tom Kilburn
- Built by UK firm Ferranti International PLC
- Sale started in 1951


Ferranti Mark 1

# UNIVAC I:UNIVersal Automatic Computer I


Univac 1 installation

- First commercial computer in US
- Designed by Eckert–Mauchly Computer Corporation
- Produced from 1951

# EDSAC 2: Electronic Delay Storage Automatic Calculator 2

- Concept of microprogramming was introduced by Sir Maurice Vincent Wilkes of University of Cambridge
- EDSAC2 was designed by Wilkes in 1958
- First computer to have a microprogrammed control unit

# Harwell CADET: Transistor Electronic Digital Automatic Computer


- Bipolar transistor was invented in 1947 by Bardeen, Brattain, and Shockley of Bell Labs
- A partially transistorized computer was built by Tim Kilburn at University of Manchester in 1953
- CADET was world's first fully transistorized computer
- Built in 1955 by Atomic Energy Research Establishment, UK

# Atlas and IBM 7030 Stretch

- World's first supercomputers
- Atlas was developed jointly by University of Manchester, Ferranti, and Plessey
- Stretch was developed at IBM

# CDC 6600


- World’s first successful supercomputer
- Designed by Seymour Cray at Control Data Corporation
- World’s fastest computer from 1964 to 1969
- Superseded by CDC 7600

# Personal Computers

- Altair 8800: an 8-bit microcomputer, designed in 1974 by Micro Instrumentation and Telemetry Systems, the first commercially successful personal computer
- Apple II: an 8-bit home computer, designed primarily by Steve Wozniak, released in June 1977, the first highly successful mass-produced microcomputer

# Laptop Computers


- Epson HX-20 (aka HC-20) was the first laptop computer
- Invented in July 1980 by Yukio Yokozawa at Seiko, Japan
- Introduced by Epson in North America as HX-20 in 1981
- Weight: 1.6 kg
- It was both the first notebook and the first hand-held computer

# Q7: The Largest Computer Ever Built

- AN/FSQ-7 Combat Direction Central was built in 1958 for USAF
- Weight: 250 Tons
- 60,000 vacuum tubes
- 3 megawatts of electricity
- 75,000 instructions per second

# 1981

IBM introduces its Personal Computer (PC)

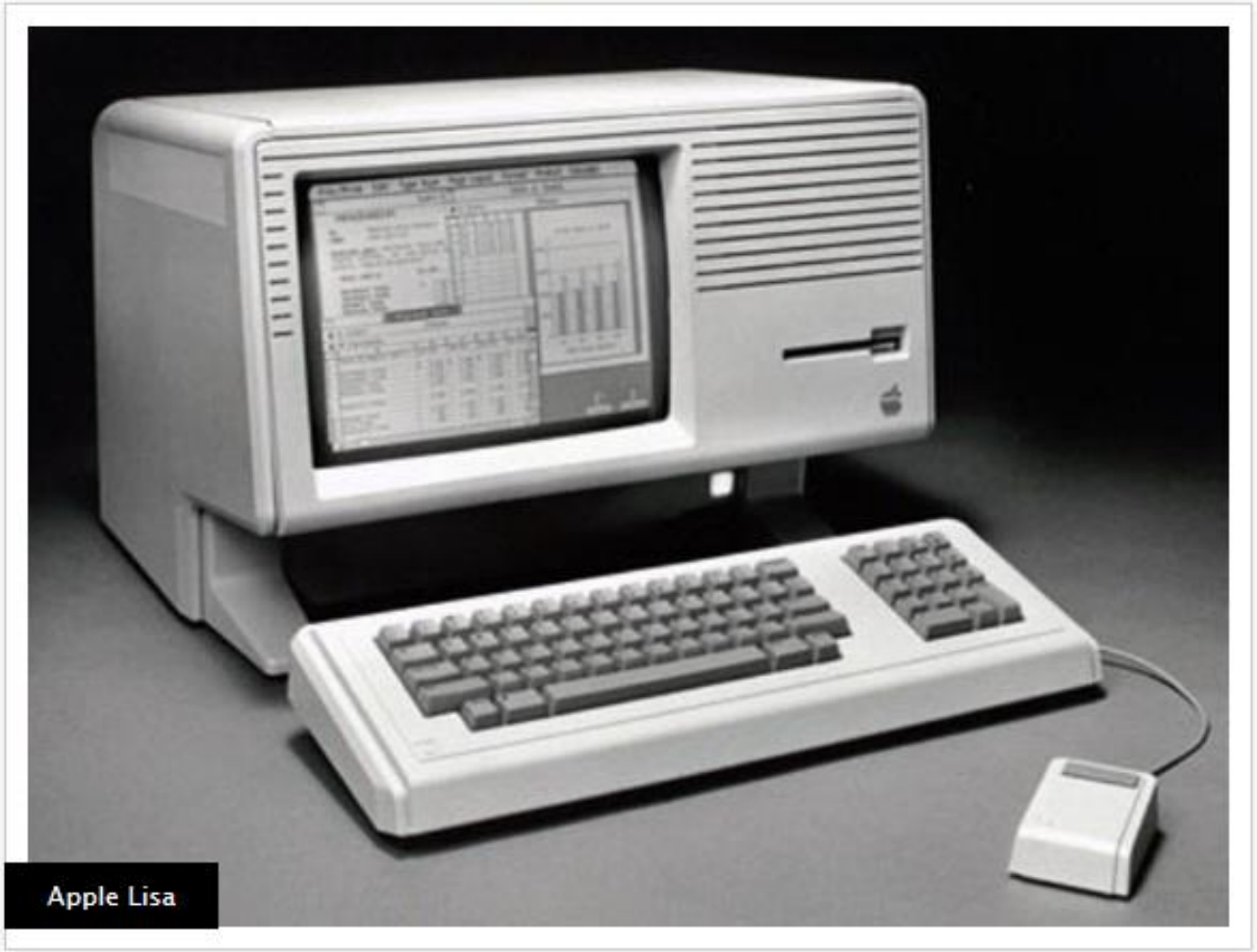

IBM PC

# 1982: Sun Microsystems Workstation

Sun-1 workstation

# 1983

## Apple introduces the Lisa computer



Apple Lisa

# 1984

Apple Computer launches the Macintosh

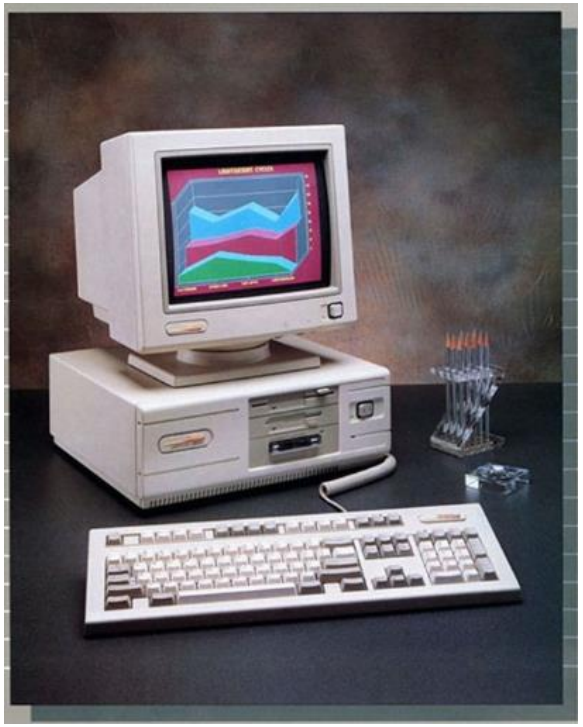

Apple Macintosh

IBM releases its PC Jr. and PC/AT

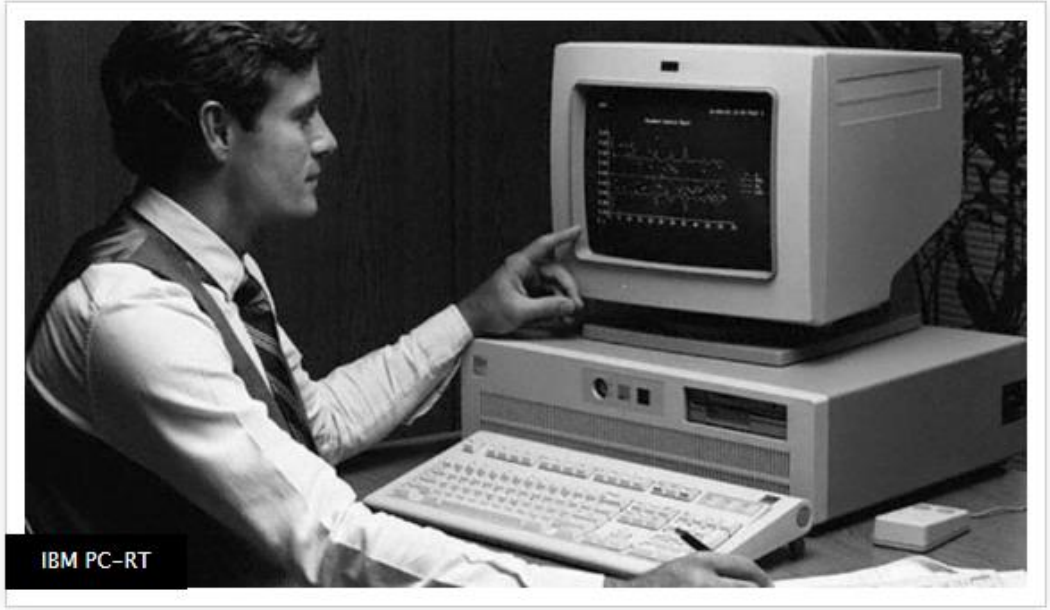
IBM PC Jr.

# 1986

Compaq introduces the Deskpro 386 system

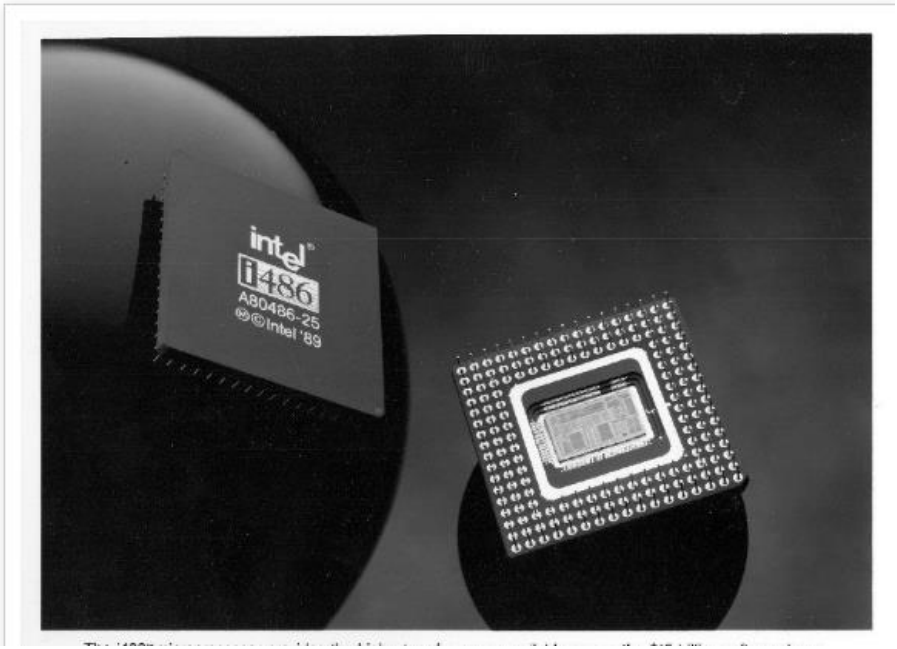


IBM releases the first commercial RISC-based workstation



# 1989

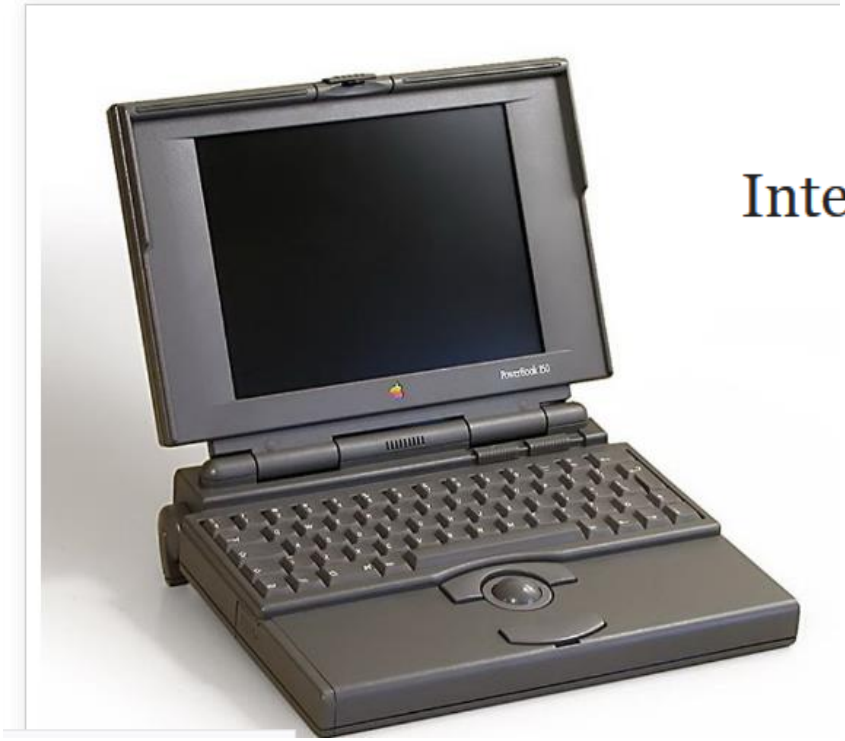
Intel introduces the 80486 microprocessor




Macintosh Portable is introduced

# 1991

PowerBook series of laptops is introduced



# 1993

Intel's Pentium microprocessor is released

# 1996

Sony Vaio series is begun

Sony Vaio laptop

# 2002

Earth Simulator is world's fastest supercomputer


Earth Simulator Supercomputer

# 2005

Arduino

Arduino starter kit

- Used a Java-based integrated development environment
- Users could access a library of programs, called “Wiring,” that allowed for simplified programming.
- Arduino soon became the main computer platform of the worldwide “Maker” movement.

# 2008

The MacBook Air is released

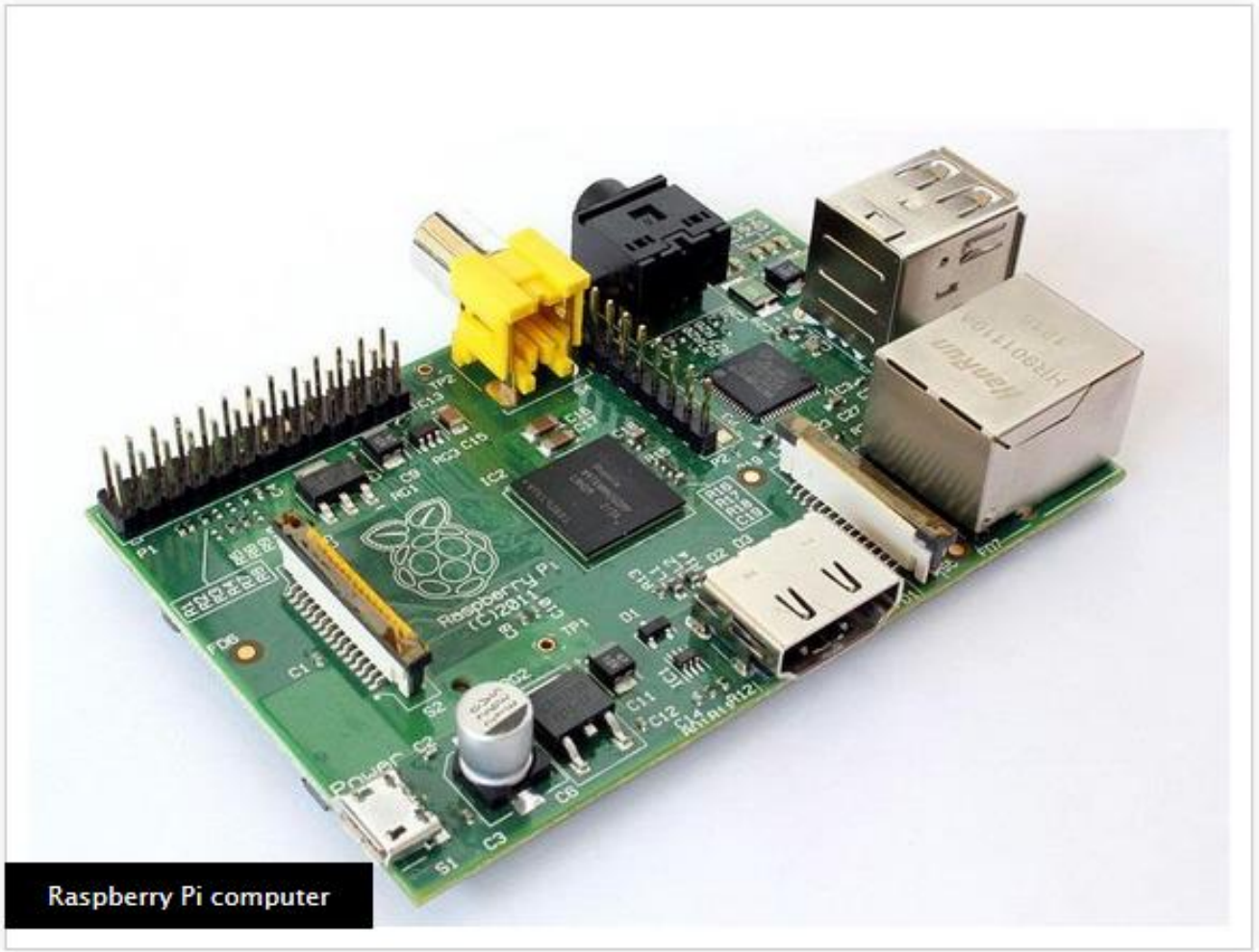
# 2009

IBM's Roadrunner supercomputer is completed

Computer-enhanced image of IBM's Roadrunner

# 2012

## Raspberry Pi, a credit-card-size single board computer, is released as a tool to promote science education



Raspberry Pi computer

# Computers are Everywhere Today

# Detailed History is available in

**https://www.computerhistory.org/timeline/computers/**

# Next Lecture

## Algorithms, Flowcharts