15-292
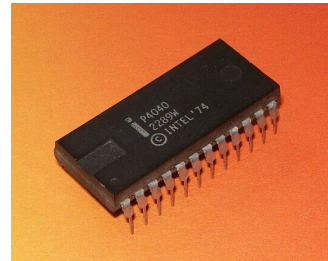# History of Computing
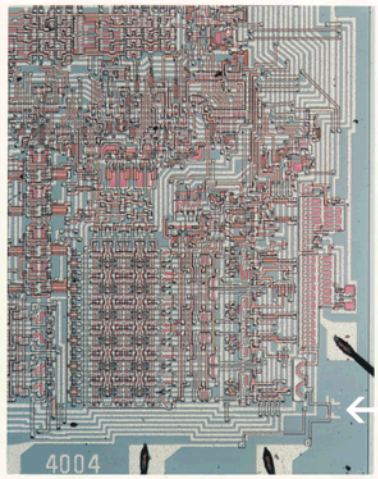
The microprocessor and
the personal computer

1

Intel 4004

Considered the world's
first microprocessor.

4-bit CPU.

It was released November 15th, 1971.

The 4004 circuit was built of 2,300 transistors.

Originally designed for the Japanese company
Busicom to be used in their line of calculators.

The chief designers of the chip
were Stan Mazor, Federico
Faggin and Marcian "Ted" Hoff
of Intel and Masatoshi Shima
of Busicom.

(L to R) Mazor, Faggin, Hoff, Shima
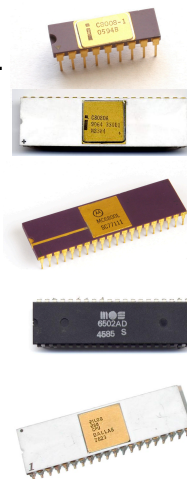
2

Intel 4004

• **Federico Faggin leaves Intel in 1974 to start Zilog, a rival company (maker of the Z80 microprocessor).**

• **Intel "disowns" his contribution to the invention of the microprocessor in patents and advertising.**

4004

3

The first 8-bit microprocessors

The **8008** was an early CPU designed and manufactured by Intel, introduced in April 1972.

The **8080** was designed and manufactured by Intel, released in April 1974 and sold for $360.

The **6800** was produced by Motorola and released shortly after the Intel 8080 in 1975.

The **6502** was designed by MOS Technologies and introduced in September 1975.

The **Z80** was designed and manufactured by Zilog from 1976 onwards. It was widely used both in desktop and embedded computer designs and is one of the most popular CPU's of all time

4

Altair 8800

A microcomputer design announced in January 1975, based on the Intel 8080 CPU.

Sold as a kit through *Popular Electronics*

Manufactured by Micro Instrumentation Telemetry Systems (MITS) in Abuquerque, NM by Ed Roberts and others.

In 1976, the competing IMSAI 8080 was released

5

Altair 8800

6

William Henry Gates III

Bill Gates was born on October 28, 1955 in Seattle, WA

His father was a corporate lawyer and his mother was a board member of First Interstate Bank, Pacific Northwest Bell and the national board of United Way.

Gates went to Lakeside School (with Microsoft co-founder Paul Allen), Seattle's most exclusive prep school

Later he went to study at Harvard University, but dropped out without graduating.

Co-founded Microsoft in 1975. (More later)

After Microsoft, he launched the Bill & Melinda Gates Foundation to enhance healthcare and eliminate extreme poverty around the world and improve education in the United States

7

Paul G. Allen

Born January 21, 1953 in Seattle, WA

Allen went on to attend Washington State University, though he dropped out after two years.

Worked at Honeywell as a programmer in Boston.

Co-founded Microsoft Corporation (together with Bill Gates).

He was forced to resign from Microsoft in 1982 after being diagnosed with Hodgkin's disease.

He was a major philanthropist (the arts, community culture and social change) and also one of the principal financiers behind the SETI (Search for Extra-Terrestrial Intelligence) project.

He died in 2018 from non-Hodgkin lymphoma.

8

The start of Microsoft

Founded in Albuquerque, New Mexico in 1975 by Bill Gates and Paul Allen

Originally, they developed and sold BASIC interpreters under the company name Micro-soft.

First successful interpreter used by Ed Roberts for the Altair 8800.

Retained the rights to market their BASIC interpreter to other companies.
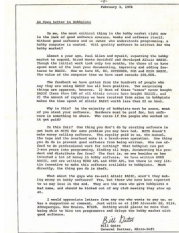
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Altair & BASIC

10

Bill Gates writes an open letter...

...Almost a year ago, Paul Allen and myself, expecting the hobby market to expand, hired Monte Davidoff and developed Altair BASIC. Though the initial work took only two months, the three of us have spent most of the last year documenting, improving and adding features to BASIC. Now we have 4K, 8K, EXTENDED, ROM and DISK BASIC. The value of the computer time we have used exceeds $40,000. The feedback we have gotten from the hundreds of people who say they are using BASIC has all been positive. Two surprising things are apparent, however, 1) Most of these "users" never bought BASIC (less than 10% of all Altair owners have bought BASIC), and 2) The amount of royalties we have received from sales to hobbyists makes the time spent on Altair BASIC worth less than $2 an hour. Why is this? As the majority of hobbyists must be aware, **most of you steal your software**. Hardware must be paid for, but software is something to share. Who cares if the people who worked on it get paid? Is this fair? One thing you don't do by stealing software is get back at MITS for some problem you may have had. MITS doesn't make money selling software. The royalty paid to us, the manual, the tape and the overhead make it a break-even operation. One thing you do do is prevent good software from being written. Who can afford to do professional work for nothing? What hobbyist can put 3-man years into programming, finding all bugs, documenting his product and distribute for free? The fact is, no one besides us has invested a lot of money in hobby software. ... **Most directly, the thing you do is theft.** ... I would appreciate letters from any one who wants to pay up, or has a suggestion or comment...
- Bill Gates, February 3, 1976

11

11

Micro-Soft, 1978

Steve Jobs

Steven Paul Jobs was born February 24, 1955, and was adopted soon after birth.

In 1972, Jobs graduated from Homestead High School in Cupertino, California and enrolled in Reed College in Portland, Oregon, but he dropped out after one semester.

In 1976, Jobs and his friend Steve Wozniak founded Apple Computer.

In 1985, Jobs left Apple and founded NeXT Computer.

In 1986, Jobs bought the Graphics Group (Pixar) from Lucasfilms' graphics division.

In 1997, Jobs returned to Apple, which was in a failing condition, and turned the fortune of the company around with the introduction of the iMac, later the iPod and iPhone.

Died in 2011 after a long bout with cancer.
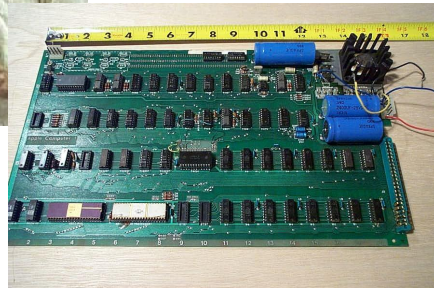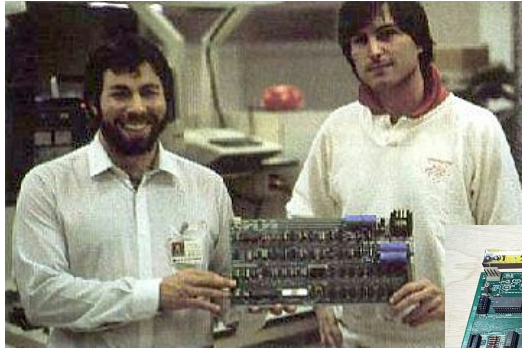
13

Steve Wozniak ("Woz")

Born August 11, 1950 in San Jose, CA

Worked with Jobs in Homebrew Computer Club.

In 1976, Jobs and Wozniak formed Apple Computer Company.

> Apple's first product was the Apple I, priced at $666.66.
> Apple I earned the company close to one million dollars.

Went back to get BS degree from UC Berkeley,1982.

He left Apple for good in February 1985.

In September 2000, Steve Wozniak was inducted into the National Inventors Hall of Fame.

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Wozniak & Jobs
with the Apple I motherboard

15

Steve Jobs
the start of Apple (talk from 1980)

16

The Apple II

The Apple II family was the first series of microcomputers made by Apple Computer, in the late 1970s and early-to-mid 1980s.

The first Apple II came with:

a Mostek 6502 microprocessor running at 1 MHz

4 KB of RAM

an audio cassette interface

and the Integer BASIC programming language built into ROM

Introduced shortly thereafter, an external 5¼" floppy disk drive with controller card that plugged into one of the computer's slots, enabled much more convenient data storage and retrieval.
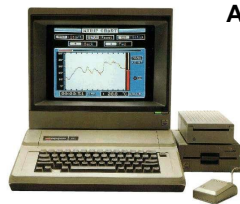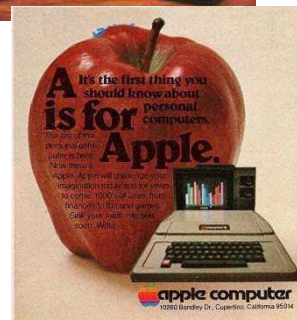
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The Apple II

http://apple2history.org/

Apple IIc

Apple II Plus

Apple IIe

18

VisiCalc

The first spreadsheet program available for personal computers.

It was the "killer app" that turned the microcomputer from a hobby for computer enthusiasts into a business tool.

Conceived by Dan Bricklin, refined by Bob Frankston and distributed by Personal Software Inc. in 1979 (later VisiCorp) for the Apple II computer,

This likely motivated IBM to enter the PC market which they had been ignoring until then.

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Commodore PET

The **PET** (*Personal Electronic Transactor*) was a home-/personal computer produced by Commodore Business Machines starting in the late 1970s.

Top seller in the US and UK educational market

20

TRS-80

The designation for several lines of computer systems produced by the Tandy Corporation and sold through its Radio Shack stores in the late-1970s and 1980s.

Affectionately known as the "Trash-80"

21

Cheap Computers

British inventor Sir Clive Sinclair introduced the ZX80 in 1980, an inexpensive computer designed to bring computing to the masses.

The first fully assembled computer for less than $100.

The Commodore 64 (in 1982) was the first cheap computer to have a whopping 64 KB of RAM

A decade later it still held the record as the best-selling single computer model of all time selling an estimated *22 million* units.

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11

Commercials

23

IBM PC

IBM enters the personal computer market as a response to the success of Apple

Departure from standard IBM practices

- Use off-the-shelf components from various OEMs
- Design an open architecture so other companies could produce and sell compatible machines

Hoped to get royalties from licensing of BIOS

Led by William C. Lowe & later Don Estridge at IBM offices in Boca Raton, Florida.

The first IBM PC was released on August 12, 1981, at a base price of $1,565.

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IBM 5100

IBM 5100 released in 1975 was IBM's first attempt at the PC market, but it failed.

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IBM PC

IBM PC – model 5150

IBM PC AT

IBM PC XT– model 5160

26

IBM PC needs an OS

Gary Kildall (1942-1994) was the creator of the CP/M operating system & founder of Digital Research Corp.

IBM approaches Kildall for an OS for the IBM PC, but he loses the contract

> Lost contract because he decided to go flying and keep IBM waiting, OR

> His wife (and business manager) refused to sign IBM's non-disclosure agreement

Microsoft sells DOS to IBM as PC-DOS.

> Original version purchased from Seattle Computer Systems.

> Called QDOS (Quick and Dirty Operating System) as a clone of the popular CP/M OS.

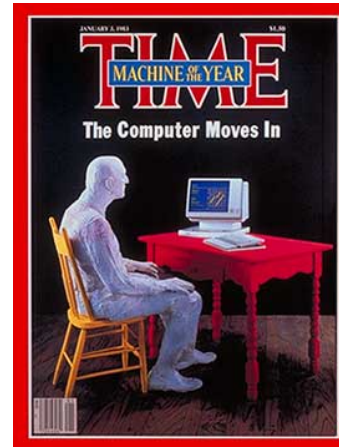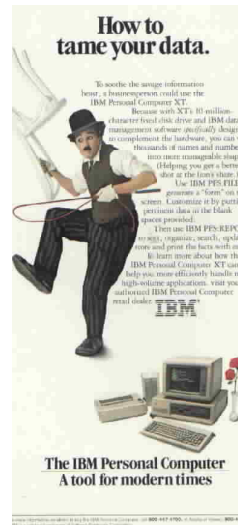> Microsoft retains rights to MS-DOS

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Kildall vs. Gates

28

14

IBM Clones

Due to the open architecture of the IBM PC, many PC "clones" soon followed that ate into IBM's profits.

Compaq Computer Corporation was founded in February 1982 by Rod Canion, Jim Harris and Bill Murto, three senior managers from semiconductor manufacturer Texas Instruments.

Compaq's efforts were possible because

IBM had used mostly "off the shelf" parts for their PC

Microsoft had kept the right to license the operating system to other computer manufacturers.

The only part which had to be copied was the BIOS

Compaq did this legally by reverse-engineering it at a cost of $1 million.

Numerous other companies soon followed their lead.

Compaq Portable (1982)

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More Clones
(courtesy of the Computer History Museum)

Eagle Personal Computer

Hyperion Personal Computer

Compaq Deskpro 286

Turbo Personal Computer

32

Commercials

33

Advent of Word Processing

An Wang starts Wang Laboratories in 1951

Wang's word processing machine, WPS, was introduced in June 1976 and was an instant success.

WordStar by Micropro was a word processor application, originally written for the CP/M OS (but later ported to MSDOS) that enjoyed a massive market share during the early-to-mid-1980s.

WordStar lost considerable market share in the late 1980s to WordPerfect.

WordStar released a version for Windows but was late in doing so, and Microsoft Word was already the popular choice for word processing by the early 1990s.

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