Chapter 10 Apple Computer in the 1980's

As a dominant personal computer manufacturer in 1980, Apple Computer had distinct characteristics. It had developed in the Apple II and the related disk drive, technology and ease-of-use features that enabled it to make the transition from hobbyist or technical hacker user to the mass consumer market. These innovations and the release of VisiCalc spreadsheet software resulted in the commercial success of the company.

It had espoused statements such as "Never build a computer you wouldn't want to own" and "One person -- one computer." The visit to the Xerox Palo Alto Research Center (PARC) in 1979 changed the course of product development. The new PARC human interface concepts suited the vision of Apple. It continued the innovative initiatives of Wozniak. The development of the Lisa computer and the Macintosh computer that would be the future of Apple in the 1980's.

10.1 ... Corporate & Other Activities

Public Stock Offering

The initial founders Jobs, Wozniak, Markkula, Holt and the venture capitalists who provided the financing had a tight control of the Apple Computer shares. Markkula also kept a firm control on the later sale and award of Apple shares. Initial shares went through several splits that significantly increased their value. A share distributed before April 1979 was the equivalent of thirty-two shares on the day that Apple went public.

During 1980 the market for new stock issues had improved. In August 1980 the Apple Computer board of directors decided to make a public offering of shares in the company. Apple selected two firms who offered 4.6 million shares of common stock for sale in December 1980. It was a huge success and oversubscribed. On the first day the offered share price of $22 increased to $29. At the end of December 1980 Jobs' ownership in the

company was worth about $256 million, Markkula's $239 million, Wozniak's $136 million and Holt's $67 million. The original founders had done extremely well.

1980/82 Activities

The company introduced Apple FORTRAN in January 1980, then they announced the Apple III computer in May (see Section 10.2). In August at a company board meeting the board members decided to implement a new company structure. They changed the organization from a functional one to a product-oriented one. The company created Divisions for the Apple II and Apple III, Lisa, accessories, manufacturing, sales and service.

In February 1981 Wozniak crashed his airplane on take-off from a local airport. Wozniak had serious injuries and for a period of time suffered from amnesia and lapses of consciousness. By early 1981 the employee count had grown rapidly to nearly 2,000. An adjustment required just over 40 employees being terminated in February. The terminations, and the way Mike Scott handled them, had a bad effect on employee morale. Employees described the layoff as "Black Wednesday." A number of activities were converging to undermine the effectiveness of Apple's president Mike Scott. He was experiencing potentially serious health problems with an eye infection. Also he had not impressed management with the poorly handled layoffs. After an executive meeting in March, Markkula requested Scott's resignation and assumed the presidency of the company.

With release of the IBM PC computer in August 1981, Apple made an interesting competitive response. Advertisements in a number of national newspapers published an open letter to IBM. It stated "Welcome, IBM. Seriously. Welcome to the most exciting and important marketplace ..." Jobs received a personal reply from John Opel, the president of IBM thanking him for his comments.

Jobs appeared on the cover of *Time* magazine in February 1982 with the caption "Striking it Rich -- America's Risk Takers." *Life* magazine also featured him a month later. Jobs appeared again in the January 1983 issue of *Time* magazine; this issue named the personal

computer as the "Machine of the Year." The article was not complimentary of Jobs, but he was becoming a national personality.

In May 1982, Apple sued Franklin Computer Corporation for patent and copyright infringement. Wozniak, who had been playing a less significant role within the company, decided to return to college and complete his bachelor's degree. Wozniak also arranged and financed a "US Festival" of rock music in September and a second one in 1983. It was during 1982 that Apple, at Jobs' initiative, began the process of giving Apple computers to academic institutions and prisons. In November 1982 Apple held its first AppleFest in San Francisco, California. Then in December, Apple became the first personal computer company to reach a rate of one billion dollars in annual sales.

The company started a project in 1982 called the Apple IIx using an early version of the Western Design Center 65816 microprocessor. The engineering manager was Dan Hillman with some assistance from Wozniak in 1983. However availability and reliability problems with the microprocessor, and potential market conflicts with the other Apple products resulted in the project cancellation in early 1984.

John Sculley

Apple started considering candidates for the presidency in 1982. Markkula had already stated that his role as president was temporary, and the board would not support Jobs' desire for the position. The personal computer market had changed after IBM's entry in 1981. IBM was gaining market share and the other companies engaged in severe price-cutting to maintain sales. The need for a new president at Apple was becoming more important. Apple engaged an executive search firm who approached several candidates, including Don Estridge of IBM. However after an attractive offer from Jobs he decided to stay with IBM. Late in the year they made the initial contacts with John C. Sculley, the president of Pepsi-Cola USA, a subsidiary of PepsiCo.
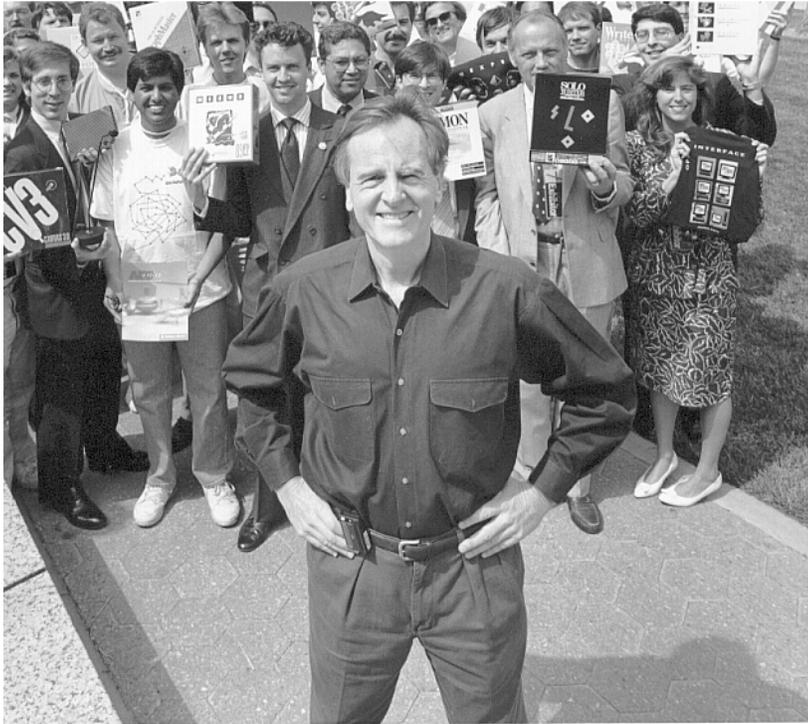
Figure 10.1: John C. Sculley.
Photograph is courtesy of Apple Computer, Inc.

John Sculley had a bachelor's degree from Brown University and an MBA from the University of Pennsylvania Wharton School. Sculley joined Pepsi-Cola in 1967 and became president of the company in 1977. Markkula offered Sculley $1 million to join Apple, $1 million in annual pay and options for 350,000 shares of Apple stock in the spring of 1983. In addition he received compensation to purchase a house in California and $1 million in severance if he did not work out. Within a few months the stock options would be worth over 9 million dollars. Jobs had made a pointed comment to Sculley when he said "Do you want to spend the rest of your life selling sugared water, or do you want a chance to change the world?" Sculley accepted the offer

in April and became the new president and chief
executive officer.

Other Activities between 1983 and 1989

The company announced the Apple IIe and Lisa
computers in January 1983 (see Sections 10.3 and 10.4
respectively). The publicity described the computers as
"evolution and revolution." Bill Atkinson and Rich Page
became Apple Fellows in February. Then Apple Computer
entered the *Fortune* magazine top 500 companies at number
411 in May and built the one millionth Apple II in June.
It was the first computer awarded in a program called
"Kids Can't Wait," that provided computers to about
9,000 schools in California. Apple introduced the ProDOS
operating system in June and an integrated software
package called AppleWorks in November. The company then
introduced the Apple III Plus computer and the
ImageWriter dot-matrix printer in December. Apple sales
had surpassed one billion dollars annual rate by
December. However competition from companies such as IBM
had reduced profits. An industry wide recession had
started that resulted in significant staff reductions.
Sculley then decided to reorganize the company into two
operational groups; the Apple II and Apple 32 that
integrated the Lisa and Macintosh product lines.

The company announced the Lisa 2 (see Section
10.4) and the Macintosh (see Section 10.5) computers in
January 1984. The company also released the ProDOS
operating system for Apple II computers and reached an
out-of-court settlement of their patent infringement
suit with Franklin Computer Corporation in January. Then
Apple introduced the Apple IIc computer (see Section
10.3) and discontinued development of the Apple III
product line in April. Alan Kay who had been a principal
at Xerox PARC and chief scientist at Atari, became an
Apple Fellow in May. Apple introduced the DuoDisk for
the Apple II computer in June for $795, that was
essentially two 5.25-inch Disk II drives in a single
cabinet. A new version of the word processing program
Apple Writer 2.0 was released in September. During the
year the company investigated strategic alliances with
companies such as AT&T, General Electric, General Motors

and Xerox. An alliance would finance major initiatives to increase company penetration in the office systems market. Sales boomed until September, and by November Apple had sold two million Apple II computers. However during the last three months of 1984 an industry wide recession lowered Apple II, Lisa and Macintosh sales significantly below marketing forecasts.

In 1984, Andy Hertzfeld who had worked on the development of software for the Macintosh computer, left Apple Computer and developed a program called Switcher. The program was developed to compete with integrated packages and enabled a user to switch between different applications that could be running simultaneously. Hertzfeld sold the program to Apple Computer who supplied it free with the Macintosh computer.

Apple introduced the Macintosh Office software and an advanced laser printer named LaserWriter priced at $6,999 in January 1985. The printer used a Motorola MC68020 microprocessor and the Adobe PostScript page description language (PDL). The Macintosh Office featured the AppleTalk Personal Network software that allowed a group of Macintosh computers to communicate and be connected to a LaserWriter printer. Unfortunately some key elements of the Macintosh Office software such as the FileServer for sharing information were not ready. Wozniak left Apple in February and started a new company called CL-9 (Cloud-Nine) to develop remote control products for the home. Apple enhanced the Apple IIe computers in March and terminated production of the Lisa computer in April. Different versions of a 3.5-inch UniDisk drive with a capacity of 800K bytes were released in 1985 for the Apple II computers.

As sales deteriorated, the relationship between Jobs and Sculley also deteriorated. In the spring of 1985 they contested in a somewhat acrimonious manner for the leadership of the company. This executive confrontation and a deterioration of sales forced Sculley as CEO of the company to make organizational changes. After securing the support of the board members in April, he persuaded them to relieve Jobs of any operational role in the company. In May the product oriented organization that Mike Scott created in 1980

and Sculley adjusted in 1983, changed back to a functional one. Personnel changes included: Del Yocam, became group executive in charge of all operations; Jean-Louise Gassée, would be in charge of product development; Deborah A. Coleman, world-wide manufacturing; and Michael H. Spindler, all international operations. Then in June, Apple closed three manufacturing plants and laid off 1,200 employees. Finally Apple declared its first quarterly loss.

Another problem for Apple Computer was a lack of application software for the Macintosh computer. This resulted in a campaign to encourage software companies to develop application programs for the Macintosh. Guy Kawasaki who had joined Apple in 1983 and Mike Boich became "software evangelists," that promoted the new campaign. A significant application program for the Macintosh, would be the desktop publishing program called PageMaker.

Jobs resigned in September and started a new company called NeXT Computer, Inc. However when five key personnel joined NeXT, Apple started litigation to stop Jobs and NeXT Computer from using any of its proprietary technology.

Work was started in 1984 to develop an online worldwide network to support the company's dealers. This evolved into a Macintosh system called AppleLink that went online in July 1985. The system was maintained and operated as a joint effort between Apple Computer and General Electric. It featured easy-to-use graphics, icons and windows.

Apple announced the Macintosh Plus and the LaserWriter Plus in January 1986. Sculley became chairman of the company and Apple reached an out-of-court settlement in the litigation with Steve Jobs in January. By February, Jobs had sold his holdings of Apple stock, the separation was now complete and Markkula now became the largest shareholder. Wozniak graduated from the University of California at Berkeley in June. The company announced the Apple IIGS computer and the enhanced Apple IIc in September (see Section 10.3).

Apple introduced the Macintosh SE and Macintosh II (see Section 10.5) in March 1987. Then in April, the company decided to create an independent wholly owned subsidiary called the Claris Corporation, to take over sales and marketing of Apple application software. Apple also introduced the MultiFinder operating system software and the HyperCard software for the Macintosh computer at the MacWorld trade show in Boston in August.

After helping to create the latest versions of the Macintosh computer, Steve Sakoman became head of a new research project in 1987. Sakoman wanted to create a radically different personal information device he named Newton. It would be pen-based, use handwriting recognition and wireless communication. By 1989, a prototype slatelike device had been developed that measured 8.5 by 11 inches. However, the estimated cost had grown from an early target of $2,500 to between $6,000 and $8,000 and Sakoman was having problems with corporate support.

Bill Atkinson developed the HyperCard system software and the HyperTalk programming language in August 1987. This personal software toolkit provided a capability to organize a body of information and then create links and cross-references within it. The data could be text, graphics, video, animation or sound.

In March 1988, Apple started litigation against Microsoft. Apple claimed for infringement of the Macintosh graphics in a new release of MS Windows Version 2.03 software. The suit also named Hewlett-Packard and it's NewWave software in the litigation. Apple introduced the Apple IIc Plus and the Macintosh IIx (see Section 10.5) computers in September. The Macintosh IIx was the first Apple computer to use the Motorola MC68030 microprocessor and 68882 math coprocessor. Claris released AppleWorks GS for the Apple IIGS computer in October.

In July 1989 a judgment in the litigation with Microsoft, significantly reduced Apple Computer's claims. Apple announced the Macintosh Portable and the Macintosh IIci in September 1989 (see Section 10.5). The Macintosh IIci was a high performance version of the Macintosh IIcx. In 1989 Xerox filed a lawsuit against

Apple, stating it had infringed on the PARC copyrights. However the court dismissed most of the lawsuit in early 1990.

Following the company reorganization in 1985 and the introduction of Macintosh products with more memory and hard disk storage, the fiscal condition at Apple started to improve. Although corporate management problems continued. Areas such as executive direction and software development could have been improved. A tug-of-war between profit margin and an open or licensed product architecture to increase the Macintosh market share, resulted in a short term solution with far reaching effects. These years were a turning point for the company. The open architecture of the IBM Personal Computer and all its clones, resulted in a massive market support in both hardware and software development that would be detrimental to Apple's future leadership in the industry. However, sales and profits continued to improve. In the 1989 annual report, the net sales were 5.3 billion dollars and the total number of employees 14,517. An impressive growth compared to 1979. John Sculley as chairman, president and chief executive officer had made significant achievements since his arrival in 1983. However the past was history, as he stated in the annual report "As we look to the new decade, we see a time of enormous opportunity for Apple Computer."

10.2 ... *Apple III*

The Apple III computer had a difficult gestation from its start in 1978 as the Sara project. A requirement to be able to run Apple II software, limited the microprocessor selection and created difficulties with the design. Wendell Sander was the chief hardware designer. Jobs was involved initially with the product design and affected its completion schedule with numerous demands. Apple set a constricted target date and problems developed around the time Jobs got interested in the Lisa technology. Planning required Apple III development within ten months. It was to be a

stopgap product to bridge between an anticipated fall-off in Apple II sales and the introduction of Lisa. The company targeted the Apple III at the small business owner and for professional-managerial users. Apple announced the computer at the National Computer Conference in Anaheim, California in May 1980 and started shipping them in the fall of 1980.

Figure 10.2: Apple III computer.
Photograph is courtesy of Apple Computer, Inc.

The computer used a Synertek 6502A microprocessor with 96K bytes of memory, expandable to 128K. The unit included one built-in 5.25-inch, 143K byte floppy-disk drive and the terminal could display 24 lines of 80-column text.

The computer had a new operating system called SOS (Sophisticated Operating System), built-in Apple Business BASIC and Pascal programming languages. An

Apple II emulation mode enabled some Apple II software to run on the computer. Jeffrey S. Raikes was a principal in the development of the Apple III software.

The company sold Apple III computers as systems. A computer system with a black-and-white monitor, an 80-column thermal dot-matrix printer and the VisiCalc III spreadsheet program sold for $4,500.

The company released a 5 megabyte hard disk called ProFile for use with the system in September 1981. The compressed schedule and the various design changes incorporated had a detrimental effect on the quality of the computer. A number of problems required a redesign of the computer then re-introduction in December. Apple allowed early customers to exchange their old computer for a new one. The company introduced the Apple III Plus with 256K bytes of memory, other improvements and a price of $2,995 in December 1983. However after the introduction of the Macintosh and Lisa 2, the company discontinued the product line in April 1984. The initial poor quality resulted in only sixty-five thousand Apple III's being sold in the three years after its introduction. The resources committed to the release and problems with the Apple III during 1980/81, inhibited enhancements to the Apple II product line.

10.3 ... *Apple II's*

Apple IIe

During 1981 the Apple II computer group started working on an upgrade that became the Apple IIe. The "e" represented enhanced. Apple intended this upgrade to extend the life of the Apple II. Peter Quinn was the chief engineer and Walt Broedner a principal in the development of the new design. Apple retained the enclosure style of the Apple II computer but completely redesigned the interior. The new design significantly reduced the number of integrated circuit chips. Two custom MOS chips and 64K bit memory chips contributed to this reduction. The company announced the Apple IIe with the Lisa computer in January 1983.

The computer used a MOS 6502A microprocessor with 64K bytes of RAM, expandable to 128K. The storage system supported six 140K byte 5.25-inch floppy disk drives and the terminal could display 24 lines of 40-column text in both uppercase and lowercase characters. The unit had a new 63-key keyboard adapted from the Apple III computer.

The programs in the 16K of ROM were the Applesoft BASIC interpreter, system monitor routine, 80-column display firmware and self-test routines. The company also released the Apple Writer IIe word processor and QuickFile IIe data base application programs. The majority of Apple II and Apple II Plus programs and peripheral cards were compatible with the Apple IIe.

The base list price for a standard unit was $1,395. A typical system with a single Apple Disk II drive and controller, 64K bytes of RAM, 80-column text card, and a monochrome monitor had a price of $1,995. An Apple Disk II drive and controller had a cost of $545. The 80-column text card cost $125 and the extended memory 80-column card that included an additional 64K bytes of memory cost $295.

Apple enhanced the Apple IIe computers with four new high-performance chips in March 1985. The new chips replaced the character-generator, Applesoft and system-monitor ROM chips and the 6502 with a 65C02 microprocessor. The changes provided system improvements, more compatibility with the IIc computer and facilitated the use of mouse-driven software. An additional update of the Apple IIe occurred in January 1987, that incorporated the Apple IIGS keyboard and other improvements.

Apple IIc

Apple introduced the Apple IIc at an "Apple II Forever" conference in San Francisco, California in April 1984. The "c" stood for compact. Peter Quinn who was the chief engineer for the Apple IIe, was also engineering manager of the IIc design team. It was a portable computer that would be in competition with the IBM PCjr. The computer used additional custom integrated circuits as compared to the Apple IIe to reduce the

number of chips on the motherboard. Dimensions of the computer were 12 by 11.5 by 2.25 inches and the weight was 7.5 pounds. A German design company styled the attractive case.

The computer used a 65C02 microprocessor and 128K bytes of RAM. The unit had one built-in half-height 5.25-inch 140K byte floppy disk drive and the monitor could display 24 lines of 40 or 80-column text. The computer was a closed-hardware architecture with no expansion slots and the power supply was an external unit. The housing integrated a 63-key keyboard that was functionally a duplicate of the Apple IIe keyboard.

A 9-inch monochrome monitor and a thermal-transfer printer called Scribe were released with the computer introduction. Also announced but not available at the introduction, was a flat-panel display that Apple intended to introduce by the end of 1984.

Apple had updated the IIe ROM software that contained the Applesoft BASIC interpreter and various routines. The computer used the new ProDOS operating system that provided for hierarchical directory structures. Most of the Apple II application programs were capable of running on the IIc computer. The basic computer had a price of $1,295.

Apple introduced an enhanced Apple IIc in September 1986. Then they introduced a less expensive Apple IIc Plus that incorporated a faster 4 MHz version of the 65C02 microprocessor, an internal 3.5-inch disk drive and a built-in power supply in September 1988. The Apple IIc Plus had a price of only $675 or $1,099 with a color monitor.

Apple IIGS

The success of the Apple IIc, the availability of a compatible 16-bit microprocessor and a new Mega II chip were factors in Apple's decision to create the Apple IIGS. The "GS" stands for graphics and sound. The Apple IIGS computer evolved from the 1982/83 Apple IIx project. Principals in the engineering design were Dan Hillman, Harvey Lehtman, Rob Moore and Wozniak. The GS project had several code names during development such as Phoenix, Cortland and Rambo. Hillman and Jay Rickard

developed the Mega II as a cost reduction project, that resulted in the integration of most Apple II functions on a single chip. The new 16-bit computer incorporated enhanced graphics, advanced sound capabilities, expanded memory and an Apple II emulation mode. Apple introduced the Apple IIGS in September 1986.

The computer used a Western Design Center W65C816 microprocessor and 256K bytes of RAM, expandable to 8 megabytes. The storage system included support for both 3.5-inch 800K byte and 5.25-inch 140K byte floppy disk drives. The terminal could display 24 lines of 40 or 80-column text. The keyboard was a separate unit with 80 keys and a 14-key numeric keypad. The standard system included a mouse. Apple also introduced an optional 20 megabyte hard disk designated 20SC for use with the computer. A computer system with a monochrome monitor and one 3.5-inch disk drive had a price of about $1,500.

Apple provided a new operating system called ProDOS 16 for the 16-bit native mode and ProDOS 8 for the Apple IIe emulation mode. ROM software included; the Applesoft BASIC interpreter, mouse based system utilities and a desktop environment with similarities to the Macintosh computer. QuickDraw II provided a set of graphic routines. Most of the existing Apple II software was compatible with the Apple IIGS. Apple released a new more powerful and flexible 16-bit operating system called GS/OS in September 1988.

The company released an enhanced Apple IIGS in August 1989. The new computer had 256K bytes of ROM and 1 megabyte of RAM. The ROM software included a number of improvements.

10.4 ... Lisa

William "Trip" Hawkins had developed a marketing plan describing the requirements for the Lisa computer by March 1980. Larry Tesler who had demonstrated the advance Xerox Alto computer systems to Apple in December 1979, joined the Lisa design team in July 1980 and became the manager of software development. Rich Page who was the chief hardware architect, had just completed

a prototype of the Lisa computer incorporating a sample Motorola 68000 microprocessor. The Lisa name now denoted Local Integrated Software Architecture.

Once again, as in the Apple III product, Jobs was affecting the design with numerous changes. This resulted in the departure of Ken Rothmueller and the appointment of Wayne Rosing as engineering manager. It also resulted in Mike Scott and Markkula advising Jobs in September that he would no longer be heading the Lisa project. In anticipation of the public stock offering and to placate Jobs they promoted him to chairman of the board. As part of a new corporate reorganization, John Couch became the general manager of the Lisa product group.

Apple had integrated and extended the Xerox PARC (Palo Alto Research Center) graphical concepts in both the hardware and software. Bill Atkinson, Tesler and others developed the operating system and bit-mapped graphics software into an innovative friendly environment for the user. The computer was designed to be intuitive and standard features consistent throughout the system. The desktop user interface utilized the windows concept, icons, a standard user program interface, menu bar, pull-down menus, clipboard and direct manipulation of screen objects by the mouse. Apple had achieved a new "state of the art" for personal computer software.

However Apple was having problems with the Twiggy floppy disk drive for Lisa. They decided to redesign the drive and have it produced by the Alps Electric Company, a Japanese manufacturer. Apple provided a preview of the Lisa computer to the Manhattan East Coast media then officially announced its introduction in January 1983. However the late delivery of disk drives from Alps Electric delayed shipment of computers until May.

The computer used a Motorola MC68000 microprocessor with 1 megabyte of RAM. The storage system had two Twiggy 5.25-inch 860K byte floppy disk drives and a separate 5 megabyte Winchester-type hard disk named ProFile. The computer housing enclosed the 12-inch monitor and two floppy disk drives. The keyboard was a separate unit and included a numeric key pad. The

system utilized a one button mouse for control of the
screen cursor.

Figure 10.3: Lisa computer.
Photograph is courtesy of Apple Computer, Inc.

The software group developed the operating system,
Window Manager, QuickDraw graphics, Desktop Manager for
file and program manipulation and LisaGuide instruction
package. Apple used software and the MC68000
microprocessor to generate the video display. The
company also developed a suite of seven application
programs called the Lisa Office System. LisaDraw
provided drawing capability for lines, boxes, circles
and other features with mouse control. LisaWrite was a
what-you-see-is-what-you-get word processor developed by
Tom Malloy, another Xerox PARC recruit. LisaCalc was a
sophisticated spreadsheet program. LisaGraph was a

graphing program for creating bar, line, mixed bar and line, scatter and pie charts. LisaList was a database program with searching, sorting and reporting capabilities. LisaProject was a PERT (Program Evaluation and Review Technique) program with capabilities for displaying Gantt and task charts. LisaTerminal was a communications program with emulation capabilities for the DEC VT52, DEC VT100 and Teletype ASR-33 terminals. AppleNet software was also available for connecting multiple Lisa installations.

A Lisa system with one megabyte of RAM, two floppy disk drives, a ProFile hard disk and seven application programs sold for $9,995. A C.Itoh dot-matrix printer cost about $700 and a Qume letter quality printer was about $2,100. The company targeted the Lisa computers as office systems with pricing that excluded Apple's traditional personal user. Unfortunately at the Lisa announcement, Jobs told reporters of the new Macintosh computer. He stated that the Macintosh would cost $2,000 compared to $10,000 for the Lisa. This and the lack of compatibility between the two computers would affect future sales of the Lisa computer. Apple unbundled the suite of software and reduced the Lisa price to $6,995 in September.

Lisa 2

Apple announced the Lisa 2 family of computers at the annual shareholders meeting in January 1984. The company changed the design and pricing to counteract marketing concerns related to the new Macintosh computer.

Apple released three models for what they called the Apple 32 SuperMicro product line. Those three models were the Lisa 2, Lisa 2/5 and Lisa 2/10. Each of the models used the same Motorola MC68000 microprocessor as the Lisa and had 512K bytes of user memory. The number of floppy disk drives on each model changed from two 5.25-inch Twiggy's to a single 3.5-inch Sony drive as used on the Macintosh. The Lisa 2 had no hard drive and sold for $3,495. The Lisa 2/5 had an external 5-megabyte ProFile hard drive and sold for $4,495. The Lisa 2/10

had an internal 10-megabyte hard drive and sold for $5,495.

An operating system software package called MacWorks was available that enabled all three models to run Macintosh application programs. However one potential problem was that the Macintosh pixel display was square, whereas the Lisa pixel display was rectangular. The Lisa Office application programs required a model with a hard drive and a memory card to extend the memory to one megabyte. Apple also announced a new AppleBus for a small-scale local-area network to connect peripherals. It also facilitated the transfer of files between the Lisa and Macintosh computer systems.

Conclusion

Corporate America did not accept the Lisa computer as an office system. The Lisa software and files were not compatible with either IBM or the Macintosh and the price was too high. Sales were significantly below marketing forecasts in 1984. Then in January 1985 Apple renamed the Lisa 2/10 computer Macintosh XL and reduced the price to $3,995. The XL denoted extra-large or ex-Lisa. Apple discontinued the other two Lisa models. This however did not result in any significant sales increase and Apple discontinued the computer in April 1985.

10.5 ... Macintoshes

Development and Release

Under Jef Raskin's direction, Brian Howard and Burrell Smith had completed prototypes using the Motorola M6809E microprocessor. Raskin had also hired Guy "Bud" L. Tribble to develop the Macintosh software. In September 1980 the board considered cancellation of the project due to problems with the Apple III and Lisa computers. After Jobs' separation from the Lisa product development in September, he started looking at the low-cost Macintosh project. Jobs now questioned Raskin's selection in 1979 of the Motorola M6809E microprocessor with its limited capabilities. Jobs supported a proposal by Burrell Smith and Bud Tribble to change the

microprocessor to the Motorola MC68000 and had a new prototype constructed by December. The new design had many capabilities comparable to the Lisa, at significantly lower cost. Jobs perceived the Macintosh as being a suitable successor to the Apple II.

Jobs became the Macintosh manager and was given authorization to change the Macintosh development from "project" to "product" status. The time frame for the new product development would be twelve months. In January 1981 Jobs increased the staff by moving key Apple II people to the Macintosh development group. Principals in the hardware development were Burrell Smith and Rod Holt. In the software development the principals were Bud Tribble the software manager, Bill Atkinson, Andy Hertzfeld, Bruce Horn and Randy Wigginton. Industrial designers Jerry Manock and Terry Oyama designed the computer enclosure. Differences in management and technical issues developed between Jobs and Raskin that resulted in Raskin leaving the development group in 1981, and resigning from Apple Computer in March 1982. Jobs had also supported the removal of Mike Scott as president in March 1981 and was now in a stronger position to control the destiny of the Macintosh computer within the company. Apple established a target date of early 1982 to ship the new Macintosh.

Jobs made a number of significant design decisions during 1981. The "footprint" of the new computer would be no larger than a telephone directory to minimize the space occupied by the computer on a desktop. After various mockups of the case, Manock finalized the enclosure design by early summer. The enclosure integrated the monitor and floppy disk drive within the case. The unit had a detached keyboard. There would be no expansion slots; Apple decided that software would be the means to expand the capabilities of the computer. A set of software tools within ROM would facilitate program development and provide a consistency in the user interface. Apple had outside suppliers write most of the application programs.

In the spring of 1981, Jobs visited Paul Allen and Bill Gates at Microsoft to discuss the requirements for software on the Macintosh computer. Jobs wanted

Microsoft to supply a spreadsheet, a chart program and a BASIC interpreter for shipment with the Macintosh. At this time Microsoft was busy developing software for the new IBM Personal Computer. However after visiting Apple and seeing a presentation of the Macintosh, they reached an agreement in January 1982 to provide the software requested by Jobs. Microsoft adapted the spreadsheet program from Multiplan, the charting program became MacGraph and work on the adaptation of a BASIC interpreter began.

The executive management approved production of the Macintosh computer in December 1981 with shipment date targeted for October 1982. However in early 1982 the introduction date of the Macintosh changed to May 1983. Jobs decided to assemble the Macintosh computer using advanced robotic techniques in a highly automated factory. They would also utilize a cost-effective Japanese concept of "just-in-time" for delivery of production parts.

The software manager, Bud Tribble left Apple in 1982. Robert L. Belleville replaced him and became director of Macintosh engineering. Bill Atkinson, Steve Capps, Andy Hertzfeld, Bruce Horn and Larry Kenyon designed the operating system. Bill Atkinson had the experience of being a principal in the development of the Lisa operating system. Horn and Capps developed the Finder program for file and program control in the desktop environment. A drawing program named MacSketch that became MacPaint, and an interface program called Toolbox by Hertzfeld were also under development internally. Apple assigned Donn Denman to develop a BASIC programming language called MacBASIC. A potential marketing problem for the Macintosh and Lisa computers was developing. It was their lack of compatibility in operating systems, programs and data files.

Jobs had arranged for Randy Wigginton to write a word processing program for the Macintosh, when he decided to leave Apple. However Jobs was determined to have Wigginton write the word processing program. In December 1981 Jobs offered Wigginton royalties up to $1 million if he developed the software on-time for the Macintosh delivery date. Wigginton demonstrated his

first pass at his word processing program in early 1982. It was obvious that the Macintosh screen had trouble displaying 80 columns of text. The screen display resolution had changed from the original 256 by 256 pixels to 384 by 256 pixels and now for the new requirements to 512 horizontal by 342 vertical pixels. This allowed the lines to break on the screen at the same place they break on the printer, a What-You-See-Is-What-You-Get (WYSIWYG) system.

Jobs was also having problems with the Macintosh name. Although Raskin had changed the spelling, McIntosh Laboratories claimed it was a phonetic infringement of their trademark. Apple subsequently made a payment to McIntosh Laboratories to license the rights to use the Macintosh name.

In January 1983, problems with the Twiggy floppy disk drive resulted in the computer introduction date being moved to August. By the summer, Alps Electric was still having problems, Apple therefore decided to use a new 3.5-inch disk drive developed by Sony. The disk had a greater capacity and a more protective plastic case. However this resulted in the computer introduction date being delayed again. Apple announced the introduction to the public in a dramatic Orwellian commercial during the Super Bowl football game in January 1984. The official introduction was two days later on January 24th, at the annual shareholder's meeting.

The computer used a Motorola MC68000 microprocessor with 128K bytes of RAM. The storage system had one integral 3.5-inch 400K byte floppy disk drive from Sony. The disk controller used a single large-scale integrated chip called IWM (Integrated Woz Machine). It was a one-chip integration of the disk controller functions as developed by Wozniak for the Apple Disk II drive. The display was a 9-inch monochrome monitor. The computer had a small 9.75 by 10.9 inch footprint and was 13.5 inches high with no expansion slots and a separate keyboard. The computer system utilized a single-button mouse similar to the Lisa mouse.
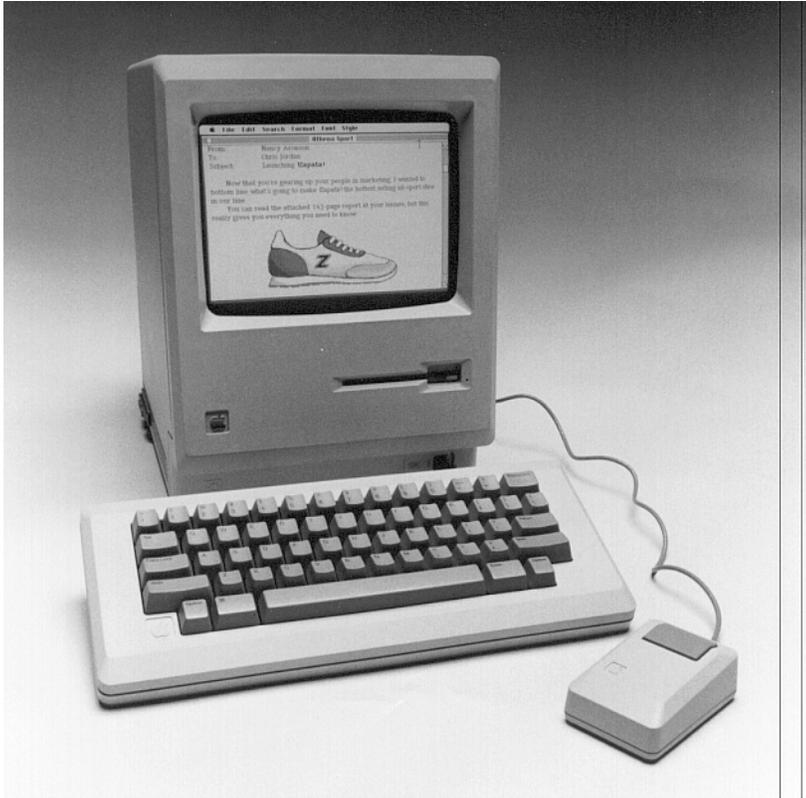
Figure 10.4: Macintosh computer.
Photograph is courtesy of Apple Computer, Inc.

The 64K of ROM contained; the operating system, a Finder program and a set of routines called the User-Interface Toolbox. The Toolbox routines controlled the mouse, windows, menus, text editing and other features of the user interface. A QuickDraw graphics program developed by Bill Atkinson was also in ROM. Two application programs were available from Apple. The first was MacPaint, also created by Atkinson and the second was the word processing program called MacWrite, written by Randy Wigginton. Microsoft had also adapted the spreadsheet program Multiplan and a Microsoft BASIC

interpreter for the Macintosh. Other programs announced for release in 1984 included; Pascal, Assembler/Debugger, Logo, MacDraw, MacProject, MacTerminal and the Word processing program.

The price of the Macintosh was $2,495, an ImageWriter printer $595 and a second 3.5-inch disk drive $495. Prior to introduction Apple devised a unique marketing strategy to increase initial sales. They formed an Apple University Consortium (AUC) that offered the Macintosh to students and faculty for a flat $1,000. This program was a huge success that enabled the Macintosh to penetrate the educational market.

Shortly after the enthusiastic introduction users noted two limitations that impeded the utilization of the Macintosh. One limitation was the storage system and the other was memory. Apple released a second 3.5-inch external drive in the early summer. The other storage limitation was the lack of a hard drive. However the significant limitation was the 128K bytes of user memory. The bit-mapped video system and extensive use of graphics utilized a portion of the RAM memory. This reduced the memory available for application programs and files. It also resulted in a slowdown of program execution. Users were saying that the computer was a weakling, slow and under-powered. Macintosh sales were below market forecasts by summer. In response to this and a lack of application software, Apple lowered the price to $1,995. Then Apple started development of the TurboMac and released the "Fat Mac" with 512K bytes of RAM memory in September.

In November 1985, Gates and Sculley signed a controversial agreement related to the similarities between Microsoft Windows software and the Apple Lisa/Macintosh graphics. The agreement recognized that Microsoft had used derivatives of the Apple graphics and allowed their use in Microsoft Windows and other application programs. Also in return for an extension of the license for Microsoft BASIC (Applesoft BASIC) on the Apple II computer, Apple agreed to terminate the completion of MacBASIC that Donn Denman had been developing. Microsoft also agreed to upgrade the Word

application program and delay the Excel spreadsheet for the IBM Personal Computer.

Macintosh Plus

Apple announced the Macintosh Plus with one megabyte of memory in January 1986. The computer had an improved disk drive with greater capacity, cursor keys and a numeric key pad. The Macintosh Plus now included provision for the connection of a hard disk drive. The computer had a price of $2,599. Apple also released the LaserWriter Plus printer that had a price of $6,798.

Raskin and Jobs concept of a closed system had limited the power and expansion capabilities of the Macintosh. However Apple changed this with the introduction of the Macintosh SE and II series of computers.

Macintosh SE

Apple introduced the Macintosh SE (System Expansion) that was an upgrade of the Macintosh Plus at the AppleWorld conference in March 1987. The SE model targeted the business market.

The computer had one expansion slot for a plug-in board, two internal disk drives and a heavy duty power supply with a cooling fan. One of the internal drives could be a 20 MB hard disk. A rewritten ROM provided a speed improvement. The Macintosh SE had a price of $2,769.

Macintosh II

Apple also introduced the Macintosh II at the AppleWorld conference in Los Angeles, California in March 1987. It was a second generation of the Macintosh family for advanced users. Mike Dhuey was a principal in the design of the computer. It featured an open architecture, a more powerful 32-bit microprocessor, built-in hard disk storage, a separate color or monochrome display and network capabilities that would enable connection to the IBM world. This release preceded the IBM announcement of the PS/2 (Personal System/2) series of computers by one month.

The computer used a Motorola MC68020 microprocessor with a floating-point coprocessor and one megabyte of RAM, expandable to 8 MB. The Mac II had about four times the speed of a Macintosh SE. The unit had an open NuBus architecture developed at MIT. The 13-inch color or 12-inch monochrome monitor could display 640 by 400 pixels as compared to the 512 by 342 pixel display on the previous Macintosh computers. The computer included custom sound chips to digitize audio input or output.

The basic computer with one megabyte of memory had a cost of $3,898. A 40 MB hard disk drive cost $1,599 and a color monitor with a display board had a cost of $1,547. A complete system had a total price of $7,044. Apple released an implementation of the AT&T UNIX operating system called A/UX, for the Macintosh in 1988.

Other Macintosh Developments

In March 1988, a software project called Pink was started to develop a next-generation operating system. The new system would incorporate advance features, including object-based technology and preemptive multitasking. Erich Ringewald was the initial project leader. Another development that became the Blue project was started to improve the current operating system. This became the System 7 operating system released in 1991.

Apple introduced the Macintosh IIx in September 1988. It used the Motorola MC68030 microprocessor and 68882 math coprocessor. The computer had a price of $7,769. Early in 1989, Apple released the Macintosh SE/30 that used the Motorola MC68030 microprocessor. Then shortly after, Apple released the powerful modular Macintosh IIcx. Apple introduced the Macintosh IIci in September 1989. It was a high-performance version of the Mac IIx operating at 25 MHz. The computer had a price of $6,269.

Macintosh Portable

Apple introduced the Macintosh Portable in September 1989. The computer was available in two models: a model with a single floppy-disk drive and a model with both a floppy-disk drive and an internal 40 megabyte hard disk drive.

The computer used a Motorola CMOS 68000 microprocessor with 1 megabyte of RAM expandable to 2 megabytes. The unit included a built-in 3.5-inch 1.4 megabyte floppy-disk drive and an active matrix liquid crystal display with a screen resolution of 640 by 400 pixels.

The computer was 15.25 inches wide by 14.83 inches deep and the height varied from 2 to 4 inches, front to back. The weight without a hard disk drive was 13.75 pounds. The keyboard had 63 keys and a unique arrangement for locating either a trackball pointing device or an 18-key numeric keypad on the left or right hand side of the keyboard. The computer used lead acid batteries with a power management system controlled by a 6502 microprocessor. This provided 8 to 10 hours of operation on a single battery charge.