Steve Jobs, Bill Gates, and the PC
and
Course Review

Radical Innovation and the Transformation of Daily Life

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Computers for NOTETAKING ONLY
Please - NO Cell Phones, texting, email, shopping
Components of Innovation

Inventor and Entrepreneur

Noyce and Hoff – 4 bit Microcomputer

Intel 4004

Intel 4004
Apple I 6502
Macintosh 68000 & TCP/IP
IBM PC 8088
Components of Innovation
Inventor and Entrepreneur

Noyce and Hoff – 4 bit Microcomputer

Intel 4004
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Noyce and Hoff – 4 bit Microcomputer

Intel 4004

Homebrew Computer Club

Silicon Valley 1975
Wozniak and Jobs
Apple Computer founded in 1976
(MOS Technology 6502 – 8 bit)
Components of Innovation

Inventor and Entrepreneur

Wozniak and Jobs
Apple Computer founded in 1976
(MOS Technology 6502 – 8 bit)
Think different.
Apple Introduces the First Low Cost Microcomputer System with a Video Terminal and 8K Bytes of RAM on a Single PC Card.

The Apple Computer. A truly complete microcomputer system on a single PC board. Based on the MOS Technology 4002 microprocessor, the Apple also has a built-in video terminal and sockets for 8K bytes of onboard RAM memory. With the addition of a keyboard and video monitor, you'll have an extremely powerful computer system that can be used for anything from developing programs to playing games or running BASIC.

Combining the computer, video terminal and dynamic memory on a single board has resulted in a large reduction in chip count, which means more reliability and lowered cost.

No More Switches.
No More Lights.

Compared to switches and LEDs, a video terminal can display vast amounts of information simultaneously. The Apple video terminal can display the contents of 192 memory locations at once on the screen. And the firmware in PROMs enables you to enter, display and debug programs (all in two) from the keyboard, rendering a front panel unnecessary.

The firmware also allows you to program letters and numbers instead of just LEDs. The keyboard interface is available to all kinds of alphanumeric software (i.e., CPM and BASIC).

8K Bytes RAM in 16 Chips!
The Apple Computer uses the new 16-pin 8K dynamic memory chips. They are faster and take up less space and power than the low power 2K8's (8K memory chip that everyone uses). That means 8K bytes in sixteen chips. It also means no more 8K power supplies.

The system is fully expandable to 64K via an edge connector which carries both the address and data busses, power supplies and all timing signals. All dynamic memory refreshing for both on and off-board memory is done automatically. Also, the Apple Computer can be upgraded to use the 16K chips when they become available.

Mr. That's 32K bytes on-board RAM in 16 ICs—the equivalent of 256 2102's! A Little Cassette Board
That Works!

Unlike many other cassette-based systems, ours works every time. It plugs directly into the upright connector on the main board and stands only 2" tall. And since it is very fast (500 bits per second) you can read or write 8K bytes in about 20 seconds. All timing is done in software, which results in crystal-controlled accuracy and uniformity from unit to unit.

Unlike some other cassette interfaces which require an expensive tape recorder, the Apple Cassette Interface works reliably with almost any home-grade cassette recorder.

Software:
A tape of Apple BASIC is included free with the Cassette Interface. Apple BASIC features immediate error messages and fast execution and lets you program in a higher level language immediately and without added cost. Also available are a disk assembler and many games, with many software packages, including a macro assembler in the works. And since our philosophy is to provide software for our machines free or at a minimal cost, you won't be continually paying for access to this growing software library.

The Apple Computer is in stock at almost all major computer stores. If your local computer store doesn't carry our products, encourage them or write us direct. Dealer inquiries invited.

Mr. That's 32K bytes on-board RAM in 16 ICs—the equivalent of 256 2102's!

Think different.

Apple Computer Company  770 Welch Rd., Palo Alto, CA 94304  (415) 326-4248
Macintosh 128K – 1984
(Motorola 68000 – 16 bit)
Graphical User Interface
DEMONSTRATION
Steve’s Jobs
He saved Apple with his hot new iMac. He struck gold at Pixar with digital movies like Toy Story 2. You’d think he’d learn to chill. Think different.

“Bill, thank you. The world’s a better place.”
—Steve Jobs talking to Bill Gates by cell phone last week about saving Apple
Steve's Jobs

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The Man Who Always Seems To Know...

WHAT'S NEXT

PLUS
TRENDSPOTTING
with Moby, Malcolm Gladwell, David Brooks and Esther Dyson
5 NEW THINGS
that will blow your mind
CLINT EASTWOOD'S revolutionary movie for 2006

Apple CEO Steve Jobs with the new video iPod and iMac

AFGHANISTAN: DEADLY HUNT
INDIA & PAKISTAN: WAR DANCE

FLAT-OUT COOL!

Steve Jobs thinks he has seen the future—again. Apple's new iMac is an all-in-one hub for music, pictures and movies. It's elegant and affordable. But will millions of PC users get it?
Environment Special: The Perils of Plastic

Inside Steve's Pad
How Jobs works by Stephen Fry
The tale of the tablet by Lev Grossman
Homebrew Computer Club
30th Anniversary in 2005 - Silicon Valley
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Bill Gates and Paul Allen – Micro-Soft Basic for Altair 8800 in 1975 (Intel 8080)
Bill Gates and Paul Allen – Micro-Soft Basic for Altair 8800 in 1975 (Intel 8080)
February 3, 1976

An Open Letter to Hobbyists

To me, the most critical thing in the hobby market right now is the lack of good software courses, books and software itself. Without good software and an owner who understands programming, a hobby computer is wasted. Will quality software be written for the hobby market?

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 DICK 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 of 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?

In this fair? One thing you don't do by stealing software is get back at MIT'S for some problem you may have had. MIT'S 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. We have written 8600 BASIC, and are writing 8800 APL and 8800 APL, but there is very little incentive to make this software available to hobbyists. Most directly, the thing you do is theft.

What about the guys who re-sell Altair BASIC, aren't they making money on hobby software? Yes, but those who have been reported to us may lose in the end. They are the ones who give hobbyists a bad name, and should be kicked out of any club meeting they show up at.

I would appreciate letters from anyone who wants to pay up, or has a suggestion or comment. Just write me at 1169 Alvarado SE, 8114, Albuquerque, New Mexico, 87110. Nothing would please me more than being able to hire ten programmers and delve the hobby market with good software.

Bill Gates
General Partner, Micro-Soft

Bill Gates and Paul Allen – Micro-Soft Basic for Altair 8800 in 1975 (Intel 8080)
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Bill Gates
General Partner, Micro-Soft
IBM Personal Computer (Intel 8088) Command Line Interface DEMONSTRATION

Bill Gates and Paul Allen – MiCROSOFT MS- DOS for IBM PC in 1981
Bill Gates and Paul Allen – MiCROSOFT
MS- DOS for IBM PC in 1981
Key Ideas

Scientific:
- Computer on a Chip
- Graphical User Interface

Social and Personal:
- Computation
- Communication
- Commerce

Symbolic:
- Individual Genius
Immigrants
Alexander Graham Bell
Andrew Carnegie
John Von Neumann
Othmar Ammann

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Telephone

Steel for Railroads,
Bridges, and Buildings
Steel for Railroads, Bridges, and Buildings

Iconic NY Bridges for Cars
Iconic NY Bridges for Cars  Digital Machine for Calculations
Inventors

- Thomas Telford
- Wright Brothers
- Thomas Edison
- Henry Bessemer

Flat Bridge
Flying Machine
Remote Power
Strong Material

Digital Machine for Calculations

\[ H = \frac{1}{8} qL \frac{L}{d} \]
Inventors

Thomas Telford  Flat Bridge
Wright Brothers  Flying Machine
Thomas Edison  Remote Power
Henry Bessemer  Strong Material

\[ H = \frac{1}{8} qL \frac{L}{d} \]

\[ L = 0.00257 V^2 C_L A \]
\[ P_L = I^2 R \]

\[ L = 0.00257 V^2 C_L A \]
\( P_L = I^2 R \)
Partnerships

James Watt – Mathew Boulton
Robert Fulton – Robert Livingston

Safety Factor $= \frac{f_B}{f}$
Partnerships

James Watt – Mathew Boulton
Robert Fulton – Robert Livingston
Patents

Steamboat  
Telephone  
Electric Light  
Airplane  
Radio  
Rocket  
Transistor  
Integrated Circuit

What are positive and negative effects of patents?
Patents

Steamboat
Telephone
Electric Light
Airplane
Radio
Rocket
Transistor
Integrated Circuit

What are positive and negative effects of patents?

delays competition

Bell Telephone wins Edison patents captured from Western Union
“War of the Currents” delays competition

AC wins

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“War of the Currents” delays competition
AC wins

Wright Brothers patent delays competition

WWI – patent suspended in national interest
Sarnoff fights FM patent
Armstrong suicide
Armstrong’s widow wins

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1964 – 50th Anniversary
of multi-stage patent

Goddard not taken seriously until after WWII
Sarnoff fights FM patent

Armstrong suicide
Armstrong’s widow wins

1956 Nobel Prize
Revolutionizes telephone, radio, computers, satellites
Independently invented by Jack Kilby and Robert Noyce, the **integrated circuit** was first available commercially in 1961. It led to smaller, inexpensive, mass-produced electronic circuits, revolutionizing the computer industry.

**CELEBRATE THE CENTURY – 1960s**

Kilby and Noyce share credit and revenue

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CELEBRATE THE CENTURY – 1960s

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Elegant bridge replaces the ferry
Artist as Engineer
Telford
Morse
Ammann

Intelligence at a distance

Elegant bridge replaces the ferry
Structural Artist
and Entrepreneur

Intelligence at a distance
Political Entrepreneurs

Amman
Livingston
Norris
Hoover

Structural Artist and Entrepreneur
Political Entrepreneurs

Amman
Livingston
Norris
Hoover

TVA – REA architect
Advocate for Public Power
Commerce Secretary
Colorado River Compact

TVA – REA architect
Advocate for Public Power
Focus on Whole System

Edison
Ford
Marconi

Commerce Secretary
Colorado River Compact

Competition with Gas Lighting
Focus on Whole System

Edison
Ford
Marconi

Assembly Line
Integrated Factory

Competition with Gas Lighting
Energy Conversion

Steam Engine
IC Engine
Jet Engine
Rocket Motor

Machine replaces Horse
External Combustion

Global Wireless Network
Energy Conversion

Steam Engine
IC Engine
Jet Engine
Rocket Motor

Machine replaces Horse
External Combustion

Compact and Efficient Machine
Internal Combustion
Turbojet Engine
Batch to Continuous

Compact and Efficient Machine
Internal Combustion
Rocket Motor carries own $O_2$ Thrust in the Vacuum of Space

Turbojet Engine
 Batch to Continuous
Government Fixes

Port Authority
Valley Authority
River Compact
Congested
Depressed
Undeveloped

Rocket Motor carries own O₂
Thrust in the Vacuum of Space

Port Authority Bridge
Automobiles
Government Fixes

Port Authority
Valley Authority
River Compact

Congested
Depressed
Undeveloped

Port Authority Bridge
Automobiles

Valley Authority Dam
Electric Power
River Compact Dam
Flood Control and Electric Power

Valley Authority Dam
Electric Power
Daring ‘Firsts’

Water
Air
Space

River Compact Dam
Flood Control and Electric Power

First Trip - Colorado River
Daring ‘Firsts’

Water
Air
Space

First Flight - Heavier than Air

First Trip - Colorado River
First Flight - Heavier than Air

Faster than Sound
bullet-shaped rocket plane
First Earth Orbit

Faster than Sound bullet-shaped rocket plane
First Earth Orbit 1969
Transformation of Daily Life

- Railroad
- Telephone
- Electricity
- Automobile
- Airplane
- Computer

Continent Crossed - 1869
Iron Road

1969
Transformation of Daily Life

Railroad
Telephone
Electricity
Automobile
Airplane
Computer

Continent Crossed - 1869
Iron Road

Nation Illuminated – 1879
Continent Crossed – 1915
Copper Transmission Lines
Atlantic Ocean Crossed - 1927
made of Aluminum
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Coast to Coast w/o Lights - 1956
Asphalt, Concrete, and Steel
Information Age born in 1946
Germanium, Silicon, and Glass

Coast to Coast w/o Lights - 1956
Asphalt, Concrete, and Steel
Innovations
How do they happen?
Why are they important?

Scientific:
applied science

Social:
transformation - context
economics
politics
culture

Symbolic:
individual genius

Information Age born in 1946
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