

## **The History of Computers**

You will learn about the developments in computing and other related technologies that were made from the 1940's onward.

James Tam

### **History Part II: The Electronic Computers**

- The ABC
- The ENIAC
- The Bletchley Park computers

James Tam

## The People Behind The ABC (Atanasoff-Berry Computer)

- John Atanasoff

- A professor at Iowa State College (now Iowa State university)



- Clifford Berry

- A graduate student studying under Atanasoff



James Tam

## Motivations For Developing The ABC

- Atanasoff was researching methods of solving complex mathematical equations.

$$\epsilon_0 \oint E \cdot dA = \sum q$$

$$\oint B \cdot ds = \mu_0 \int J \cdot dA + \mu_0 \epsilon_0 \frac{d}{dt} \int E \cdot dA$$

$$\oint E \cdot ds = -\frac{d}{dt} \int B \cdot dA$$

$$\oint B \cdot dA = 0$$

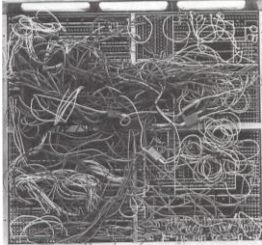
- He started by modifying the small IBM calculator that was leased to the college to see if it could solve these problems.



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## Motivations For Developing The ABC (2)

- His modifications were extensive



- The folks at IBM weren't happy with the modifications



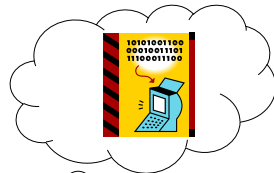
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## Motivations For Developing The ABC (3)

- Atanasoff then decided to build his own machine.
- Unfortunately this proved to be more of a daunting task than he first anticipated.



- After a particularly frustrating night he decided to take a break from the lab.



- This led to an astonishing breakthrough!

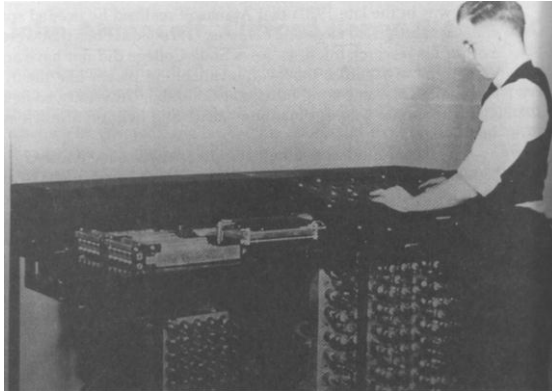


Wav file from "The Simpsons"

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## The First Electronic Computer: The ABC

- After enlisting the aid of Berry and several years of hard work the ABC was *nearly* completed at a cost of \$6000 (including the \$450 paid to Berry) in 1942.
- It was the first *prototype* electronic computer!

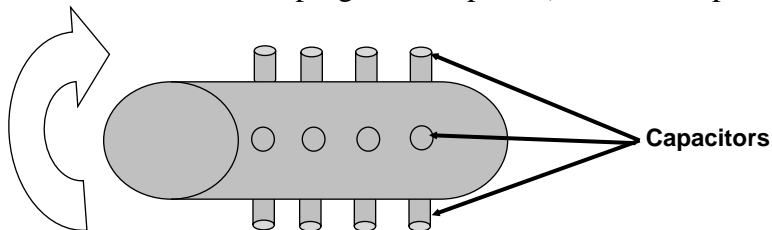


A photo of Clifford Berry and the ABC, courtesy of Dr. Atanasoff

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## The First Electronic Computer: The ABC (2)

- It used a form of regenerative memory that was similar to the kind used in modern RAM.
- But it was not a stored program computer (modern computer).



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## The Moore School Of Electrical Engineering

- It was a major provider of technical and computing resources for the US arm (Ordinance department, ballistics research lab)



- Current approaches to calculate trajectories were too slow and work on the ENIAC was begun to solve these problems.

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## The People Behind The ENIAC

- John Mauchly
  - A Physics professor at Ursin College.
  - Developed the designs for the ENIAC



- J. Presper Eckert
  - A lab instructor at the Moore School
  - Designed the individual circuits of the ENIAC



- Joseph Chedaker
  - Supervised the construction team

James Tam

## The Second Electronic Computer: The ENIAC (Electronic Numerical Integrator Calculator)

- It was completed in 1949 at a cost of \$500,000
- The machine was huge and required a great deal of resources
  - 8' high x 3' deep x 100' long
  - 30 tons
  - 140,000 watts to power
  - 18,000 vacuum tubes



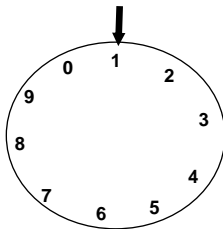
Image from the History of Computing Technology by Michael R. Williams

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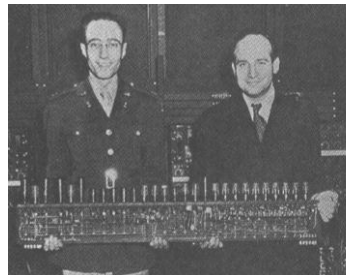
## The Second Electronic Computer: The ENIAC (2)

- Many of the components were just electronic equivalents of the mechanical version.
- E.g., to store a single digit:

Mechanical approach



The approach used in the ENIAC



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## The ABC And The ENIAC

- The ABC was the first *prototype* electronic computer (not quite completed): 1942.
- The ENIAC was the first *fully operational* electronic computer (finished): 1949.

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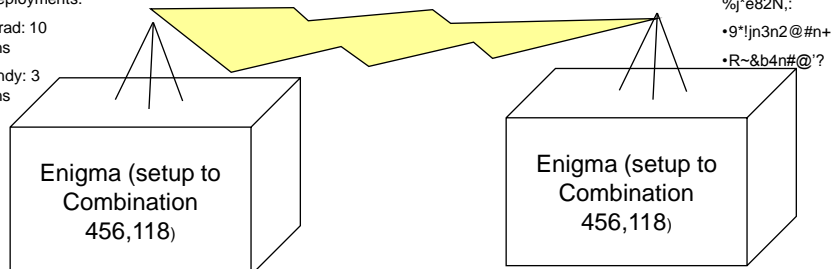
## The Machines At Bletchley Park: Colossus Machines

- The Enigma machines: used before and during WWII by Germany as an encryption device.
- There were two version: one for the military and one for business.
- The sheer number of possible combinations (100 billion!) made mere possession of the machines useless.

Troop deployments:

•Stalingrad: 10  
divisions

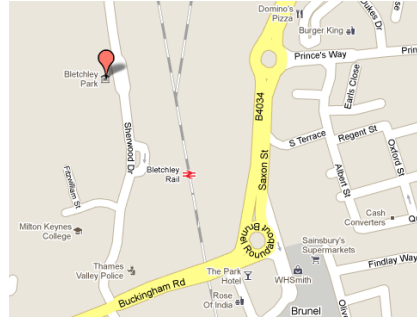
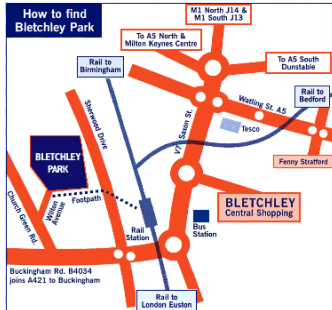
•Normandy: 3  
divisions



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## The Machines At Bletchley Park: Colossus Machines (2)

- The British code breaking group, the Code and Cipher School worked on deciphering the German codes at Bletchley Park outside of London:

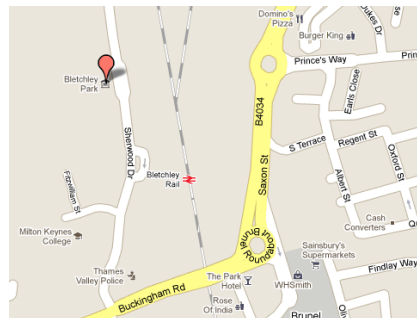
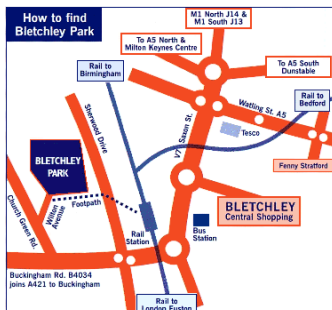


- Intelligence work involved a great deal of secrecy:
  - Information was strictly on a “need to know basis” for the people working there.
  - Even now much of the information is still classified

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## The Machines At Bletchley Park: Colossus Machines (2)

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**TOP SECRET**



## An Enigma Machine



Photo: courtesy of James Tam (Imperial War museum: London England)

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## Alan Turing



- A distinguished British Mathematician from Cambridge.
- He worked at Bletchley Park as a code-breaker (contributed to the design of the machinery as well as applying his Mathematical knowledge).

Image from the History of Computing Technology by Michael R. Williams

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## The Third Set Of Electronic Computers: The Machines At Bletchley Park

- Heath Robinson machines (1942)
  - Used a combination of mechanical relays and electronic vacuum tubes
  - Their exact function is still unknown but they were probably used for deciphering the German codes
  - Unreliable
- The Colossus (1943)
  - Developed to replace the Heath Robinson machines
  - Addressed the reliability problem by replacing the relays with vacuum tubes
  - The produced a remarkable increase in speed over the previous machines.
  - Miraculously the first one was completed in less than a year.

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## The Third Set Of Electronic Computers: The Machines At Bletchley Park

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## Before The First Stored Program Computers

- Before these computers were developed existing machines received their instructions from:

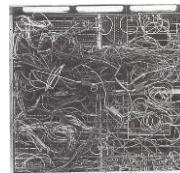
- Punch card



- Punch tape



- Complex wiring and rewiring techniques.



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## Who Came Up With The Concept Of The Stored Program Computer?

- Why it's important.
  - It's a fundamental part of modern computers.
- The answer
  - It's shrouded in a great deal of controversy.
- The location where the idea was developed
  - The Moore School (the team that developed the ENIAC)
- The person most widely credited with coming up with the idea
  - John Von Neumann



- He received so much notoriety that modern computers are sometimes referred to as "Von Neumann machines".

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## The Manchester Machine

- After the end of the war many of the people who worked at Bletchley Park obtained jobs at Manchester university.
- In 1948 the Manchester machine was the first fully electronic machine that operated based on the instructions stored in it's memory.
- However the initial machine was extremely limited in it's capabilities:
  - The instruction set consisted of subtractions, conditional branches and a 'stop' instruction.

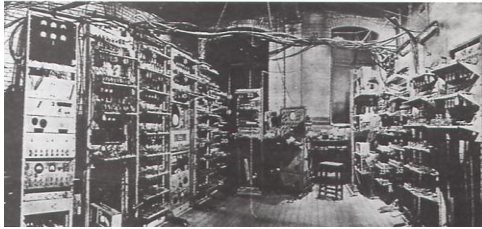


Image from the History of Computing Technology by Michael R. Williams

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## History Part III: Modern Times

- History of the microcomputer
- History of the Internet

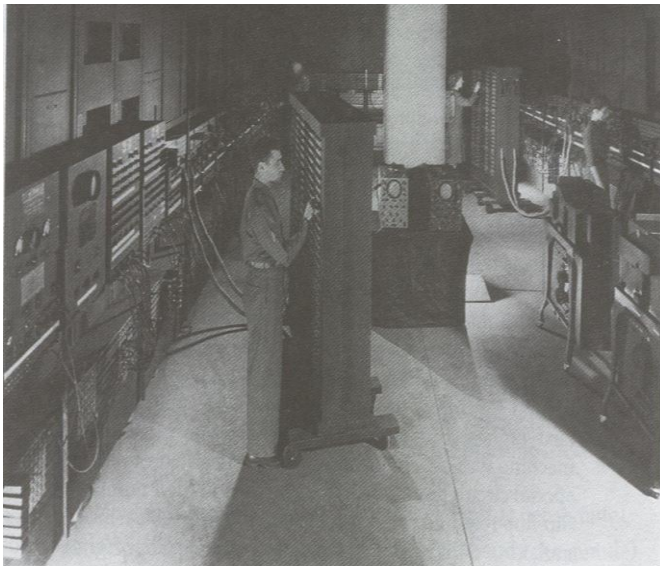
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## History Of The Microcomputer

- The microprocessor
- The first microcomputer for home users: Altair
- Microsoft and it's influence on Microcomputers
- The IBM-PC
- History of Apple computers
- The attack of the clones and the rise of Microsoft

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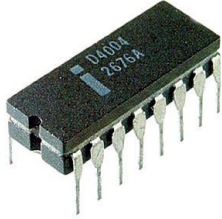
## Recall: Computers Before The Microprocessor



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## The First Microprocessor

- Produced by Intel in the early 1970's
- It's development revolutionized computers by allowing computers to be more widely used.



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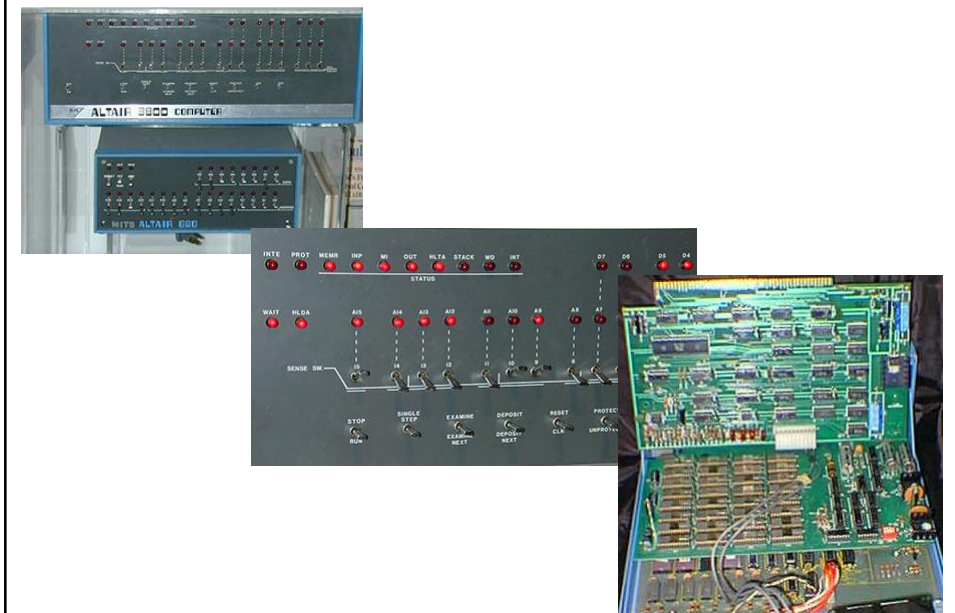
## What Is Microcomputer?

- Sometimes it's referred to as a 'PC' (Personal Computer)

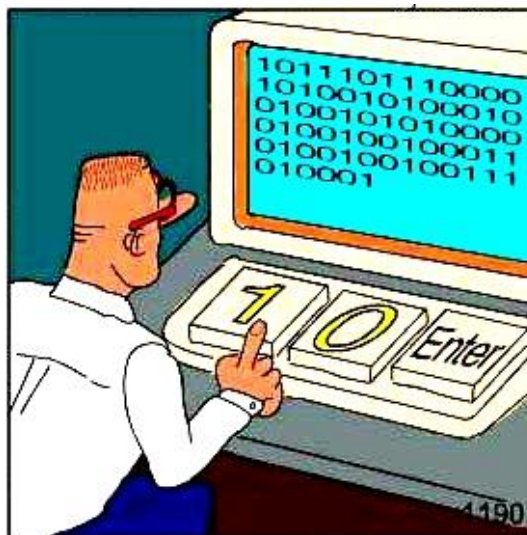


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## The First Computer For Home Users: The Altair



Note: Most Computer Users At The Time Were  
Extremely Technically-Oriented



**REAL Programmers code in BINARY.**

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## Microsoft's Influence On Microcomputers



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## Microsoft's Influence On Microcomputers (2)

- IBM approached two companies as possible vendors of an operating system to run its computers:
  - Digital Research
  - Microsoft
- IBM and Microsoft worked out an arrangement to have a version of Microsoft's DOS (Disk Operating System) run IBM computers: PC-DOS.

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### Microsoft's Influence On Microcomputers (3)

- The interface of PC/MS-DOS has been criticized as being user-unfriendly.

```
C:\Documents and Settings\tamj>dir
Volume in drive C: is System Disk
Volume Serial Number is 7039-558E

Directory of C:\Documents and Settings\tamj
02/17/2007 06:34 PM <DIR> .
02/17/2007 06:34 PM <DIR> ..
11/04/2003 09:11 PM <DIR> .java
11/04/2003 09:11 PM <DIR> .javaws
11/04/2003 09:11 PM <DIR> .jpi_cache
01/20/2004 02:07 PM      710 .plugin141_02.trace
02/19/2003 11:18 AM      3,236 =
02/07/2007 07:27 PM      2,592,068 AdobeWeb.log
02/08/2007 05:42 PM      12,216 cached-routers
02/24/2007 02:51 PM <DIR> cached-routers.new
02/24/2007 05:42 PM <DIR> cached-status
02/25/2007 07:39 PM <DIR> Contacts
02/17/2007 06:36 PM <DIR> Desktop
02/17/2007 06:36 PM      8,422 gsview32.ini
02/13/2007 06:27 PM <DIR> Junk
02/05/2007 11:17 AM <DIR> My Documents
10/14/2003 06:49 PM <DIR> My pictures and videos
02/05/2007 12:05 AM      3,961 N1
02/10/2003 07:49 PM <DIR> presets.ini
02/12/2007 08:37 PM <DIR> Plog
01/08/2007 09:34 PM <DIR> PRESENT
02/12/2007 08:37 PM <DIR> Start Menu
01/08/2007 09:34 PM      23,040 state
12/13/2003 07:03 AM      4,131 subile_technologies.doc
11/19/2003 07:13 PM <DIR> T!
02/29/2003 05:49 PM <DIR> VSWebCache
02/29/2003 05:49 PM <DIR> WINDOWS
01/02/2004 06:26 PM <DIR> zip utilities
02/19/2003 04:51 AM      502,744 ew
02/01/2003 04:50 PM      3,440 #
02/01/2003 04:50 PM      24,852 T!
12/27/2003 06:24 PM      4,131 U1
12/06/2003 07:30 AM      131 s.
19 File(s)      3,195,041 bytes
17 Dir(s)      56,508,698,624 bytes free

C:\Documents and Settings\tamj>
```

Command

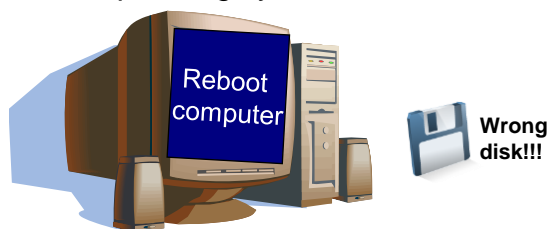
Effect of the command

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### Microsoft's Influence On Microcomputers (4)

- However the interface of PC/MS-DOS was a significant improvement over other operating systems.

CP/M operating system



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## Microsoft's Influence On Microcomputers (4)

- However the interface of PC/MS-DOS was a significant improvement over other operating systems.

PC/MS-DOS operating system



```
Not ready reading drive A
Abort, Retry, Fail?_
```

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## The IBM PC (Personal Computer: 1981)

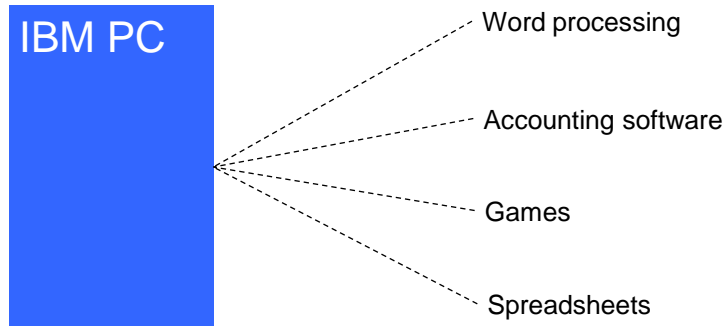


- IBM was a large company but a late comer into the microcomputer market.
- As mentioned its machines used an operating system produced by Microsoft.

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## The IBM PC (Personal Computer: 1981): 2

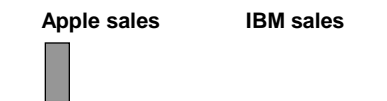
- With the entry of IBM in the microcomputer market, many developers produced a plethora of software.



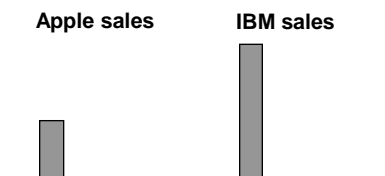
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## The IBM PC (Personal Computer: 1981): 3

- Apple entered the microcomputer market sooner and already had an established market when IBM began to first market the PC.



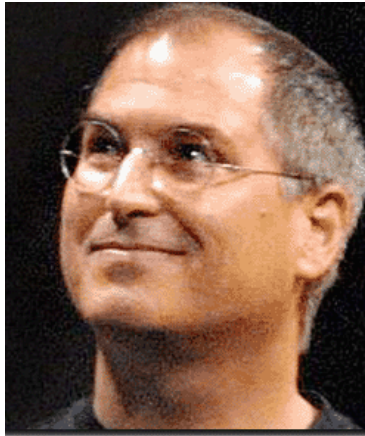
- Because of the prevalence of so much software the IBM-PC soon overtook the Apple in sales.



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## The History Of Apple Computers: Steve And Steve

- Apple was founded by Steven Jobs and Steve Wozniac in Silicon Valley garage.



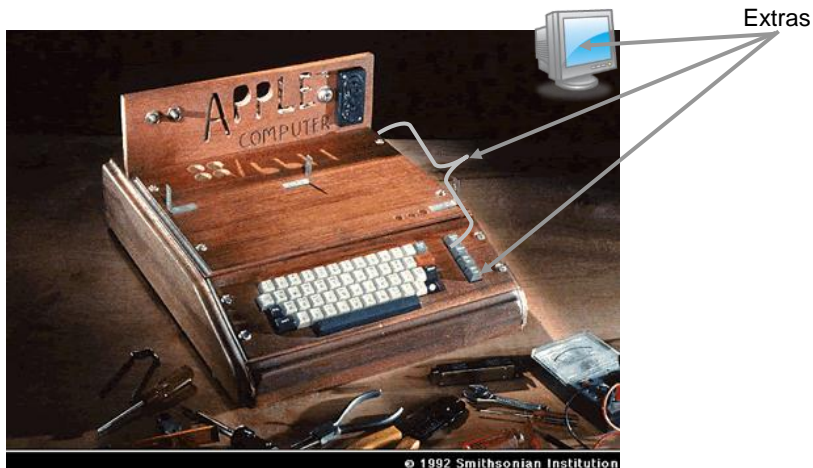
Steven Jobs



Steve Wozniac

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## The Apple I Computer (1976)



- Purportedly built under extreme conditions
- It was far from the standard of a modern computer

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## The Apple II Computer (1977)



- It was a simpler and more powerful design than the Altair
- The color graphics were superior to larger and more expensive computers
- Strong selling points
  - Name
  - Appearance

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## The Apple II Computer (1977): 2



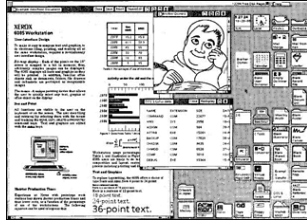
- The storage device was primitive by today's standards but actually sufficient to meet the needs of the time
- VisiCalc: *"It was the software tail that wagged the hardware dog"*

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## First Graphical Interface



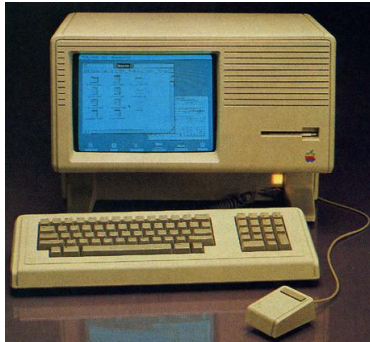
- Contrary to popular belief it was not developed by Apple.
- Xerox star: pioneered in early '80s, copied by almost everyone



- Simulates desktop with icons
- In and out baskets
- File folders and documents
- Calculators
- Printers
- Blank forms for letters and memos

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## The Apple Lisa (1984)



- The Lisa (1983) incorporated many of the features of the Xerox Star.
- Like the Star it was expensive (\$10K) and sales were weak

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## The Apple Macintosh (1984)

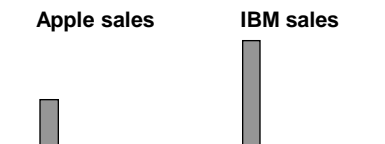


- Apple's next computer was the Macintosh
- It incorporated the best features of the Lisa but was sold at a substantially lower price.
- Also features not present in the Lisa were added to the Macintosh
- Compared to the IBM-PC it was a speed vs. ease of use tradeoff

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## The Attack Of The Clones

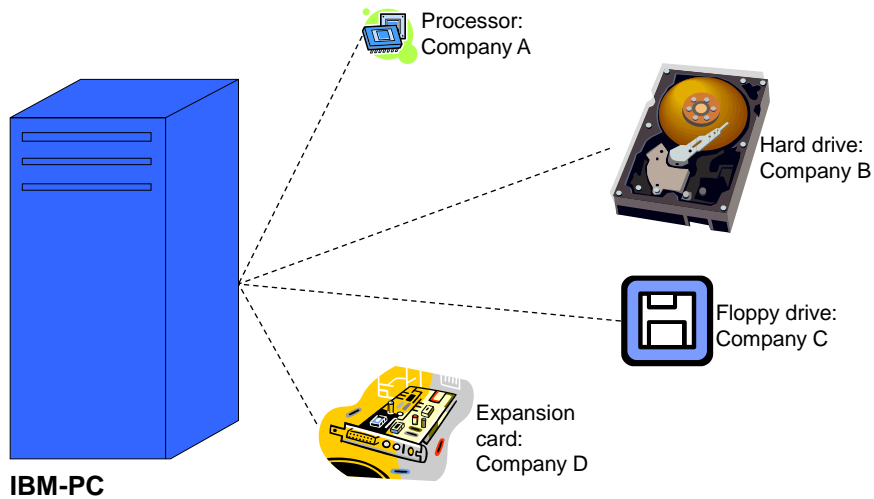
- Although it was a late entry into the microcomputer market IBM eventually dominated.



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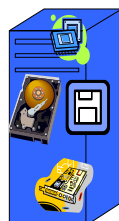
## The Attack Of The Clones (2)

- Although the IBM-PC was marketed and sold under the IBM brand most of the parts were not manufactured in-house.

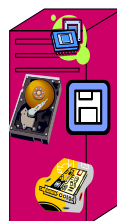


## The Attack Of The Clones (3)

- The parts manufacturers were free to sell their components to other companies.
- About the same time that the IBM-PC was sold, three ex-employees of Texas Instruments founded their own company: Compaq.
  - They conceived of producing their own copy of the IBM-PC under their own brand name.
  - It would run under MS-DOS and be 100% compatible with other software
  - The first IBM-PC clone was delivered by Compaq in 1983.



IBM-PC



Compaq clone

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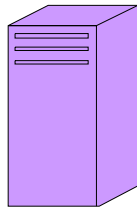


## The Attack Of The Clones (4)

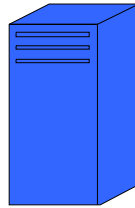
- This opened the flood gates for other computer manufacturers to produce their own clone computers.



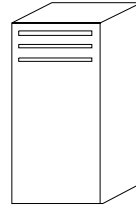
**Compaq  
clone**



**Dell  
clone**



**IBM-PC**

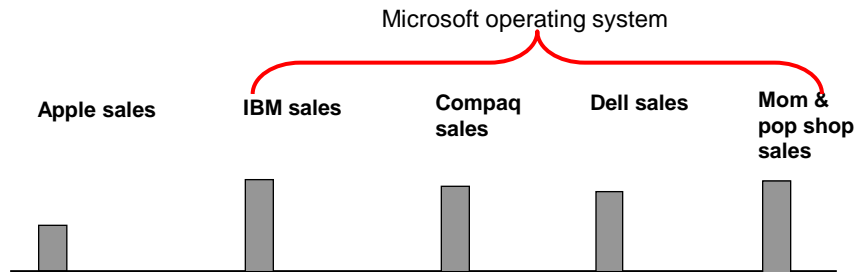


**Mom and pop  
shop clone**

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## The Attack Of The Clones (5)

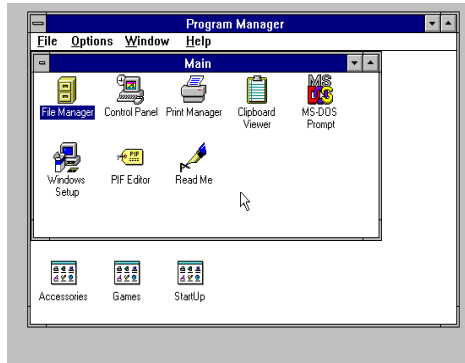
- The result was that IBM eventually lost control over the computer architecture that it marketed.



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## The Attack Of The Clones: The Rise Of Microsoft

- The loser of the clone war was IBM.
- The real winner of the clone war was Microsoft.
- By the 1990's Microsoft developed an interface for MS-DOS that incorporated some of the features of the MAC GUI.



Windows 3.1 © Microsoft

James Tam

## Versions Of Microsoft Operating Systems

- PC/MS-DOS (many versions): text based command line
  - Windows 1.X, 2.X, 3.X
- Windows 95, 98, ME: GUI interface, MS-DOS operating system
- Windows NT: 2000, XP, Vista, 7: newer more secure and stable operating system (Windows NT)

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## Origins Of The Internet

- History: what was happening in the 1950's



Rock and roll was in its infancy



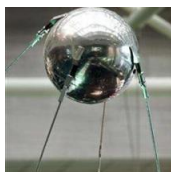
*Lenin*

The Cold War was on

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## Origins Of The Internet (2)

- The cold war competition spilled over into space exploration.
- Both sides tried to be the first to send a satellite into space.
- Americans in 1957: A sophisticated three stage rocket was planned as the first human-made vehicle to be sent into space.
- The USSR in 1957: surprised the world by launching Sputnik I (first artificial satellite).



- The launch of Sputnik motivated the creation of ARPA (Advanced Research Projects Agency) in the US.

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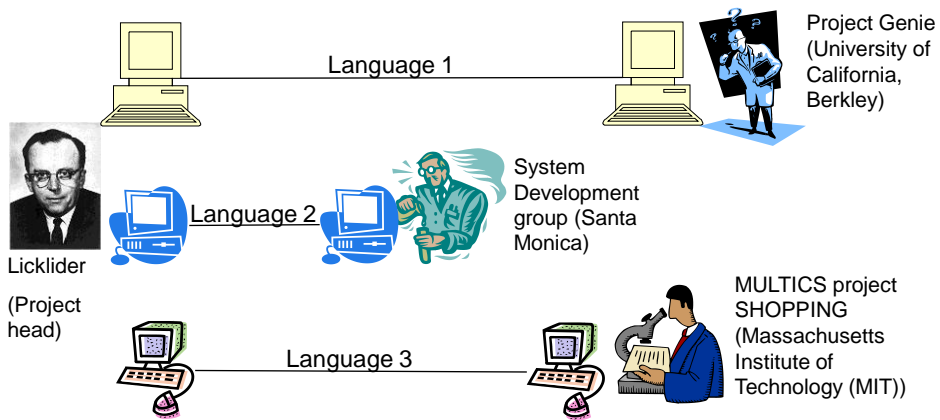
## ARPA

- ARPA was a branch of the ministry of defense.
- The focus was on:
  - Getting different types of computers communicating

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## Getting Computers To Communicate

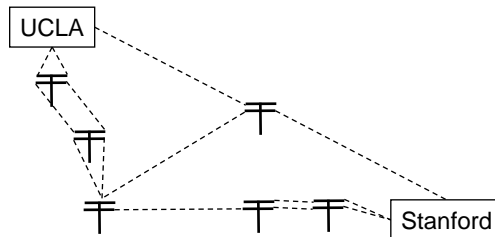
- Researchers working for ARPA needed computers to communicate and to share information.
- Current approaches weren't satisfactory.



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## ARPANET

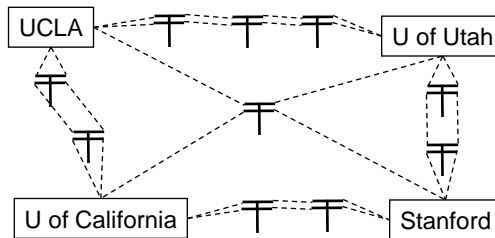
- The first computers were connected via ARPANET (Advanced Research Projects Agency Network).
- The initial ARPANET consisted of 2 host computers which were connected at the start of 1969 from the following locations:
  - UCLA
  - Stanford



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## ARPANET (2)

- Later additional hosts were added to the network (end of 1969) from:
  - The University of California (Santa Barbara)
  - The University of Utah



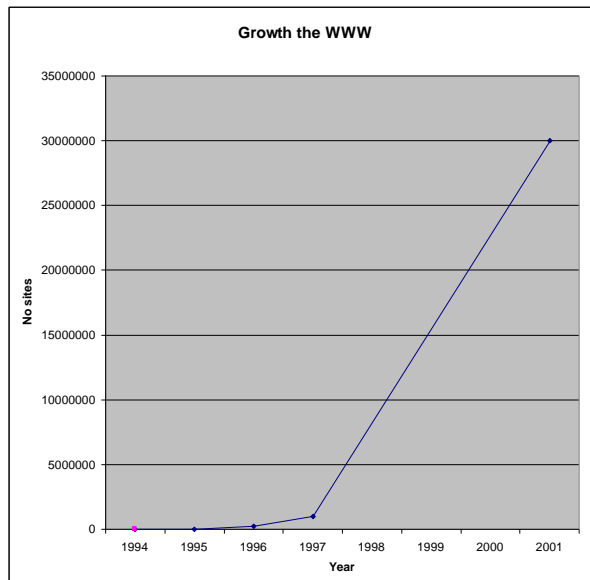
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## Important Milestones Of The Internet

- In 1972
  - The first "hot application" (something that really caught on) was introduced by Ray Tomlinson.
- 1989:
  - The ideas behind the World Wide Web were first described in a paper.
- 1990:
  - The ARPANET was shut down.
  - The first Internet search program Archie was developed at McGill university.
- 1991:
  - The World Wide Web was released to the public.

James Tam

## The Growth Of The World Wide Web



James Tam

## The History Of The World Wide Web



- Designed in 1989 by Tim Berners-Lee and scientists in Geneva who were interested in making it easier to share research documents.
- Documents could be linked through a protocol (rules of communication) called http (hyper text transfer protocol).
- Documents were made available for free browsing and downloading from the web (*substantially* easier than the alternative).
- 1990 the first web browser “WorldWideWeb” was written.
- 1993 Mark Andreesen of NCSA (National Center for Super Computing Applications) launched Mosaic X the first popular web browser.

James Tam

## The History Of The World Wide Web (2)



- Prior to the advent of the WWW the Internet was largely used by a niche user group.
- The advent of the WWW drastically changed that.

James Tam

## **You Should Now Know: History Part II**

- When were the different categories of computers completed and what were some of their distinguishing features:
  - The computers of the electronic revolution
  - The first SPC (stored program computer)
- Who were the people who were involved in the creation of these machines.

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## **You Should Now Know: History Part III**

- How the invention of the microprocessor revolutionized computing
- What was the first computer that was targeted specifically for the home user
- What was the influence of Microsoft on microcomputers
- The history of the IBM-PC
- The foundation of Apple Computers
- The history of some of Apple's early computers: Apple I, Apple II, Lisa, Macintosh
- How IBM lost control over a computer architecture that it developed through the rise of clone computers
- How the rise of clone computers led to the market dominance of Microsoft in the microcomputer market

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