

1840

Using & Programming the MacintoshTM including 32 Ready-to-Run Programs



By Frederick Holtz

T/P 31
H23

8660814



E8660814

Using & Programming the Macintosh[®] including 32 Ready-to-Run Programs

By Frederick Holtz



TAB **TAB BOOKS Inc.**
BLUE RIDGE SUMMIT, PA. 17214

Apple® is a registered trademark of Apple Computer, Inc.

IBM® is a registered trademark of International Business Machines Corporation.

Multiplan™ is a trademark of Microsoft Corporation.

Lotus 1-2-3™ is a trademark of Lotus Development Corporation.

Lisa™ is a trademark of Apple Computer, Inc.

Macintosh™ is a trademark licensed to Apple Computer, Inc.

MacPaint™ is a trademark of Apple Computer, Inc.

MacWrite™ is a trademark of Apple Computer, Inc.

MacTerminal™ is a trademark of Apple Computer, Inc.

Macintosh Assembler/Debugger™ is a trademark of Apple Computer, Inc.

Macintosh Project™ is a trademark of Apple Computer, Inc.

MacDraw™ is a trademark of Apple Computer, Inc.

FIRST EDITION

FIRST PRINTING

Copyright © 1984 by TAB BOOKS Inc.
Printed in the United States of America

Reproduction or publication of the content in any manner, without express permission of the publisher, is prohibited. No liability is assumed with respect to the use of the information herein.

Library of Congress Cataloging in Publication Data

Holtz, Frederick.

Using and programming the Macintosh, including 32
ready-to-run programs.

Includes index.

1. Macintosh (Computer) 2. Macintosh (computer)—
Programming. 3. Computer programs. I. Title.
QA76.8.M3H65 1984 001.64'2 84-2428

ISBN 0-8306-0840-0

ISBN 0-8306-1840-6 (pbk.)

Cover photograph courtesy of Apple Computer Inc.

Using & Programming the
Macintosh[®]
including 32 Ready-to-Run Programs



To my son Robert, whose help on this project was greatly appreciated, and whose faith and trust over the past 16 years have meant more than he could ever know.

Acknowledgments

I wish to thank the staff and management of Computer Solutions in Leesburg, Virginia, for supplying the Macintosh system used to research and write this book.

Many thanks to the staff and management of Frederick Computer Products in Frederick, Maryland, for providing technical data and support throughout the writing of this book.

Introduction

The Apple Macintosh is here, and it can be accurately described as a jewel of a computer. Rumored for over a year, the Macintosh is more than anyone expected. It's much more. It may eventually change the way we humans interact with computers, when other manufacturers begin to (and they undoubtedly will) emulate its unique interactive style. This can only benefit the consumer.

The Macintosh was first rumored to be a high-level market personal computer, offering an 8088 microprocessor that makes it IBM PC-compatible. This rumor was completely false. Unlike other manufacturers, Apple has chosen to go its own route and has now arrived—with a machine that contains a 32-bit microprocessor, which operates at incredible speed. Hardware is only one factor.

There are already more than 500 software packages on the market for the Macintosh, and they give the user tremendous flexibility. And it contains a good number of bundled programs, too.

At this writing, the Macintosh is a brand-new phenomenon. Its operational features seem incredible by any standard in the microcomputer industry. For years, other computers have been advertised as being flexible, but none comes close to Macintosh. At long last, there really is a computer that offers the experienced programmer high-powered computational capabilities and at the same time offers the beginner an easy-to-use machine—one that's easier than all the rest.

This book is more than a simple introduction to the Macintosh. Certainly, it overviews the system's features, but it helps tell Macintosh's true story by helping you interact with it. This book is dedicated to explaining how to get the most from your machine. Also, if you are considering purchasing a Macintosh, this text can function as a valuable source of information needed to decide whether or not Macintosh is the right computer for you. Beginner programmers and users who have never even touched a microcomputer will espe-

cially appreciate the detailed step-by-step chapters on using the Macintosh and programming in Microsoft BASIC. If you've never programmed a computer before, you will be able to do so in just a few hours. Additionally, many programs are included that you can type into your computer. You can use them to perform complex mathematical operations in seconds, draw accurate images on the screen, and even play a game or two.

The Macintosh is here. It is a force to be

reckoned with by the microcomputer industry and a machine that will become your close partner. Macintosh, more than any other computer, is a true extension of you, the user. It doesn't take the place of an inquisitive, alert mind, but it allows that mind to reach into areas not previously explored. Compact, powerful, and user-friendly are all terms that accurately describe the Macintosh. I think you will agree that Macintosh truly bridges the gap between people and personal computers.

Contents

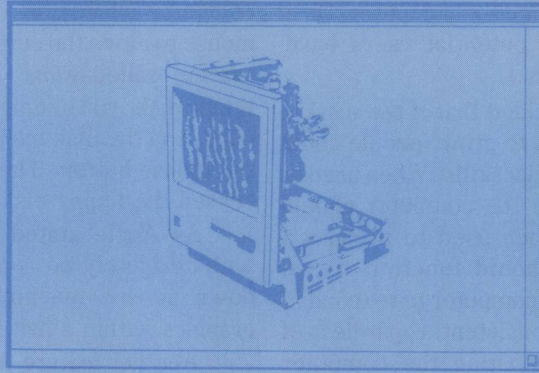
Acknowledgments	vii
Introduction	viii
1 An Evolution in the Microcomputer Market	1
A New Concept—Apple Versus IBM—Super ROMs—Macintosh Critics—The Computer for Everyone—Features of the Macintosh—Items on the Macintosh Desk Top—Software for the Macintosh— <i>MacWrite</i> , <i>MacPaint</i> and More—Specialized Software—Where to Find a Macintosh—The Lisa-Macintosh Connection—Summary	
2 Using <i>MacPaint</i>	20
The Graphics Tools—The Menu Bar—Patterns, Patterns, Patterns—Drawing Lines—Some Graphic Results—Shrinking and Enlarging—Using a Few More Tools—Summary	
3 Using <i>MacWrite</i>	43
Spacing and Alignment—The Search Selection—Indenting and Tabbing—Changing the Typeface—Printing Your Document—Saving Your Document—Summary	
4 Using The Macintosh Finder	68
The Finder Menu Bar—File Handling—Summary	
5 Manipulating the Microsoft BASIC Screen	86
Four Windows—Using the Windows—Editing in BASIC—Multiple LIST Windows—Moving Other Windows—The Menu Bar—Summary	
6 Programming the Macintosh in Microsoft BASIC	115
A First Program—Clearing the Screen—Two Modes in BASIC—Creating a Loop—More About Loops—	

1180000

FOR-NEXT Loops—Going Further with FOR-NEXT Loops—More on PRINT Statements—Variables—Naming Variables—Manipulating Numeric Variables—INPUT Statements—Formulas—Built-in Functions—More String Functions—Another Branch Statement—READ/DATA Statements—Multiple Statement Lines—Logical Operators—Relational Operators—Arrays—Summary

7	Programming Graphics in BASIC	149
	The Graphics Screen—CIRCLE Statements—LINE Statements—Use of Color—PSET/PRESET Statements—Animation Techniques—More Ways to Use Graphics Statements—The POINT Function—Summary	
8	Macintosh Filekeeping	168
	File Reading Program—Advanced File Reading Program—File Writing Program—Another File Writing Program—File Appending Program—Complete Filing Program—File Item Search Program—Partial Item File Search—Summary	
9	Programming the Mouse	178
	The MOUSE Function—Calling a ROM Subroutine—Putting the Mouse to Work—Summary	
10	Ready-to-Run Programs	191
	Ohm's Law—Mortgage Payments—Leap Year Calculator—Binary to Decimal Conversion—Checkbook Balancer—Macintosh Typewriter—Alphabetizer—Alarm Clock—ASCII Character Display—Mathematical Circle—Random Lines—Graphic Funnel—Steer Horn—Circle Pattern—Multicircle Pattern—Solar System—Four-pointed Star—Smoking Cigarette—Oriental Prince Picture—Automatic Random Seed—Word Maze—Numbers Guess Game—Computer Numbers Guess—Summary	
	Appendix A ASCII Character Codes	229
	Appendix B Non-ASCII Character Codes	230
	Appendix C ImageWriter Printer Specifications	231
	Appendix D ASCII, Binary, and Hexadecimal Print Codes	234
	Appendix E More MacPaint Drawing Samples	236
	Appendix F Bar Charts	239
	Index	242

Chapter 1



An Evolution in the Microcomputer Market

The microcomputer revolution has been sprung upon us again! A few years ago, most of us predicted that the hardware revolution was just about over for a decade or so. We also predicted that the industry would turn itself toward the task of revolutionizing microcomputer software. Most of these predictions occurred shortly after IBM announced their Personal Computer.

The IBM PC seemed to be a quantum leap for microcomputers, and indeed, it was. It was touted as the most sophisticated microcomputer ever offered. Most advertisements about the machine centered around the fact that it was the first mass marketed personal computer to contain a microprocessor with 16-bit architecture. For those of you not familiar with computer electronics, the *micro-processor*, or *chip*, is the heart of any microcomputer, and the chips architecture determines the amount of data the machine can handle in any one operation. Most pre-IBM PC microcomputers contained eight-bit microprocessors, and many people were

impressed with the increased capabilities of the 16-bit systems when they appeared.

A NEW CONCEPT

Before the 1930s, driving an automobile involved learning transmission shift patterns and synchronizing those patterns with the clutch pedal. That combination of coordination and expertise kept a number of people from using the automobile. But in the late 1930s, automobile manufacturers introduced the automatic transmission, a feature that put more people behind the wheel.

Personal computers have followed a similar course. From the Apple II through the IBM PC, personal computers have forced people to learn unfamiliar ways of doing familiar things. To operate personal computers, users had to learn about operating systems, study programming languages, decipher cryptic messages, and perform tasks in ways very different from the manual tasks the application software was supposed to improve. Learning

to use these personal computers required a large investment of the individual's time. And there was generally a phobia surrounding the computer. As a result, a large number of potential users have stayed away from computers.

The folks at Apple decided that if the market for personal computers was to grow, people could not be forced to acquire special skills. When used to type a letter, for instance, the computer should resemble a typewriter. When used to prepare a diagram, the computer should function like a sketchpad. People want the computer to respond in ways that are familiar and consistent, regardless of what it does. They are awaiting the computer equivalent of the automatic transmission.

The Xerox 8010 Workstation (Star) was the first computer system to embody features that attempted to make computers easy to use and understand. It offered a powerful "user interface" that simplified the system's operation. Symbols and graphics, rather than coded messages, represented the computer's different resources. And the Star used *pointing* technology, where the *mouse*, like a joystick, moved the cursor around on the screen. The Star made great strides toward using, learning, and understanding computers. But its dependence on a large network made Star impractical for small installations.

In January 1983, Apple Computer introduced its Lisa computer shown with the Macintosh in Fig. 1-1, a personal computer that improved the concepts used in Star and increased its simplicity and usefulness. And Lisa could be used as a stand-alone work station, so offices could start with one and add others as needed. Additionally, Lisa used a microprocessor with a 32-bit architecture, allowing it to handle even more data than the 16-bit chips that had only recently been so impressive.

Lisa was to revolutionize the way people interacted with microcomputers. No longer would it be necessary for the user to learn a computer lan-

guage. All you had to do was turn the computer on and, instead of typing English words to tell the computer what you wanted to do, you used the mouse to move the cursor to picture symbols on the screen, called *icons*. If you wanted to access a floppy disk, you simply used the mouse to place the cursor on the disk icon displayed and then pressed the mouse button. The computer automatically accessed the floppy disk in the drive.

As Apple stated quite accurately, a person with absolutely no computer experience could sit down at this machine and draw sophisticated graphics within a half hour or so.

Another feature that made Lisa unique among microcomputers was that no high-level language was offered for the machine. It was never meant to be *programmed* by the average user. Rather, Apple supplied the programs the user might need, including graphics programs, a word processor, and various business packages.

Lisa, though, was considerably less than a booming success for Apple. The machine simply did not catch on with a large segment of the market. Certainly, one reason it did not was the price, abutting \$10,000. Lisa was intended as a businessman's machine and the price reflected this intention. Another reason for its less than spectacular showing was that most software was only available for the IBM PC and similar hot-selling machines. Because the Lisa concept was untested, few companies supported it with software. Undoubtedly, a large number of computer buyers were simply afraid to take a chance on buying such an expensive machine for which there was limited software support.

Rumors were circulating that Apple, who had reportedly spent \$10 million dollars on the Lisa project, was in serious trouble. The Apple II series of computers had been a mainstay of the company for many years. At one time, the Apple was *the* microcomputer manufacturer, and even today,

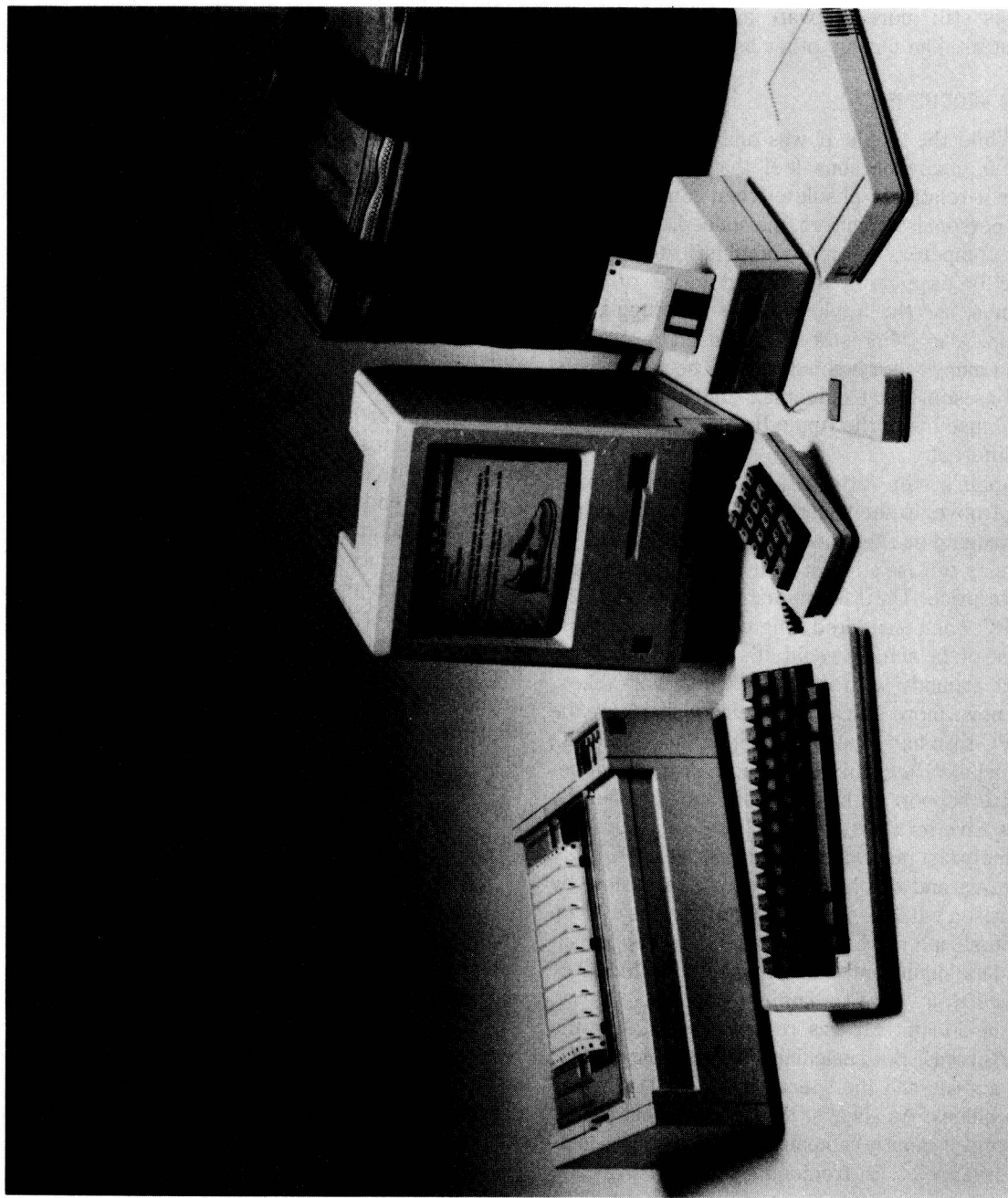


Fig. 1-1. Apple Computer's Macintosh is shown here with mouse and detachable keyboard. Peripheral devices and accessories include a numeric keypad, an external disk drive, the ImageWriter printer, a modem, and the Macintosh carrying case. (Courtesy of Apple Computer, Inc.)

there is still more software available for Apple computers than for any other brand.

APPLE VERSUS IBM

While the Apple II was and is a good basic machine, many persons feel that its limitations render it relatively obsolete when compared with other personal computers and indeed, with many home computers. A more sophisticated buying public is expecting more and more of their machines, and the Apple II series is struggling to keep up. Also, Microsoft BASIC, used by the IBM PC and many other computers, has become established as somewhat universal, and the Applesoft BASIC, used with the Apple II series, is considerably different.

Apple's step forward with Lisa was a much needed move, to set it apart from competitors in the fast changing marketplace. The Macintosh now offers many of Lisa's features at a much more competitive price. Until Macintosh was released, the IBM PC was considered king of microcomputers, because of the numbers sold. It's so popular that the market abounds with many IBM PC workalikes. Right now, more software is being written for the IBM PC than any other microcomputer. While the PC is an excellent microcomputer, and it has tremendous support both in software and peripherals, it does have its shortcomings. Once considered an extremely fast microcomputer because of its ability to receive and display data, it is rather slow by comparison with the Macintosh and the Lisa. Then Macintosh and the Lisa have the capability of handling data significantly faster than the IBM PC or the IBM PCjr, the PCs family computer.

The Macintosh was released soon after the IBM PCjr was. Both machines had been planned for about a year, and the speculation about them had been endless. As always, IBM got the best part of the word-of-mouth campaign. The PCjr was officially released with tremendous advertising cam-

paigns, press showings, and all of the other hoopla that goes along with a worldwide gala event. IBM expended tremendous energy on the PCjr campaign, while Apple was putting its energy into another area altogether.

The Macintosh project was nearing completion but Apple was keeping a low profile. Apple's machine would promote itself. Apple delivered a "Pocket Rolls Royce" at Volkswagen prices, a hard buy to pass up. In early January of 1984, demo units were sent to Apple dealers across the country. Dealers found them extremely easy to market. All the dealer has to do is set up the unit, activate it, load one of the application programs, and let the potential buyer have a free hand with it—because he needs almost no explanation at all. If dealers tried this with any other computer on the market, they would end up frustrating potential buyers.

The Macintosh is also easy to store and easy to transport, because it's so tiny. The main unit contains its own high-resolution monitor in a package that measures a little over 13 inches in height, 10 inches in width, and approximately 11 inches in depth. Additionally, the whole system, including keyboard and mouse, weighs in at a little less than 20 pounds. Dealers won't have to allot a great deal of shelf space to the machine, and users won't have to acquire much muscle to carry it home.

SUPER ROMS

As sophisticated as the Macintosh hardware is, one cannot say enough about the internal programs contained in the ROM chips. Unlike most computers whose operating systems are on disk and must be loaded into the machine, the Apple Macintosh's operating system is stored in the ROM. ROM stands for *read-only memory* and consists of a tiny integrated circuit device that can store thousands of bits of information.

The Macintosh ROMs contain over 500 programs that set up an extravaganza of functions it is

capable of performing. Unlike most computers, when you activate the Apple Macintosh without a disk because of the ROM programs which it can still do quite a bit. Unlike most microcomputers today containing between 8K and 32K of ROM, the Apple Macintosh contains 64K of ROM. This is more memory than some computers contain in both ROM and RAM, (*random-access memory*) combined. RAM is integrated circuit storage as well, but RAM chips receive information from the user (usually via the keyboard) or from disk storage. RAM chips can be reprogrammed at will, while ROM is fixed and cannot be changed.

For those of us who have been around computers for quite some time, a machine that contains 64K of ROM is extremely impressive, because a tremendous amount of program data can be contained in 64K of memory. Still, what you get from this 64K memory module is equivalent to at least twice what you would expect. The Apple engineers and programmers must have worked themselves sick to use memory so efficiently. The programs contained in this 64K ROM have the capability of what one would expect from 128K or more. Admittedly, almost any program that is written in any language can be shortened by making better use of the language, but undoubtedly, thousands of hours have gone into reducing *code* (programming) length to allow such extensive capabilities to be contained in such a small amount of memory.

MACINTOSH CRITICS

Although the Macintosh has so much ROM and so much in general, most professional programmers tend to shy away from its "menu-driven" concept. Certainly, most of the programs they write for individuals to use will contain menus, but they find using a menu while in the conceptual stage of writing a program can definitely slow down the process. However, many of these complaints may be coming from individuals who are fighting a change simply

because it is a change. I overheard one program development manager remark that he would never buy a computer that displayed a trash can on the screen. This is the case with Lisa as well as Macintosh. If I could have asked him a question, it would have been "Why not?" I can think of no reason why someone would prefer to type an ERASE or KILL command at the keyboard in order to delete a disk file when it's far simpler to use the mouse to drag the file (by name) down to the trash can and "throw it away."

One must realize that computers and the people who program them are all part of a new industry. Some people consider themselves above all the average individuals who don't know anything about computers. Many of these persons have added to their mystique by implying that their work with computers is so complex that the average individual could never understand it. This is not true. Computer programming is no more mysterious than operating a restaurant, building a house, or being a plumber. All of these fields are different, and each requires its own type of basic training. Therefore, if a computer can be made that allows more people to use it (including programmers as well as the other users), then I say all the better.

THE COMPUTER FOR EVERYONE

Reasonably priced at \$2,495, the Macintosh computer is certain to sell well, because it is within the price range of a large number of individuals. And the Apple ImageWriter printer can be purchased with the Macintosh for a total of \$2,995 for the entire system, and its available audience is even larger. There would be no sense whatsoever in offering a computer for everyone that almost no one could afford.

Unlike the original Lisa, the Macintosh is going to be supported by a bevy of commercial software and peripheral companies. Over the next few years, a lot of software will be offered and, of

course, the peripheral selection should become equally plentiful. There is always hesitance to buy a new product we cannot be sure will last. This is especially true of microcomputers, since if there is no software or peripheral support, a great machine can be rendered totally useless. Many thousands of persons who purchased very expensive business computers in the middle and late seventies are now finding it necessary to try and unload them as scrap because the machines are obsolete and no longer supported.

I don't believe this will be the case with the Macintosh. The machine itself is certainly state-of-the-art and would seem to offer what other popular personal computers do, plus a lot more. What makes me feel most secure about the Macintosh is the overall concept of an inexpensive, high-level microcomputer that provides extremely efficient human interaction. In other words, a person with no computer expertise can be given a few minutes of instruction on the use of *MacPaint*, for instance, and then proceed to draw and learn more about this machine through using it. This is not true of many other computers, although programs could be written to make it so. Let me also say that programs like *MacWrite* and *MacPaint* may be the best features of all. A computer can be high-level and maybe even ahead of its time, but it's the software available that really counts. Any other high-level computer could be almost as easy to learn if such comprehensive, easy-to-use programs as *MacPaint* and *MacWrite* were offered. The mouse also makes the human computer interaction easy, but it is not so unique that they're not available for other computers as well. However, no other software, peripheral, or computer manufacturer has ever made available the combination of software and hardware necessary to accomplish such easy interface. The people at Apple have, and they are to be commended for it. Unlike many other companies who develop a high-level product and

then thrust it upon the market, Apple developed a high-level product and a high-level user interface before offering it for sale. If other companies would think of the inexperienced user and equate this person's importance with the electronic design of the machine itself, everyone would be much better off.

FEATURES OF THE MACINTOSH

Shown in Fig. 1-2, the Apple Macintosh is a new kind of personal computer. It pretends the screen is a desk top and uses those familiar working methods to establish a new, more comfortable relationship between the user and the computer.

Personal computers that use current technologies present various and confusing interfaces each time the user changes applications. Macintosh does not. Familiarity and consistency are its keys. Macintosh applications offer methods the user already knows to perform tasks. Regardless of which task, the user approaches each application in the same manner.

At the heart of Macintosh is a 32-bit microprocessor, the Motorola MC68000. The 32-bit architecture and speed support the Macintosh graphics-based user interaction system. Macintosh uses a 9-inch, high-resolution (512 by 342 pixels) bit-mapped display. The entire system is extremely compact. See Fig. 1-3.

The Macintosh toolbox, the built-in software that controls its user interface system, has more than 480 separate software routines and is stored in the 64K of ROM discussed earlier. It contains 128K of RAM—enough room for more than an eighth of a million characters.

Application software and information are stored on the small disk in the Macintosh computer's built-in 3½-inch disk drive. The disk can store up to 400K of data, or about 100 double-spaced typewritten pages of information. In addition, the disk is small enough to fit in a shirt pocket



Fig. 1-2. Apple Computer's new Macintosh: extraordinary computing power and exceptional ease of use. Macintosh's main unit, which weighs less than 17 pounds, contains a 32-bit microprocessor, a built-in 3½-inch disk drive, a 9-inch black-on-white display, 64K of ROM and 128K of RAM. Equipped with a detachable keyboard and a mouse pointing device, Macintosh fits quickly and easily into the work style of business people, professionals, and students. The suggested retail price for Macintosh is only \$2,495. (Courtesy of Apple Computer, Inc.)