

First Generation Computers 1951 - 1959

- Vacuum tube logic.
- Magnetic drum or tape storage.
- Punched cards used for data inputs.
- Programmed in machine language.
- Large, slow and expensive.

Second Generation Computers 1959 – 1963

- Discrete transistors replace vacuum tubes.
- Magnetic core used for main memory.
- Magnetic disk storage developed.
- Faster, smaller, and more reliable.
- Time-sharing systems developed.
- First programming languages appear.

Third Generation Computers 1963 – 1965

- Based on small and medium scale integrated circuits.
- Smaller and less expensive than mainframes: minicomputers.
- Timesharing through remote Teletype terminals with printers or CRT displays.

Influence of DEC minicomputers

- The designers of Intel's first microprocessor were familiar with the architecture of the PDP series.
- Gary Kildall, based CP/M operating system on PDP operating system.
- PDP-11 introduced a common system bus (Unibus) for peripheral equipment.
- PDP-11 used a version of BASIC adapted for its small memory space.
- Many pioneers of microcomputers learned on PDP computers, including Paul Allen, Bill Gates, and Steve Wozniak.

Fourth Generation Computers 1975 – Present

- Based on microprocessor technology.
- Semiconductor RAM and ROM memory.
- Cathode ray tube monitor display.
- Floppy disk drive and hard disk drive storage.
- Personal workstation.
- Local Area Networks.

ARPA

- In 1957 the Soviet Union launched Sputnik.
- To boost the American Space program, Eisenhower formed Advanced Projects Research Agency (ARPA) in 1958. NASA was created later that year.
- In 1962, ARPA hired J. C. R. Licklider to head the Information Processing Technology Office.
- Licklider advocates the development of “man-computer symbiosis” and an “intergalactic network”.

ARPANET

- IPTO funded the development of a computer network to link computer science research centers, which became the nucleus of what we now know as the Internet.

University of Utah

With the aid of ARPA funding, David Evans established a computer graphics program at the University of Utah in 1968 where he was joined by Ivan Sutherland, the second head of IPTO and the author of SketchPad. Notable graduates from this program include:

- Alan Kay, inspired the user interface for the Alto at PARC, developed SmallTalk language, Apple fellow, Disney fellow.
- John Warnock, worked on Interpress page description language at Xerox PARC, co-founder of Adobe Software, which marketed Postscript page description language.
- Nolan Bushnell, developer of Pong and founder of Atari.
- Henri Gouraud, created Gouraud shading for polygon shading.
- Edwin Catmull, Lucasfilms digital division, co-founder of Pixar.
- Bui Tuong-Phong, invented Phong shading for rendering reflections in 3-D graphics.
- Jim Clark, co-founder of Silicon Graphics, co-founder of Netscape.

Concepts developed at Xerox Palo Alto Research Center (PARC) in the 1970s:

- Desktop (documents, file folders, icons, overlapping windows)
- Ethernet networking
- Laser printer and page description language
- Digital video editing
- Object oriented programming (Smalltalk)

Xerox PARC researchers - Where are they now?

Adobe Systems

Charles Geschke
John Warnock
Ed McCreight
Edward Fiala

Disney Imagineering

Alan Kay
Ted Kaehler
Daniel Ingalls

Microsoft

Butler Lampson
Charles Simonyi
Alvy Ray Smith
Gary Starkweather
Charles Thacker

Sun Microsystems

Bert Sutherland
James Mitchell

3-Com Corporation

Bob Metcalfe
Robert Sproul

Interval Research

Richard Shoup
David Liddle

Apple

Larry Tesler (until 1998)
Alan Kay (until 1996)
Gary Starkweather

Sematech

William Spencer

Pixar (Lucasfilm)

Alvy Ray Smith

Digital Equipment Corporation

Bob Taylor (retired)
Charles Thacker (until 1997)