

# Personal Computing

Thomas J. Bergin

©Computer History Museum

American University

# Recap: Context

- By 1977, there was a fairly robust but fragmented **hobbyist-oriented microcomputer** industry:
  - Micro Instrumentation Telemetry Systems (MITS)
  - Processor Technology
  - Cromemco
  - MicroStuf
  - Kentucky Fried Computers
- Two things were needed for the personal computer revolution: 1) a way to store and retrieve data, and 2) a programming language in which to write applications.

# Homebrew Computer Club

- **March 5, 1975**: the Amateur Computer Users Group (**Lee Felsenstein, Bob Marsh, Steve Dompier, Bob Albrecht** and 27 others) met in **Gordon French's garage, Menlo Park, CA**
- 3<sup>rd</sup> meeting drew several hundred people and was moved to the Coleman mansion
- Stanford Linear Accelerator Center's auditorium
  - **Steve Wozniak shows off his single board computer**
  - **Steve Jobs attends meetings**

# Homebrew-ed

- 21 companies formed:
  - Apcoese **Apple**
  - Cromemco **Morrow**
  - North Star **Osborne**
- West Coast Computer Faire
- **Byte magazine**, September 1975
- Byte Shop



# And then there was Traf-O-Data

- October 28, 1955: **William H. Gates III** born
  - father: attorney   mother: schoolteacher
- Lakeside School: Lakeside Programming Group
  - Mothers Club: access to **time-shared system** at GE
  - Students hired by local firm to debug software
  - First computer program: **Tic-Tac-Toe** (age 13)
  - Traf-O-Data to sell traffic mgt. software (age 16)
- 1973, **Bill Gates** enrolls at Harvard in pre-law.
- **Paul Allen** is in his second year.

# January 1975, *Popular Electronics*: Altair

- Allen shows *Popular Electronics* to Gates
- Decide to write a BASIC compiler
  - 4K of memory; mixture of **Dartmouth** and **DEC** features, including a machine language interface
- Allen flies to Phoenix and demonstrates it to Ed Roberts (works the first time)
  - March 1, 1975, Allen joins MITS as **Director of Software**; Gates remains at Harvard
- April 7: Altair BASIC "up and running!"
- July 1: Altair BASIC 2.0 ships

# Homebrew Computer Club newsletter

*February 23, 1976*

## *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. Through 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 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 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?*

*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 the 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 6800 BASIC and are writing 8080 APL and 6800 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 any one who wants to pay up, or has a suggestion or comment. Just write me at 1180 Alvarado Se, #114, Albuquerque, New Mexico, 87108. **Nothing would please me more than being able to hire ten programmers and deluge the hobby market with good software.***

*Bill Gates, General Partner, Micro-Soft*

- Mar 27, 1976: Gates gives opening address to First Annual World Altair Convention
- Nov 1, 1976: Allen joins Microsoft full time
- Nov 26, 1976: "Microsoft" registered trade name
- Feb 3, 1977: partnership agreement signed
- July 1, 1977: FORTRAN-80 available
- Dec 31, 1978: sales exceed \$1 million
- Jan 1, 1979: Microsoft moves to Bellevue, WA
- April 2, 1980: Z-80 SoftCard - circuit board for Apple II allowing CP/M programs to run

# Intergalactic Digital Research

- 1972, **Gary Kildall** is a computer science professor at U.S. Naval Postgraduate School, Monterey, CA
- 1973: visits **Intel**; begins working with the I-8008 and the Intel development system
  - **Wrote PL/M** (a version of PL/1)
- **Intel** gave him a **display monitor** and a high-speed **paper tape reader**; **Shugart** gave him a **disk drive**
- Late 1973, Kildall writes a simple operating system in PL/M and called it **Control Program/Monitor**

- With Ben Cooper, Gary Kildall develops the software for an *astrology machine*:
  - Writes a BASIC compiler to do the application
  - Allows the testing of his operating software
  - Talked about microcomputers....
  - Sold a copy of his development system for \$90
- 1976: Intergalactic Digital Research incorporated
  - President: Dorothy McEwen (Gary's wife)
  - Name later shortened to Digital Research
- 1977 IMSAI licensed CP/M for \$25,000
  - DR became a full-time business

# *Paris Match: Gary Kildall, La premier victime de Bill Gates*



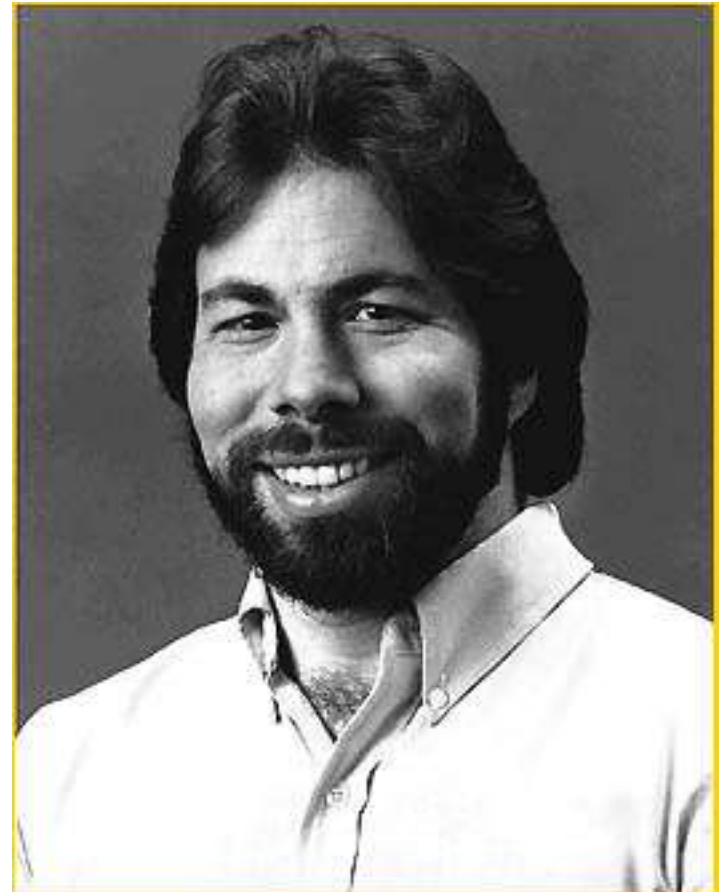
[www.parismatch.com/reportage/kindall0202/ kildall114089.jpg](http://www.parismatch.com/reportage/kindall0202/kildall114089.jpg)

# Critical Mass

- By 1977, the critical ingredients for personal computing were in place:
  - Altair S-100 bus
  - Powerful microprocessors: I-8080
  - Microsoft BASIC
  - Digital Research's CP/M
  - An ethic of charging for software
  - Standard serial and parallel ports

# Steve Wozniak

- **1973**: working on calculators for Hewlett Packard
  - One of the first companies in Silicon Valley
- Constructed a circuit board using a **Motorola 6502** processor (chip cost \$20 vs. a few hundred for an I-8080)
- **Supervisors weren't interested** in the **small hobby market!**



# Steve Jobs

- Works as a video games programmer for Atari.
- Meets Woz at the Homebrew Computer Club
- Wants to make a computer!
- Beatles fan: *Apple Records*





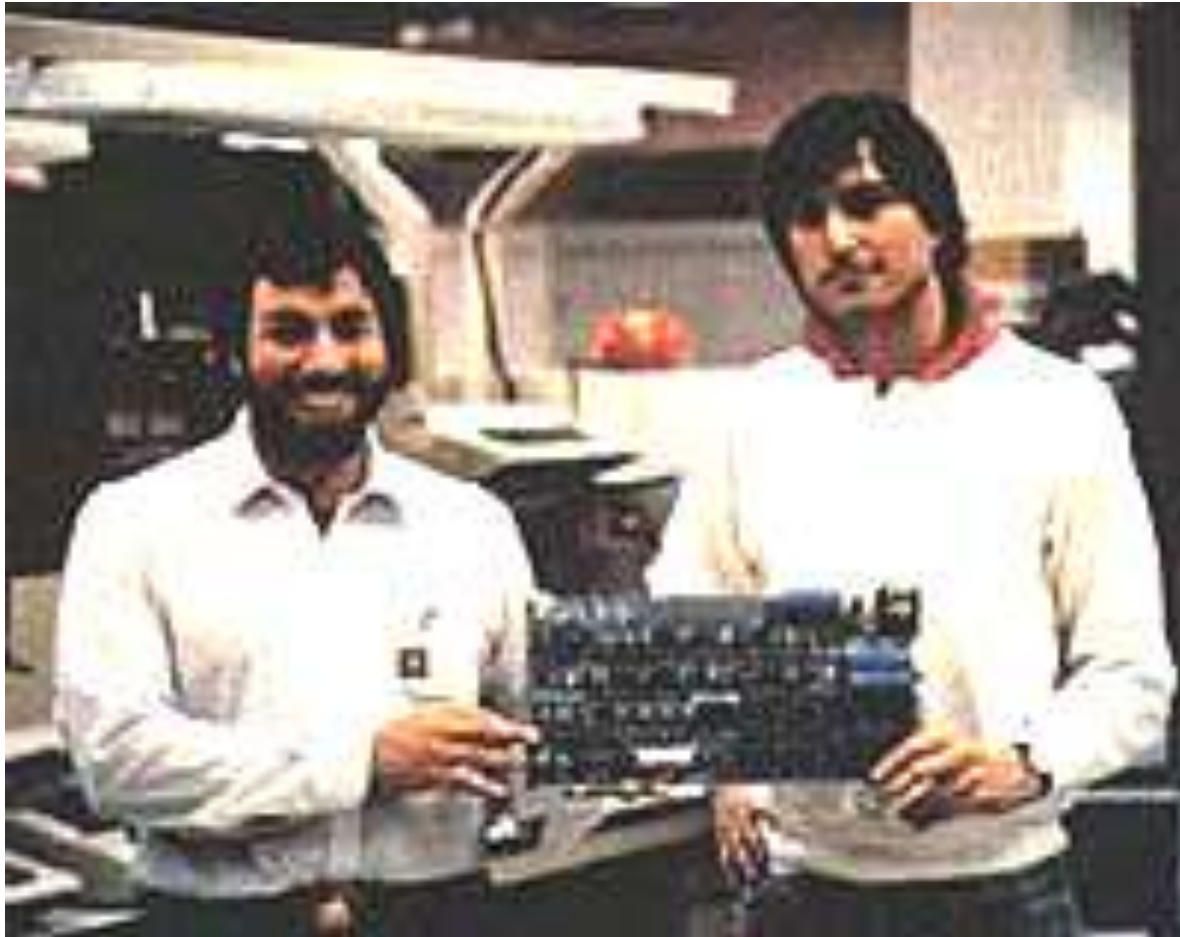
- Jobs (age 21) sold his VW Microbus; Woz (age 26) sold his H-P calculator to raise capital.
- They work in Job's garage making boards and selling them (\$549) to **Paul Terrell of the Byte Shop** who sold them for \$666
- 175 Apple Is sold in 1975 and 1976
- Jobs realizes that they need a third partner with **business experience**.
- Apple Computers is founded on April 1, 1976 by: Steven Jobs, Steve Wozniak and **Mike Markkula** (who retired as a multimillionaire, at age 33, from Intel -- due to their IPO!)

# Steve Jobs' garage in Cupertino, CA



<http://www.garagenouszone.com/Images/jobs-garage.gif>

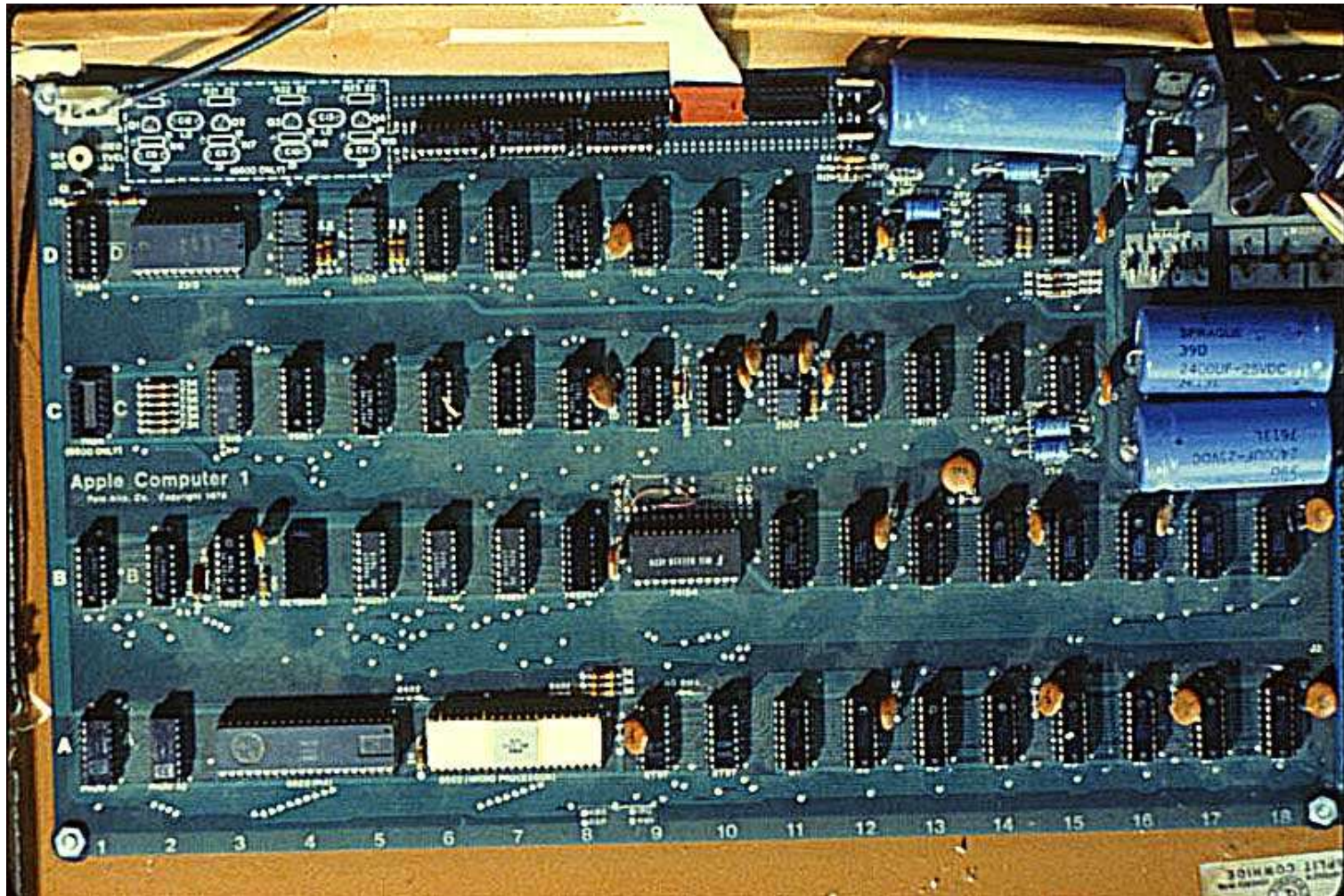
# Steve Wozniak and Steven Jobs



[www.computerhalloffame.org/ results.html](http://www.computerhalloffame.org/results.html)



# Apple 1 single board computer



source: Computer Museum

# And then there was



[www.apple2history.org/history/ah02.html](http://www.apple2history.org/history/ah02.html)

# Apple I

- Motorola 6502
- 4K expandable to 8K
- Could drive a TV
- Designed in late 1975
- Produced July 1976
- \$666.00 (150 produced)





# Apple II (1978)

introduced at *West Coast Computer Faire* in 1977

- \$1295 + peripherals
- Motorola 6502 @ 1MHz
- 4K expandable to 64 K
- Drive b/w or color TV
  - 24 lines X 40 characters (1c)
  - 80 char u/l case (later)
- integral 52 key keyboard
- Cassettes (5 1/4disk intro at *Second West Coast Computer Faire*, March 1978



source: Computer Museum

See also: <http://apple2history.org/>

[illegible]

**Computer Inc.**





# Apple II Software

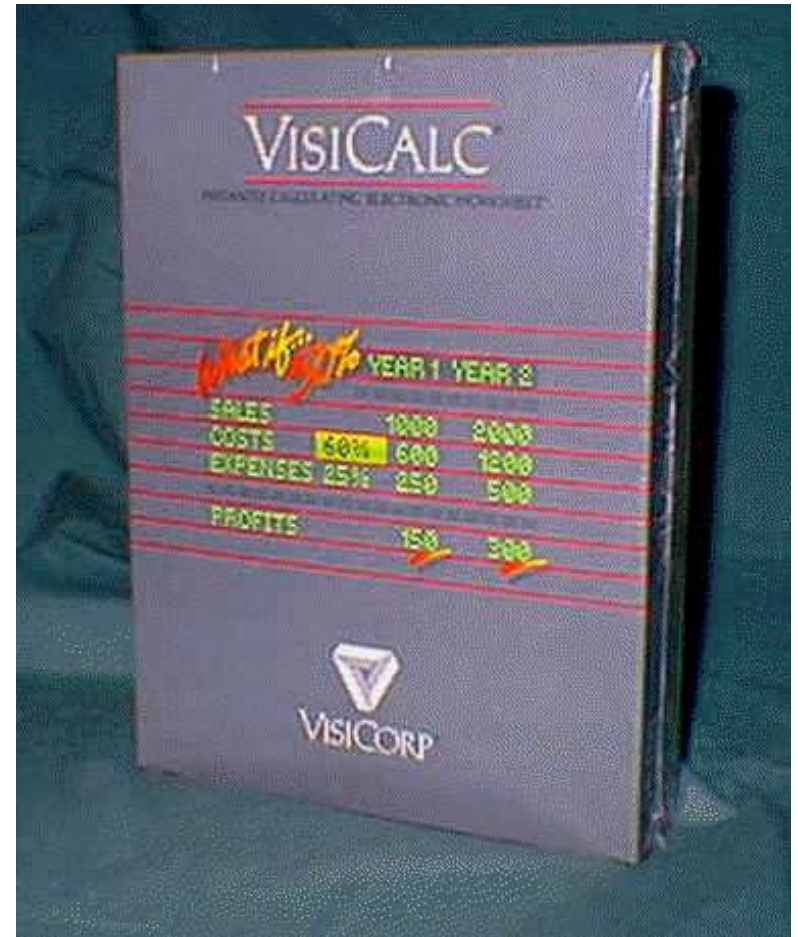
1. Super Invader
  2. Adventure
  3. VisiCalc
  4. Sargon II
  5. Asteroids in Space
  6. Flight Simulator
  7. Hi-Res Adventure #2: The Wizard and the Princess
  8. Odyssey: the Compleat Adventure
  9. DOS 3.3
  10. Apple Writer
  11. Bill Budge's Space Album
  12. Temple of Apshai
  13. HR A #3 Mystery House
  14. Cyber Strike
  15. Easy Writer
- Also:
- Apple Plot
- Data Management System

[www.apple2history.org/history/appy/aha78.html](http://www.apple2history.org/history/appy/aha78.html)

# VisiCalc: the first “killer application”



<http://www.thocp.net/software/pictures/1979-visicalc.gif>



<http://www.compududes.com/museumimages/largevisi.gif>

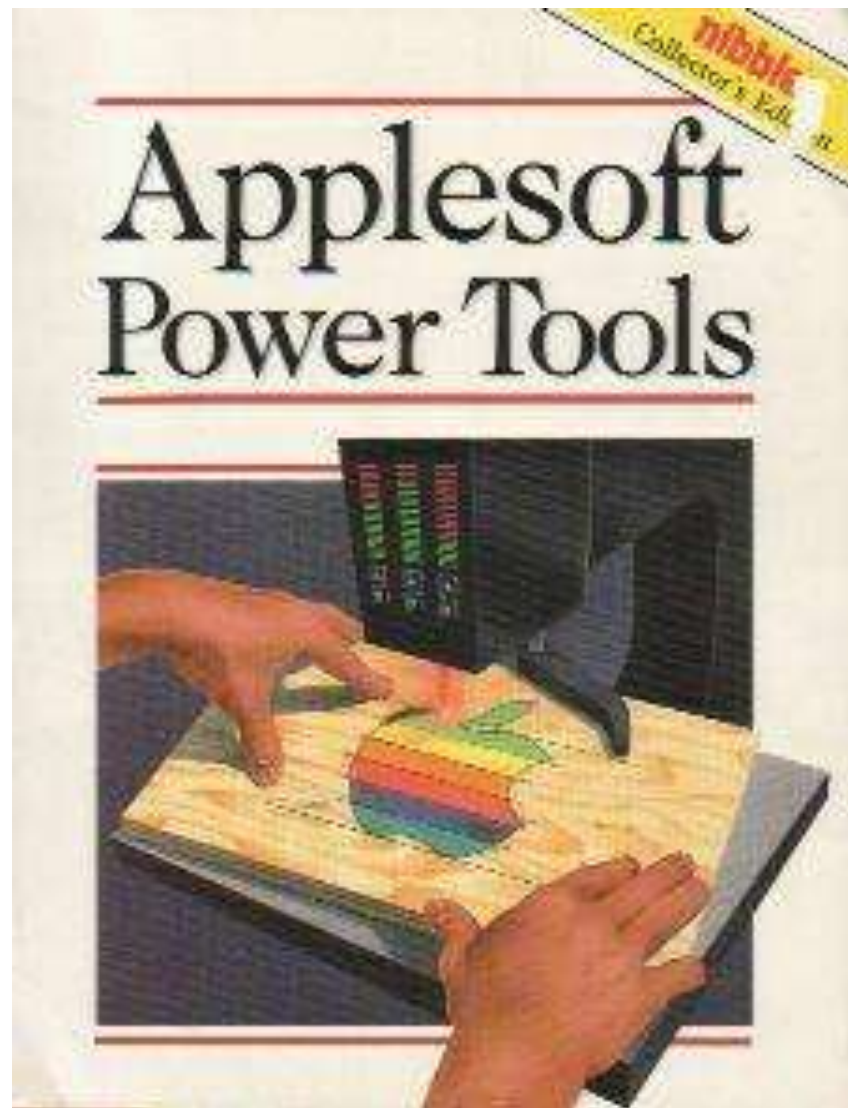
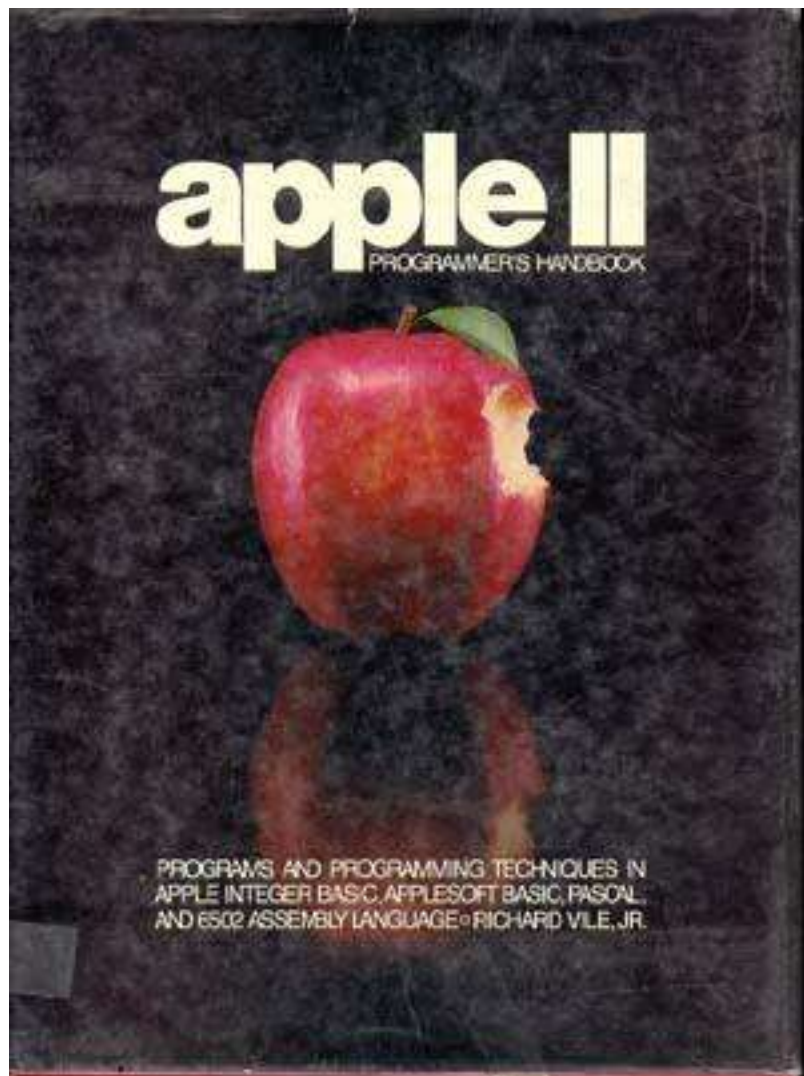
# VisiCalc (1979)

- Bob Frankston and Dan Bricklin
  - Software Arts
- Ran on an Apple II
- Perhaps the single most important reason for the personal computer revolution!
  - People could use this capability
  - People could build their own applications
  - Dan Fylstra: Personal Software

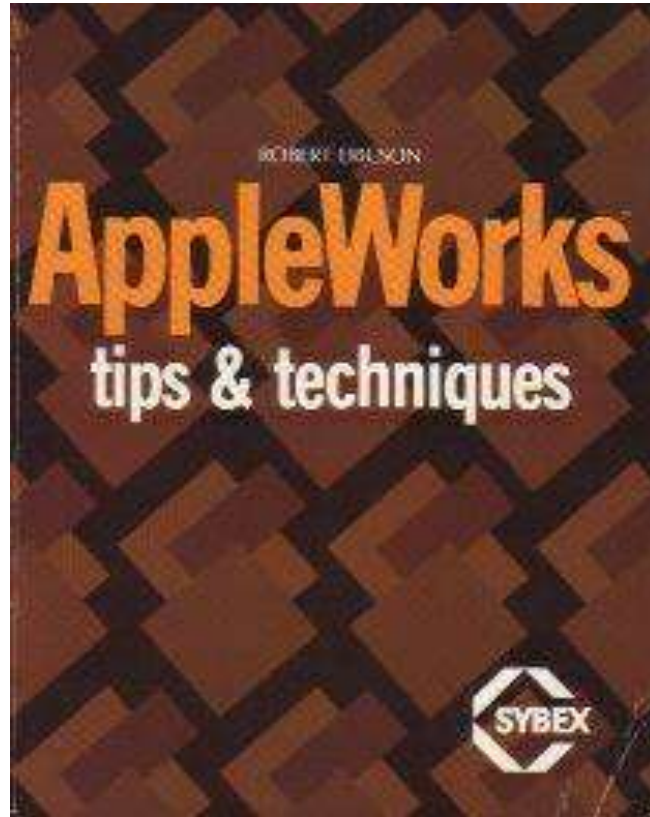


AppleWriter IIc (ProDOS version) sold for use on the Apple IIc. Also pictured are disks for **Random House Dictionary** and **Typing Tutor**.

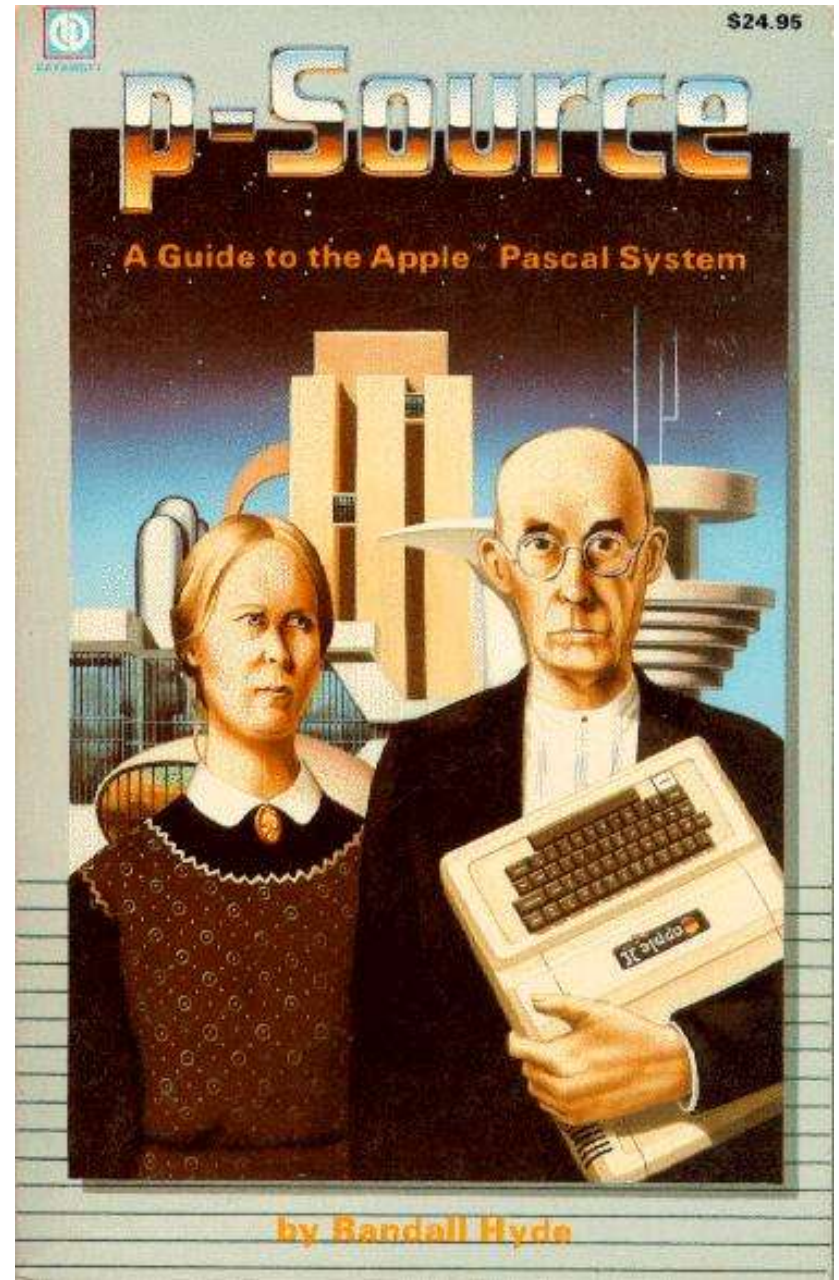




# Publishers get on the bandwagon!

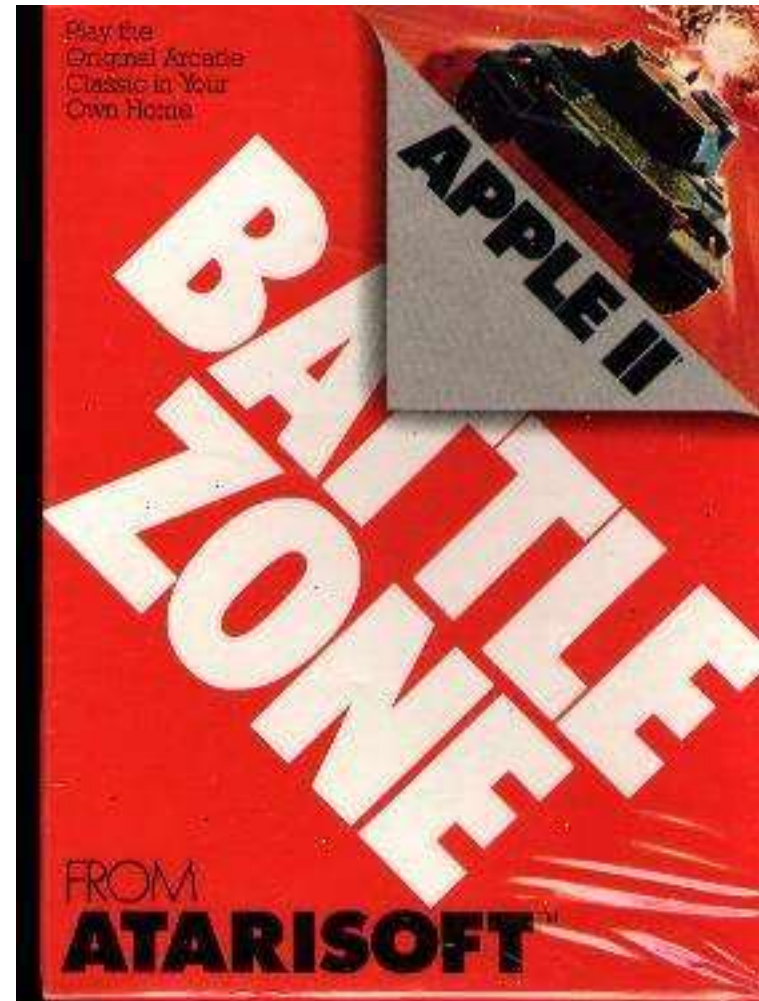
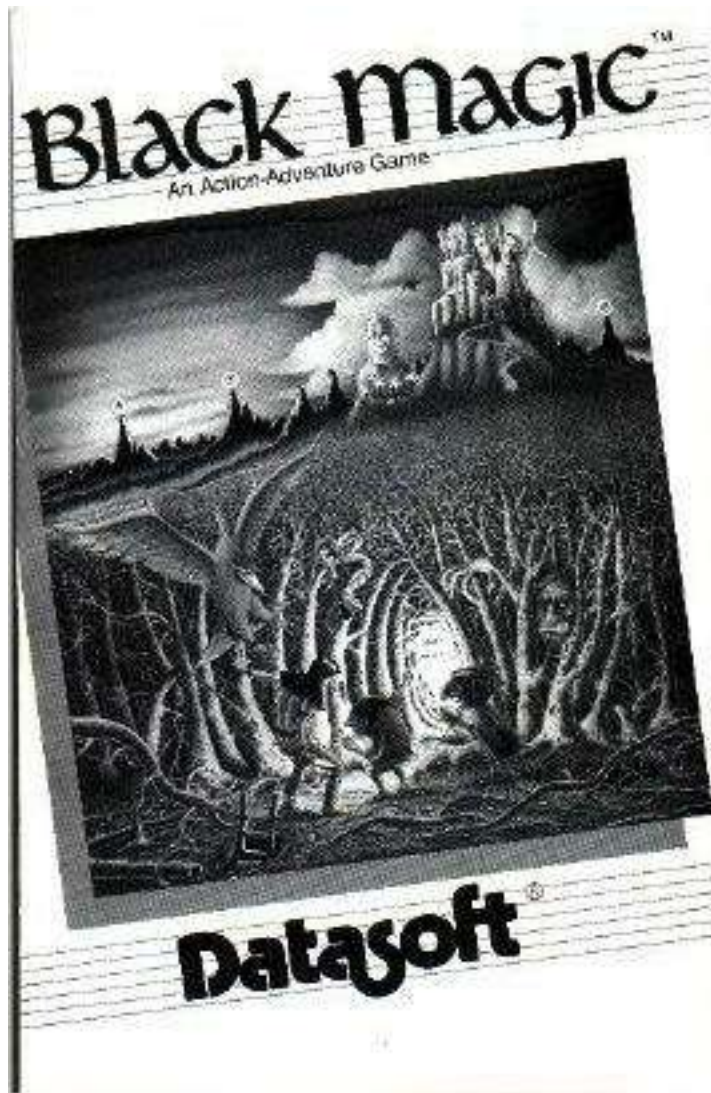


<http://apple2history.org/museum/books/books.html>





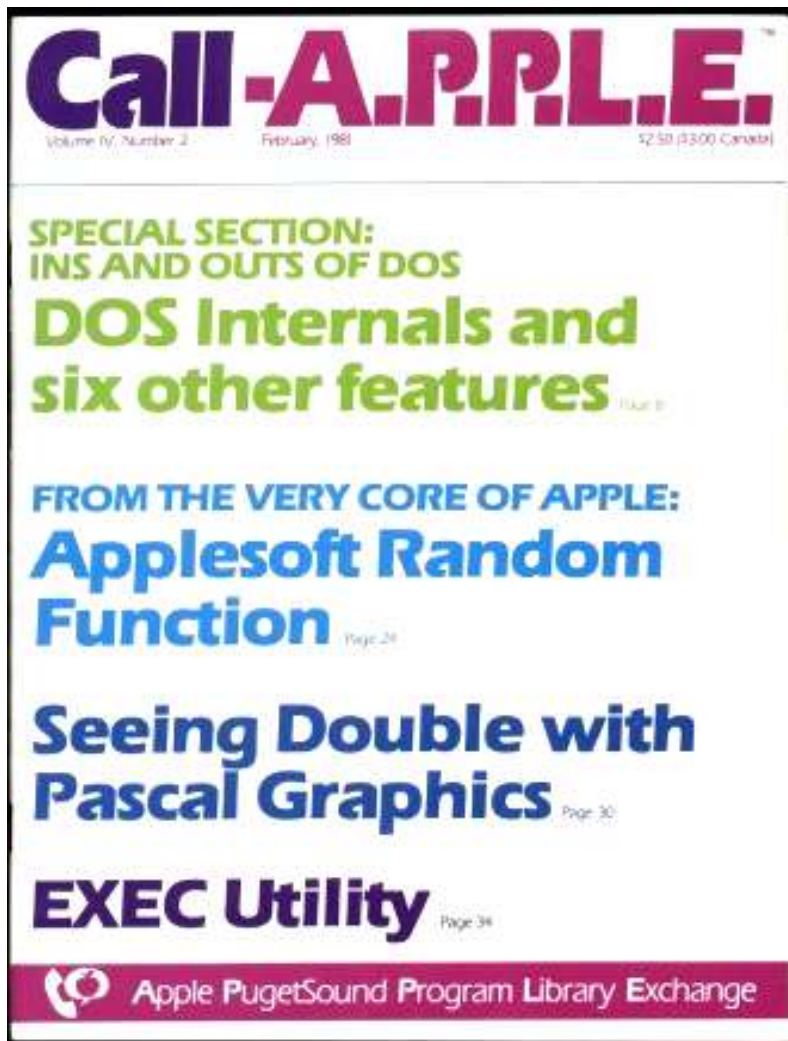
# Games for the Apple II



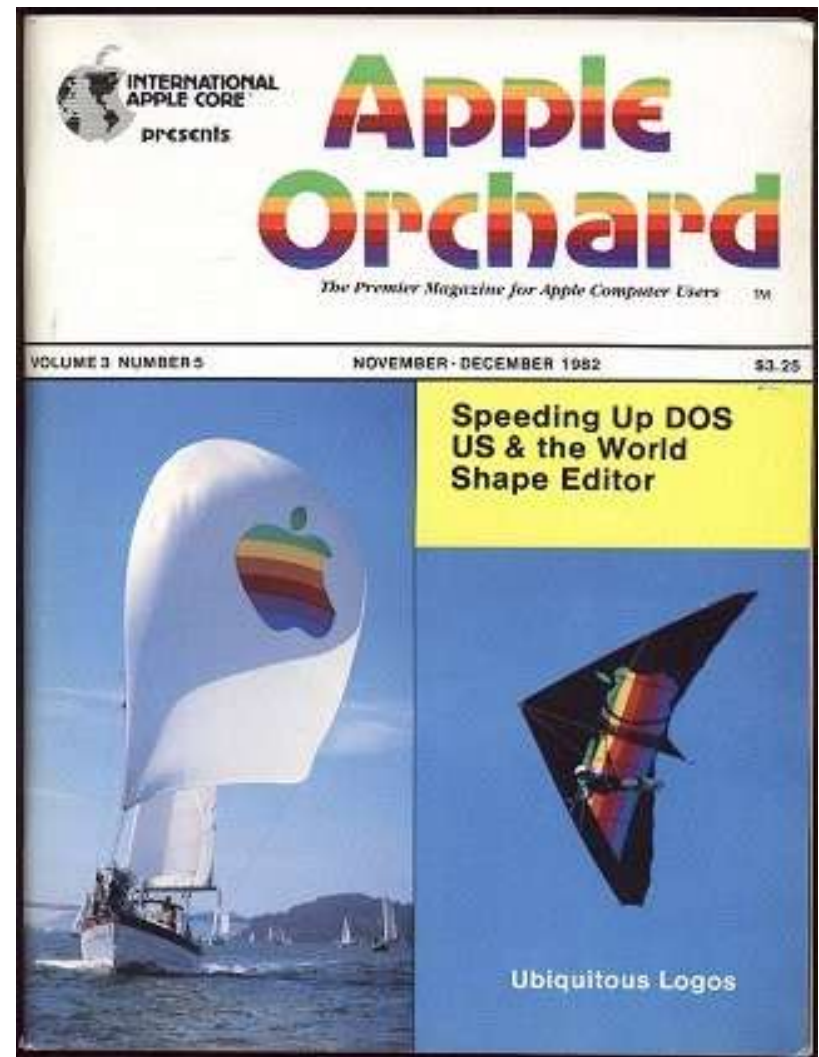
# Woz

- “To me, a personal computer should be small, reliable, convenient to use, and inexpensive.”
  - *Byte* magazine, May 1977





February 1982



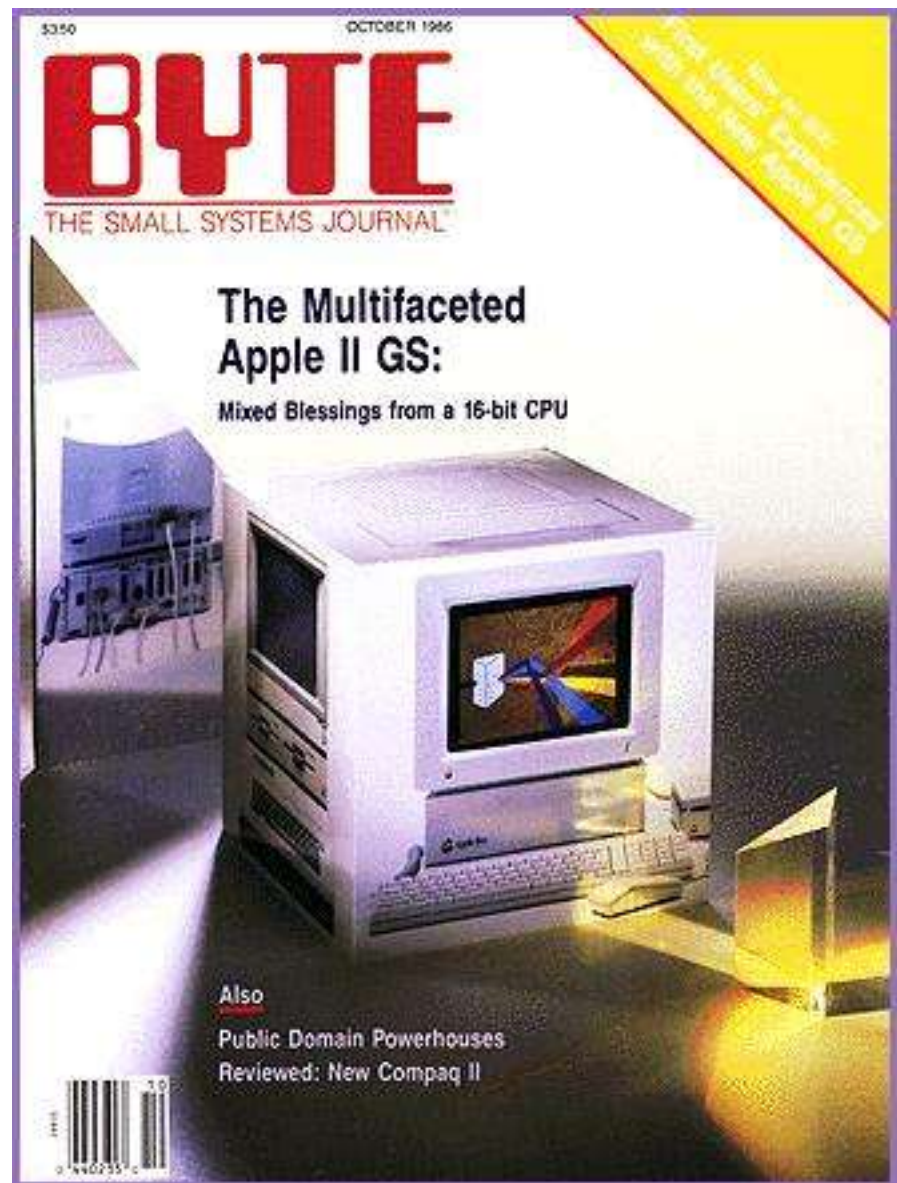
November 1982

<http://apple2history.org/museum/magazines>



*The Magazine for the  
**Advanced IIGS** and II User*

February 1989



October 1986



# Apple Subculture



- Washington Apple Pi starts in 1978



<http://www.wap.org/events/gsale200106/pages/pict11.html> and pict8

# One of thousands of **user groups**

- Washington Apple Pi is an international user group, with a history spanning three decades to the dawn of personal computing. "The Pi" continues to serve users of the very first personal computers as well as users of the most modern, advanced systems through its meetings, magazine, computer bulletin board and Internet services.

<http://www.wap.org/>

# Apple III

- 6502A at 1.4 MHz
- 96 K to 256K
- 12 inch monitor
- Built-in 5 1/4 floppy
- National Computer Conference: Sept. 1980
- \$3,495 to \$8,000
- *Plagued with reliability problems and ultimately unsuccessful*



# Legitimization and Proliferation

- In the corporate world, there are three things to remember about buying a computer:
  - 1. IBM
  - 2. IBM
  - 3. IBM
- "No one ever got fired for buying IBM!"
- August 12, 1981: IBM Personal Computer
- August-Sept. 1981: 13,000 IBM Personal Computers sold

# IBM 5150 Personal Computer (1981)



Source: T. Bergin: IBM publication packet for authors

# IBM Personal Computer

- Intel 8088 @ 4.77 MHz
- 16K expandable to 64K
  - PC1 expandable to 256K
- 11.5 inch monitor
  - 25 rows by 80 characters
- Cassette or 5.24 floppy drives at 160 KB
- 512 K, color monitor,  
2 floppies, dot-matrix  
printer \$6,000 (TJB)





# Key Decisions

- Developed at IBM's research facility in Boca Raton, FL (little corporate oversight)
- Off the shelf components from outside suppliers
- Open architecture (to allow others to create hardware and software)
- PC DOS and BASIC from Microsoft
- Wide range of languages, utilities and application software

# Legitimacy!!!

- ComputerLand stores
- Sears Business Centers
- Macys'
- Computer stores in shopping malls
- Software: Volkswriter, Lotus 1-2-3, dBase III
- And hundreds of other applications programs

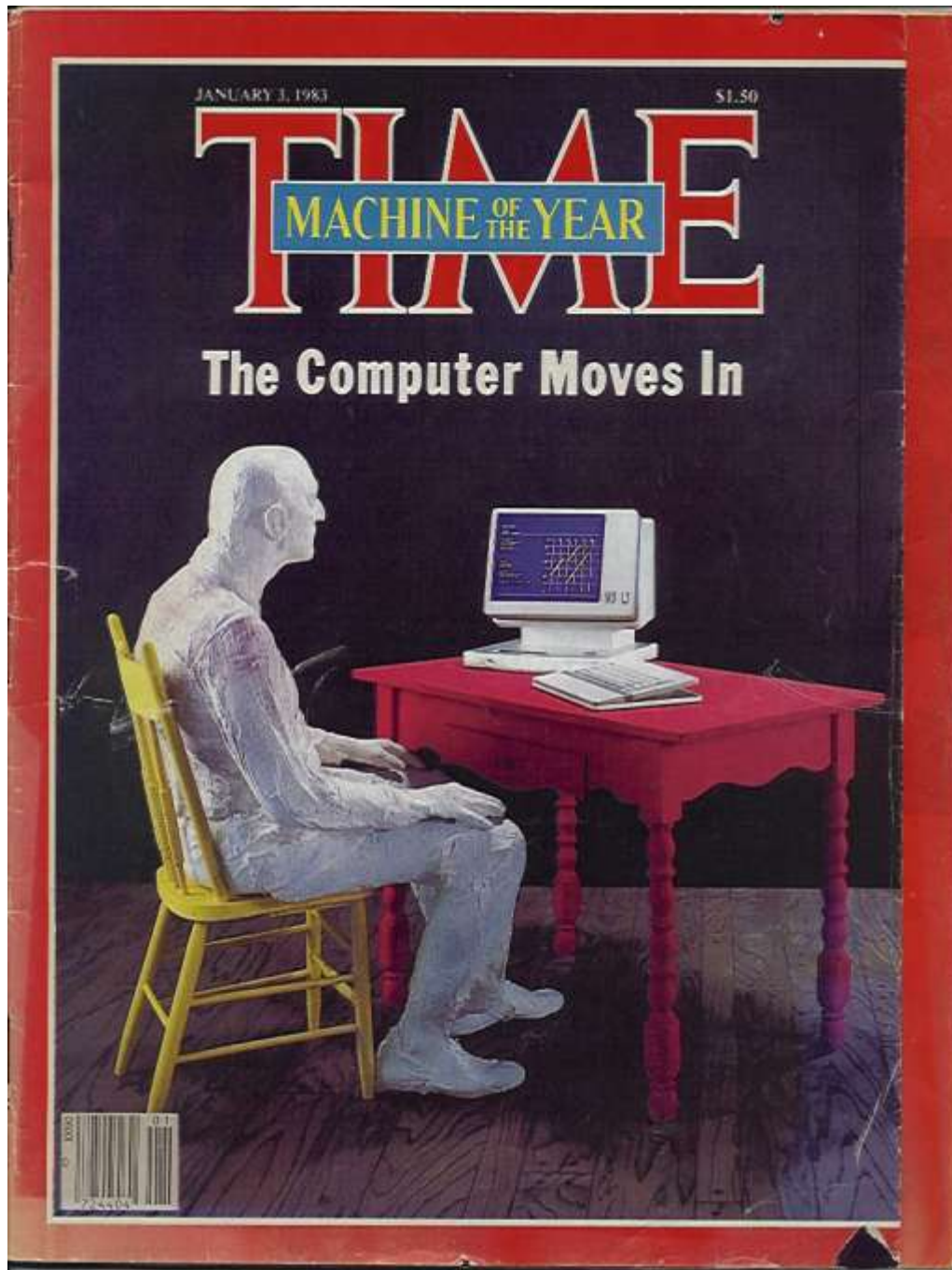
# Lotus 1-2-3: PC Killer Ap!

- Mitch Kapor, 1983
- Integrated spreadsheet, database and graphics
- \$599



# PC-DOS 1.0

- IBM tries to get Gary Kildall to adapt his CP/M operating system for the Personal Computer
- Kildall balks at the IBM nondisclosure agreement
- 1980 IBM offers Microsoft Corporation founder Bill Gates the opportunity to develop an operating system for their new microcomputer: PC-DOS
  - Tim Patterson, working for Seattle Computer Products, created QDOS (Quick and Dirty Operating System)
  - Microsoft bought the rights and developed it into PC-DOS
- Microsoft later negotiates the right to sell MS-DOS to the makers of IBM clones.



# Time's Man of the Year (1982)

# Meanwhile....

- 1982 **Compac** unveils an IBM-compatible portable PC
- 1983 **IBM PC-XT** (80286 at 6 MHz
  - 20 MB hard drive and 1.2 MB floppy
  - \$2495
- 1983 **PC Jr.** (Intel 80888 at 4.77 MHz)
  - color TV; "Chicklet" keyboard used infrared transmission: \$669 to \$1289

# Systems Software

- Control Program for Microprocessors (CPM)  
Microsoft Disk Operating System (MS-DOS)
- Apple DOS
- TRS-DOS
- Other proprietary operating systems: GEM, etc.

# MS-DOS

- **DIR** a:
- DIR a:/p
- **OPEN** a:oldfile for input as #1
- OPEN b:newfile for output as #2
- **LIST** a:myfile
- **LLIST** a:myfile
- **RENAME** a:myfile:oldfile
- **KILL** a:myfile



# Directory

```
INTERLNK  EXE      17197  11-17-94  1:00p
XDFCOPY   EXE     31737  11-17-94  1:00p
JOIN      EXE     10279  11-17-94  1:00p
PKUNZIP   EXE     29378   4-03-95  4:09p
DRVLOCK   EXE      6501  11-17-94  1:00p
FIND      EXE      5814  11-17-94  1:00p
RAMSETUP  EXE    89649  11-17-94  1:00p
POWER     EXE      8806  11-17-94  1:00p
ACALC     EXE     22851  11-17-94  1:00p
NLSFUNC   EXE      5609  11-17-94  1:00p
MEM       EXE     16231  11-17-94  1:00p
APPEND    EXE      7735  11-17-94  1:00p
SMARTDRV  EXE     44121  11-17-94 12:00p
ZIP       EXE   125964   9-13-93  3:36a
ZIPNOTE   EXE     22942   9-07-93  8:42a
UNZIPSFX  EXE     26331  10-09-95  7:59p
UNZIP     EXE   166332  10-09-95  7:59p
REXXDUMP  EXE       968  11-17-94 12:00p
CPSCHED   EXE      4946  11-17-94  1:00p
IBMAVSP   EXE   158977  11-17-94 12:00p
RAMBOOST  EXE   164272  11-17-94  1:00p
    59 file(s)      2980199 bytes used
      113414144 bytes free
```

C:\DOS>

<http://junior.apk.net/~qc/comp/os/dead/dos.jpg>

Microsoft Windows 95  
Fixed Disk Setup Program  
(C)Copyright Microsoft Corp. 1983 - 1995

### FDISK Options

Current fixed disk drive: 1

Choose one of the following:

1. Create DOS partition or Logical DOS Drive
2. Set active partition
3. Delete partition or Logical DOS Drive
4. Display partition information
5. Change current fixed disk drive

Enter choice: [1]

Press Esc to exit FDISK

# Need for Standards

- Every software package had its own user interface, the commands used to manipulate data. Learning one package did not help with another:

—	F1	F2	F3	F4	**	F10
WordPerfect	Cancel	Search	Help	Indent		Save
Lotus 1-2-3	Help	Edit	Name	Abs		Graph
Reflex	Help	Edit	Row	Column		Choices

# Xerox: Palo Alto Research Center (PARC)

- Douglas Englebart: mouse
- Robert Metcalf writes a memo on "ether acquisition" leads to Ethernet
  - (1<sup>st</sup> local area network)
- Graphical User Interface (GUI)
- Charles Simonyi writes the first WUSIWYG application, Bravo
- Alan Kay: Smalltalk
- Xerox Alto (1973)
- Never sold commercially; less than 2000 produced



# Alan Kay's "Office Computer"

- Smalltalk (object oriented language)
- GUI:
  - Icons
  - desktop metaphor
- *"The best way to predict the future is to invent it!"* Alan Kay





# Dynabook

- Kay did post graduate studies at the University of Utah
  - Defined the Dynabook as
    - *"a portable interactive personal computer, as accessible as a book"*.
- Later realized as the Apple Newton which was not successful.



# Meanwhile, back at



- **Steve Jobs** visits **PARC** and sees the **Alto**
- Returns to Apple and heads up the **Lisa** project
  - graphical user interface
  - mouse
  - icons
  - pull down menus
- Launched in May 1983
- \$ 10,000



<http://www.obsoletecomputermuseum.org/lisa.html>

Apple logo from

<http://images.google.com/images?q=Apple+Macintosh&num=20&hl=en&start=40&sa=N>

# Macintosh (1984)

introduced during the Super Bowl



# Macintosh

- Motorola 68000 at 7.83 MHz
- 128 K RAM
- 9" B/W bitmapped display
  - 512 by 342 pixels
- 3.5 inch, 400 K floppy
- \$2,495
- Macintosh 512 "Fat Mac"
  - September 1984
  - 512 K RAM



<http://www.pattosoft.com.au/jason/Articles/HistoryOfComputers/Macintosh.gif>

# Jobs, Scully and Wozniak



Bettmann/CORBIS

[www.wsj.com/public/current/articles/ SB973301110711536244.ht](http://www.wsj.com/public/current/articles/SB973301110711536244)



# Apple

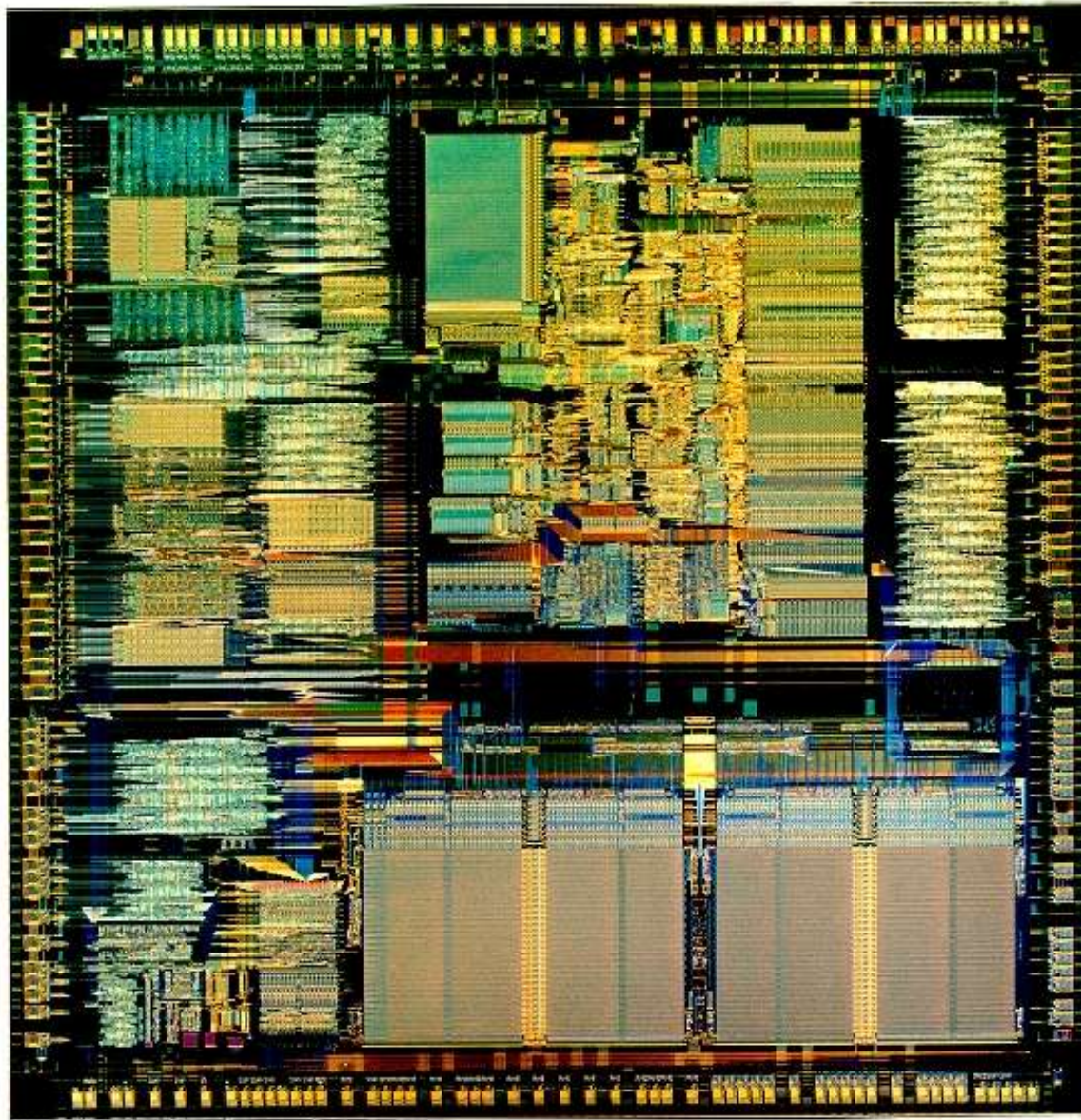
- **Apple III** introduced at National Computer Conference in May 1980, Anaheim, CA
- February 7, 1981, **Woz** crashes his four-seater single-engine airplane at Scotts Valley Airport: suffers from physical problems and amnesia; leaves Apple in fall 1981
- **1981: Steve Jobs named Chairman of the Board at age 26!**
- **Lisa project: May 1983**
- **Macintosh: February 1984**
- Friction between Jobs and Sculley
- **Steven Jobs is sacked by the Board, May 24, 1985**



1985



- Microsoft ships retail version of *Windows 1.0*, and brings Macintosh-like features to DOS-compatible machines
- Intel (October) introduces the *80386 chip* with 32-bit processing and on-chip memory management
- Paul Brainard's *PageMaker* becomes first PC desktop publishing program (first on Macintosh and later on IBM compatibles)



[http://www.intel.com/intel/intelis/museum/exhibit/hist\\_micro/hof/386B.htm](http://www.intel.com/intel/intelis/museum/exhibit/hist_micro/hof/386B.htm)

# Intel processors

<i>• CPU</i>	<i>Year</i>	<i>Data Memory</i>		<i>MIPS</i>
• 8080	1974	8	64K	
• 8088	1980	8	1M	.33
• 80286	1982	16	1M	3
• 80386	1985	32	4G	11
• 80486	1989	32	4G	41
• Pentium	1993	64	4G	111

# Microsoft

- 1987: M and IBM announce OS/2
- 1987 Releases Excel for Windows
- **1988: Microsoft surpasses Lotus Development Corporation as the world's top software vendor**
- 1989 Office, general business software for Macintosh available on CD-ROM
- 1990 Windows 3.0
- 1990 15<sup>th</sup> Anniversary: revenues of \$1.18 billion





Letting AT&T Loose? P.12 IBM At Your Service P.15 Stock Around The Clock P.17

# INFORMATIONWEEK

THE NEWSMAGAZINE FOR INFORMATION MANAGEMENT

AUGUST 5, 1991

A CMP PUBLICATION \$3.00

## A DECADE OF PERSONAL COMPUTING

A new era was born 10 years ago this month with the introduction of the IBM PC—and the way we do business was irrevocably changed. But at what cost? P.24



August 5,  
1991

GUN CONTROL: CAN BACKGROUND CHECKS CURB THE VIOLENCE?

# U.S. NEWS

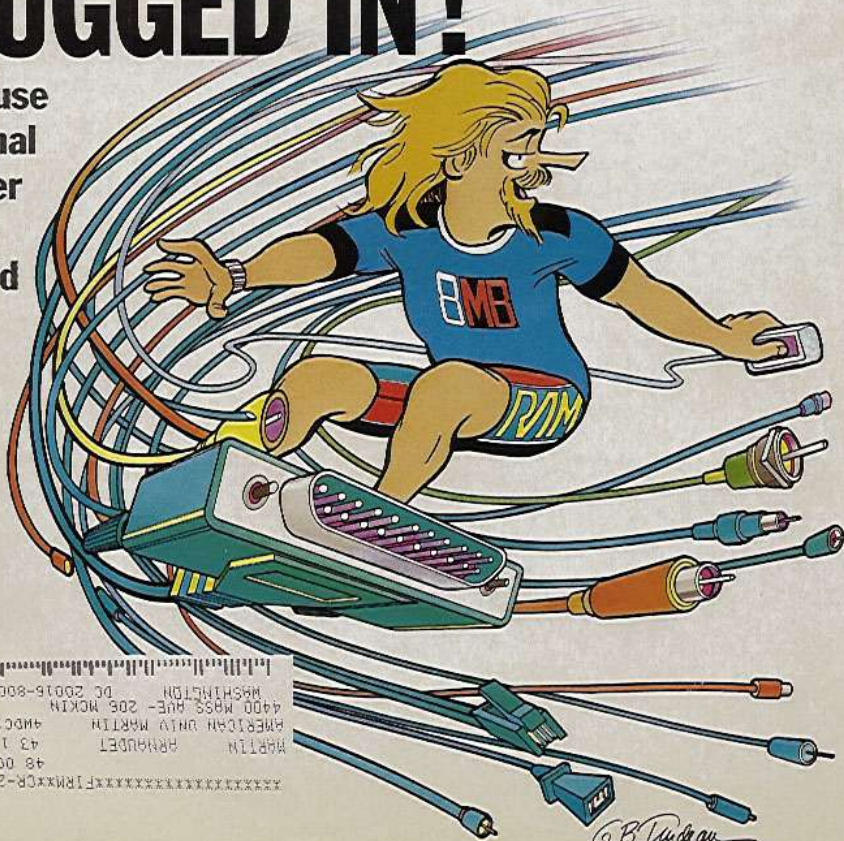
DECEMBER 6, 1993

& WORLD REPORT

\$2.50

## PLUGGED IN!

How to use  
a personal  
computer  
to bring  
the world  
to you



\*\*\*\*\*R-24  
48 000119 31  
MARTIN ARHUBET  
43 1  
AMERICAN UNIV MARTIN  
4MDC1 1  
4400 MORG AVE-205 MCKIN  
0618  
WASHINGTON DC 20016-8001

December 6,  
1993





December 1997

# References

- Bunch and Hellemans, *The Timetables of Technology*, Simon and Schuster, 1993
- Freiburger and Swaine, *Fire in the Valley: The Making of the Personal Computer*, Osborne/McGraw-Hill, 1984



# Celebrate the Century®

TECHNOLOGY • ENTERTAINMENT • SCIENCE

HISTORICAL EVENTS

## 1980s

CELEBRATE THE CENTURY®



ART • SPORTS



## Space Shuttle Launched, Berlin Wall Falls

**T**he space shuttle Columbia, the first reusable spacecraft, was originally launched April 12, 1981. Sandra Day O'Connor became the first female justice on the U.S. Supreme Court, and Sally Ride became the first American woman in space. The Iran-Contra hearings made headlines. Several events signaled the easing of international tensions. In December 1987, President Ronald Reagan and Soviet leader Mikhail Gorbachev signed a nuclear arms reduction treaty. The fall of the Berlin Wall in November 1989 presaged the end of the Cold War. The Vietnam Veterans Memorial was dedicated November 13, 1982. A new national holiday, Martin Luther King Day, was first celebrated in January 1986. The growth of cable television, video games, and compact discs had a major impact on home entertainment. Dallas and The Cosby Show topped TV ratings. Hip-hop culture and music videos gained popularity. New Words: yuppie, infomercial, bioethics.

POLITICAL FIGURES • LIFESTYLE





# References

- Thomas F. Haddock, *A Collector's Guide to Personal Computers and Pocket Calculators*, Florence, AL, Books Americana, Inc. (1993)
- Stan Veit, *Stan Veit's History of the Personal Computer*, copyright Stan Veit (1993)
- The Computer Museum: slide sets 13-17

# Biographies

- J.A.N. Lee, *Computer Pioneers*, IEEE Press, 1995
- Robert Slater, *Portraits in Silicon*, MIT Press, 1987
- Mary Northrup, *American Computer Pioneers*, Enslow Publishers, 1998
- Doug Garr, *WOZ: The Prodigal Son of Silicon Valley*, Avon (paperback), 1984 (paper)
- Steven Manes and Paul Andrews, *GATES, How Microsoft's Mogul Reinvented an Industry-and Made Himself the Richest Man in America*, Doubleday, 1993
- Jeffrey S. Young, *Steve Jobs: The Journey is the Reward*, Scott, Foresman and Company, 1988

# Corporate Biographies

- John Scully (with John A. Byrne), *Odyssey: Pepsi to Apple...The Journey of a Marketing Impresario*, Harper & Row, 1987 (paper)
- Jim Carleton, *APPLE: The Inside Story of Intrigue, Egomania, and Business Blunders*, Random House, 1997
- Frank Rose, *West of Eden: The End of Innocence at Apple Computer*, Penguin Books, 1990 (paper)

## More Corporate Biographies

- Jonathan Littman, *Once Upon A Time in ComputerLand*, Simon & Schuster, 1987
- Ted G. Lewis, *Microsoft Rising...and other tales of Silicon Valley*, IEEE Computer Society, 1999 (paper)