MACWORLD

February 1985 $4.00
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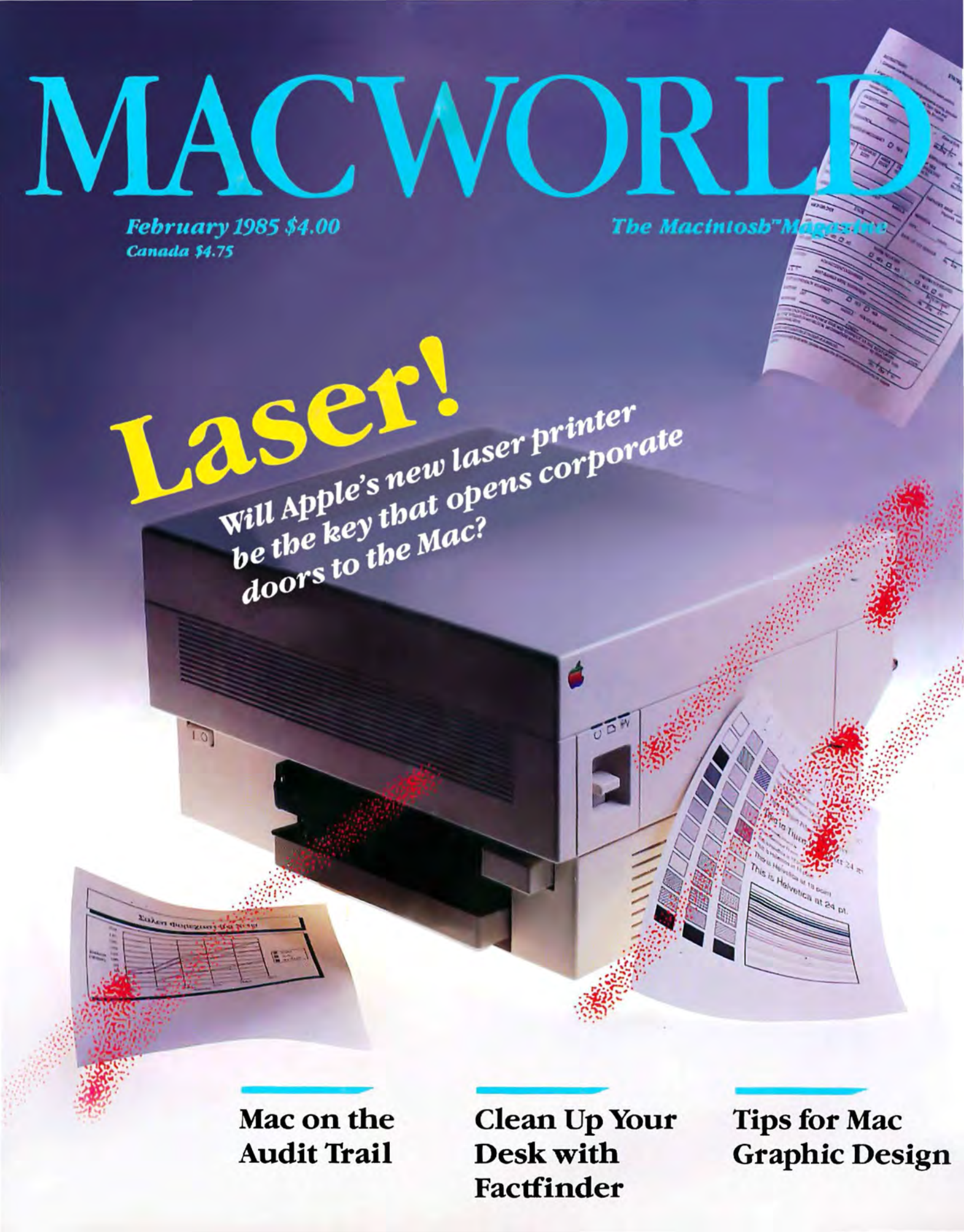
The Macintosh™ Magazine



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Mac on the Audit Trail

Clean Up Your Desk with Factfinder

Tips for Mac Graphic Design

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It's MacStation. An integrated workstation that's at home in offices, dorm rooms or dens. And a terrific way to save valuable desk-top real estate.

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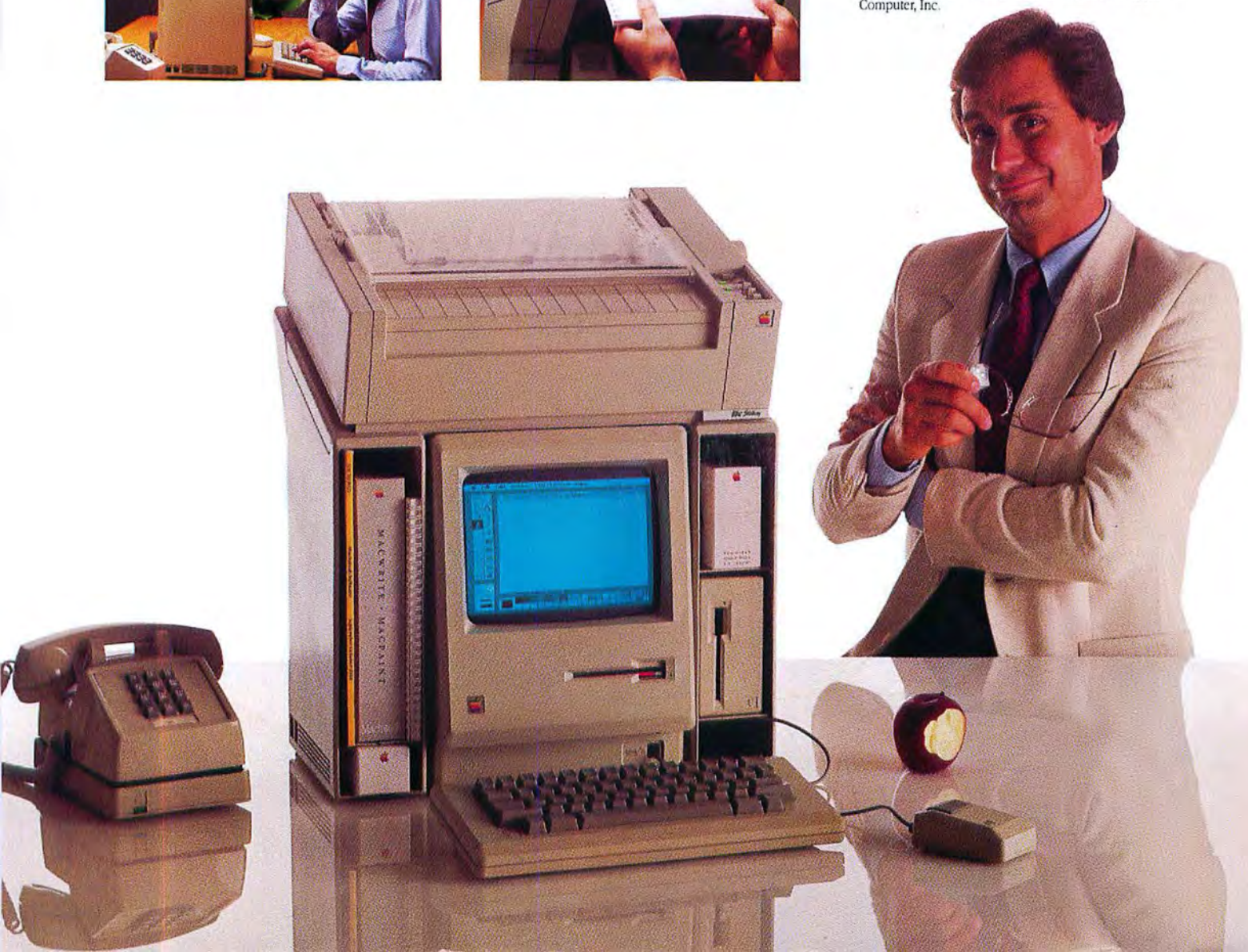

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MACWORLD

February 1985 *The Macintosh™ Magazine*

Getting Started

44 A Face for All Seasons
James Felici and Evelyn Spire
An introduction to the world of typography, including a close look at the LaserWriter's high-quality typefaces.

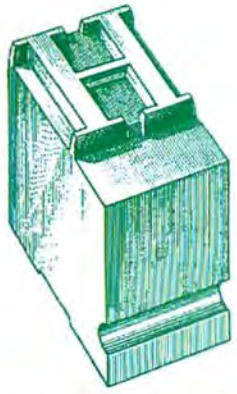
57 Get Info
Lon Poole
Macworld's tutor answers questions from readers about the Mac.

Review

70 The Laser's Edge
Danny Goodman
Just as the Macintosh redefined personal computing, Apple's LaserWriter printer will redefine the way business and professional people produce printed output.

84 Just the Facts
Bill Grout
Factfinder's free-form filing system lets you keep the desk clutter out of sight while keeping facts within reach.

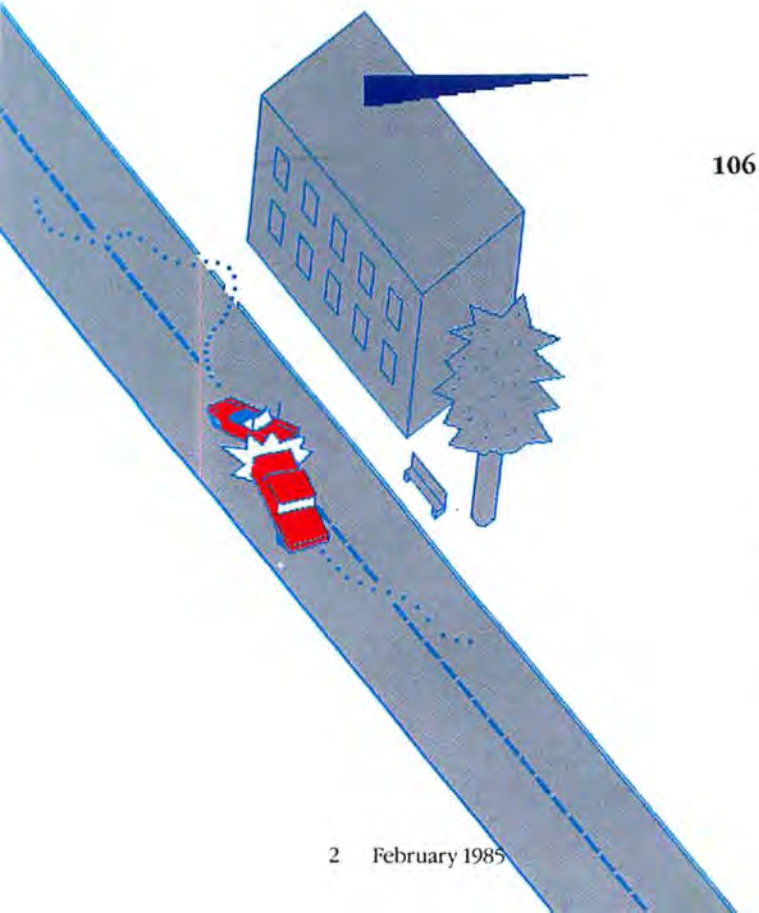
95 Macware News
Edited by Erfert Nielson
Announcements of the latest developments in Macintosh software, hardware, and accessories.



Printing technology has come a long way from blocks of type set by hand, but the centuries-old traditions of quality and readability have remained. Find out how the LaserWriter laser printer, with a built-in computer that has four times as much memory as the 512K Macintosh, carries on those traditions in "A Face for All Seasons," beginning on page 44.

State of the Art

106 The Language that Talks to Your Printer
Richard Sprague
PostScript, the revolutionary programming language that the LaserWriter uses to create professional-looking text and graphics, promises to become the industry standard for producing high-resolution output.



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Hands On

122 **The Elements of Graphic Design**
Edited by Bill Grout
An interview with *Macworld*'s designer reveals some basic strategies for helping you communicate visual information effectively.

138 **Open Window**
Edited by Daniel Farber
An exchange of Macintosh discoveries.

Community

150 **Mac on the Audit Trail**
Steve Mann
The saga of how Peat Marwick, one of the world's largest auditing firms, is changing the way accountants do business.

166 **Macworld Gallery**
Edited by Erfert Nielson
An exhibition of Macintosh graphics, including a first-prize winner with two entries.

Columns

9 **A Call to the First Mac Tribal Gathering**
David Bunnell

15 **From Milestone to Cornerstone**
Kearney Rietmann

21 **Letters**

34 **Macworld View**
Edited by Janet McCandless
How to get *MacPaint* on your clothes and other news and notes for the Macintosh community.

Indexes

175 **Products**

176 **Advertisers**

Can you picture these people wearing green visors? Auditors face an innovative future in a profession that isn't known for radically new developments. Starting on page 150, read about a computerized auditing system based on Macintosh hardware and software that prefigures an end to auditing as usual.

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Then draw your

Microsoft® Multiplan® and Microsoft Chart. They're crackerjack programs working on their own. But you should see this pair in action together on the Macintosh.™

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The other, a picture perfect charting program that makes rows and columns of numbers graphically clear.

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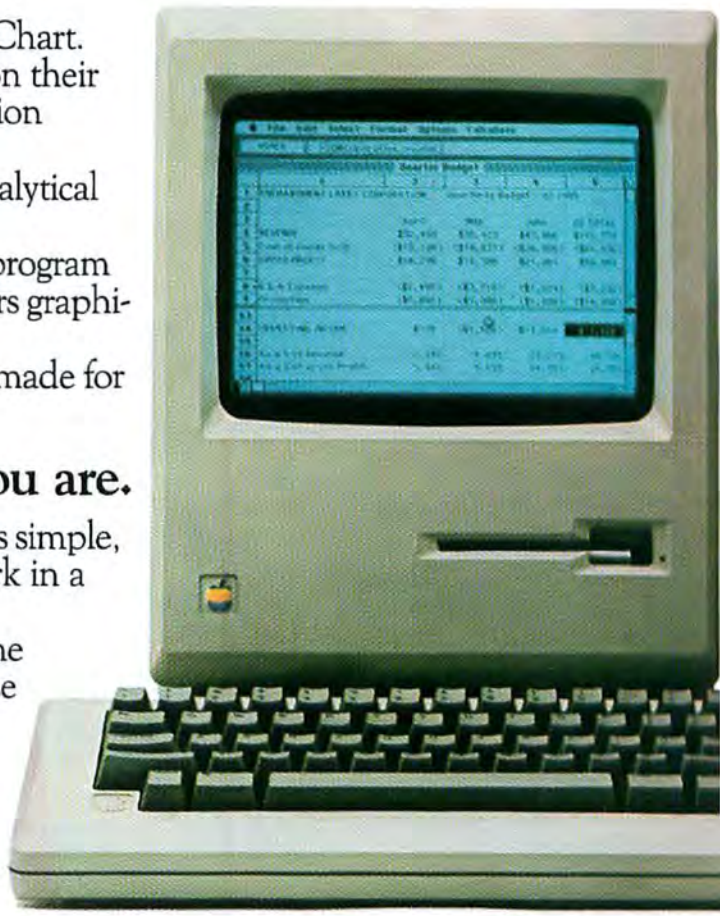

Multiplan accepts you as you are.

Multiplan takes full advantage of Mac's simple, intuitive operating style. So you can work in a way that will come natural to you.

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Chart can even be linked with Multiplan. So any change on your spreadsheet will show up automatically on the charts.

answer.
own conclusions.

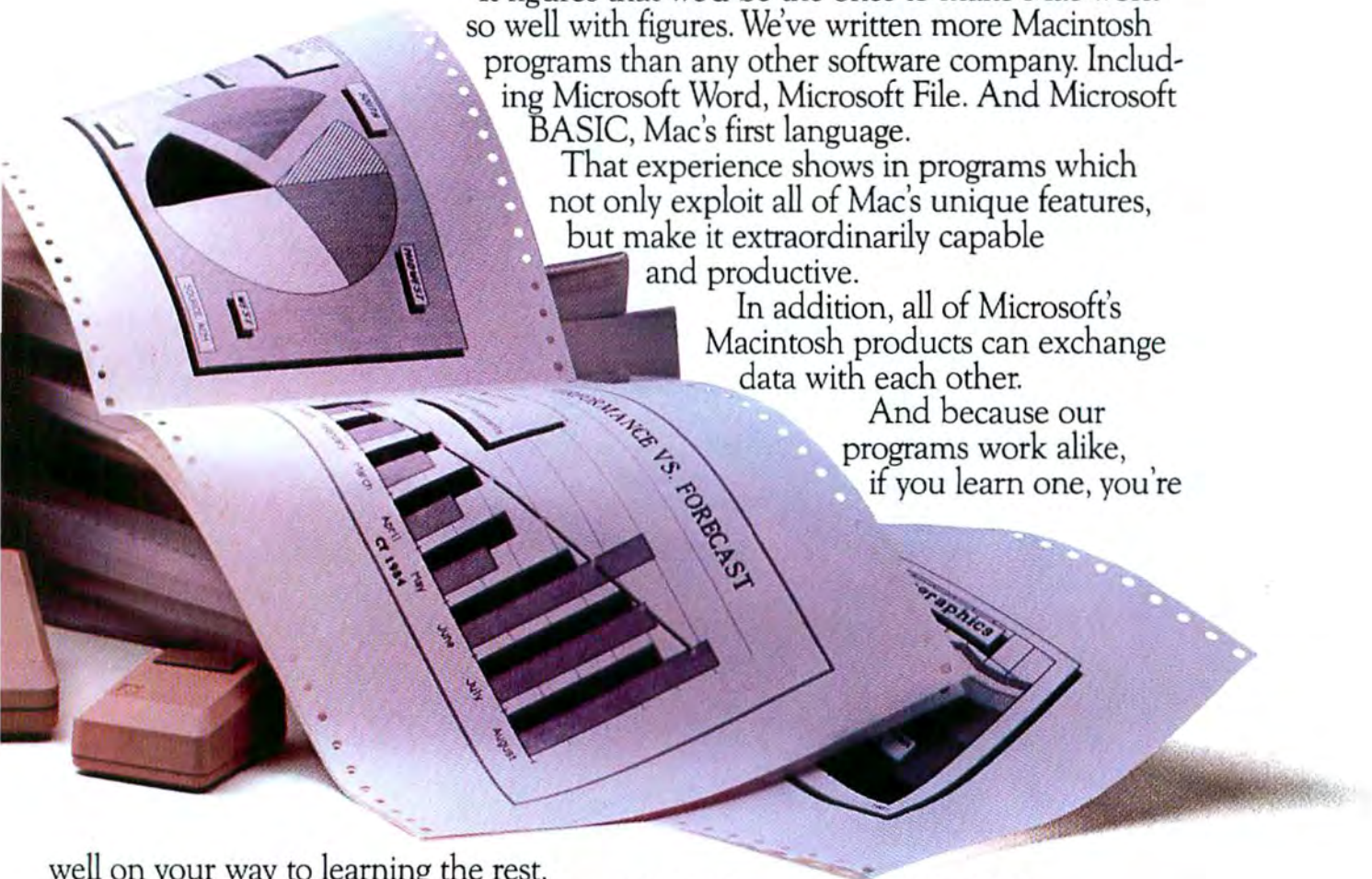
We get the max out of Mac.

It figures that we'd be the ones to make Mac work so well with figures. We've written more Macintosh programs than any other software company. Including Microsoft Word, Microsoft File. And Microsoft BASIC, Mac's first language.

That experience shows in programs which not only exploit all of Mac's unique features, but make it extraordinarily capable and productive.

In addition, all of Microsoft's Macintosh products can exchange data with each other.

And because our programs work alike, if you learn one, you're well on your way to learning the rest.



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David Bunnell

A Call to the First Mac Tribal Gathering

The Macintosh revolution is not based only on a particular piece of computer hardware that happens to represent a new stage in personal computing. And it is not merely a reaction to a few startling TV commercials. The revolution stems from how you use the Macintosh and how it affects your work. The Macintosh revolution is in you.

As a Macintosh user you not only represent a dynamic subculture–you are part of a significant stage in personal computing evolution and able to help shape the future of the industry. The timing couldn't be better for you to voice your opinions on how personal computers should work.

For these reasons, we have decided to call the first convention of Macintosh users and product suppliers. I don't normally write columns to promote events we sponsor, but I am anxious to inform every Mac owner about the impact of this trade show and the opportunities to learn and explore the different facets of the Macintosh age. The Macworld Exposition will set a new standard in computer shows. Guaranteed to be more than the average consumer trade show, it will be an extremely important gathering of the Macintosh tribe.

The first Macworld Exposition will be held February 21-23, a little over a year after the Mac's introduction, in San Francisco, the beautiful city that is our home. With Silicon Valley and Apple Computer next door, we decided there was no better place to have the show. And what could be more appropriate than holding the expo at Brooks Hall, where the Apple II was introduced at Jim Warren's original West Coast Computer Faire in 1978.

Most companies that advertise in *Macworld*–including Apple–have already reserved exhibit space at the show, so there will be an abundance of Macintosh software and hardware. The Macworld Expo will have clusters of Macs on the exhibit floor to give you the opportunity to test-drive impressive new software. Seminars and panel discussions will also be available for users, software authors, and others in the Macintosh industry.

These three days in February will allow you to get involved with the Macintosh to a degree that's never been achieved before. Among the seminars will be How to Start a Business with Your Macintosh, Maximizing MacWrite, Unveiling the Mac's Hidden Features, Data Base Management with the Mac, Local Area Networks, What's Available in Mac Software, and Maximizing MacPaint. For potential software authors, we have special programs on topics such as MacPascal and MacBASIC, How to Write Friendly Mac Software, How to Get Your Programs Published, How to Become a Wizard at Machine Language Programming, and as a special enticement, A Complete Technical Guide to How the Macintosh Works. Combined with a chance to meet some of the original Macintosh software developers and a few members of the famous Macintosh team from Apple, these seminars could change your approach to programming.

Whether or not you can attend, the expo represents your chance as a Mac user not only to learn about the Macintosh and maximize its usefulness, but also to help influence future Macintosh development. Every company exhibiting at the Macworld Expo will be extremely interested in your opin-

ions; your endorsement or rejection of their products and ideas could have an enormous impact on their revisions. As early users, most of you will have many opportunities to influence both hardware and software in the the Macintosh market.

There is no mysterious shroud surrounding the reason for newpapers and business magazines being filled with stories about Apple, IBM, and other major players in the personal computing industry. It's an exciting field with the unparalleled ability to affect the shape of our society and the path of our future. By getting involved in this industry, you help make your own history. So come to San Francisco for the Macworld Expo and experience the great Macintosh revolution. □

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February 21-23, 1985
World Expositions
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617/329-7466

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The most BASIC.

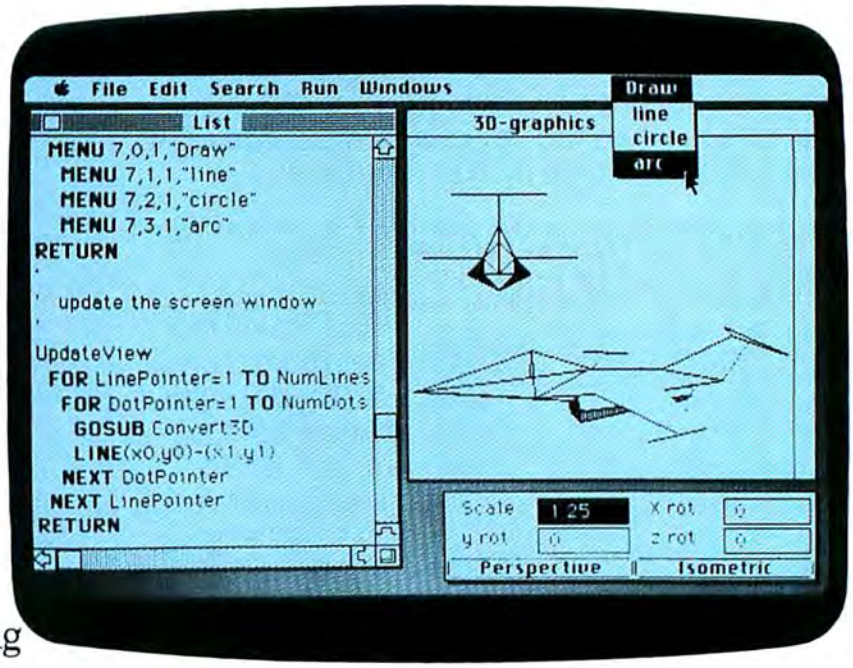
Microsoft® BASIC is the language spoken by nine out of ten microcomputers worldwide. It's the language with the most programs written for it.

So if you want to access the power of your Macintosh,™ only one language makes the most sense. Mac's first language, Microsoft BASIC.

Not only is it the industry standard, it's the most advanced BASIC for Macintosh. It lets you add mouse commands. Graphics. Windows. Change type fonts and styles. Customize menus. Incorporate music and sound effects. Write your own dialog boxes. Basically, it lets you take advantage of everything that makes Mac 'Mac.'

It makes editing programs as easy as cutting and pasting and pointing and clicking. Debugging is easier than ever with the advanced trace command.

It's no wonder Microsoft is the most logical choice for the Macintosh.



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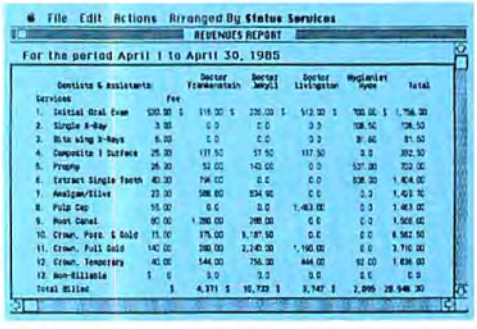
Front Desk.™ There's nothing else available that lets you see what's available in so many different ways.

It's a better way for dentist offices to keep their doctors ordered. For health clubs to sort their courts. For schools to schedule their A/V equipment. For companies to allocate their conference rooms. Or for accounting firms to keep account of their CPA's.

In short, it's for anyone who has a lot to allot.

It lets you zoom from one person's calendar to the next. Or zip from a monthly view to a weekly view to a single day view for one person or everyone. All as quick as a click. In fact, when you've got a lot of scheduling to do, nothing can make time fly like Front Desk.

SEE THE PAST. THE FUTURE. AND THE BOTTOM LINE.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REVENUES REPORT

For the period April 1 to April 30, 1985

Dentists & Assistants: Services	Fee	Doctor Frankenstein	Doctor Jekyll	Doctor Livingston	Hygienist Hyde	Total
1. Initial Oral Exam	$30.00	$ 510.00	$ 330.00	$ 510.00	$ 330.00	$ 1,750.00
2. Single X-Ray	3.00	0.0	0.0	0.0	126.50	126.50
3. Bite wing X-Rays	6.00	0.0	0.0	0.0	81.60	81.60
4. Composite 1 Surface	25.00	137.50	57.50	137.50	0.0	332.50
5. Prophy	26.00	52.00	140.00	0.0	520.00	712.00
6. Extract Single Tooth	40.00	156.00	0.0	0.0	520.00	1,404.00
7. Amalgam/Silver	23.00	598.00	334.00	0.0	0.0	1,431.70
8. Pulp Cap	15.00	0.0	0.0	1,403.00	0.0	1,403.00
9. Root Canal	80.00	1,280.00	280.00	0.0	0.0	1,560.00
10. Crown, Porc. & Gold	75.00	375.00	3,187.50	0.0	0.0	6,562.50
11. Crown, Full Gold	140.00	280.00	2,240.00	1,120.00	0.0	3,710.00
12. Crown, Temporary	40.00	544.00	756.00	444.00	92.00	1,836.00
13. Non-Billable	$ 0	0.0	0.0	0.0	0.0	0.0
Total Billed		$ 4,371	$ 10,722	$ 3,747	$ 2,096	20,940.30

But Front Desk does more than just let you organize how time is spent. It also gives you powerful tools that let you see how *well* time is spent.

It remembers what services are performed by each staff member during any particular time period.

So in the click of a mouse you can create a report for last month showing how many hours each dentist in your office spent—or how many dollars they brought in—by cleaning teeth, or filling cavities, or whatever. And you can project how much money each dentist will bring in on those services in the next two weeks or two months. This not only helps you improve the way your cash flows, it helps you make more of it.

LET THE GOOD TIMES SCROLL.

Whether you're scheduling activities for an architect, or engagements for an engineer, a flick of your finger will call up that person's full day calendar, which is preset in whatever time intervals you choose. Use the side scroll bar to view the entire day's schedule. Or the bottom scroll bar to see the previous or next day.

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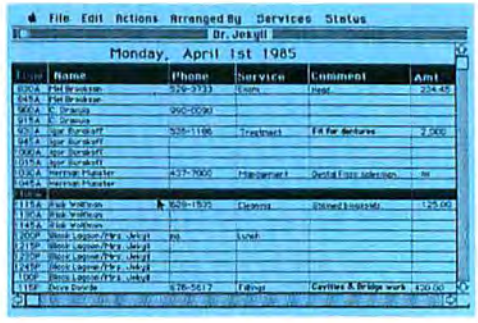
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Dr. Jekyll

Monday, April 1st 1985

Time	Name	Phone	Service	Comment	Amt
830A	Mel Brookson	529-3733	Exam	Heat	234.45
845A	Mel Brookson				
900A	C. Dracula	960-0090			
915A	C. Dracula				
930A	Igor Burakoff	528-1186	Treatment	Fit for dentures	2,000
945A	Igor Burakoff				
1000A	Igor Burakoff				
1015A	Igor Burakoff				
1030A	Herman Munster	437-7000	Management	Dental Floss selection	??
1045A	Herman Munster				
1100A					
1115A	Rick Wolfman	1620-1535	Cleaning	Stained Enamel	125.00
1130A	Rick Wolfman				
1145A	Rick Wolfman				
1200P	Black Lagoon/Mrs. Jekyll	??	Lunch		
1215P	Black Lagoon/Mrs. Jekyll				
1230P	Black Lagoon/Mrs. Jekyll				
1245P	Black Lagoon/Mrs. Jekyll				
100P	Black Lagoon/Mrs. Jekyll				
115P	Dave Dowde	626-5612	Fellow	Cavities & Bridge work	420.00

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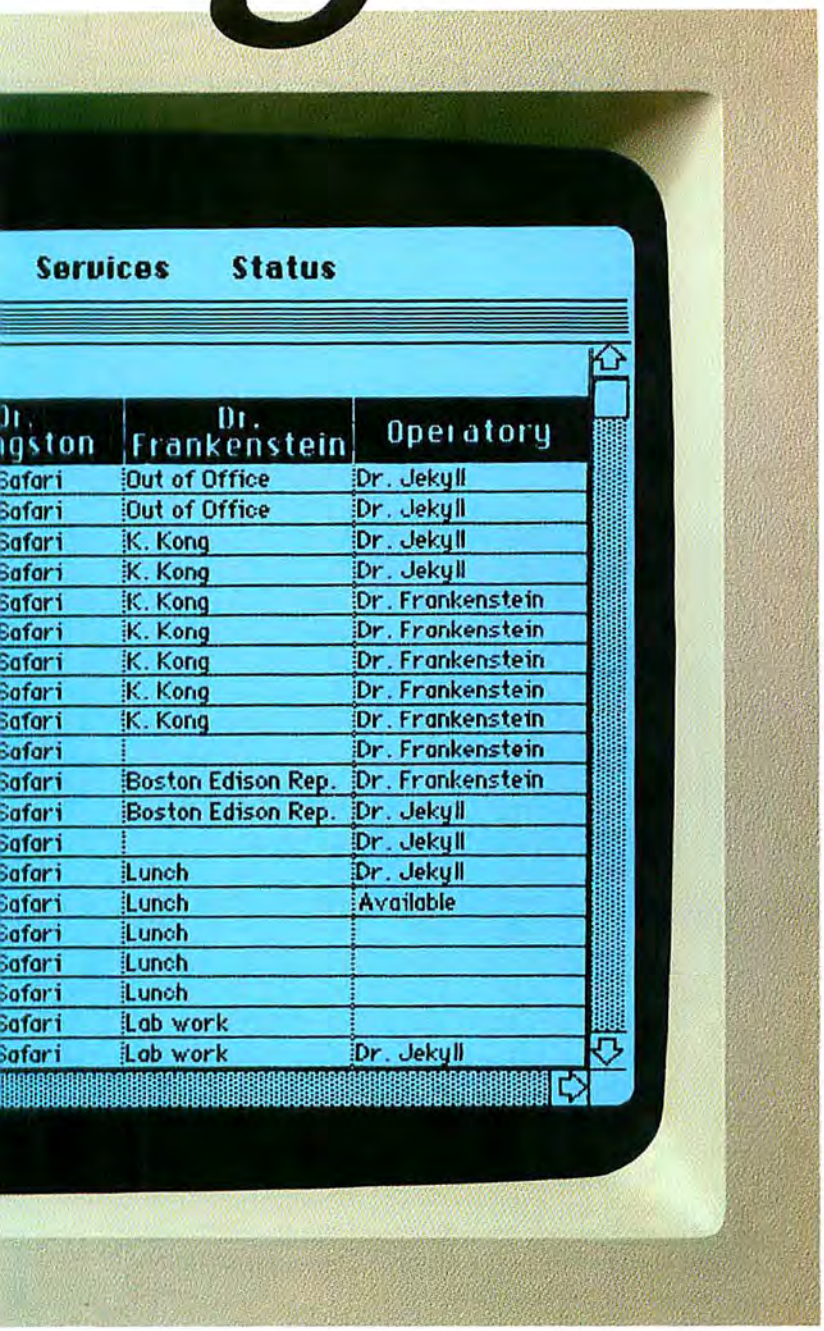
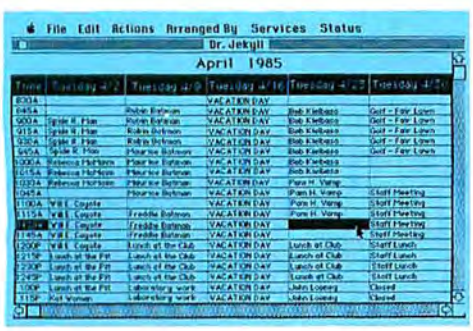
a good time?

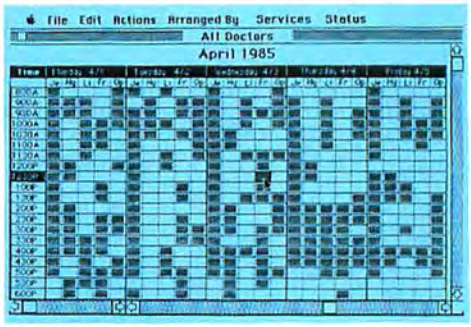




SEE A MONTH OF SUNDAYS.

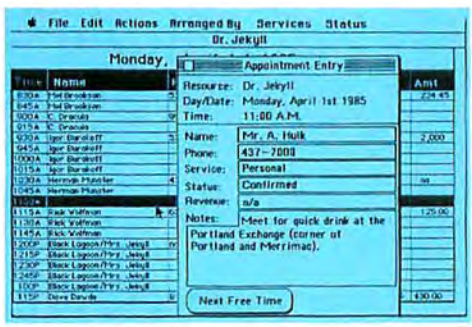
Tap your mouse and Front Desk will put a whole week of appointments on the screen at once. But what's really amazing is that when someone tells you "I'm only available on Tuesdays," a single view of all Tuesdays in April is just a click away.

GET THE BIG PICTURE.



Front Desk not only lets you select the calendar of any one particular dentist, racquetball court, or company fleet car, it lets you select a composite view of every schedule. By scanning the columns under the initials you can spot every available opening in an instant. And because you can see everyone's calendars in one view, scheduling internal meetings is a snap.

HOW TO PUT PEOPLE IN THEIR PLACE.

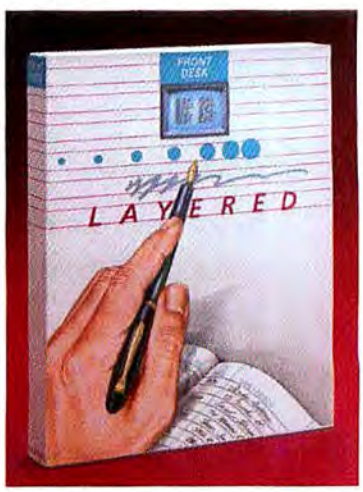


Once you find an open time slot, double-click to call up an appointment entry form. Fill it in, click save and the information is recorded on the calendar. Plus you can cut or copy and paste information from any time slot to rearrange schedules in seconds. And print out copies of any view of any calendar at any time.

DON'T WASTE ANOTHER DAY.

Cancel your next appointment and rush down to your computer store.

And tell them you're looking for a good time.



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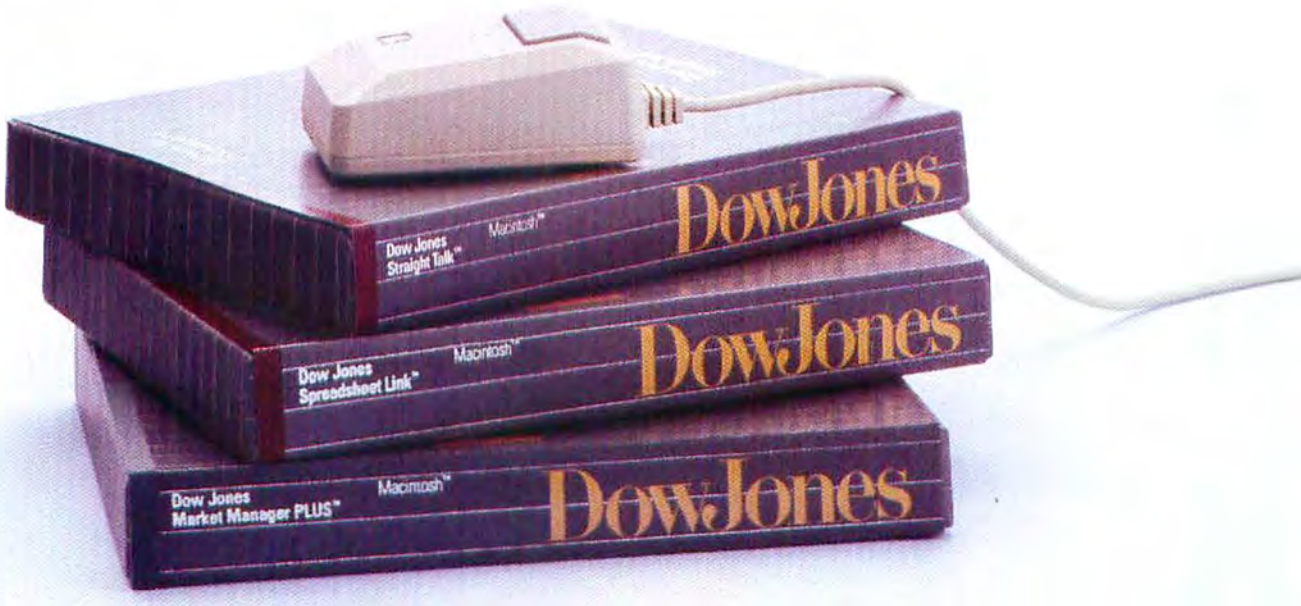

In the beginning there was Dow Jones Straight Talk.™

All across the country, Macintosh™ computers – and their owners – are getting smart with just the information they need: an electronic encyclopedia, business news and information, the latest stock quotes, sports and weather reports, airline schedules and fares. Point, click, Dow Jones News/Retrieval® and other leading electronic information services are at your fingertips.

In fact so many Macintosh computers are getting smart that Straight Talk is a best seller.

Now there's more.

Introducing Dow Jones Spreadsheet Link™ and Dow Jones Market Manager PLUS™ – new software for the Macintosh computer.

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Dow Jones Software™

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Kearney Rietmann

From Milestone to Cornerstone

As the novelty of the Macintosh begins to wear off, its owners are wondering if the computer is a milestone or a cornerstone. If the Mac is only a milestone, technology may pass it by. Like the Osborne portable, milestone computers sometimes become millstones too heavy to carry around.

The Macintosh was introduced in 1984 with all the ceremony of a cornerstone-laying. But with the oratory over, it's time for the building to go up. In 1985, a series of new Apple products is creating the superstructure for the Macintosh office. The series includes the LaserWriter printer, the AppleTalk Personal Network and related products, and a file server. The Macintosh office is designed for groups of people who work together in small businesses, corporations, and universities. The products link individual Macs together in a network. Computers in the network share printers, storage devices, and other hardware. They also exchange information in the form of messages or data from shared data bases.

The first available Macintosh office product is the LaserWriter laser printer. The printer brings high-quality printing to people who produce Macintosh text and graphics. Because output from the LaserWriter approaches the typeset quality of books and magazines, professionals–from writers and graphic designers to insurance agents and financial planners–can produce camera-ready art, technical documentation, or even tax return forms.

Like the 512K Macintosh, the LaserWriter price tag is high –$7000. But to justify the cost, Apple has designed the printer to be shared via the AppleTalk network cable and connectors. To find out more about the LaserWriter, read Danny Goodman's preview, "The Laser's Edge," in this issue. Goodman's article and two others in the issue–"A Face for All Seasons" and "The Language that Talks to Your Printer"–should give you the background you need to judge if the LaserWriter is right for you.

The AppleTalk network connects as many as 32 pieces of hardware in configurations that include Macs, printers, and file servers. Persons on the network can share hardware and exchange information. The file server is like an electronic filing cabinet in which you keep messages, programs, and data bases.

One component planned for the network is a circuit board developed by Apple for the IBM Personal Computer. When installed in the IBM PC, this hardware will enable people who own both PCs and Macintoshes to share the LaserWriter and the Macintosh file server. Setting up a scheme for exchanging information such as spreadsheet data or word processing documents between two computers as different as the IBM PC and the Macintosh is complicated, and sophisticated software will have to be developed to completely link the two computers. But if Apple makes such communication possible with Macintosh-style ease of use, the company will have indeed developed a brilliant product. A well-implemented Mac-PC link will be worth waiting for.

But waiting is the question. Macintosh owners spent most of 1984 waiting for new software and hardware to build on the foundation laid by the new computer. Many of us grew impatient with unfulfilled promises. Although the LaserWriter is available now, we have to wait until late spring or early summer for the file server and electronic mail software. The circuit board for the IBM PC is scheduled for even later. It remains to be seen if people will accept Apple's step-by-step approach to building the Macintosh office. If we don't have to wait too long for all the products to be put in place, the Macintosh office concept may become a cornerstone in office automation. □

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With NEC's new accessory kit for the Apple™ Macintosh. Which consists of a diskette (plus a backup), an interface cable and a manual. This easy-to-use package lets you control printing on your Spinwriter with your mouse.

Spinwriter printers have unique capabilities.

You can do more things with a Spinwriter and your Macintosh than other letter-quality printers. Like use our more than 80 different type styles. Or print in a foreign language. Or have proportional spacing.

You can also use a variety of NEC-designed and made paper handlers which let you do such things as address envelopes automatically, right along with your letters.

Spinwriter printers also last a long time. In fact, their record for quality and reliability is unmatched. And survey after survey shows they are the preferred letter-quality printer of personal computer owners.

See your computer dealer, now.

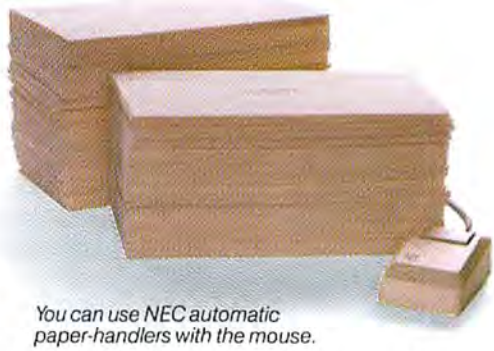
Ask for a Spinwriter printer demo and see what it can do for your Macintosh. Or for more information call 1-800-343-4419; in MA call (617) 264-8635.

Introducing the Spinwriter/Macintosh connection.

There are times when even a Macintosh™ user doesn't want printing that looks like it came from a computer. Important business letters. A make-or-break presentation. A resume. A legal brief.

Works with Spinwriter printers 2010, 3510 and 8810.

Now Macintosh users can have genuine letter-quality printing. And not just ordinary letter-quality but Spinwriter® letter-quality



You can use NEC automatic paper-handlers with the mouse.

Find out why more and more Apple users are saying, "NEC and me."

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Microsoft played an integral role in the development of the Macintosh. It has our brains and a lot of our personality. Here are the first titles in the MacBook Library from Microsoft Press.

MacWork/MacPlay

Lon Poole

MacWork/MacPlay is a gallery of ideas for home and business on the personable Macintosh. Lon Poole, author of the popular *Apple II User's Guide* and "Get Info" columnist for *MacWorld*, brings you 24 original projects for using the Mac's most popular application software: MacWrite, MacPaint and Microsoft Multiplan. Practical...inventive...and loads of fun.

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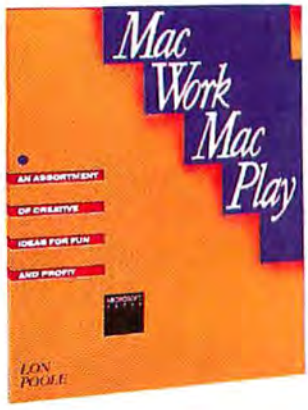

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Steve Lambert

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The Apple® Macintosh™ Book

Cary Lu

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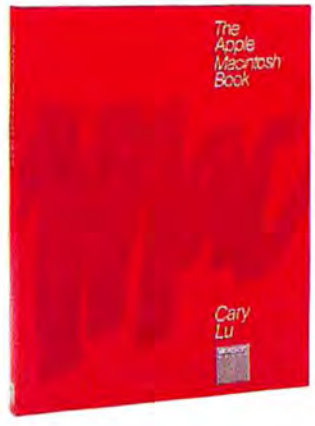

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How to bring out the

Out of respect for your unbridled love of the Macintosh (and ours, too), we've created even more insanely wonderful ways to enhance its remarkable performance. With five easy-to-use, useful and totally captivating tools that take full advantage of the Macintosh's incredible capabilities. All designed to the Macintosh's high standards for quality and reliability. Priced to please the most discriminating Macintosh lover.

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Now, with the Mac·Daisywheel·Connection, your Macintosh can print with any popular daisywheel letter-quality printer. Like the Apple Daisywheel Printer, the Brother (HR Series), the C-Itoh (Starwriter), the Daisywriter, the Diablo, the NEC Spinwriter, and the Qume (Letterpro and Sprint 11 Series)—just to name a few.

The Mac·Daisywheel·Connection gives you complete flexibility. You can keep your daisywheel and dot matrix printers connected to your Macintosh at all times. Just point and click to the printer you want to use.

The Mac·Daisywheel·Connection is ideal for business correspondence, reports, legal documents and even spreadsheets. It lets you print a full 15″ paper width. It comes complete with a program disk, a quick start-up guide and an interface cable. List price $99.

Mac·Spell·Right™

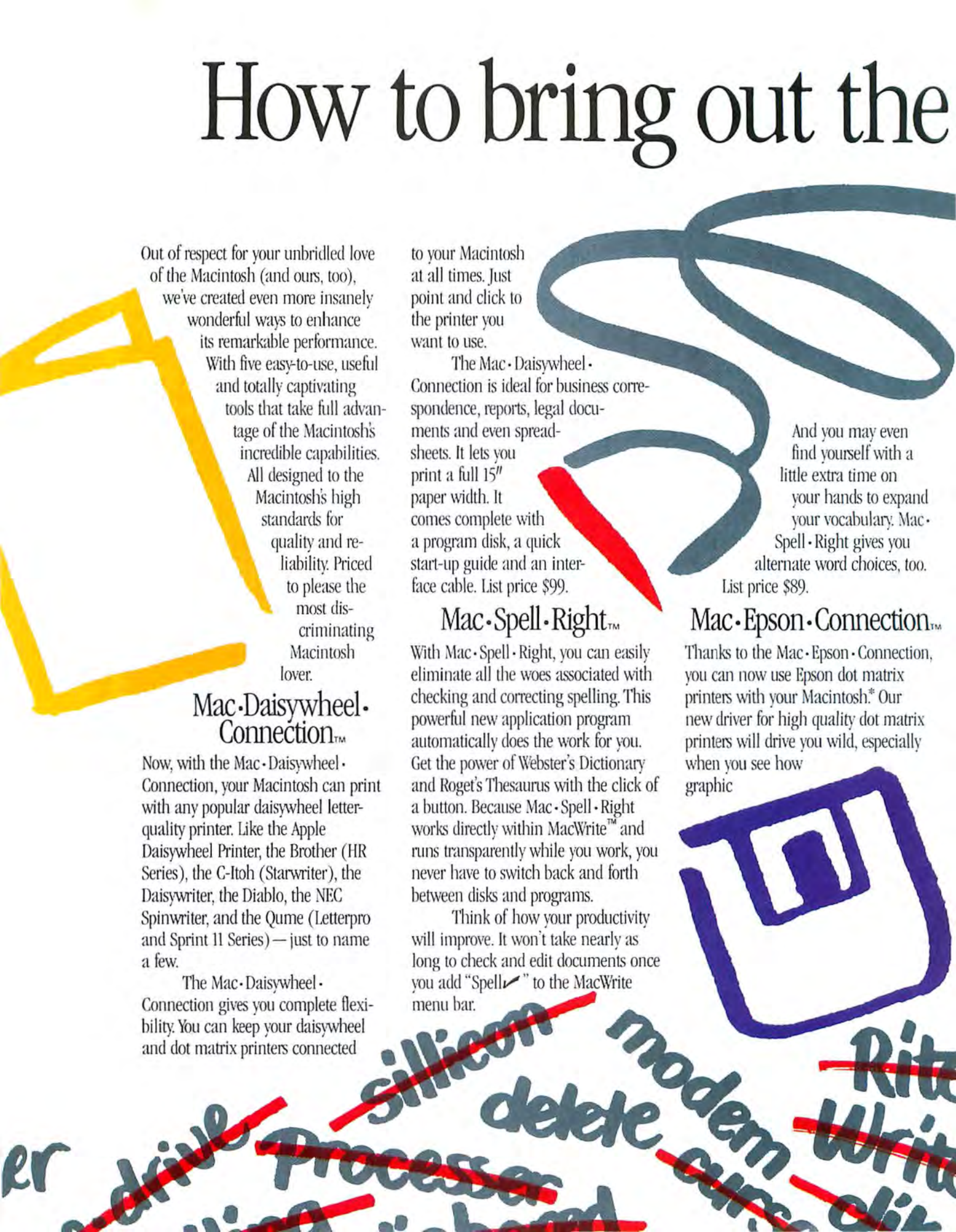
With Mac·Spell·Right, you can easily eliminate all the woes associated with checking and correcting spelling. This powerful new application program automatically does the work for you. Get the power of Webster's Dictionary and Roget's Thesaurus with the click of a button. Because Mac·Spell·Right works directly within MacWrite™ and runs transparently while you work, you never have to switch back and forth between disks and programs.

Think of how your productivity will improve. It won't take nearly as long to check and edit documents once you add "Spell✓" to the MacWrite menu bar.

And you may even find yourself with a little extra time on your hands to expand your vocabulary. Mac·Spell·Right gives you alternate word choices, too. List price $89.

Mac·Epson·Connection™

Thanks to the Mac·Epson·Connection, you can now use Epson dot matrix printers with your Macintosh.* Our new driver for high quality dot matrix printers will drive you wild, especially when you see how graphic



best in your Macintosh™

your graphics look and how professional your texts look. Nothing could be simpler or faster (at 160 characters per second). And it takes only 30 seconds to transfer the software to your 3½" diskettes or hard disks.

The Mac • Epson • Connection is totally versatile, too. Anything you can print on the Imagewriter™ you can print on an Epson. The Mac • Epson • Connection is compatible with any software that runs between the Macintosh and the Imagewriter.

The Mac • Epson • Connection comes with a program disk, a quick start-up guide and an interface cable. List price $89.

*The Mac • Epson • Connection supports a wide range of printer models from Epson, including the FX 80 and 100, the RX 80 and 100 and the LQ1500.

Mac • Turbo • Touch™

The Mac • Turbo • Touch is a new high-speed direct input device (or, if you will, a turbocharged "mouse") for your Macintosh. This is not meant to imply that the legendary love affair between mouse and man is over. Rather, for those of you who are ready for something that can respond as quickly as you do, there is now an exciting option. An option that reduces the time it takes to edit a document by 40%. An option that covers the same ground the mouse covers in one-third the time and in one-fourth the desk space.

What's more, the Mac • Turbo • Touch is always right where you need it whether you're right- or left-handed because you can park it on either side of the keyboard. Where does it plug in? In the mouse port, of course.

Flexibility is only one of its many virtues. Responsive performance is another. The slightest touch of the gyroscopic ball positions the pointer quickly and accurately on the screen. Mac • Turbo • Touch makes MacWrite, MacPaint and any other software work better, faster and more precisely than before. List price $129.

Mac • Memory • Disk™

The Mac • Memory • Disk lets you access more of the memory in your 512K Macintosh. It makes interaction between software applications ten times faster. It also lets you allocate a portion of the RAM (Random Access Memory) resident in your 512K Macintosh and treat it like a disk. With the Mac • Memory • Disk, you now have immediate access to more memory. List price $29.

More For Your Macintosh

These five innovative and fun tools make it easier than ever to get to the heart of your Macintosh. For additional tips on romancing your Macintosh and a demonstration, see your local Apple Computer Dealer. Or call toll-free: 1-800-MAC-5464. In California, toll-free: 1-800-421-0243. In Canada, direct dial: 408-446-0797.

Mac Turbo Touch

Assimilation Process™

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Maccessories™ make a good thing even better.

The Macintosh™ is easy to use. Maccessories from Kensington Microware make it easier.

First in the Maccessories family of enhancement products is the **Swivel.** A slim swivel base that attaches underneath the Macintosh, making it easier to reposition the computer. It goes everywhere the Macintosh goes, even inside the carrying case.

The **Surge Suppressor** is a replacement power cord, providing UL listed surge suppression and line noise filtering for the Macintosh. It fits easily into the carrying case, so your Macintosh is protected no matter where you take it.

There are two anti-static **Dust Covers** in the family. One protects your Macintosh and keyboard. The other takes care of your Imagewriter.

Leave your delicate, intelligent modem at home. The **Portable Modem** is the perfect traveling companion for the Macintosh. It's small, sturdy, battery powered, weighs less than a pound and even has its own carrying case. The Portable Modem operates at 300 baud with any communications software.

The **Control Center,** styled to fit underneath the external disk drive, provides fingertip control over your whole system. There's a master switch to power the whole system on and off, and separate switches for a printer, modem and one auxiliary device. It also protects your whole system from power surges, line noise and static shocks.

The **Universal Printer Stand,** for the Apple® Imagewriter,™ also fits most other dot matrix printers. It raises your printer 1½" from the desk at the front and 4½" at the back, an angle that allows you to monitor your printer's performance more easily. By raising your printer a few inches from the desk, the Universal Printer Stand solves the problem of where to store your paper. Several hundred sheets are accommodated neatly underneath.

The **Disk Case** provides safe storage for 36 Macintosh disks. And it comes with a handy packet of spare disk labels.

There is more to Maccessories than hardware.

Maccessories Professional Type Fonts are styled after the most popular type faces in the advertising and publishing industries, like Times Roman™ and Helvetica.™ They give reports a professional look and add a touch of elegance to correspondence. Available in two volumes. Professional Type Fonts For Text contains 16 unique fonts in sizes 12 to 24 point. For Headlines (for the 512K Mac) contains the same fonts in sizes 24 to 72 point.

Maccessories Graphic Accents is a collection of over 250 professional illustrations, covering everything from business to holidays. Use them for reports, newsletters or greeting cards. Graphic Accents are stored in standard MacPaint™ files, so you can adjust them, copy, cut and paste them just like your own illustrations.

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Letters

MacWrite Update
As a recent letter to you noted, it would be nice if you could indicate when news you carry is probable rather than accomplished. In "The Macintosh Deluxe" [November 1984], you go into great detail about an upgrade of *MacWrite*. I eagerly rushed to my local dealers and even went so far as to insist that they open up the new 128K and 512K machines that they had received to check whether the new *MacWrite* version was, as you had noted, bundled in with the new machines. As I am sure you are well aware, no such upgrade was to be found.

Being in the communication business, I am well aware of the lead time needed to produce a magazine, but it would be helpful if you could indicate an item's expected availability date.

By the way, I am an associate professor of mass communication and feel that the Macintosh is the true communication wonder of my age (47). Your magazine has also contributed immeasurably to my understanding of the machine, its software, and the potential that truly resides in this deceptive tool, and I shall be a subscriber until I can no longer type and see the screen.

Marvin R. Bensman
Germantown, Tennessee

We used a preview version of the upgraded MacWrite *when we wrote the 512K Macintosh story. Our information from Apple was that the updated software would be ready for distribution at the time the 512K Mac was announced in September 1984. We apologize if the information we published inconvenienced you.–Ed.*

Warranty Worries
Not having grown up with computers, they were an alien world to me. So I spent two years studying and looking at computers and took a computer course. Then I got in line to buy a Macintosh. It arrived in May, and I thought it was everything that Apple promised and then some.

But my enthusiasm waned with the warranty, which ended at about the same time that the Imagewriter's printhead stopped functioning properly. The technician told me the printhead could not be repaired and that it was very rare for a printhead to go bad on any make of printer. He was as flabbergasted as I was to discover that a replacement costs $136 (printheads for other printers cost from $30 to $60).

At considerable expense, I called Apple customer service and got a long-winded dissertation on how one can expect defects no matter how carefully the maker exercises quality control. The Apple representative said that they only had one supplier for the part and that they had no reports of these heads breaking down on a large scale, suggesting I was just unfortunate in getting one that broke.

Anne D. Snyder
Gainesville, Virginia

MacWrite Gets an A
In a letter published in your September/October issue ["MacWrite Flunks Test"], the writer complained that *MacWrite* is not suitable for an extensive word processing project like a Ph.D. thesis. I recently finished using *MacWrite* to write my Ph.D. thesis in physics, and I believe that the advantages of using *MacWrite* far outweighed its disadvantages. I had some help from Prof. Gerald Heller at Brown University, who created a Greek letter font for me. Using the Greek letters and the math symbols available on the Macintosh, I was able to include complicated equations in the text.

Since *MacWrite* displays on the screen a close copy of what the Imagewriter prints, you can write equations involving fractions and integrals requiring more than one line of text. These equations are particularly difficult to create with ordinary word processors, because the spacing on the screen often does not match the spacing of the printed output, and Greek symbols often do not appear on the screen.

The ten-page limitation of *MacWrite* did not present a problem, since I divided the thesis into sections of less than ten pages. I formatted an empty file called Set-up and opened it whenever I wanted to start a new section. With a second disk drive, the whole thesis (175 pages) easily fit on one disk. Certainly *MacWrite* can be improved, but it is already an excellent tool for demanding writing projects.

Jefferson Strait
Atlantic Heights, New Jersey

A Worm in the Apple
I have come down from the initial delight of becoming a Macintosh owner and am now stranded between tears at the large amount of money that I might have just wasted and euphoria at what the future might bring to the Mac. I am a college student and got the "special deal" on my Mac. It turns out, though, that the price I paid is about the same as the discounted prices now offered by many dealers. I bought a Mac

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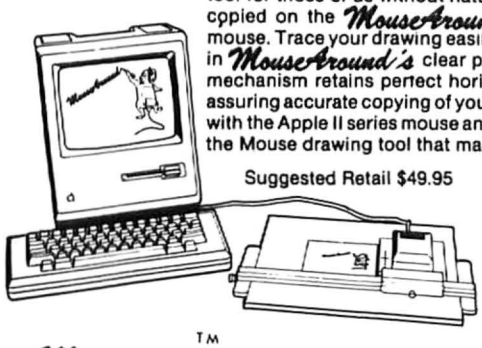
for the rest of us.

Sure MacPaint is a great program, but did you ever try to copy a drawing with the mouse? Like your company logo, clip art, a cartoon, a map or a sketch? Rather difficult unless you're an artist! Well not with the MouseAround ... the drawing tool for those of us without natural artistic talent. Simply place the drawing to be copied on the MouseAround drawing board and insert your Macintosh mouse. Trace your drawing easily and faithfully using the red cross-hairs engraved in MouseAround's clear plastic frame. MouseAround's simple sliding mechanism retains perfect horizontal and vertical alignment of the mouse, thus assuring accurate copying of your drawing. MouseAround is also compatible with the Apple II series mouse and the MousePaint package. MouseAround ... the Mouse drawing tool that makes the rest of us look like artists.



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Mousessories™ ... products that make the best computer even better!

MouseMat™

MouseMat has two important functions. *First*, it provides a clean smooth rolling surface for your Macintosh mouse. The surface of most desktops is like a magnet for dust and invisible small particles of dirt and grit. Constantly rolling your mouse over this contaminated environment could damage its delicate inner workings. Your mouse will glide effortlessly and safely over the hard rubber surface of the Mouse Mat. The MouseMat also allows for more accurate positioning of the mouse pointer. *Second*, the MouseMat safely drains away harmful static charges through its built-in grounding system. Because you touch the MouseMat every time you use your mouse, static buildup is continuously dissipated. Each 11½" x 13" MouseMat comes equipped with an 8 foot snap-on ground cord and a one megohm resistor. The backing on the MouseMat prevents slippage during use. The MouseMat is extremely durable and stain resistant. The MouseMat is also compatible with the Apple II series mouse, and the Apple Lisa mouse.

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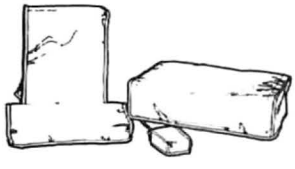
MacCover is a custom tailored set of anti-static dust covers for your Apple Macintosh computer system. It will protect your Macintosh from dust, dirt, and spills.



MacCover is made from 6 gauge anti-statis vinyl with machine stitched reinforced seams. The MacCover package includes four pieces, one cover each for your Macintosh, keyboard, mouse and Imagewriter printer. MacCover affords low cost protection for your valuable computer investment.

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are available now through your local Apple Computer Dealer.

FRONTRUNNER

MouseMedic™

MouseMedic is a cleaning kit for your Macintosh mouse. MouseMedic contains all the supplies required to clean your mouse as recommended by Apple in your Macintosh Owner's Manual. Inside the mouse case are two rubber rollers. The oil that collects on these rollers is removed with foam-tipped swabs and a specially formulated solution that does not leave a residue. Hair and dirt particles entangled in the rollers are extracted with a precision pair of non-metallic tweezers. The mouse ball is cleaned with lint free towels lightly soaked with the cleaning solution and then dried with an anti-static cloth. The interior of the mouse case is wiped out with a small air brush. A can of compressed air with a long thin flexible nozzle is provided to blow out dust from inaccessible parts of the mouse. Proper care of your mouse will assure that it always operates and that it will continue to function for a long time. MouseMedic is not just for your mouse. The supplies in MouseMedic will also clean your complete Macintosh system, including the screen, keyboard and printer. MouseMedic is compatible with the Apple II series and the Apple Lisa.

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because I was immensely pleased with my Apple II+, but I find that I have been entirely excluded from the workings of the Mac. The documentation is pathetic coverage of the obvious. *Macworld* is the only useful documentation available for the Mac, but I resent having to wait a month for each tidbit of system information that should be in the manuals. It seems that Apple wants to make me pay heavily for my brand loyalty by giving me a machine that is capable but colossally useless.

Finding things out about the machine is virtually impossible because even the software developers don't know anything. Apple needs to write a user manual and give it away to all Mac owners who have supported them from the beginning instead of trying to rip us off with rampant overpricing and self-inflated hype. The Mac is great for computer illiterates, but it should also have been great for the programmers and hobbyists who had plans to use its capabilities.

Steven P. Redman
Seattle, Washington

Travels mit Mac

I have just taken my Mac and my IIe to Germany for a year of academic work. In response to Robert Buderi's article ["Travels in the Orient with the Mac," July/August 1984], I would like to inform your readers that taking these systems along and hooking them up to 220 volts and 50 cycles is probably easier than they think.

Carrying the Mac with its second drive and keyboard in the commercially available carrying case posed no problems. The carrying case does indeed

fit under the seat in a Boeing 737 as well as under the seat in a Boeing 747–and I do not mean in first class but in "super economy"–that is, People Express from Portland, Maine, to London. I recommend that prospective Mac travelers sign up for an aisle seat, where the Mac will definitely fit. The Imagewriter and the IIe, by the way, fit very nicely side by side in a large suitcase. The monitor should be in its original box and can also be handled as luggage by the airline.

As to getting the Mac ready to run on European power, a little planning makes all the difference. If you plan to run any other low power consumption articles like a printer, a modem, or another small computer, take a U.S. power strip along (six outlets with some kind of surge protector built in would be an excellent choice). Be prepared to "sacrifice" the plug on this power strip to be able to connect the power strip to a transformer.

Depending on where you plan to go, you should either get a transformer in the U.S. or depend on European sources. Almost all large European cities have electronics parts stores. Transformers are a very common item and are normally called "Autotransformers" or, in German, "Spartransformator." A 75-watt transformer (sufficient for the Mac) costs about $13.

Once you have bought the transformer, you should go to a shopping center and buy a grounded plug and a piece of wire to connect the transformer to the local power. Connect your U.S. power strip to the 110-volt connector and you are ready to run your Mac. Be

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We've been busy!

Our crew of Mac addicts run new programs as fast as they come in, and we've outlined a few of our favorites to give you a better idea of what there is for the Macintosh (so far), as well as what's coming.

DATABASES

OverVue
PROVUE
The database approved for use in-house at Apple. ***OverVue*** is written in assembly language, and it's fast (sorts 1000 records in 2 seconds)! Spreadsheet-like display for easy data entry, advanced math capabilities, and data exchange between Microsoft's Multiplan and Chart. Stores 8 report templates, and can handle up to 15 pp on 128K Mac. A sophisticated, powerful new package.
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CREATIVE SOLUTIONS
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BASIC 1.02	***$ 109.88***
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120 pictures with a detailed manual and "how-to" tips for using artwork. Worth the money for the manual alone.
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OTHER

Dow Jones Straight Talk	***$ 59.88***
Videx MacCalendar	***64.88***

HARDWARE

Microline 92
OKIDATA
Full Imagewriter compatibility, and much better quality in hi-res and draft modes. It's a bit slower than the Imagewriter, but the final output's worth it. ***Microline 92***'s are rugged, with 160 cps (Shannon Text), 10, 12 and 17 cpi, a correspondence font and full graphics support for the Mac. Cable included.
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careful with the 220-volt connection, and ground everything correctly. Make sure that there are no exposed wires–touching 220 is an experience you won't have time to tell about. It is lethal. For those who do not dare to make these connections: a local electrician can set you up for a very small fee, if you bring in the parts.

For Mac users who do not mind a little heat coming out of the 75-watt transformer: yes, the Imagewriter *printer runs* fine together with the Mac on the same transformer. I recommend that the Imagewriter be turned on only when printing needs to be performed.

Modem users should be prepared to use acoustic modems only. In West Germany, for example, it is strictly illegal to connect directly to the phone system. Nevertheless, most phone parts are available. Fines have been issued and collected by the German federal communications officials. Modem users who do not mind the risk of a fine should bring along a cable for connecting their modem to the standard European connectors. Once again, they will have to sacrifice one plug to convert one side of the cable to the non-U.S. outlet. European data transfer protocols are different from those used in the U.S. You won't be able to hook up to the local bulletin board in Europe.

Needless to say, the ability of the Mac to produce print in all European languages is a tremendous asset over here. Its graphics capabilities are superb. The price, on the other hand, is simply shocking! Two Macs cost about the same as a well-equipped small car.

Otmar K.E. Foelsche
Bremen, West Germany

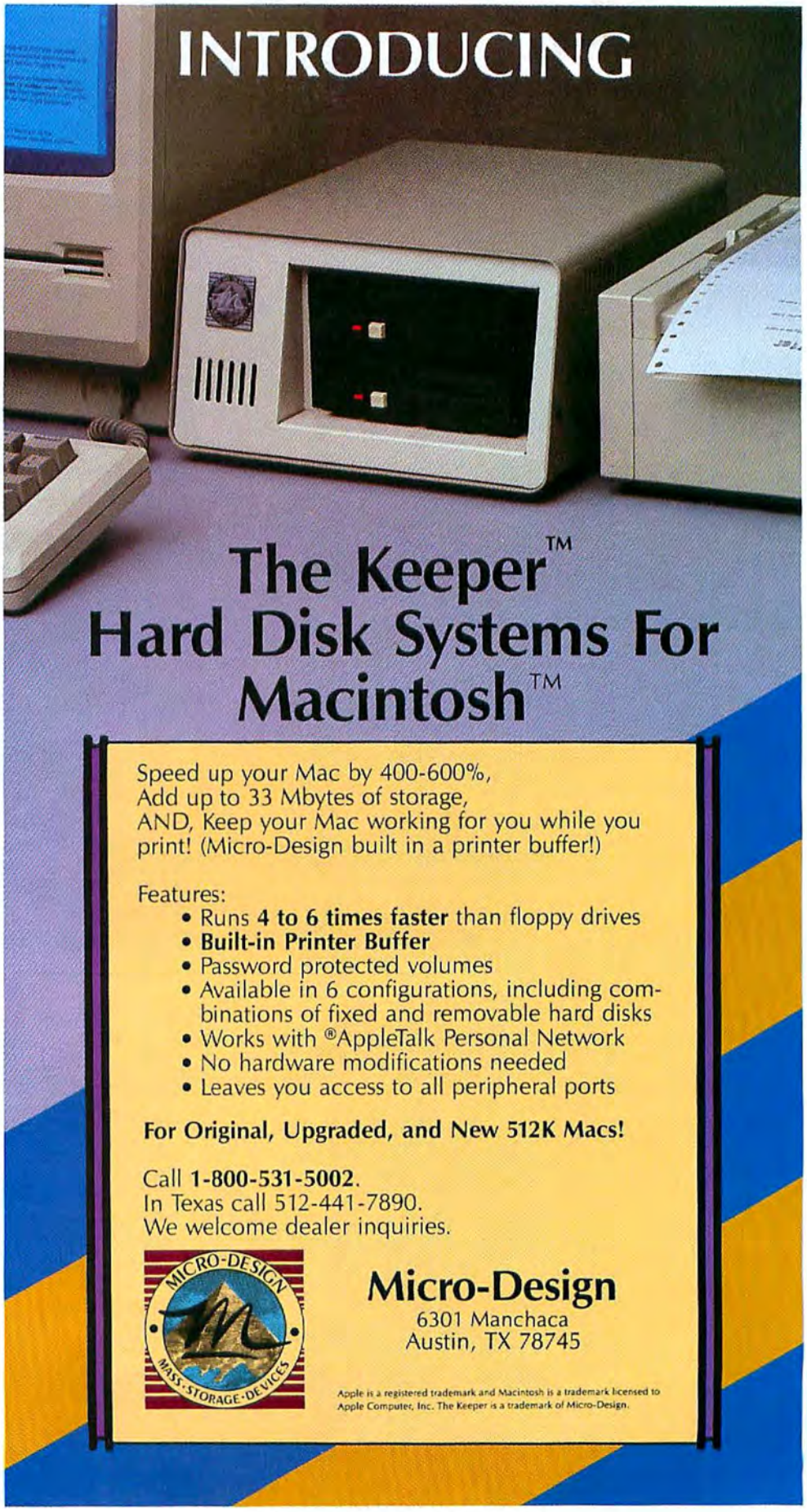
Please Don't Tease

Recently, I went to the local watering hole after work to have a few beers with some of my fellow knowledge workers. A commercial for the Macintosh appeared on the tube and I pricked up my ears, as I'm a Mac owner. The commercial showed a lone Macintosh, introduced it as Apple's new computer, and then zoomed out to show a multitude of Macs, all displaying some sort of fuzzy and nebulous software on their screens. The announcer informed us that this was some of the software being developed for the Macintosh "at the rate of one program per business day."

"That's great!" I thought. "One can't run a small business efficiently with only *Habadex, MegaMerge,* and *Transylvania.* I'll save up some money, visit my computer store 30 business days from now, and browse through the 30 new programs they'll have." Imagine my surprise when I went to a computer store over a month later and found that they'd added only 9 programs to their supply. I think Apple is adding insult to injury by tantalizing the software-starved public with this commercial.

Phil Studge
San Francisco, California

Letters should be mailed to Letters, Macworld, *555 De Haro St., San Francisco, CA 94107, or sent electronically to CompuServe 74055,412 or The Source STE908.* □



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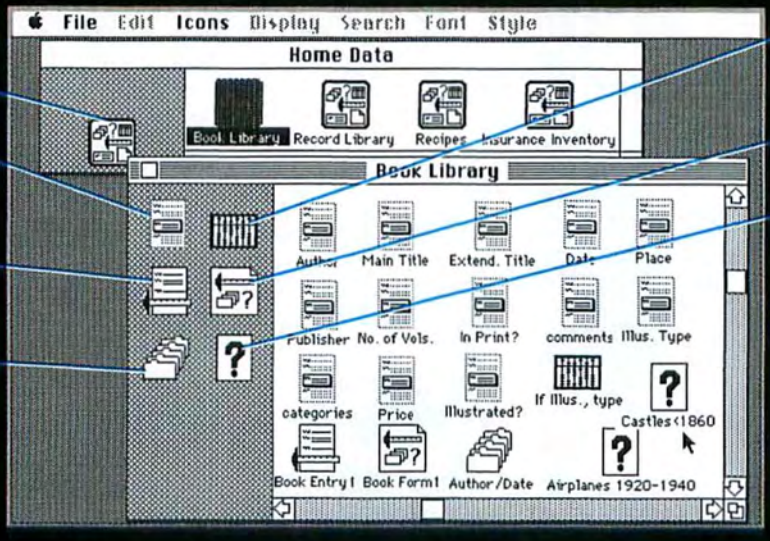
Relation icon to set up different "data bases"

Field icon represents types of information

Template icon for constructing and changing forms

Index icon lets you get at things in whatever order you want



Abacus icon for setting up calculations and relationships

Form-view icon pulls everything together

Query icon lets you do interactive searches

Odesta Helix uses icons (visual symbols) to represent ideas, relationships and functions as **objects** that you can easily manipulate. Create them by clicking on the icon-wells on the left, and dragging them to your desktop. Each opens to reveal deeper and deeper operations and values that may be invoked and shaped with the click of a mouse button.

Odesta, 4380 Doolittle Drive, Northbrook, IL 60062 (USA)
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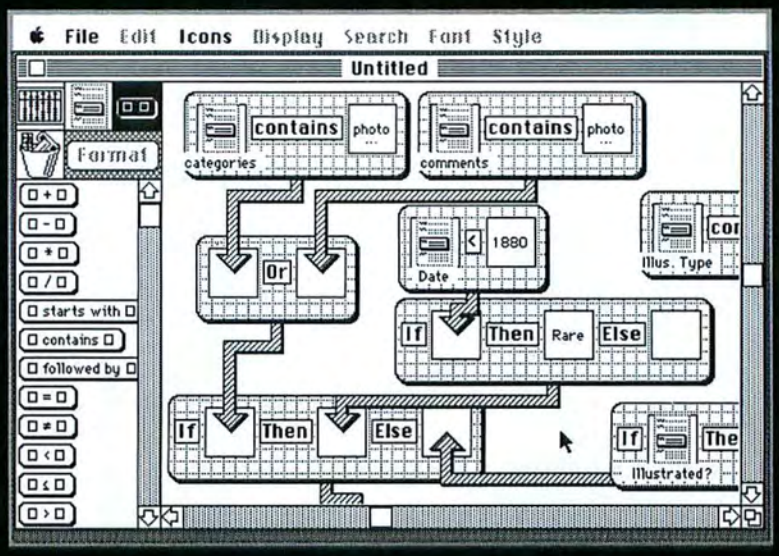
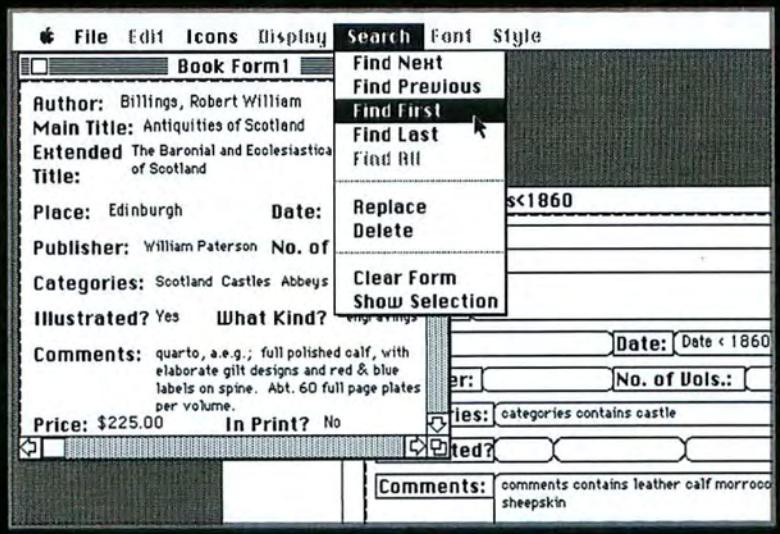
Odesta Helix™ & Macintosh™

The Next Step.

Tiles act as arithmetic, text, Boolean and date operators, functions and values.



Visual building blocks let you set up even the most complicated statement or calculation and use it whenever you want to. Drag tiles out from the list at the left. Drop icons into the tile holes, or type in numbers or text. Connect the tiles by pulling arrows around. This whole calculation is represented by a single abacus icon that may be used on any form, and you may make up as many as you feel like.



Here is a form-view being used in conjunction with an interactive search form (query icon titled "Castles - 1860"). One aspect of the radically innovative design of **Odesta Helix** is that you can enter, query, edit, and print information all from one window – without having to shift from one mode or application to another. Another reflection of this dynamic design is that if you make a change in one window, you see the result pop-up in any open related window.

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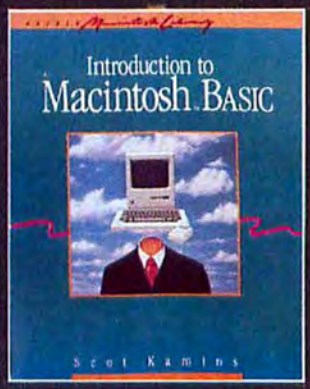

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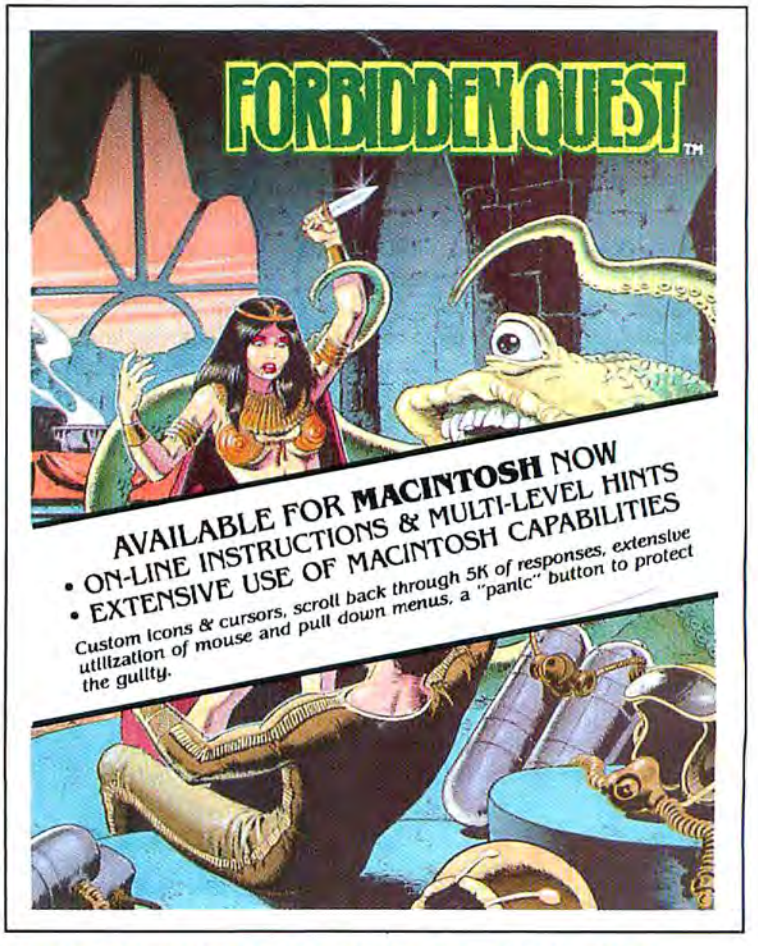

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ThunderScan

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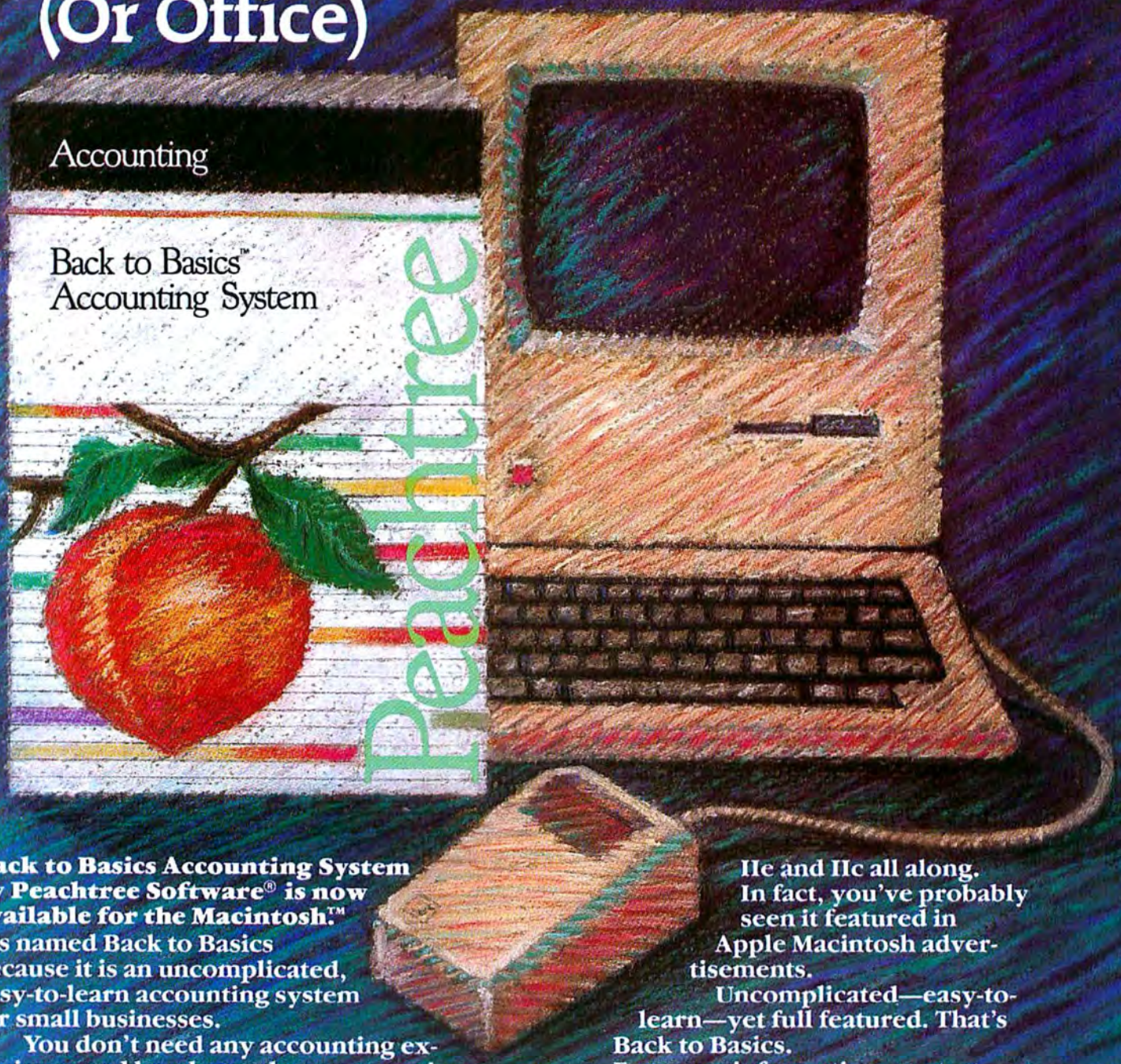

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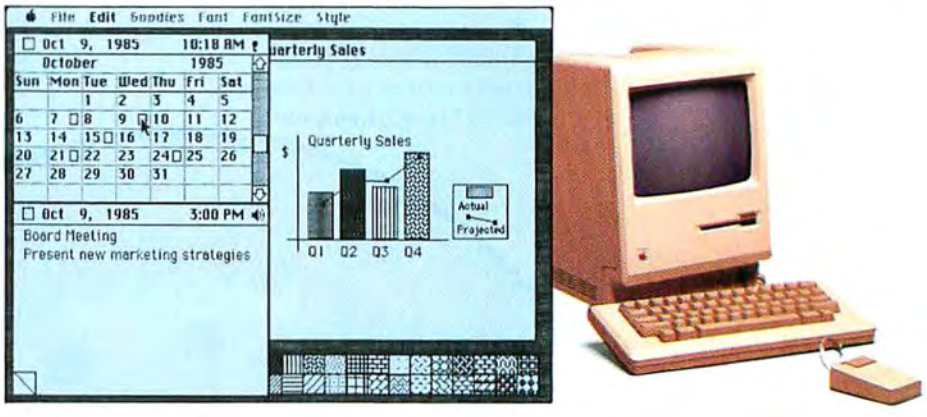

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Macworld View

News and notes for the Macintosh community

Edited by Janet McCandless

Macworld View *reports on new products and developments in Macintosh technology. We will cover items of interest to Mac users and comment on industry trends. We welcome contributions from readers and pay up to $50 for each item we use. Please include your name, address, and phone number with your contributions; send them to* Macworld View, *555 De Haro St., San Francisco, CA 94107.*

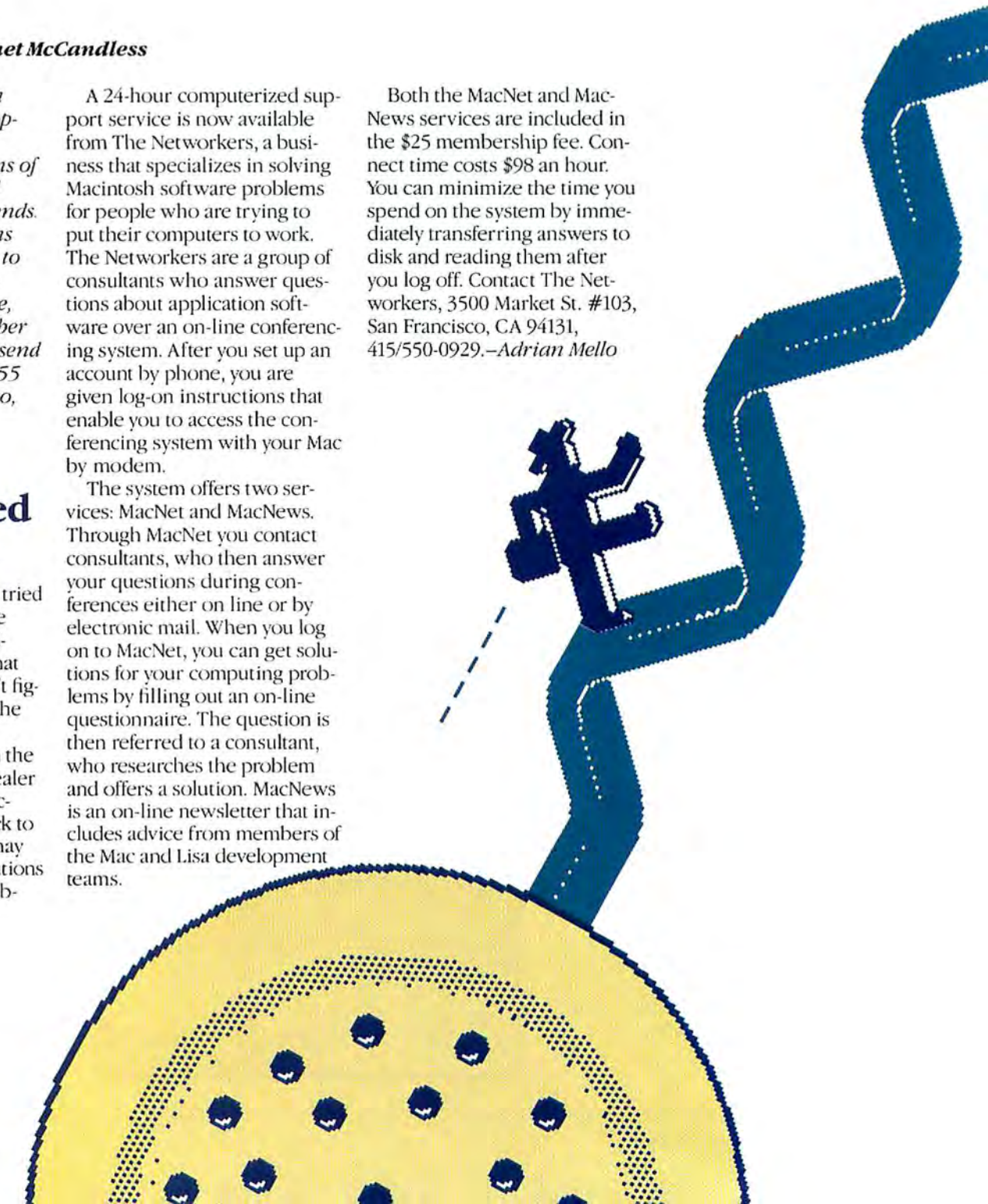
Computerized Consultants

How many times have you tried to solve a problem with the data base program, spreadsheet, or other software that you purchased but couldn't figure out how to apply it to the job at hand? Often when people try to get help with the program they buy, their dealer refers them to the manufacturer, who refers them back to the dealer. But now they may actually be able to get solutions from the source of the problems—their computers.

A 24-hour computerized support service is now available from The Networkers, a business that specializes in solving Macintosh software problems for people who are trying to put their computers to work. The Networkers are a group of consultants who answer questions about application software over an on-line conferencing system. After you set up an account by phone, you are given log-on instructions that enable you to access the conferencing system with your Mac by modem.

The system offers two services: MacNet and MacNews. Through MacNet you contact consultants, who then answer your questions during conferences either on line or by electronic mail. When you log on to MacNet, you can get solutions for your computing problems by filling out an on-line questionnaire. The question is then referred to a consultant, who researches the problem and offers a solution. MacNews is an on-line newsletter that includes advice from members of the Mac and Lisa development teams.

Both the MacNet and MacNews services are included in the $25 membership fee. Connect time costs $98 an hour. You can minimize the time you spend on the system by immediately transferring answers to disk and reading them after you log off. Contact The Networkers, 3500 Market St. #103, San Francisco, CA 94131, 415/550-0929.–*Adrian Mello*



Norris Palmer (left) and Josh Wilson in one of the homes they designed for computer commuters, people who work out of their homes and send in work to the office electronically.

A Mac in Every Home

It's doubtful that any politician ever had the vision to promise a "teleport" in every home and a Mac in every kitchen, but a new housing development in California makes just such a promise. Forty-five miles northeast of Sacramento, 360 homes are being built on 1338 acres in the Sierra Nevada foothills. Each house comes with a Mac and a room called the teleport, which is designed for telecommuters, people who regularly work out of their own homes and send computerized information to an office instead of physically traveling to the office.

The project designers have tried to anticipate the electronic communications requirements of twenty-first century homeowners. Every home has between eight and ten communications ports, with each one providing voice, data, and video hookup. A central switching network provides phone, data, and video communications to individual homeowners. Within the village, owners will be networked for electronic mail between homes. The homes are built to order and range from $160,000 to $240,000. For more information, contact Norris Palmer or Josh Wilson, Eagle Crest, P.O. Box 1-D, Foresthill, CA 95631, 916/367-2801.
–Adrian Mello

Macworld Canvas

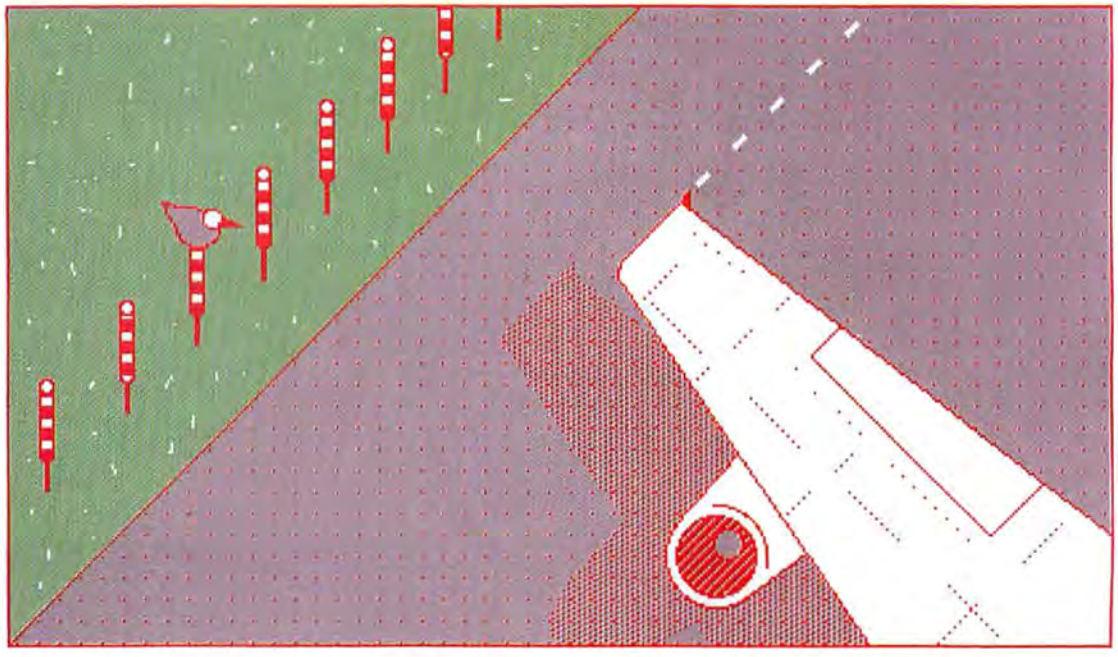
If you thought you had previously seen the matte-coated paper in *Macworld* used only in books, you are right. *Macworld* diverged from the consumer magazine publishing custom of printing strictly on glossy paper. In late 1983 Jacqueline Poitier, Vice President for Design of *Macworld* and *PC World,* contacted S. D. Warren Co., a division of Scott Paper Company, about a paper stock called Somerset Matte, customarily used by book publishers.

Poitier believes that although paper quality is often ignored by readers, it is one of the most important elements in the mag-

azine. For her, paper is the starting point, the canvas of *Macworld*. But she faced the problem of finding paper for a new publication at the onset of a severe paper shortage that was predicted to continue into 1987. She wanted to find paper that would satisfy the readers' preference for stock with less glare than glossy paper, the advertisers' need for high-quality four-color ads, and her own requirement for premium stock.

S. D. Warren had a reputation for manufacturing high-quality paper. The company developed a formula that applies a finish to the paper so that the ink sits on the matte surface and is not absorbed. The softer matte finish accommodates the readers' preference for less glare, and the surface characteristics of the paper let colors retain their brilliance. Even though *Macworld* was to be the first magazine account that S. D. Warren supplied with Somerset Matte, the company's representatives assured Poitier that they could meet her paper needs.

Although *Macworld* will have paper during the coming years of paper shortage, relief for other publications is not assured. New paper mills can cost as much as $250 million and take 18 months to build. The next one will not be producing paper until 1987. In the meantime, many publishers are going overseas to obtain paper stock, and other publishers are using alternate stocks to stretch their paper supply.



Macs in the Hangar

One government agency, the Arizona Department of Transportation and Aeronautics, has come up with an imaginative and practical Macintosh data base application. Department division director Sonny Najera is using Telos Software Products' *Filevision* to store information for a statewide data base on airport facilities. Najera is sending employees to approximately 60 Arizona airports to gather statistical data that will be tied to a map of each airport. Runways, taxiways, parking aprons, access roads, terminal buildings, aircraft hangars, fueling farms, and maintenance operations will be documented. He intends to document the number of aircraft, use patterns, flight frequency, and the kind of fuel the airport sells.

Department of Transportation employees will take Macs to airports throughout the state and enter information into *Filevision* on the spot.

The information will be used to help distribute grants to the airports and to anticipate the fiscal impact of each airport facility on the local community. To assist the department in this financial evaluation, Najera is also looking at other data bases, such as *pfs:file* and *pfs:report*, to track both revenues and costs of operation. The data base information will be used to evaluate the economic viability of an airport and the return on investment that can be expected from the facility. Until now, this level of data gathering and projection has not been performed for medium- and lower-level facilities. The airports operate as public facilities and are not considered sources of revenue. The data from these small- and medium-size facilities can be used to help make the airports self-sustaining and give pilots and local communities a realistic appraisal of costs.

Najera expects that the next *Filevision* application for the Department of Transportation and Aeronautics will be data bases for major streets and highways. If the data for all the roadways is tied to a data base, the department will be able to zero in on a section of a roadmap to determine the condition of the pavement, and project maintenance costs and schedules for several years into the future.

Computers for the Rest of U.C.

The University of California, Berkeley, has an innovative approach to computer education using Macintosh computers. The course, prosaically entitled "Introduction to Computing," originates in the Interdisciplinary Studies Group of the College of Engineering. Its only prerequisite is that students not have prior computer training or

experience other than minimal use of a word processor. The course is designed for undergraduate humanities and social science students. The lecturers, Professor Richard White, an electrical engineer, and Professor David Patterson, a computer scientist, are from the Department of Electrical Engineering and Computer Science and are both known for their hardware achievements. The course developers have also consulted with the campus's Instructional Technology Office and SESAME (Search for Excellence in Science and Math Education).

The course accommodates the approximately 400 students by selecting laboratory teaching assistants from various humanities and social science departments. Some of these graduate students have considerable computer experience and some have never used a computer.

The students start with major application programs, such as word processing, data base management, spreadsheet, and communications, to become comfortable with the Mac and get some idea of what it can do. Then they move on to programming in MacPascal, learning a half-dozen fundamental programming concepts, including algorithms, loops, decisions, subroutines, and variables. The next step is modifying existing programs. The course concludes with a project. Students work in groups of two or three with a teaching assistant from their own area of study.

The Macintosh was chosen, said Mark Bedau, a course teaching assistant from the Philosophy department, because it is good for beginners. Fundamental concepts such as file organization are easy to explain on the Mac, because it uses icons and a mouse. The graphics orientation of the Macintosh is also useful for teaching purposes, Bedau says. The graphics allow a more natural presentation of concepts, and screen shots are worth a thousand bytes. During the final weeks of the course, the students will use other computers and can choose to do their project on any available computer. It will be interesting to see how many switch to a less friendly computer.–*Heidi Mitchell*

Print It and Wear It

"If you can print it with your Mac, you can wear it on your back (or front)." So reads the "permanent press" release (it's printed on a T-shirt) announcing the advent of Underware, a ribbon for the Imagewriter that lets you turn your Mac art into iron-on transfers for T-shirts, banners, or any other material imaginable.

Underware is the product of Diversions, a Belmont, California, company that came into being, according to president Weldon Benedict, on Friday the 13th of July 1984 when Benedict and one of the other two principals were fired from their jobs at a software company. "We were sitting around talking about what we could do to make money on a low budget, and we came up with Underware," says Benedict.

Despite its unlucky birthday, Underware looks like a winner. At $19.95 it prints at least 20 designs, and transfers have the quality of commercial T-shirt prints. The Underware ribbon also works with the Apple Dot Matrix Printer, the NEC 8023, and the C. Itoh Prowriter. Contact Diversions, 1550 Winding Way, Belmont, CA 94002, 415/591-6739.

We have learned about two other firms that market products similar to Underware: Sharp Color, 400 N. High St., Box 175, Columbus, OH 43215, 614/221-0502; and The Reference Corporation, 212 Fifth Ave. #1312, New York, NY 10010, 212/685-4809.–*Joe Matazzoni* □

A special ribbon for the Imagewriter allows you to make iron-on transfers of Macintosh designs. Remember to flip the design before you print it out; otherwise you'll have to stand in front of a mirror for anyone to enjoy it.

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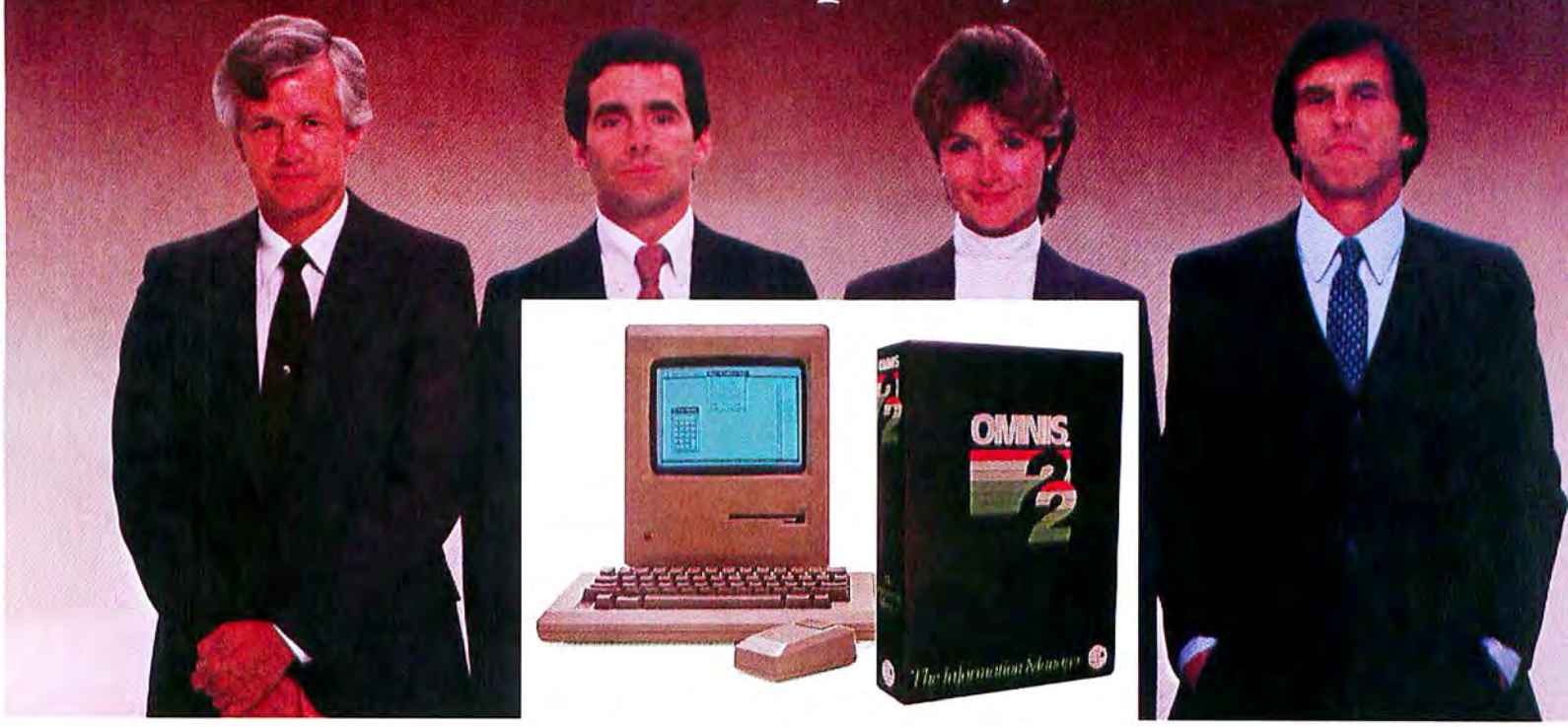

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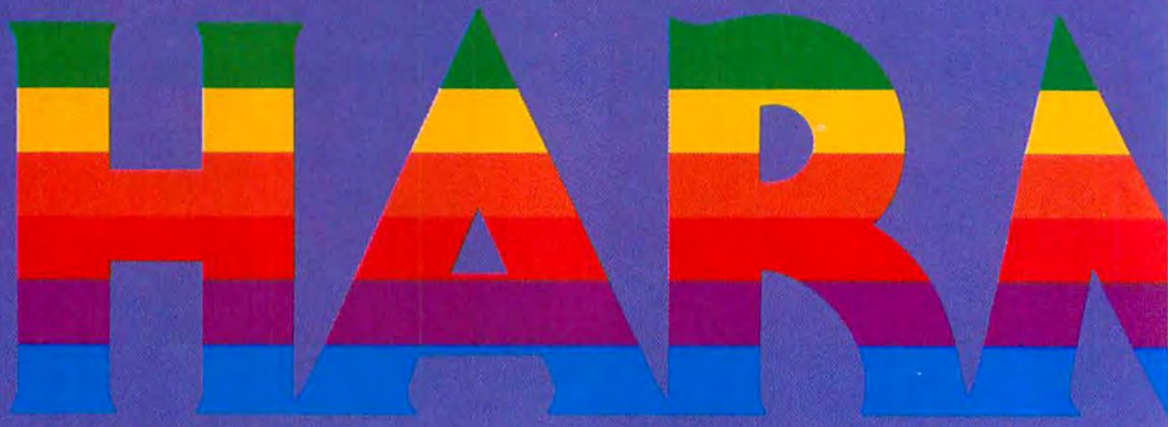

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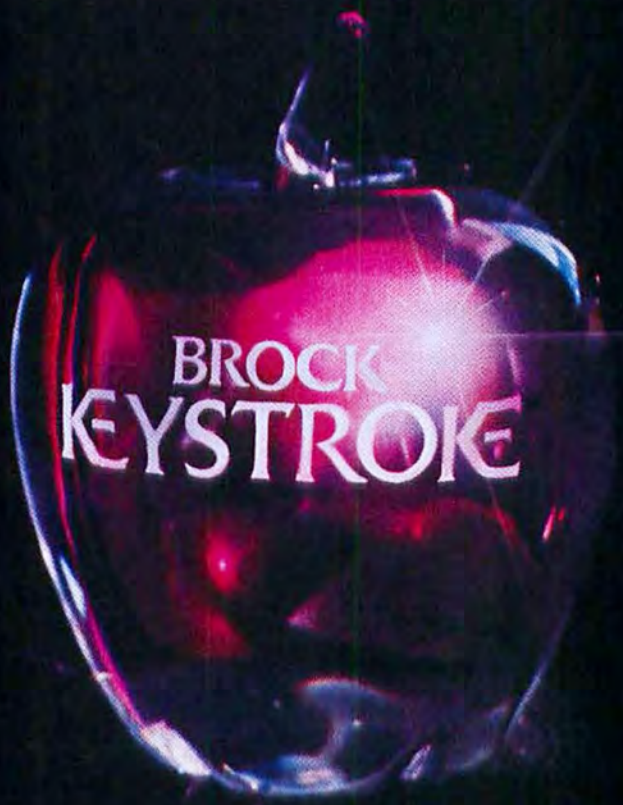

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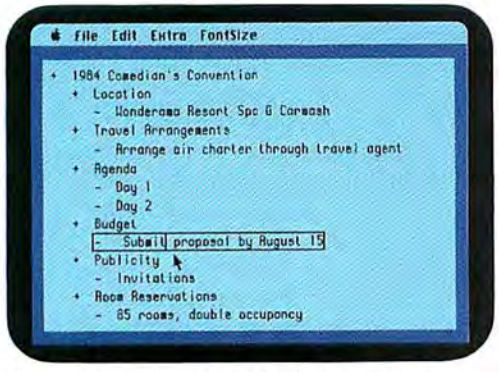

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A Face for All Seasons

James Felici and Evelyn Spire

You can print all the familiar Macintosh fonts on the LaserWriter, but you probably won't be satisfied with their appearance compared with the new fonts built into the printer's memory. Whereas the old library of Mac fonts was designed around the limitations of the Mac screen and the Imagewriter's printing capabilities, the new font library is based on professional type standards.

The LaserWriter is certainly an impressive combination of hardware and software. But what makes the printer truly useful is its selection of typefaces. Built into the printer's ROM are 13 typefaces, including representatives from the world of commercial typography: Times Roman, Helvetica, and Courier, as well as a set of mathematical and Greek characters for scientific writing. Times Roman and Helvetica are among the most popular commercial typesetting faces, while Courier is the face made famous by the IBM electric typewriter (see Figure 1).

The software that makes the LaserWriter's quality typefaces possible is the PostScript programming language, developed by Adobe Systems of Palo Alto, California (see "The Language that Talks to Your Printer"). But the key to this assemblage of hardware and software is the licensing agreement between Adobe Systems and the Mergenthaler Linotype Company. Mergenthaler is a leading international manufacturer of state-of-the-art typesetting equipment, and their type library of over 1300 faces is renowned for its quality. The adaptation of commercial typefaces represents a convergence of personal computer technology and a typesetting tradition that dates back to Gutenberg.

Faces, Fonts, and Families

Gutenberg's invention of movable type in the 1430s essentially put calligraphers and hand carvers of type out of business. It became the job of type designers to create the artfully crafted and readable typefaces that would be the successors to the hand-letterer's unique characters. This chore was and still is an exceedingly tedious one, calling for the creation of a family of some 60 or 70 characters that share a common design motif and proportional scheme, presenting a unified impression to the eye.

Creating a readable typeface is no mean feat, which is why only a limited number of such faces are available in type libraries. Many typefaces are several hundred years old; like the Garamond you are reading now, such typefaces have proven over time to be the most readable.

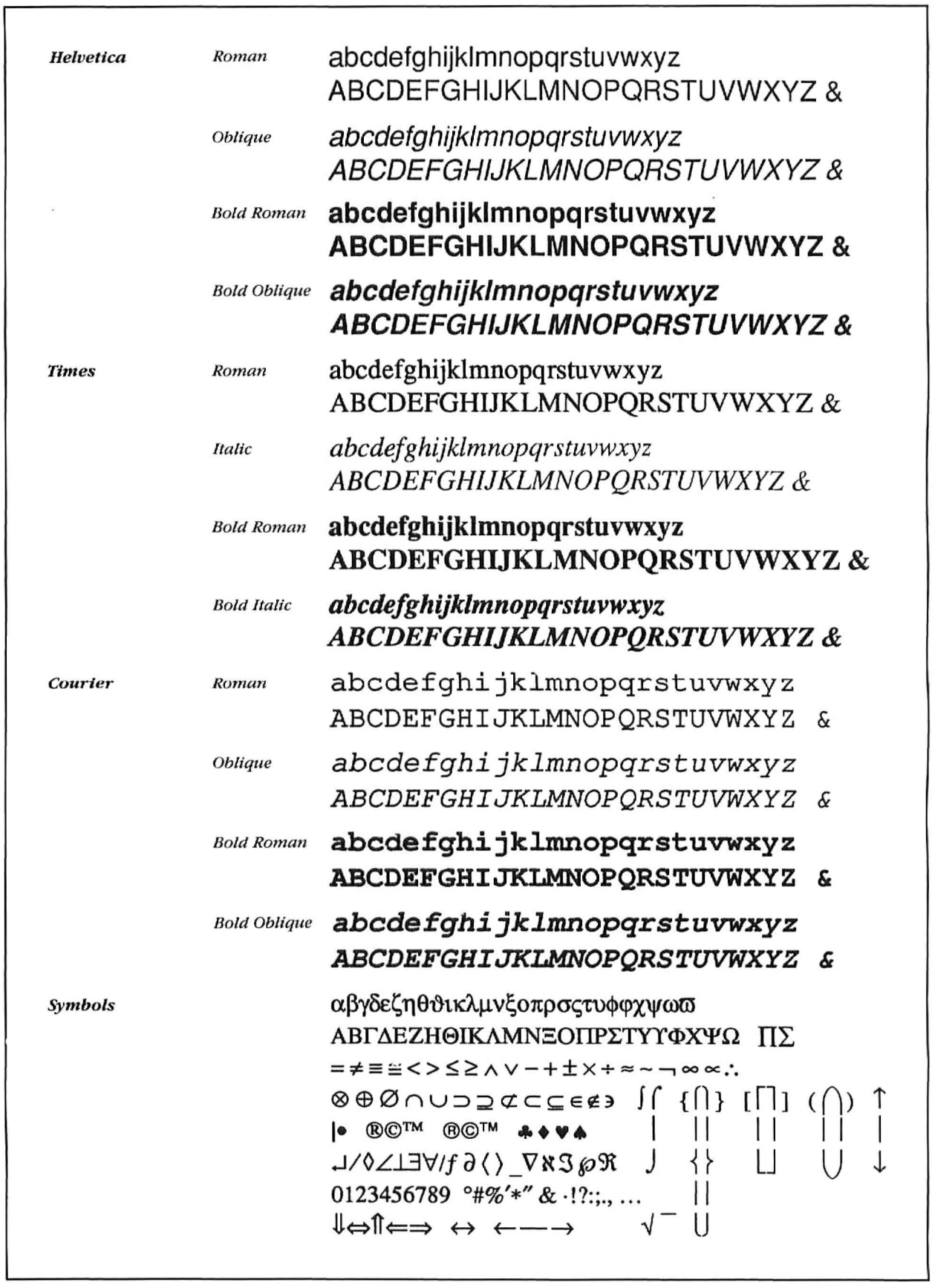
Typefaces are generally grouped into families, related by design similarities that allow them to be used together harmoniously. A font is a complete character set of a given typeface in a particular size. Members of type families are distinguished by two variables, the first of which is the weight, or thickness, of the strokes making up the letters. Thus a face can have several versions, such as light, regular (or book weight), demibold, bold, heavy, and extra bold (see Figure 2).

The second variable is character width. Variants on a face can be created by making the letters wider or narrower while keeping the same letter height. A condensed face has narrower characters, giving the letters a more vertical appearance. Conversely, an extended face has wider characters, which gives the type a squatter, more horizontal look. Condensed faces are commonly used in situations in which it's desirable to cram a lot of type into a small area, such as in ingredient lists on food packaging.

Most type families have two styles: roman, the "normal" style, like the type you're reading now, and italic, which is inclined to the right and resembles cal-

The LaserWriter contains 13 professional-quality typefaces. The characters in each font are stored in the printer in outline form (as simulated in this figure). This feature enables the LaserWriter to print its fonts in any size or rotation.

Figure 1
Built into the LaserWriter's ROM are 13 faces selected to cover a wide range of applications. Helvetica and Times Roman are among the most common faces used in commercial typography, and Courier is a standard face for business correspondence and word processing. In addition to the alphabets shown, each font contains numerals, punctuation, diacritical marks, foreign accents, and utility characters. Also built into the printer is a utility font that includes Greek, mathematical, legal, and decorative characters. All fonts are displayed here at 24-point.



ligraphic, or pen-drawn, characters. Some faces that lack true italic complements use inclined versions of the roman-style characters; these inclined versions are referred to as "oblique." Helvetica has such a face.

Typeface families can be quite extensive, consisting of both roman and italic faces that vary in both weight and character width. The complete Helvetica family, for example, includes 40 separate faces. Times Roman, on the other hand, has less than 10 family members.

Display and Body Faces

Each typeface, by virtue of the design characteristics of the individual letters, carries a subliminal message that influences the content of the words composed in its alphabet. Certain typefaces present a scholarly aspect, some are dramatic, and others have a scientific, informal, or jazzy look (see Figure 3).

Typefaces are divided into two main groups based on their dramatic and aesthetic qualities: display and body faces. Display type is usually reserved for headlines and advertisements. These typefaces are usually arresting in appearance, having been designed to stop and hold the eye (see Figure 4). Body, or text, faces are used for long passages of text in which readability is the primary concern; the reader's eye should be able to fly along at high speeds, recognizing instantly the letter forms and the words. For this reason, most body faces look similar to the untrained eye of the casual reader.

The fonts introduced with the LaserWriter printer offer flexibility and diversity. They can be used for both text and display purposes. As the library of fonts grows, we can look forward to the introduction of faces that have more specific text or display applications.

Serif and Sans Serif

An important division among typefaces has to do with the way the letters are drawn. Serif type is distinguished by the fact that the strokes making up the letters vary in thickness and by the presence of serifs, the small extensions at the ends of the strokes. Both of these features enhance the readability and aesthetic appeal of serif faces.

The LaserWriter serif face, Times Roman, designed for the *Times* of London in 1931, is the product of a concerted effort to use historical models to create a modern serif typeface of unsurpassed readability. The fact that Times Roman is now a publishing indus-

Figure 2
Selections from a family album: some representative members of the Helvetica family, illustrating the permutations possible through the variation of character width and weight.

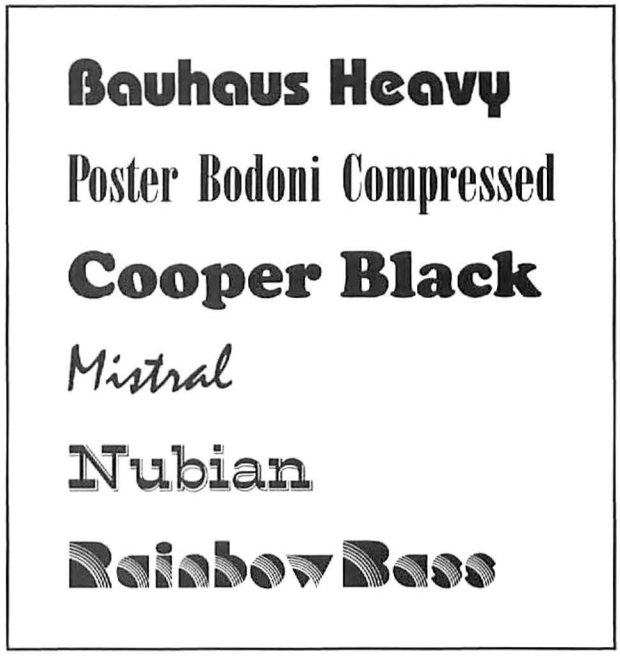


Figure 3
Display faces are eye-catching—great for headlines, but not very useful for long passages of text, as in bulk they become difficult to read. Imagine trying to read a short story set in Mistral or Rainbow Bass.

Type Talk

The type terminology we use today is largely based on Gutenberg's original typesetting technology. In his system of movable type, each character was carved on the face of an individual, reusable block. These blocks were combined to form lines of text, and the lines stacked to form pages. In modern typesetting, these blocks no longer exist, but the old terms are still in use.

Point Sizes

The measurements most often used to describe type are picas and points. There are 12 points to the pica, and although there is no exact correlation between type measurements and either English or metric measurements, there are almost exactly 6 picas (hence 72 points) to the inch.

Type sizes are expressed in points, which refer to the height of the imaginary type block upon which the letter sits (see the figure "How Type Sizes Up"). This measurement is roughly equal to the distance from the top of the ascender (that part of the *b* or *k*, for example, that extends upward) to the bottom of the descender (the lower stroke of a *y* or a *q*).

Leading

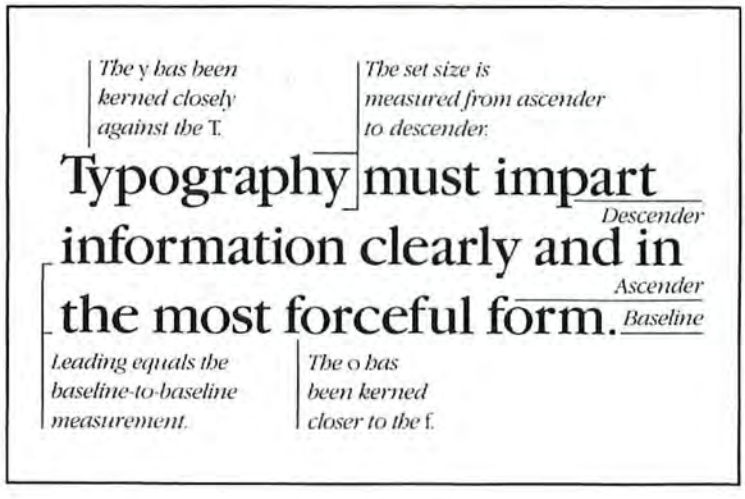
Because the original letter blocks were made of lead alloy, vertical distances in typography are referred to as leading. Leading is measured with regard to the base line, that invisible line upon which the characters sit.

To describe the type you want on a page, you must define both the size of the letters and the amount of leading. In magazine or book type, which generally ranges from 9- to 12-point, readability is enhanced by the addition of a point of extra lead between lines. This helps the eye find the proper line when moving from the right margin back to the left. On very wide pages, two or three extra points of lead may be necessary to help the eye locate the correct line when moving from margin to margin.

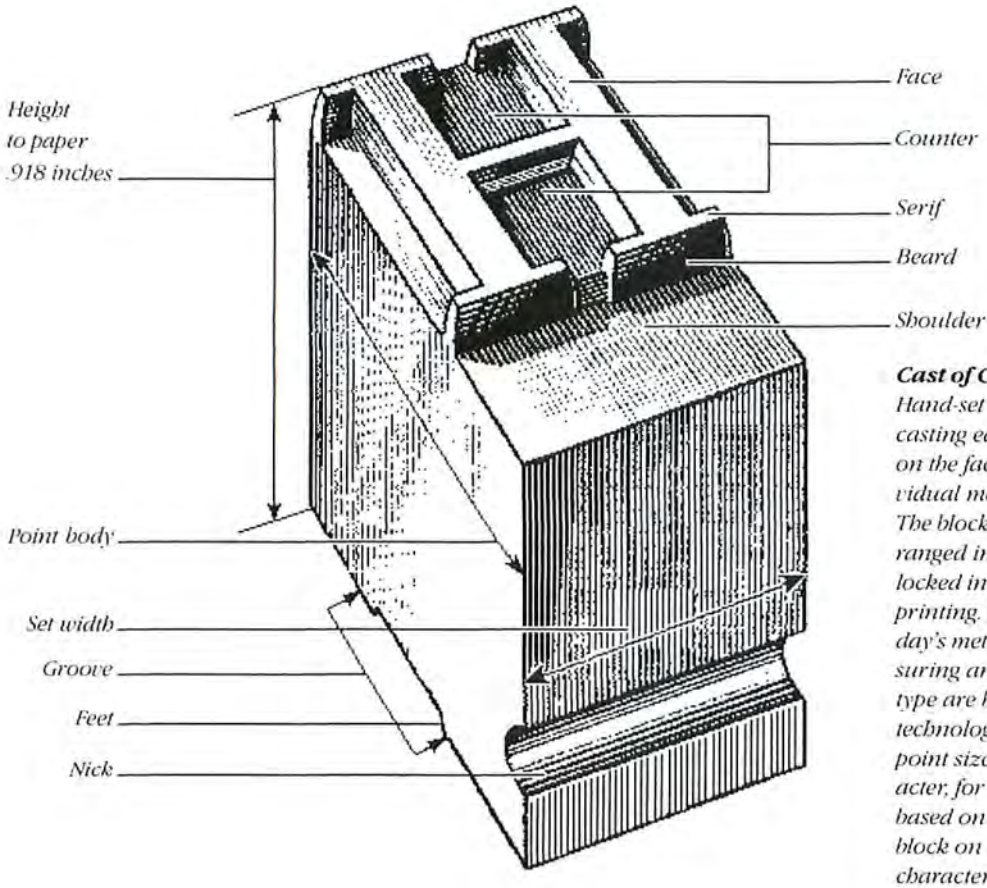
The type you are now reading is set in 10-point type on 11 points of lead, a formula expressed as 10/11, or "10 on 11." If you wanted to set type without extra leading, you would call for 10/10.

Letter Spacing

A major consideration in typographic aesthetics is the spacing between characters in a word. Although each face is designed with an eye toward harmony between character shapes and sizes, the type designer has little control over how the spacing between particular characters will affect the type's readability and balance. Character spacing, then, becomes a major concern for the typesetter. Ideally, each character in a word should nestle against its neighbors, giving the general appearance of even spacing between letters. However, owing to the different shapes of letters, that ideal is not always easy to achieve. Ad-



How Type Sizes Up
The basic terminology of modern typesetting is still based on the assumption that each character sits on its own lead block, although these blocks are now imaginary. Kerning, likewise, is based on the idea that the physical width of these blocks is an impediment to proper character spacing.



Cast of Characters
Hand-set type involves casting each character on the face of an individual metal block. The blocks are then arranged in rows and locked into place for printing. Most of today's methods of measuring and specifying type are based on this technology. The stated point size of a character, for instance, is based on the size of the block on which that character would be cast (see "Type Talk").

jacent round characters are apt to look too far apart, while adjacent flat or square characters (such as *l*, *i*, or *m*) may appear too close.

Some computer printers are equipped with a facility for proportional spacing, which takes into account the differences in widths among the letters of the alphabet. These machines create type that looks better than that of regular printers or typewriters, but since they still cannot space letters on a case-by-case basis (round letter to flat letter, flat to flat, round to round, and so on), they are limited in their ability to offer consistently even letter spacing.

The Imagewriter, like most computer printers, assigns all characters, including punctuation, the same width, so that all typed characters on the printed page align in vertical columns, just like on the computer screen. The LaserWriter printer, by using Mergenthaler character widths, sets each character with the variable widths used in commercial type shops.

In the days of metal type, there was little the typesetter could do to adjust interletter spaces. Certain characters, though, were equipped with *kerns*, parts of a letter that extended off their own letter blocks and overlapped adjoining blocks. Part of the cross-stroke of a capital *T*, for example, might overlap the character to the right, so that a subsequent lowercase letter might nestle slightly into the white space around the *T*'s vertical stroke. Character kerning reduces the obtrusive white space between characters, creating a sense of uniform spacing. The ability to kern is what separates great type from good type.

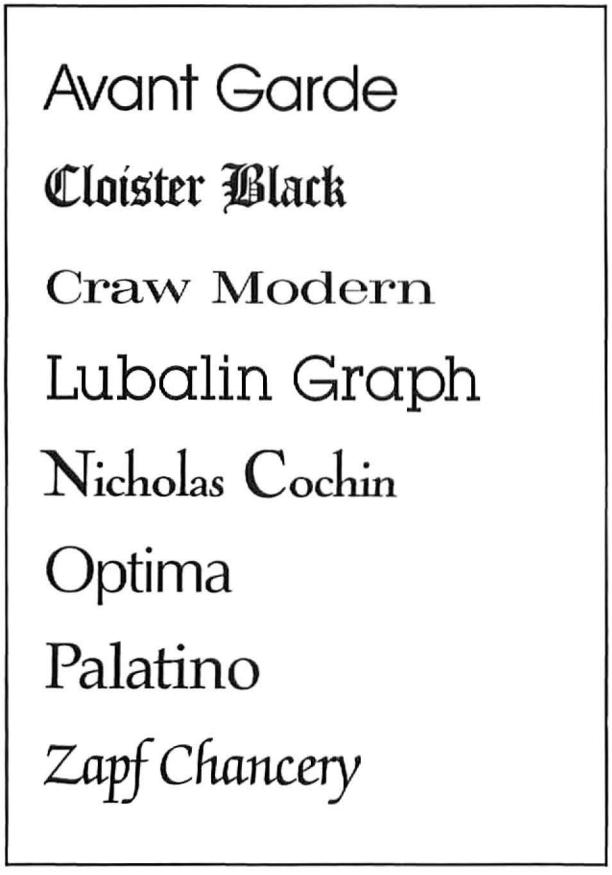


Figure 4
Typefaces are expressive by themselves, and a good typographer becomes adept at matching a type style to the tenor of the text. Nicholas Cochin, for example, presents an old-fashioned, scholarly look, while Avant Garde has a modern look, lighthearted yet formal. Craw Modern is decidedly emphatic, Optima is light and elegant, and Lubalin is machine-like and precise. Cloister Black speaks for itself.

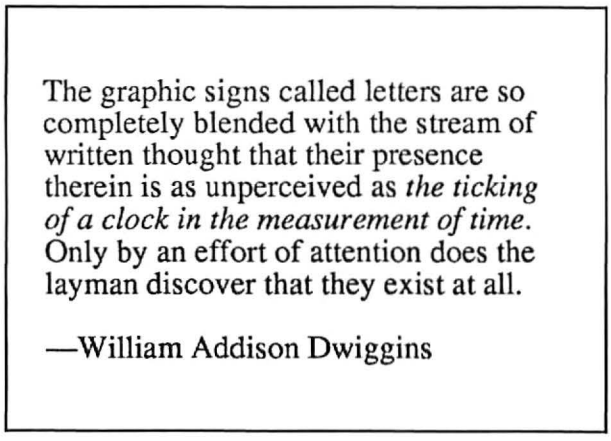


Figure 5
Times Roman is among the most legible and readable serif faces ever designed. The balance and proportion of its characters make it useful for both small type and large headlines.

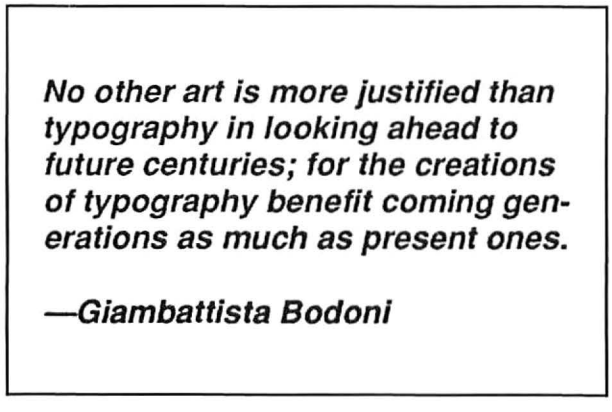


Figure 6
Helvetica is the darling of sign-makers and corporate logo designers because of its clean design, readability, and image of clarity and objectivity. Once you become familiar with the appearance of this face, you'll begin to recognize it just about everywhere.

try standard attests to the success of that endeavor. Times Roman is the text face used in *Newsweek, Sports Illustrated, Esquire, Personal Computing,* and *Fortune,* among others. Most proofreaders will tell you that Times Roman is the least fatiguing face to read (see Figure 5).

In contrast to serif faces, sans serif faces tend to have strokes of approximately equal thickness and lack the serif ornamentation. These faces have a modern, clean, architectural look that is readable from long distances–thus their appeal for use in signs and billboard advertising. The LaserWriter sans serif typeface, Helvetica, is modeled after faces designed in the 1930s at the Bauhaus school of design in Germany. Although Helvetica is readable in small sizes and is useful as a body type, you probably see it more often in corporate logos, parking lot signs, and government forms. You'll recognize Helvetica next time you see an ad for American Airlines, stop at an ARCO gas station, or fill out your income tax form (see Figure 6).

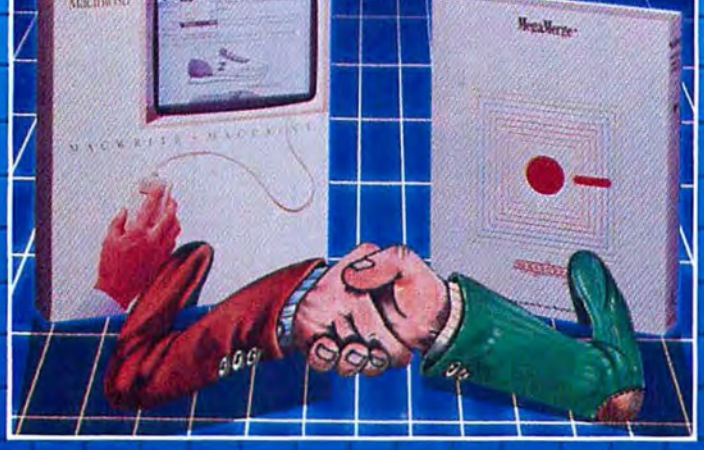
Courier, another typeface introduced with the LaserWriter, is not part of the Mergenthaler library. This square serif face was originally designed as a typewriter face and is used in office and business applications. Whereas office printing technology has often sought to imitate typeset faces, this, ironically, is a case of typesetting technology imitating the look of an office printer.

In the coming months, Apple will undoubtedly offer new Mergenthaler faces for the LaserWriter, including Palatino (serif), Avant Garde (sans serif), and Zapf Chancery (calligraphic). You'll be able to download these fonts into the printer's memory, and place equivalent screen fonts in the System file of your application disks. The LaserWriter's increased resolution, PostScript's sophisticated font creation capabilities, and Mergenthaler's professional fonts create a true typesetting environment–a marriage of personal computing and commercial typography. □

■■■■■■■■■■■ *James Felici is the Production Editor of* Macworld *and* PC World.

■■■■■■■■■■■ *Evelyn Spire is a freelance writer and editor based in San Francisco. She currently edits for PC World Books/Simon & Schuster, Hayden Book Company, and* Tri-Athlete *magazine.*

MegaMerge is here!



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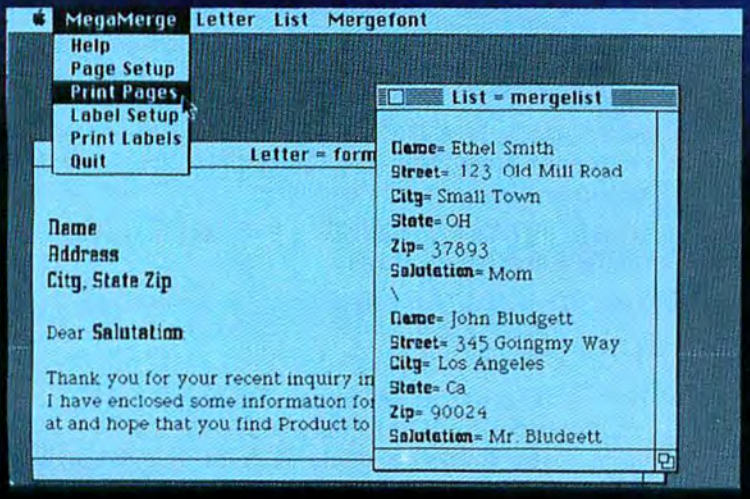

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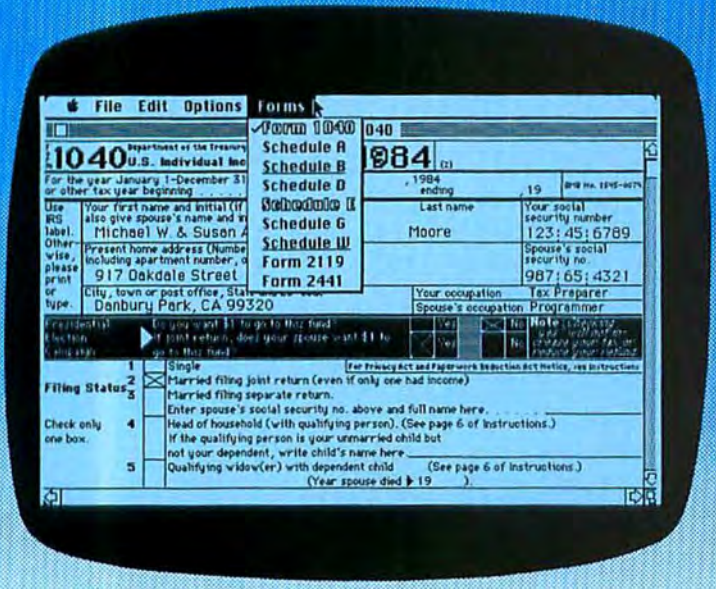

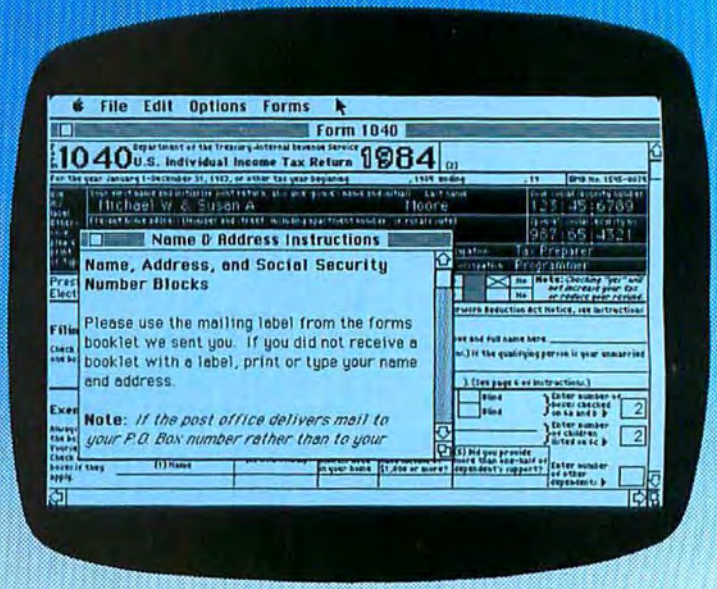

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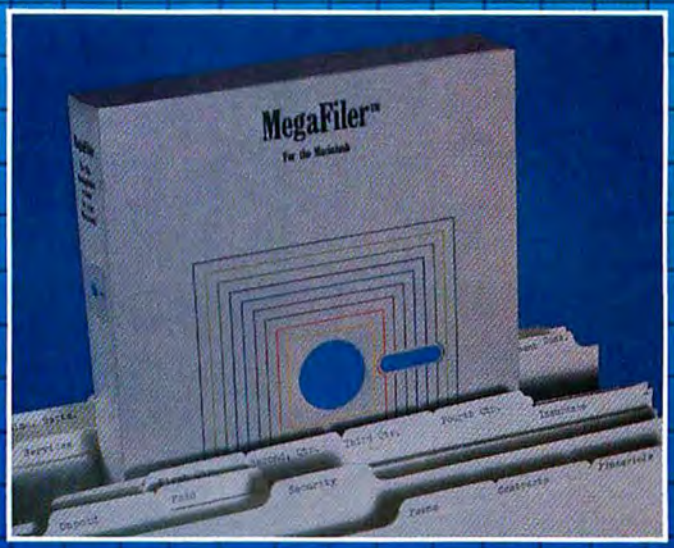

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In addition:

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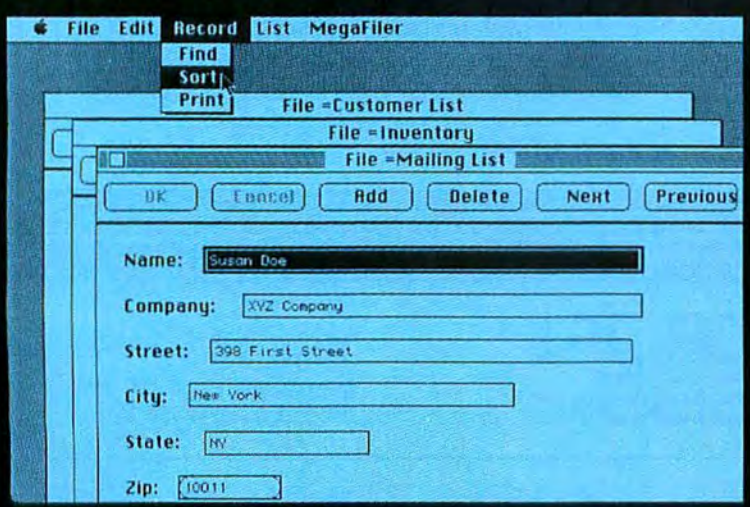

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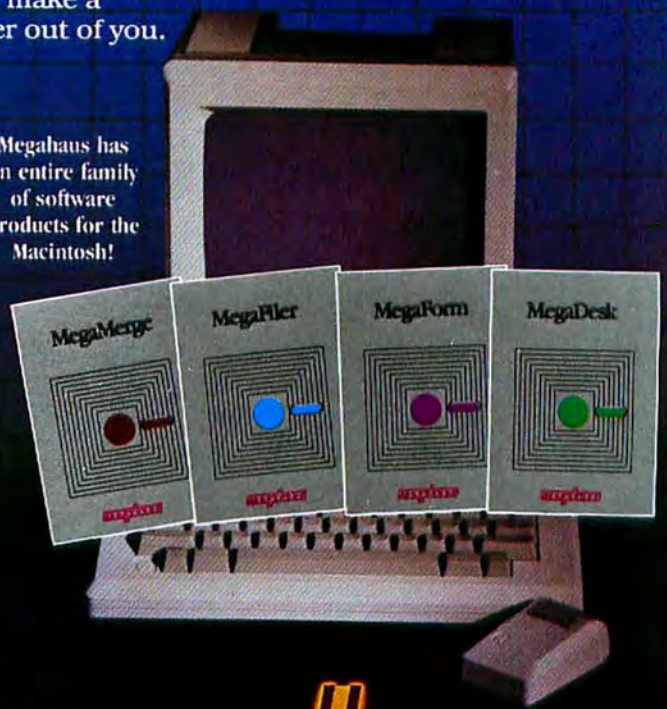

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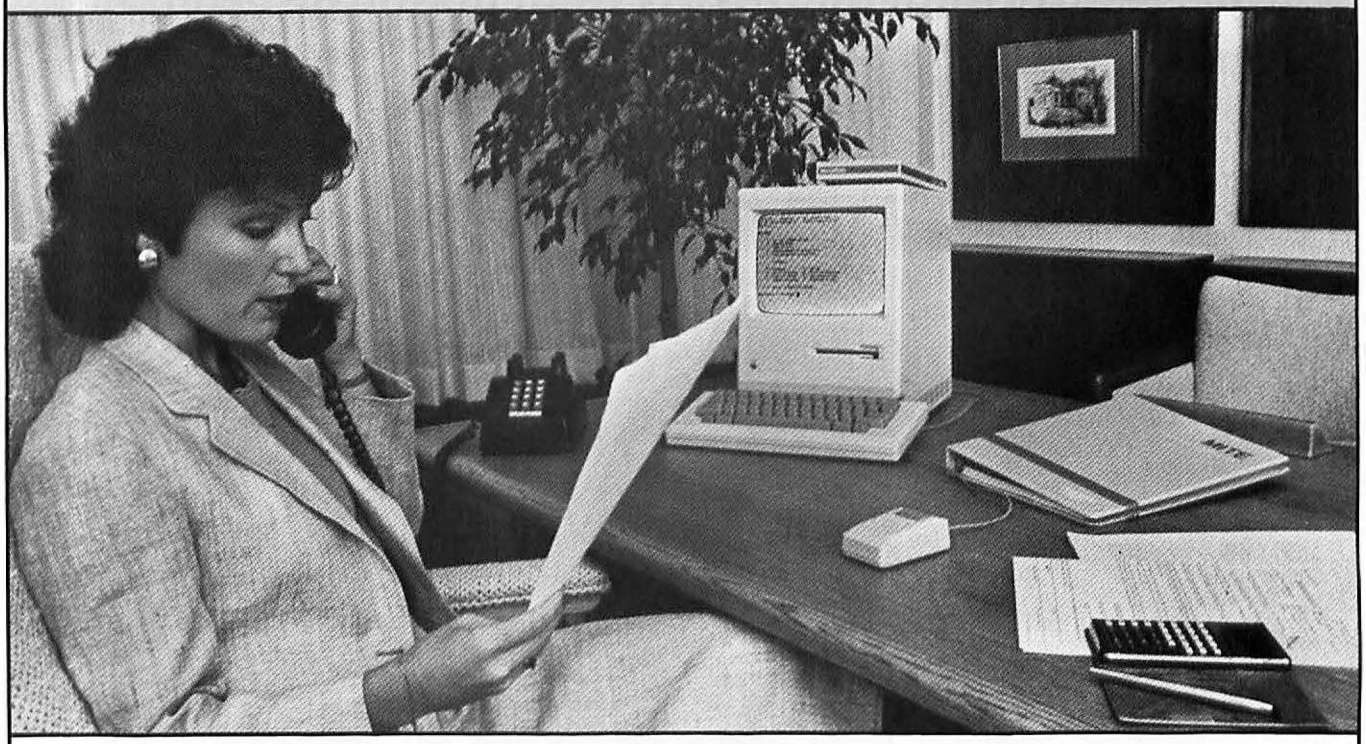

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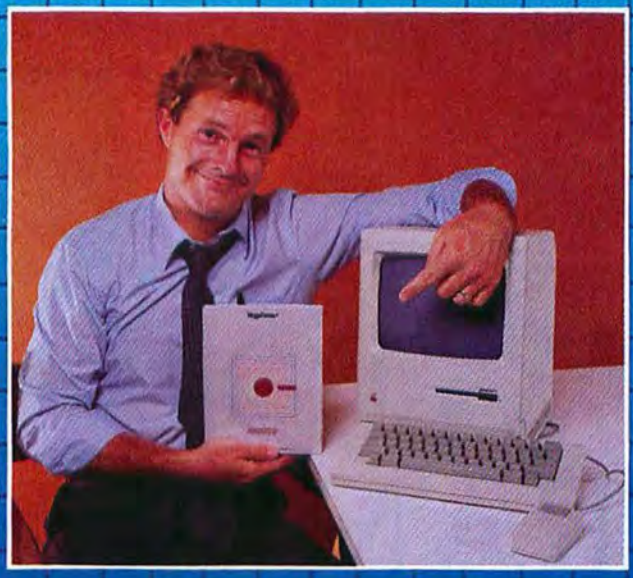

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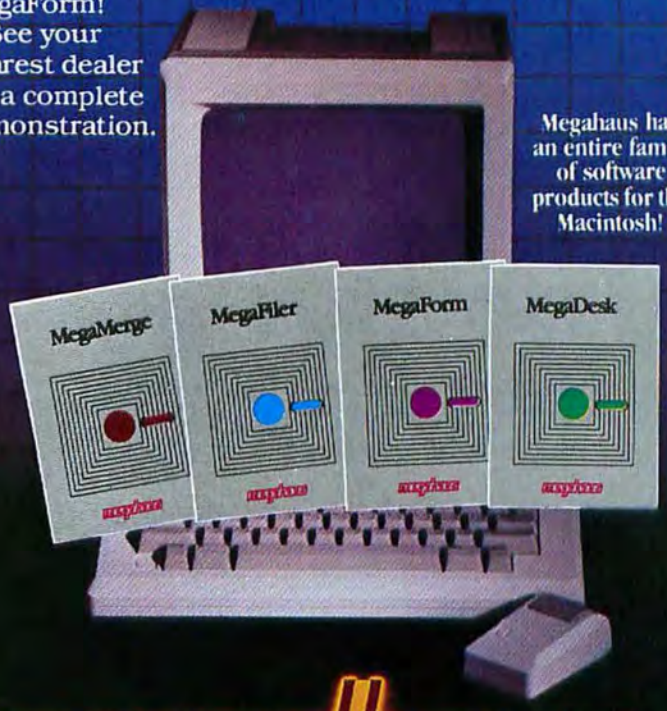
John Doe 123 Main Street #10 Los Angeles, CA 91001	Date August 30, 1984 Invoice No N3982 Customer No 4093

Qty	Description	Unit Cost	Total
12	MegaMerge	125.00	1500 00
9	MegaWriter	99.95	899 55
Total			2399 55
Tax			143 97
Amount Due			2543 52



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Get Info

Macworld's tutor answers questions about using the Mac

Lon Poole

Get Info answers questions about the Macintosh and how it works. Most inquiries deal with application programs, but no topic is too elementary or too advanced. Discussions range from setting up the Mac to programming in BASIC and Pascal. When you need advice about using the Mac, drop me a line. I cannot respond to individual letters, but I will answer the most representative questions.

This month's *Get Info* includes the answer to an often heard query from intrepid Mac owners: Can I run my Macintosh off car batteries? Another person wants to know about the usefulness and compatibility of Motorola's 68020 microprocessor as an eventual replacement for the Mac's 68000. One reader wants an explanation of some of the less obvious *MacPaint* shortcuts and the Print Catalog command. Another person is looking for a Macintosh word processing program that has cursor key assignments. And a number of people have written in with questions about creating special fonts, such as scientific and mathematical symbols or foreign alphabets, and adding them to the System file.

Battery-powered Mac

Q. My summer home in Vermont has no electricity. Is it possible to somehow power a Macintosh with car batteries?
Jeff Broadbent
East Calais, Vermont

A. The Mac is designed to accept the 120-volt alternating current that usually comes out of power outlets in residences or business offices. Car batteries produce 12-volt direct current and as such cannot power the Mac. However, George Crow, Analog Manager of Apple's Macintosh Division, points out that by purchasing an inverter, a device designed to transform electrical current from one form into another, you should be able to power the Mac off car batteries. Make sure that the inverter produces power between 95 and 120 volts rms (root mean square). The Mac can accept alternating current within this range.

The Mac is also designed to accept current in a sine wave form rather than a square wave form. Sine wave inverters are rather expensive, but inexpensive square wave inverters can be used if there is a sufficiently slow transition between the negative and positive alternation in the flow of the electric current. If these transitions occur too quickly the Mac's line filter capacitors could draw excessive current and heat up. However, this situation is unlikely to cause a problem because the inverter is likely to fail before the capacitors do. Most inexpensive square wave inverters contain transformers that produce comparatively slow voltage transitions. So you can attach your Mac to a car battery through an inexpensive square wave inverter without damaging your computer or losing data.

MacPaint Shortcuts

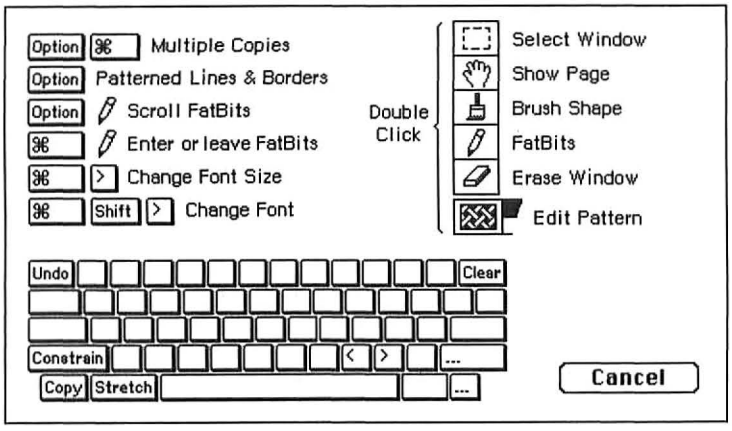
Q. There are a few items in *MacPaint* that I can't find reference to in my *MacPaint* manual. First, choosing the Short Cuts option from the Goodies menu displays a keyboard diagram overprinted with various commands (Constrain, Undo, and so forth). How do the keys that change the font and font size work? Why are the right-hand Shift and Option keys marked with ellipses? And what does the Print Catalog command in the File menu do?

Richard W. Brigg
Moonie Ponds, Victoria
Australia

A. In *MacPaint* you can use the ⌘ key and the Shift-⌘ key combination with the comma and period keys to change fonts and font sizes, respectively. The symbols < and >, the uppercase symbols on the comma and period keys, suggest the direction of the font or font size scrolling; for example, pressing ⌘-period changes the selected text to the next larger font size. To move in reverse to a smaller font size, you press ⌘-comma. Pressing Shift-⌘-period changes text to the next font in the sequence, and pressing Shift-⌘-comma changes text to the previous font in the sequence.

The Shift and Option keys on the right side of the keyboard perform Constrain and Copy functions, respectively, like their counterparts on the left side of the keyboard. On the keyboard map displayed by the Short Cuts option, the keys on the right are not labeled with words because there isn't room. (All the keys on the left end of the keyboard map are elongated to accommodate the words.)

The Print Catalog command prints miniature versions of all the *MacPaint* documents on a disk. This feature provides a visual directory of your documents. The documents are drastically reduced, so you can discern only their major features. On an 8½- by 11-inch sheet of paper, five miniatures fit in a row across the page, and there can be up to five rows. Only those *MacPaint* documents on the disk for which the *MacPaint* application was opened are included in the catalog. If you want to print a catalog of the *MacPaint* documents on a different disk, you must quit *MacPaint,* copy the *MacPaint* program to the disk you want to print from, open *MacPaint* from that disk, and choose Print Catalog.



Short Cuts

The Short Cuts option in the Goodies menu shows the key combinations that let you scroll through the various fonts and font sizes.

68020 Microprocessor

Q. Recently I read about the development of the Motorola 68020 chip, a new member of the 68000 chip family. The chip is supposed to be very fast and compatible with the rest of the chips in the family. Since the Mac uses a 68000 chip, does this mean that someday we could see a 68020 "Super Mac"? And is it possible to replace my existing Mac's 68000 chip with a 68020 chip?

Scott C. Meeker
Madison, Wisconsin

A. The 68020 microprocessor is being developed by Motorola but it is not known whether it will be used in some future version of the Macintosh. Theoretically the chip could replace the 68000 chip in the Mac. The chief advantage of the 68020 chip is that it can process information about four times as fast as the 68000. The processor's speed is a combined result of the chip's faster internal timing, a true 32-bit data path instead of the 68000's 16-bit data path, and a built-in 256-byte buffer. The buffer augments the 68020's speed because it allows the processor to check for incoming data less frequently so that the processor can concentrate on crunching data.

For several reasons, you can't simply replace the 68000 chip on the Mac with a 68020. One reason is that the 68000 is soldered into place and cannot be replaced like a socketed chip can. Another reason is that the 68020 has nearly twice the number of pins (which carry power and information between the microprocessor and the rest of the computer) as the 64-pin 68000. The difference in number and the fact that the pins are set into the Mac's digital board in a different way (the 68000 uses dual in-line pins whereas the 68020 uses a pin-grid array) would require a completely redesigned digital board for the Mac. You also can't replace the 68000 with a 68020 because the timing difference between the two microprocessors could cause some software to execute improperly.

For some time, any Mac upgrade will probably not involve replacing the 68000 chip. One of the main reasons for using a powerful microprocessor is that high-resolution graphics require the computation of a large amount of information. The 68000 processor is perfectly mated to the Mac's screen. Unless a display more advanced than the present one were installed, the improved performance of the 68020 wouldn't be that noticeable.

If a future version of the Macintosh is built with the 68020, modifications to the digital board will be necessary and economies of scale will have to be met. Before the 68020 could be used in a future Mac, sufficient quanities of the chip would have to be available to match the Mac's production rate. Also, the price of the chips would have to come down. The 68020 now costs $500 while the 68000 chip costs less than $20. The cost of a Mac with a 68020 chip would be prohibitive.

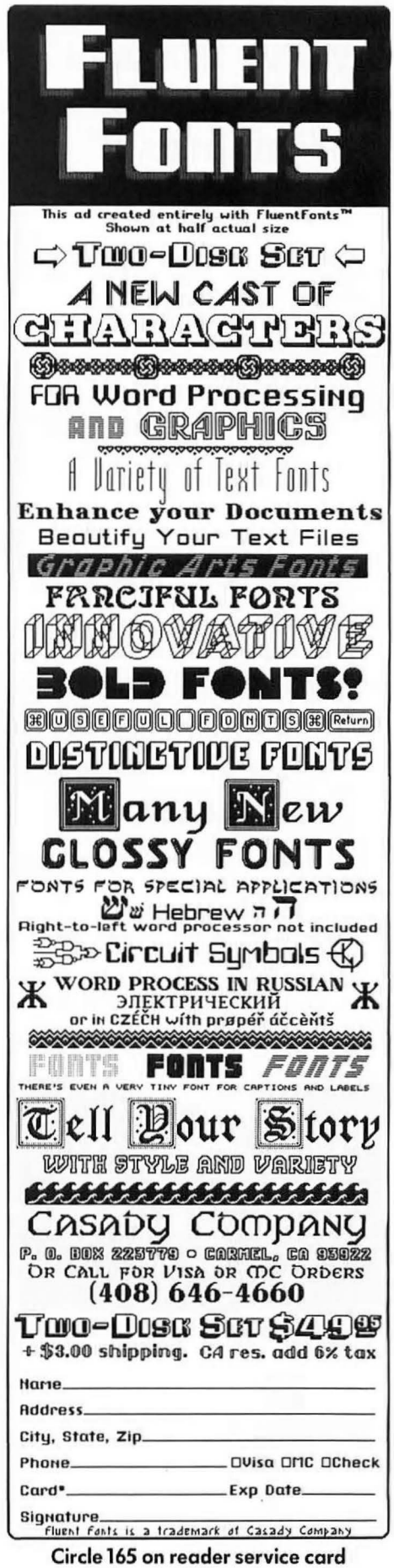
A Macintosh based on the 68020 should be able to run current Mac software. According to Burrell Smith, who as Hardware Wizard at Apple designed the Mac's digital board, the 68020 chip demonstrates Motorola's commitment to continue the development of the 68000 chip design. This commitment means that computers presently based on the 68000 can be improved and expanded without jeopardizing consumer investment in software.

Cursor Keys

Q. As an experienced word processor I have used a variety of word processing programs, such as *WordStar* and *Microsoft Word*. Recently, the company I work for traded in its IBM Personal Computers for Macintoshes. I like the Mac's friendly user interface and high-resolution graphics, but using a mouse instead of cursor keys for word processing has slowed me down considerably. Is there any Mac word processing program that uses cursor keys?

Anne Dickson
Larchmont, New York

A. At present I know of only one Macintosh program that has cursor keys to supplement the mouse–*Microsoft Word*. The beta-test version I used included a wide range of cursor key assignments that should satisfy the keyboard-bound fingers of experienced word processors. The program uses a diamond configuration on the right side of the keyboard. You need the left side free for the ⌘ and Option keys, which must be used in combination with other keys to produce cursor movement. The J, K, L, and ; keys in the middle row used in combination with the ⌘ and Option keys correspond to the following cursor position movements: J, word left; K, character left; L, character right; and the semicolon key, word right. The keys directly above the aforementioned keys move the cursor as follows: O moves the cursor up one line, P



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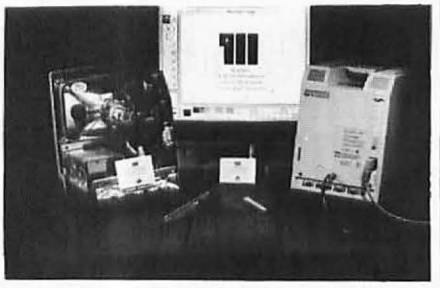

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scrolls up one page, and the left bracket key scrolls up one line. On the bottom row, the comma key moves the cursor down one line, the period key scrolls down one page, and the slash key scrolls down one line. In addition, *Word* also uses the quotation mark key in combination with the ⌘, Option, and Shift keys to select text and move the cursor in additional ways. Holding down the ⌘ and Option keys while pressing the quotation mark and J keys, for example, moves the cursor to the beginning of a sentence.

The Domain of Fonts

Many scholars, including mathematicians and linguists, have asked me about obtaining scientific and foreign language fonts that they can put in the System files of their application disks with the Font Mover. I hope the following information sheds some light on the subject.

Several fonts, including Cyrillic, Hebrew, Greek, and the Princeton Math Font, are available commercially or as public domain software. In fact, most Macintosh user groups offer a disk containing a variety of useful fonts. Many special fonts academicians seek can be downloaded from The Source or CompuServe. The fonts should be compatible with the Font Mover, which enables you to move them in and out of the System file.

If you need to create your own fonts, a font editor has been available in the public domain for several months. This resource editing utility was originally designed by Apple for certified software developers, but most user groups offer the utility on disk. The font editor doesn't have any formal documentation and has some strange quirks, so you'll need to experiment or get some advice from someone who has managed to master its idiosyncracies. An improved version of the font editor has started to appear that makes the process of font creation easier than before. Check with your local user group or log on to CompuServe or The Source for the most up-to-date information.

Send your questions to Get Info, Macworld, *555 De Haro St., San Francisco, CA 94107.*

Lon Poole is a Contributing Editor of Macworld *and the author of several computer books including* The Apple II User's Guide *and* MacWork/MacPlay. □

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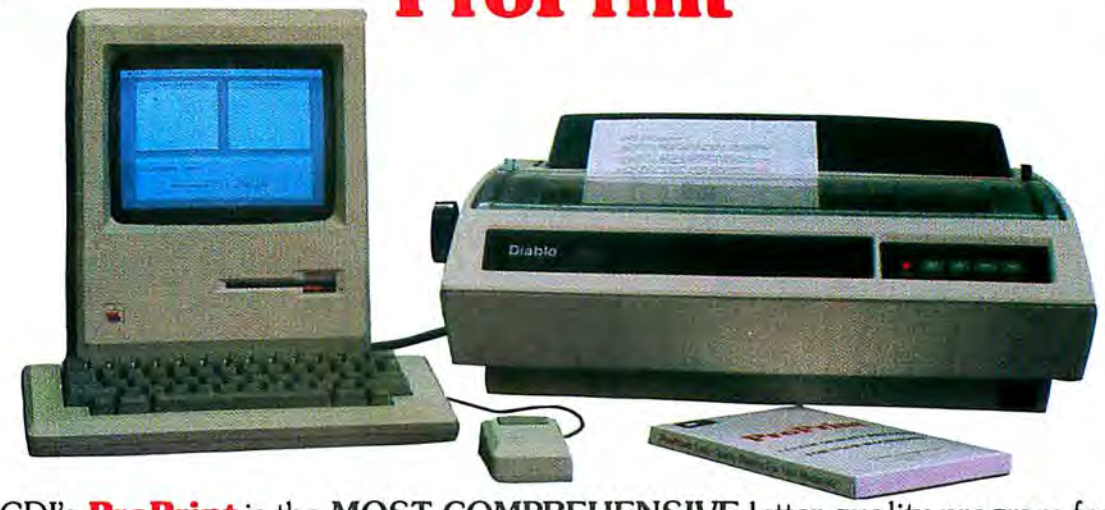

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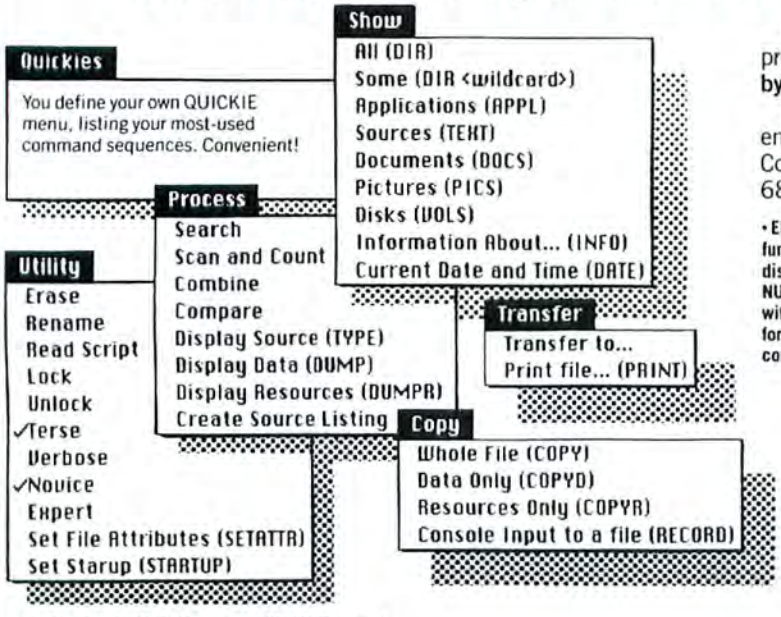

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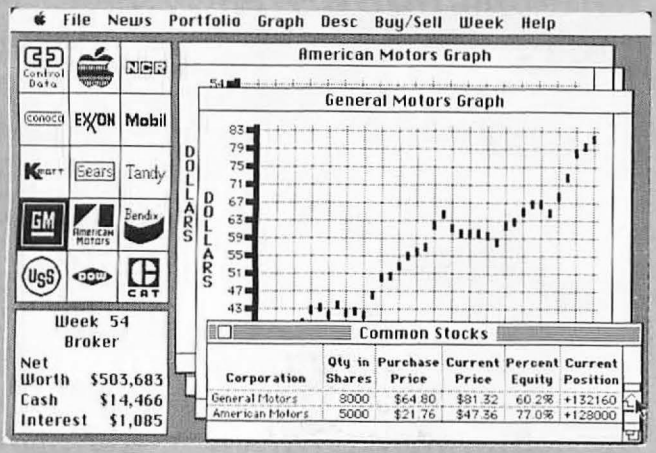

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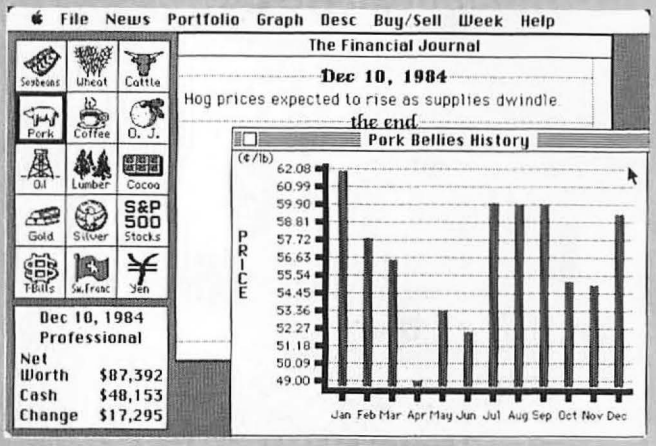

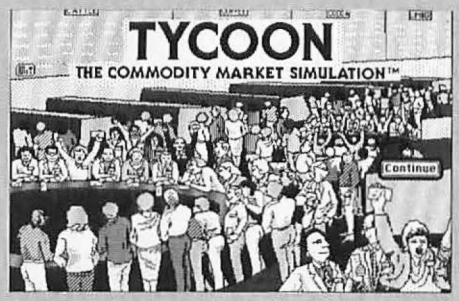

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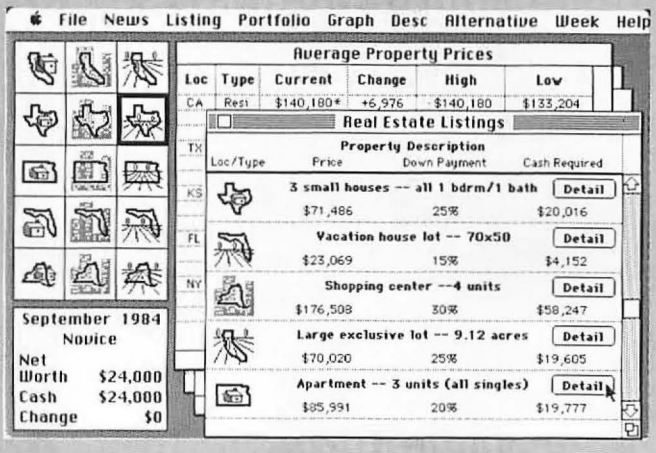

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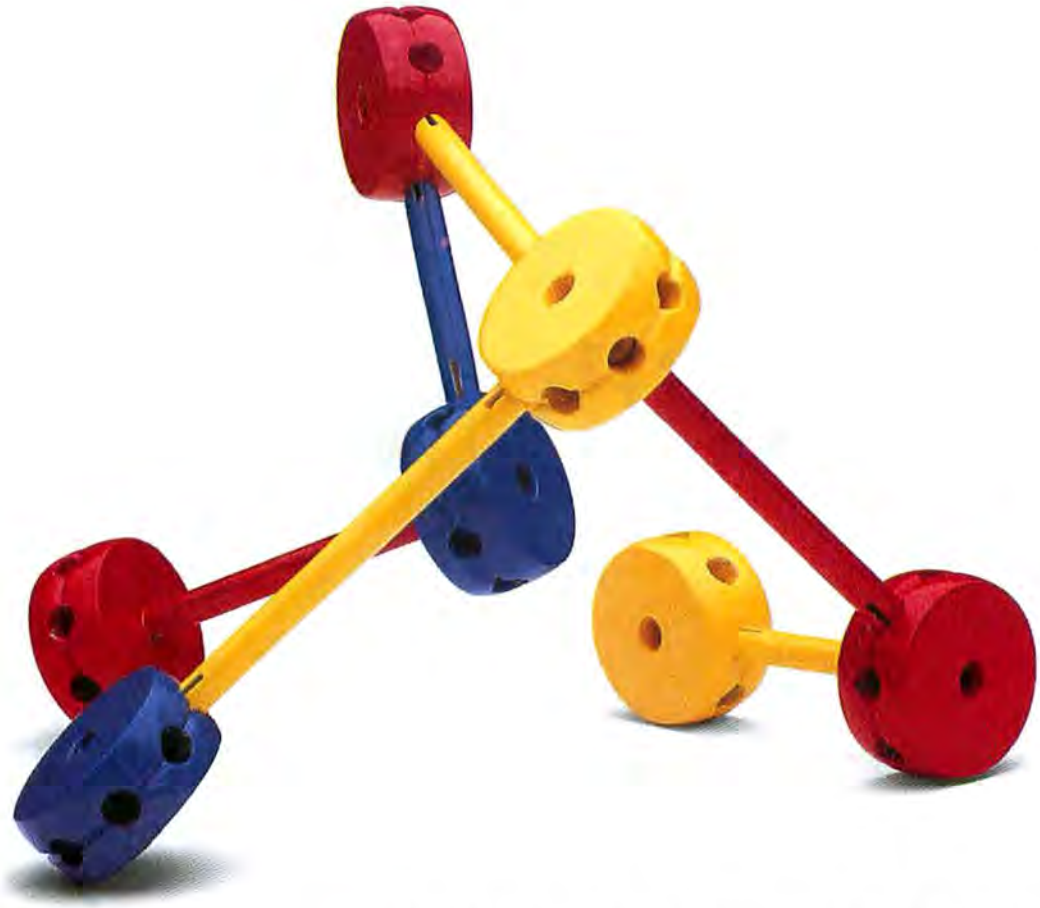

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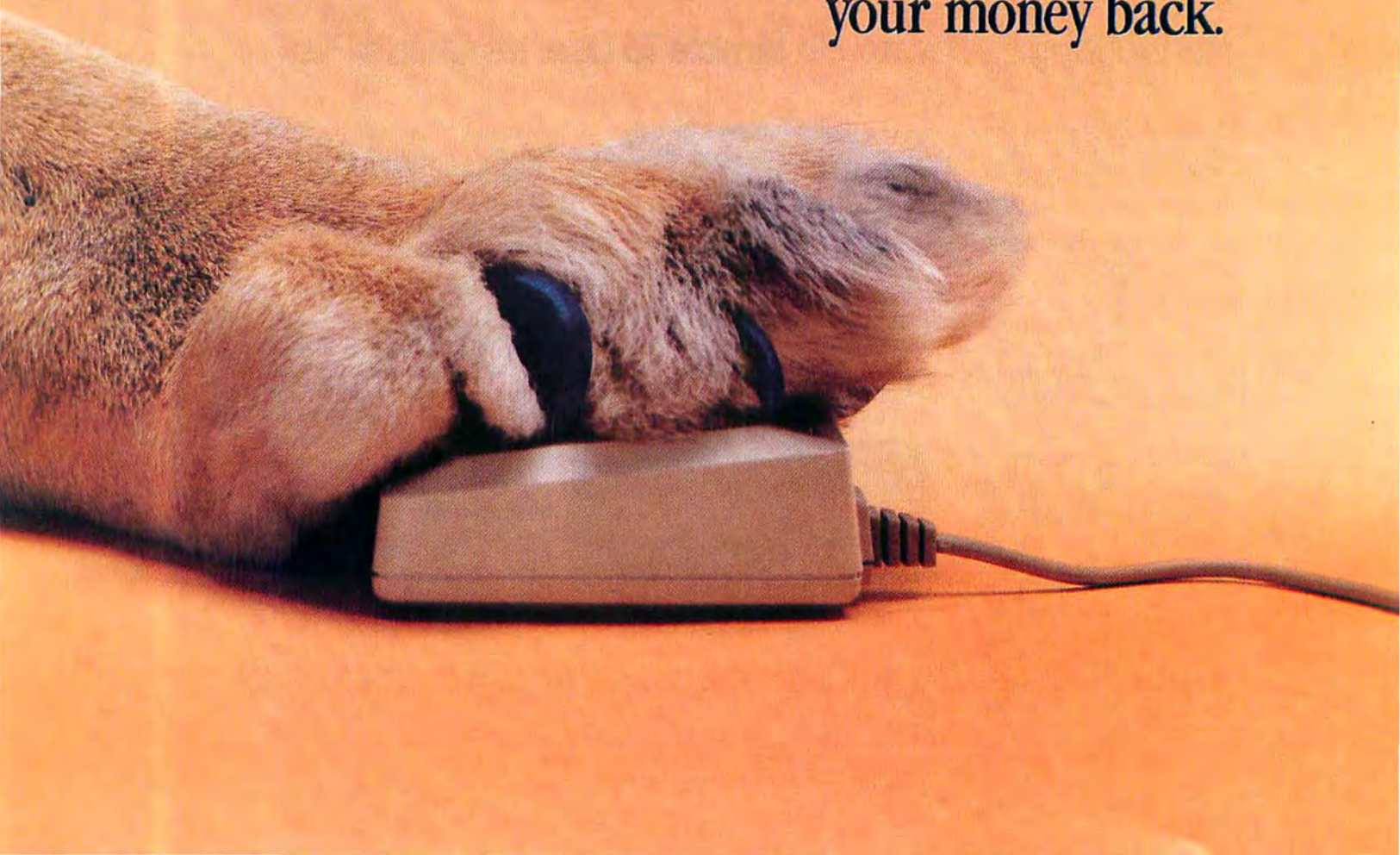

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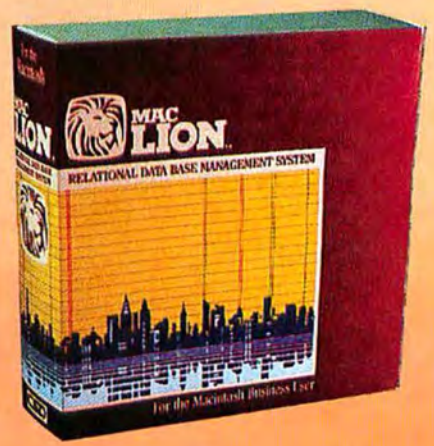

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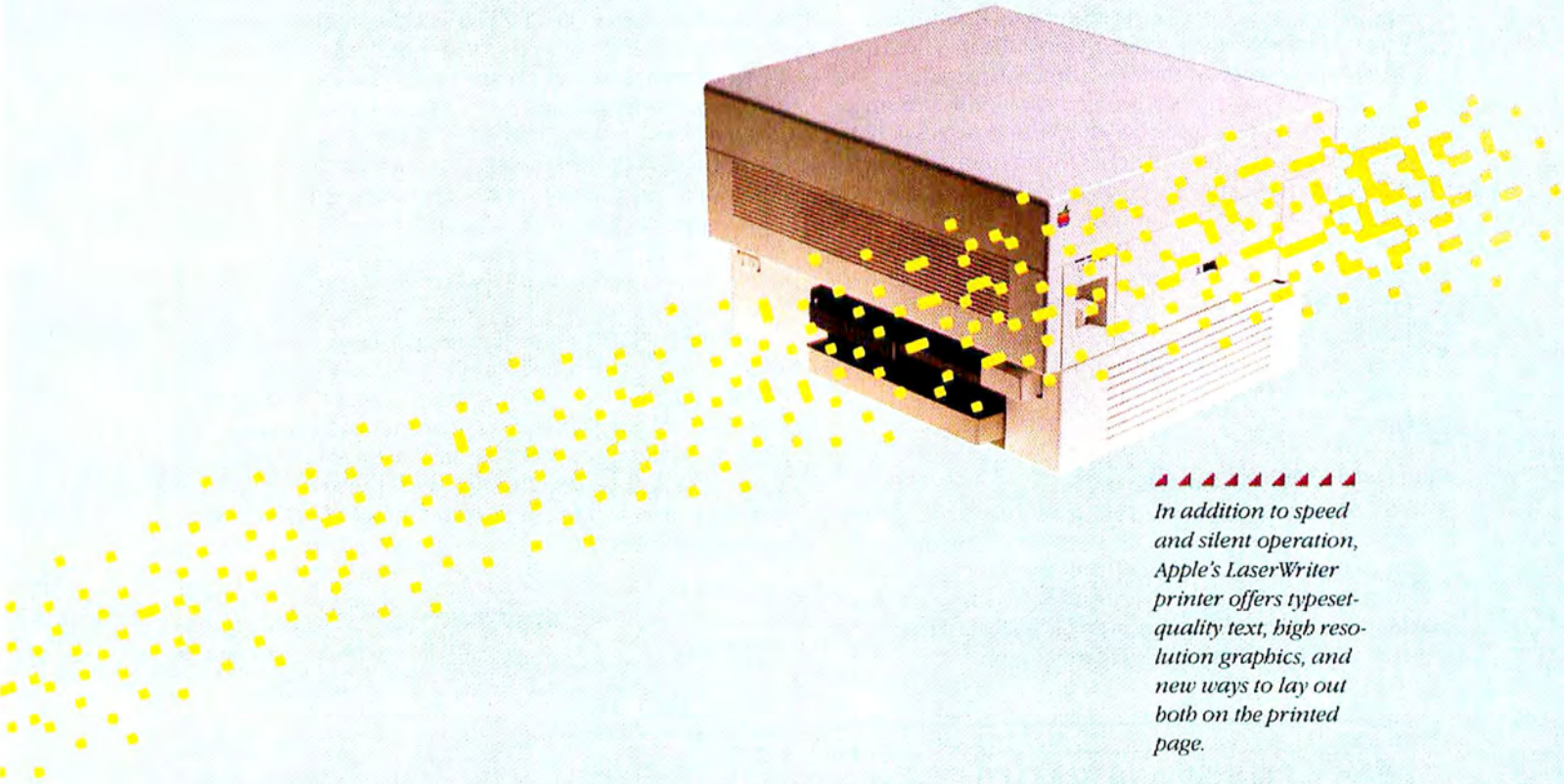
The Laser's Edge

Danny Goodman

On the desk, connected to a Macintosh, sat a machine the size of a small microwave oven. It looked like a photocopier without a hatch for original documents. The quiet rush of an internal cooling fan was about the only sound it made. Despite the absence of noise, the machine appeared to be hard at work; 8½- by 11-inch pages emerged every 8 to 30 seconds. To my astonishment, the printed sheets looked like professionally typeset *MacWrite* documents and artist-drawn *MacDraw* pictures—the kind of quality work that normally takes many hours to prepare. Although the printouts seemed magical, the machine was real—Apple's new LaserWriter laser printer.



In addition to speed and silent operation, Apple's LaserWriter printer offers typeset-quality text, high resolution graphics, and new ways to lay out both on the printed page.

Just as the Macintosh redefined the limits of personal computers, the LaserWriter redefines the limits of printers. Laser printers have been available since the mid-1970s, but until 1984 they were too expensive for most personal computer owners. The Xerox 9700, for example, costs $400,000. Last year, Hewlett-Packard introduced the LaserJet for $3495.

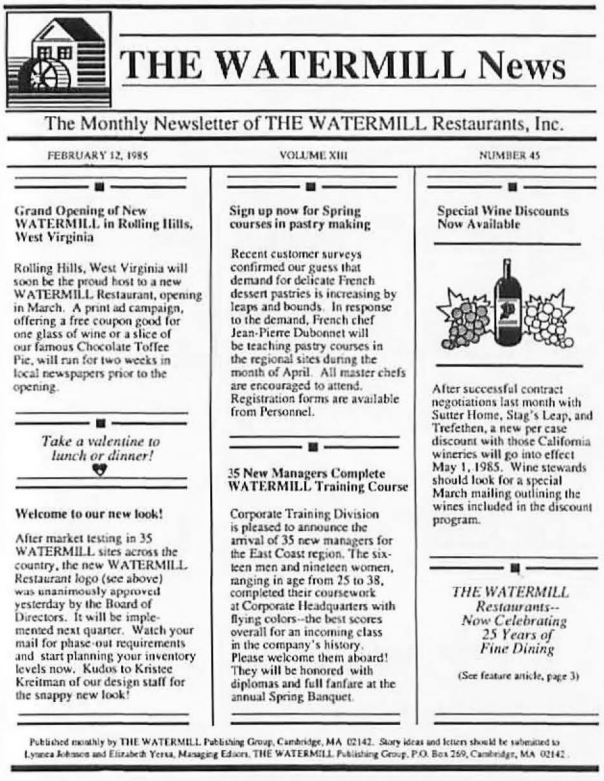
But to classify the LaserWriter with ordinary laser printers such as the HP LaserJet is like calling the Palace of Versailles a country house with a few pictures on the walls.

The LaserWriter has the usual features of laser printers—speed, silent operation, and high-resolution printing—but it also offers professional typefaces, full-page high-resolution graphics, and new ways to lay out text and graphics on the printed page. But these advanced features don't come cheap; at $6995 the LaserWriter costs twice as much as the HP LaserJet.

The LaserWriter's advanced capabilities promise to change the way business people and professionals produce printed information. Documents look like those previously produced at considerable expense by skilled typesetters and graphic artists. The LaserWriter can print documentation, technical drawings, camera-ready art, and illustrations for written reports and oral presentations (see Figure 1). It can print directly on overhead transparency material. The printer can produce tax and insurance forms and newsletters that look like they came from a professional printer (see Figure 2).

The Print Engine

Although the LaserWriter is more advanced than other laser printers, it shares the same basic printing mechanism. Designers often call this mechanism the print engine. The LaserWriter uses the same semiconductor laser printing technique as do other laser printers that use the Canon print engine.



THE WATERMILL News

The Monthly Newsletter of THE WATERMILL Restaurants, Inc.

FEBRUARY 12, 1985 VOLUME XIII NUMBER 45

Grand Opening of New WATERMILL in Rolling Hills, West Virginia

Rolling Hills, West Virginia will soon be the proud host to a new WATERMILL Restaurant, opening in March. A print ad campaign, offering a free coupon good for one glass of wine or a slice of our famous Chocolate Toffee Pie, will run for two weeks in local newspapers prior to the opening.

Take a valentine to lunch or dinner!

Welcome to our new look!

After market testing in 35 WATERMILL sites across the country, the new WATERMILL Restaurant logo (see above) was unanimously approved yesterday by the Board of Directors. It will be implemented next quarter. Watch your mail for phase-out requirements and start planning your inventory levels now. Kudos to Kristee Kreitman of our design staff for the snappy new look!

Sign up now for Spring courses in pastry making

Recent customer surveys confirmed our guess that demand for delicate French dessert pastries is increasing by leaps and bounds. In response to the demand, French chef Jean-Pierre Dubonnet will be teaching pastry courses in the regional sites during the month of April. All master chefs are encouraged to attend. Registration forms are available from Personnel.

35 New Managers Complete WATERMILL Training Course

Corporate Training Division is pleased to announce the arrival of 35 new managers for the East Coast region. The sixteen men and nineteen women, ranging in age from 25 to 38, completed their coursework at Corporate Headquarters with flying colors—the best scores overall for an incoming class in the company's history. Please welcome them aboard! They will be honored with diplomas and full fanfare at the annual Spring Banquet.

Special Wine Discounts Now Available

After successful contract negotiations last month with Sutter Home, Stag's Leap, and Trefethen, a new per case discount with those California wineries will go into effect May 1, 1985. Wine stewards should look for a special March mailing outlining the wines included in the discount program.

THE WATERMILL Restaurants-- Now Celebrating 25 Years of Fine Dining

(See feature article, page 3)

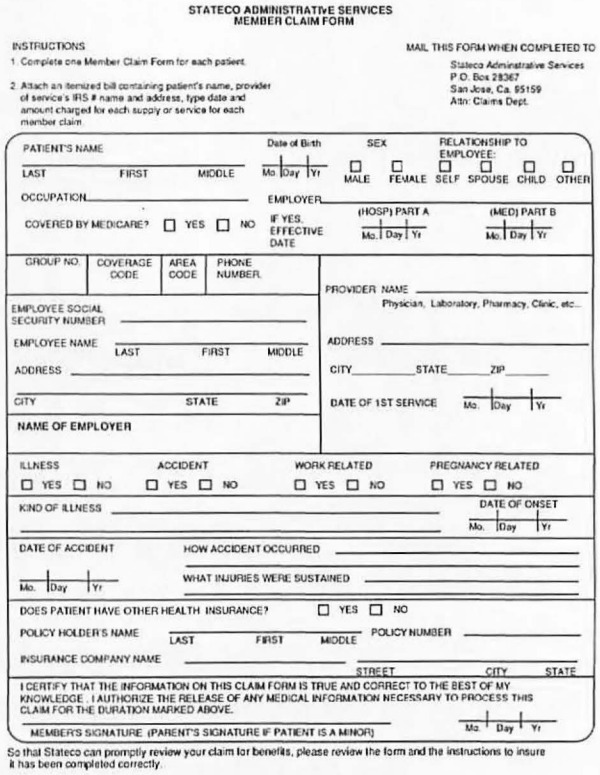
Published monthly by THE WATERMILL Publishing Group, Cambridge, MA 02142. Story ideas and letters should be submitted to Lynnea Johnsen and Elizabeth Yerxa, Managing Editors, THE WATERMILL Publishing Group, P.O. Box 269, Cambridge, MA 02142.

Figure 1

This newsletter demonstrates the LaserWriter's ability to print high-resolution text and graphics, including documentation, technical drawings, camera-ready art, and illustrations.

The Canon print engine forms character and graphics images by shooting a pinpoint stream of light pulses onto the surface of a large rotating drum (see Figure 3). Wherever a light pulse strikes, that tiny part of the drum takes on an electrical charge that attracts very fine toner powder as the drum rotates past the powder compartment. As the drum continues to rotate, it meets blank paper, letterhead stationery, transparency film, or a mailing label. When contact is made, a combination of heat and pressure fuses the "dots" of toner onto the paper or film to reproduce the image. The laser stream is so precise and the resulting dots so small that the print resolution is 300 dots per inch horizontally and vertically (which totals 90,000 dots per square inch).

To appreciate a laser printer's ability to produce high-quality print, it helps to understand the way a printer's resolution is measured. In general, resolution is defined in terms of dots or lines per inch, which represents the fineness of the grid used to construct the letters. The coarsest example of printer resolution is a dot matrix printer such as the Imagewriter, which typically prints type at 80 dots per inch. In the Mac's



STATECO ADMINISTRATIVE SERVICES
MEMBER CLAIM FORM

INSTRUCTIONS
1. Complete one Member Claim Form for each patient.
2. Attach an itemized bill containing patient's name, provider of service's IRS # name and address, type date and amount charged for each supply or service for each member claim.

MAIL THIS FORM WHEN COMPLETED TO
Stateco Administrative Services
P.O. Box 28367
San Jose, Ca. 95159
Attn: Claims Dept.

PATIENT'S NAME LAST FIRST MIDDLE — Date of Birth Mo. Day Yr — SEX ☐ MALE ☐ FEMALE — RELATIONSHIP TO EMPLOYEE: ☐ SELF ☐ SPOUSE ☐ CHILD ☐ OTHER

OCCUPATION — EMPLOYER

COVERED BY MEDICARE? ☐ YES ☐ NO — IF YES, EFFECTIVE DATE — (HOSP) PART A Mo. Day Yr — (MED) PART B Mo. Day Yr

GROUP NO. | COVERAGE CODE | AREA CODE | PHONE NUMBER

EMPLOYEE SOCIAL SECURITY NUMBER

EMPLOYEE NAME LAST FIRST MIDDLE

ADDRESS

CITY STATE ZIP

NAME OF EMPLOYER

PROVIDER NAME
Physician, Laboratory, Pharmacy, Clinic, etc.

ADDRESS

CITY STATE ZIP

DATE OF 1ST SERVICE Mo. Day Yr

ILLNESS ☐ YES ☐ NO — ACCIDENT ☐ YES ☐ NO — WORK RELATED ☐ YES ☐ NO — PREGNANCY RELATED ☐ YES ☐ NO

KIND OF ILLNESS — DATE OF ONSET Mo. Day Yr

DATE OF ACCIDENT Mo. Day Yr — HOW ACCIDENT OCCURRED — WHAT INJURIES WERE SUSTAINED

DOES PATIENT HAVE OTHER HEALTH INSURANCE? ☐ YES ☐ NO

POLICY HOLDER'S NAME LAST FIRST MIDDLE — POLICY NUMBER

INSURANCE COMPANY NAME — STREET CITY STATE

I CERTIFY THAT THE INFORMATION ON THIS CLAIM FORM IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I AUTHORIZE THE RELEASE OF ANY MEDICAL INFORMATION NECESSARY TO PROCESS THIS CLAIM FOR THE DURATION MARKED ABOVE.

MEMBER'S SIGNATURE (PARENT'S SIGNATURE IF PATIENT IS A MINOR) Mo. Day Yr

So that Stateco can promptly review your claim for benefits, please review the form and the instructions to insure it has been completed correctly.

Figure 2

One useful application of the printer's capabilities is the production of forms. Using MacDraw *or forthcoming software specifically designed for page layout, forms can be designed on the Mac and printed on the LaserWriter.*

case, this resolution represents a close correspondence between the pixels on the screen and the dots on the printed output. This level of resolution creates readable type, but it can't produce the highly defined characters associated with letter quality printers.

The LaserWriter defines characters using a grid of 300 dots per inch, which is suitable for in-house memos, reports, and documentation but remains too coarse for high-quality printing jobs such as magazines and books. The type that you read in *Macworld* is resolved at 1950 dots per inch, and some typesetting systems can build type using a grid of over 5000 dots per inch.

In addition to being able to produce relatively high-resolution output, laser printers are quiet and fast. They are quiet because, unlike dot matrix and letter quality printers, they don't print with the impact of a print mechanism against paper. The LaserWriter can print letter quality text at up to eight pages per minute, or 300 characters per second (cps). By comparison, fast daisy wheel printers produce about 80 cps. The Imagewriter dot matrix printer prints standard-quality characters at 90 cps and draft-quality characters at 120 cps. A few dot matrix printers print at 300 cps, but they produce very coarse characters at that speed.

A Two-Megabyte Computer

The feature that separates the LaserWriter from other laser printers is the complete, special-purpose computer inside–a computer that in many ways is more powerful than the Macintosh itself. The LaserWriter's computer uses a Motorola 68000 microprocessor, the same one used in the Mac. The printer also has an enormous amount of memory–1.5 megabytes of RAM. This amount is almost 3 times that found in the 512K Mac and about 20 times the memory of the HP LaserJet. The advantage of so much memory is that the printer can image (translate a document into print commands) an entire page in memory at once to produce full-page graphics in high resolution. By comparison, the HP LaserJet can print only 5½ square inches of high-resolution graphics at 300 dots per inch. The LaserJet can also produce full-page graphics, but at only 75 dots per inch. Another advantage of a large amount of memory is that the printer will never outpace the imaging process, an occurrence that can cause the printer to stall and produce blank pages.

Accompanying the LaserWriter's massive amount of RAM are 500K of ROM. If you add RAM and ROM together, the LaserWriter's total memory is 2 megabytes. The real magic of the LaserWriter lies in its ROM, which contains a library of type fonts and a program-

(continues on page 75)

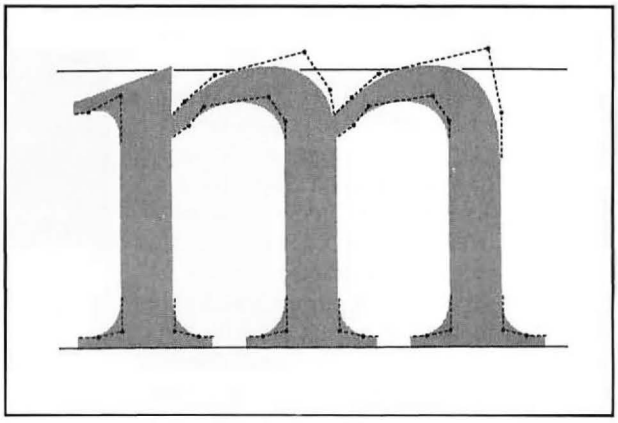


Figure 4
The LaserWriter's ROM contains outlines of a full set of characters in 13 font styles. Based on the outlines, the computer inside the printer can generate dot patterns for a character in any size.

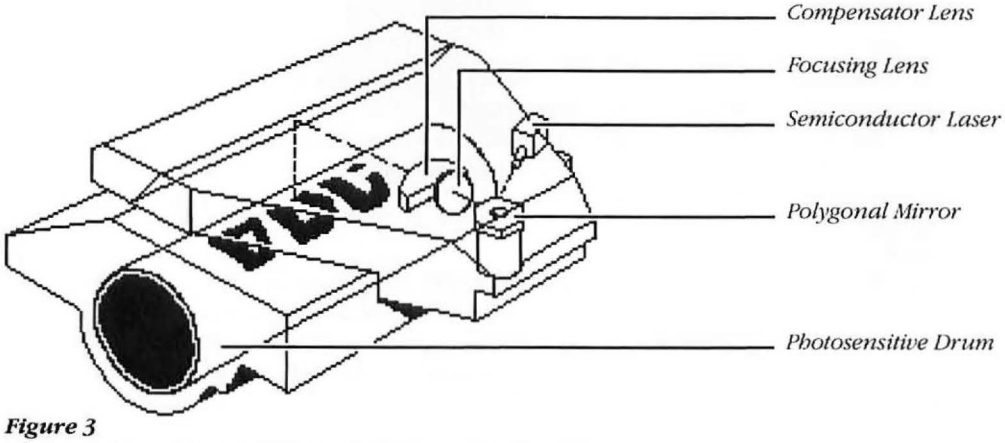


Figure 3
The LaserWriter creates images by shooting a pinpoint stream of light pulses from a laser beam through a system of mirrors and lenses onto the surface of a large rotating drum. Wherever a light pulse strikes the drum, a small electric charge is created that attracts very fine toner powder as the drum rotates past the powder compartment. As the drum continues to rotate, the toner is fused to paper by a combination of heat and pressure.

The AppleTalk Connection

The LaserWriter can be attached to a single Macintosh, but because its price is high, the printer will more likely be shared among a number of Macs in a network. The LaserWriter attaches to Apple Computer's AppleTalk network, previously referred to as the AppleBus (see the figure "Attaching the LaserWriter"). AppleTalk serves as an electronic "highway" linking one or more Macs to a LaserWriter or other devices in a network.

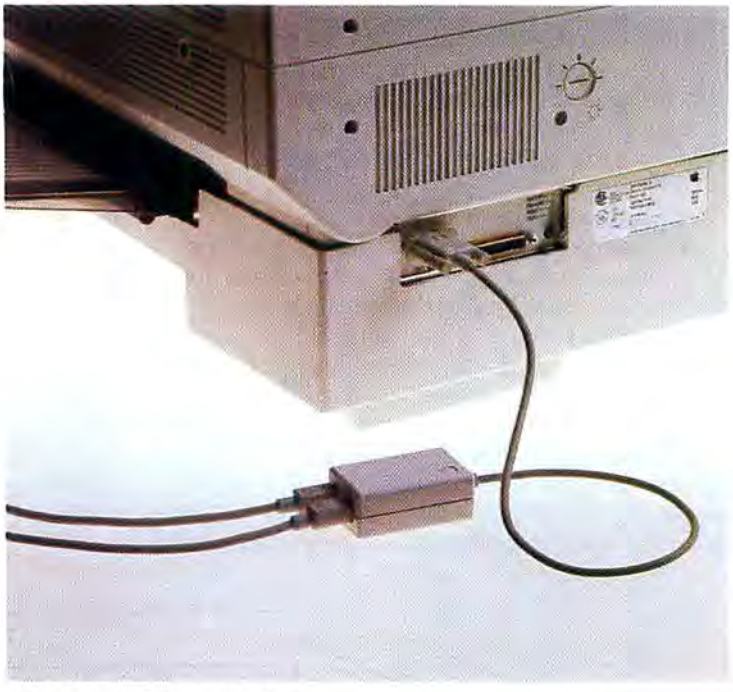
The LaserWriter, the Macintosh, and future products planned for the network each have specialized chips that enable devices to communicate over the network. Up to 32 devices (Macs, printers, or file servers for program and documentation storage) can be connected to the network. The only hardware required to link the devices is a cable that costs $50 per device.

Electronic mail software is being developed to enable people to send messages and documents between Macs on the network.

Since AppleTalk can transfer information no faster than 231 kilobits (29 kilobytes) per second, the 1 megabyte of information required to image a printed page would normally take a long time to arrive at the printer. Because the LaserWriter contains a built-in computer, printing a document is faster than if all the processing were handled by the Mac alone. When you print a *MacWrite* document, for example, the LaserWriter Print Manager goes to work after you select the Print option from the File menu. The Print Manager converts the document from QuickDraw commands into PostScript commands, which are then sent to the LaserWriter for processing in its own computer.

If the Mac were doing page assembly within its own memory instead of leaving it for the LaserWriter's built-in computer, the Mac would have to shuttle approximately 1 megabyte of printer information to the printer via AppleTalk. At AppleTalk's 29K per second maximum speed, it would take over 30 seconds to send a page of information to the printer. But because the Print Manager converts the page data into PostScript inside the Mac, letting the LaserWriter's computer do page assembly, the information to be transferred to the printer requires only 4 to 8K. This amount of data is 100 to 200 times less than 1 megabyte, and can be sent over AppleTalk in less than 1 second.

The printing commands sent from the Mac via AppleTalk to the LaserWriter are standard ASCII characters—the same signals transmitted over a modem. Any computer capable of generating PostScript commands can use the LaserWriter by communicating information via the printer's serial port. If you are proficient in the PostScript language, you can use a dumb terminal, instead of a computer, to send PostScript commands to the printer to create both text and graphics.



Attaching the LaserWriter

The LaserWriter is attached to one or more Macintoshes via the AppleTalk network. Each device in the network needs an AppleTalk connector set.

(continued from page 73)

ming language created specifically for high-resolution laser printers. These features give the Mac (with the assistance of specially designed software) the flexibility to produce printed text and graphics in any size or angle of rotation.

PostScript

The LaserWriter's language, called PostScript, converts simple commands from an external computer, such as the Macintosh, into precise images of text characters and graphics that are then painted on the print engine drum with the laser (see "The Language that Talks to Your Printer" in this issue for an explanation of PostScript).

Of particular interest is the way PostScript generates text characters inside the printer. Unlike other multiple-font laser printers, which generate text characters from a stored table of "bit maps" for each character in a given size, the LaserWriter stores the outlines of characters in 13 font styles (see Figure 4). The uniqueness of this text-generating system is that the outline of a font has to be stored in only one size in ROM. The computer inside the printer generates dot patterns (bit maps) for each character in virtually any size decreed by the software that you are running.

The fonts contained within the LaserWriter's ROM are designed to produce the highest-quality type that the laser printer is capable of printing (see "A Face for All Seasons" in this issue for a look at the laser fonts). Additional fonts are currently being designed for the LaserWriter; you will be able to download them into the printer's RAM from a floppy disk.

Figure 5

Disposable snap-in cartridges contain the toner and other parts of a laser printer that are the most likely to degrade print quality over time. Each cartridge should be good for 2000 to 3000 copies and costs about $99.

Setup Procedures

To set up the printer you must add two AppleTalk connectors: one for the Mac and another for the printer (see "The AppleTalk Connection"). If more than one Mac is using a LaserWriter—which is a cost-effective way to use Macs and the LaserWriter in an office environment—you need one AppleTalk connector for each Mac.

The LaserWriter does not come with a toner cartridge; you will have to purchase one from an Apple dealer to get started. To improve reliability and reduce the need for service, the toner and other parts of a laser printer that are the most likely to degrade the print quality over time come in disposable cartridges that anyone can snap in (see Figure 5). The cartridges should be good for 2000 to 3000 copies, depending on how much toner your pages require. Graphics pages that have heavy borders and many dark areas, for ex-

(continues on page 77)

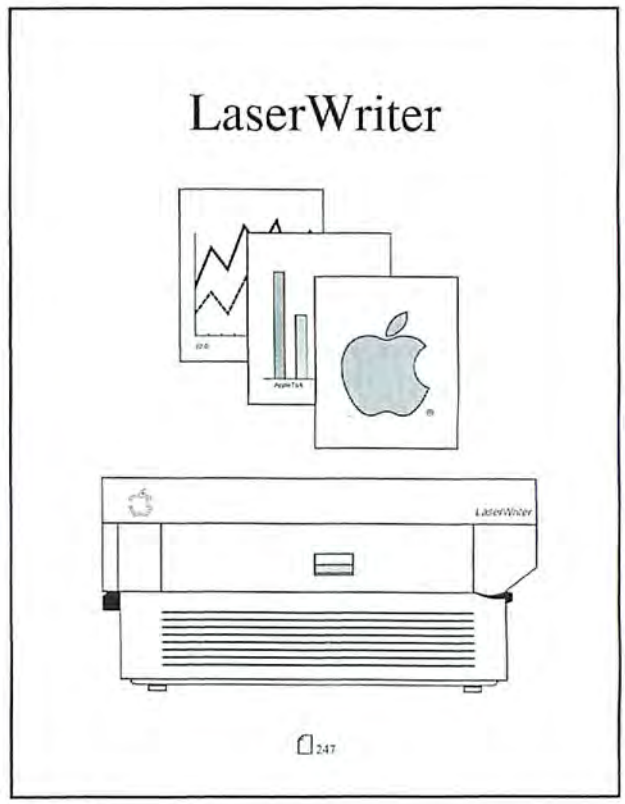


Figure 6

Each time you turn on the LaserWriter, it prints a diagnostic sheet that contains coded information on its current state. Next to the page icon on the bottom of the sheet is the number of copies printed since the very first time the printer was used. The bar and line graphs show current port and switch settings.

Anatomy of a Printing Job

Perhaps the best way to understand how the Macintosh and the LaserWriter work together is to follow the execution of a small printing job from beginning to end. The document is a three-page *MacWrite* report. The text is written almost entirely in Times Roman-12, but the headline and several subheads are in larger sizes and in boldface. As you type the document, you select the appropriate fonts from *MacWrite*'s Font menu, just as you would select Seattle or Monaco for the Imagewriter.

When you are ready to print a document, choose Print from the File menu and select the printing parameters in the dialog box that appears. After you click the OK button in the Print dialog box, the Mac and the LaserWriter begin communicating with each other. The Print Manager converts the document's print file from QuickDraw commands into PostScript commands and sends the commands to the LaserWriter. Then either a dialog box indicates that the printer is ready to print your document, or a screen message advises you that the LaserWriter is working on another document.

With several people sharing the printer, printing bottlenecks are likely to occur, forcing people to wait. Print spooling software, which is unavailable at the time of this writing, should solve the bottleneck problem. A spooler would temporarily store the documents sent to the printer and then print them when the printer was free. Product managers at Apple say that print spooler software will become available later in 1985.

During printing the Mac sends PostScript commands to the LaserWriter one page at a time. Inside the LaserWriter the PostScript computer converts the incoming commands to "dot information." In the case of text characters in the document, the first ones encountered are Times Roman Bold-18, the headline of the first page. The computer inside the printer retrieves character outlines from ROM and assembles a bit map for each character in 18-point. This bit map models in memory the placement of dots that will appear on paper.

The bit-mapped characters in 18-point are stored in a small portion of the 1.5 megabytes of RAM. The characters remain in memory so that if they are needed later, they won't have to be assembled from the ROM font outlines. The character bit maps are also sent to a portion of RAM where the entire page is assembled bit by bit. This assembling process quickly fills up almost one full megabyte of the RAM for each page.

For the main portion of the text on the first page, the LaserWriter calls upon one of three fonts stored in ROM. Those fonts—Times Roman-12, Helvetica-12, and Courier-10—are the most frequently used fonts in business communications. By having these fonts already bit-mapped in ROM, the page can be assembled much faster than if the fonts had to be reconstructed for each printing job.

MacWrite text in fonts other than those stored in the LaserWriter don't print with the same sharp appearance as the laser fonts. Characters are smoothed to some degree and look better than those produced on the Imagewriter, but they don't have the high resolution and the resulting near-typeset quality of the laser fonts.

The first page of a printing job takes about 30 seconds to assemble and print. Succeeding pages are ejected at about 8 pages per minute. Although the LaserWriter is fast, its paper loading tray holds only 100 sheets of paper. If several people sharing a network use the printer in succession to print long documents, the paper tray will have to be refilled fairly often.

Printing graphics can take longer than printing text, because most graphics images are more complex. While previewing a LaserWriter prototype, I created an organizational chart with *MacDraw*. The printer took only slightly longer to print the chart than it took to print the first page of the *MacWrite* report mentioned earlier. However, a highly detailed graphics image that frequently varies the white and black dots in the picture takes longer to print than a simple chart.

The LaserWriter Print Manager is optimized for *MacDraw*-type graphics rather than *MacPaint* graphics. *MacDraw* stores the attributes of objects (the attributes of a square start at point $x1,y1$ and end at point $x2,y2$, with a border of z thickness, filled with pattern w). *MacPaint* reduces objects to a series of picture elements (bits), as they appear on the screen. It is easier to convert the *MacDraw* attributes into PostScript commands than it is to convert the relatively coarse bit images from a *MacPaint* picture. A *MacDraw* circle, for example, prints on the LaserWriter with a smoother curve than the same object drawn in *MacPaint*.

Writing is dead in Europe; and even when it flourished, it was

Writing is dead in Europe; and even when it flourished, it was

ample, use more toner than pages of straight text. Canon estimates that the $99 cost of the Apple cartridge is roughly equivalent to the replacement cost of ribbons and print wheels for a letter quality printer producing an equal number of pages.

After slipping the toner cartridge under the hood of the printer, you can turn on the LaserWriter. The printer goes through an internal self-test and produces a printout (see Figure 6). This sheet—which prints each time you turn on the printer—may seem superfluous but contains coded information about the printer's current state, including the communications switch settings and the number of copies that have been made since the first time the printer was turned on. That number, printed at the bottom of the sheet, is stored inside the printer in a special circuit (EPROM) that retains information even after the printer is turned off or unplugged.

Software Installation

Once you set up the LaserWriter's hardware, you have to use an installation program from the LaserWriter disk, which comes with the printer, to modify your application disks so that they will work with the LaserWriter. When you open the installation program it adds new fonts to the System file and adds a LaserWriter file to the System folder. The LaserWriter file contains an AppleTalk driver and its own printer manager. The AppleTalk driver designates the printer and modem port for connecting the printer to the AppleTalk network.

Figure 7

When you install the LaserWriter software, the screen fonts representing the fonts contained in the LaserWriter's ROM are added to the System file. The names of the added fonts (Times, Symbol, Helvetica, and Courier) appear in the Font menu above the System fonts.

Figure 8

A comparison of text in 18-point Times Roman as printed by the LaserWriter (top line) and as it appears on the screen (bottom line).

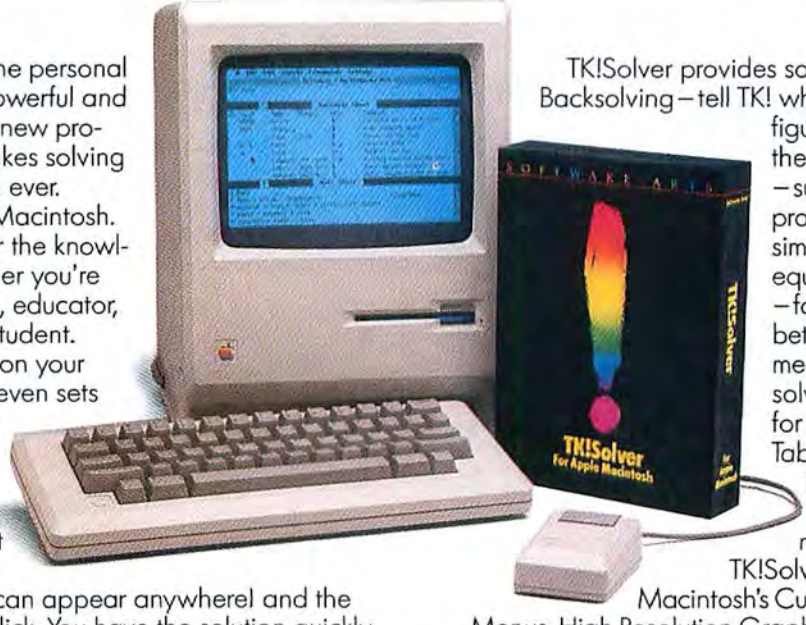
The fonts included on the LaserWriter disk are "screen fonts." After the LaserWriter software is installed, the fonts appear in the Fonts menu along with the original Mac fonts (see Figure 7). These fonts should not be confused with the fonts residing in the LaserWriter. The screen fonts represent the built-in LaserWriter fonts on the Mac screen and don't contribute to print quality.

"Tuning" the fonts to make them both easy to read on the Mac screen and representative of the font style (see Figure 8) was a job comparable to building a dollhouse with stone blocks from the Pyramids. Compared to the LaserWriter's resolution of 90,000 dots per square inch, the Mac's screen displays only 5184 dots per square inch. Because the great difference in resolution could not always be overcome, some of the LaserWriter fonts look fuzzy on the Mac screen (see Figure 9). Smaller sizes, especially those under 12 points, suffer from the Mac's relatively low screen resolution.

With the LaserWriter, you lose the one-to-one correspondence between screen images and printed output that you usually get using the Mac and the Imagewriter, but you gain highly defined characters. A few font sizes retain a relatively close correspondence to the fonts you see on the screen. Of the font sizes available in *MacWrite,* only 9-, 12-, 18-, and 24-point fonts are tuned to look the same size on screen as when printed by the LaserWriter.

MAKE SHORT WORK OF LONG EQUATIONS

Introducing TK!Solver® for Apple® Macintosh™. An equation processing program that helps students and professionals solve even their most difficult problems.



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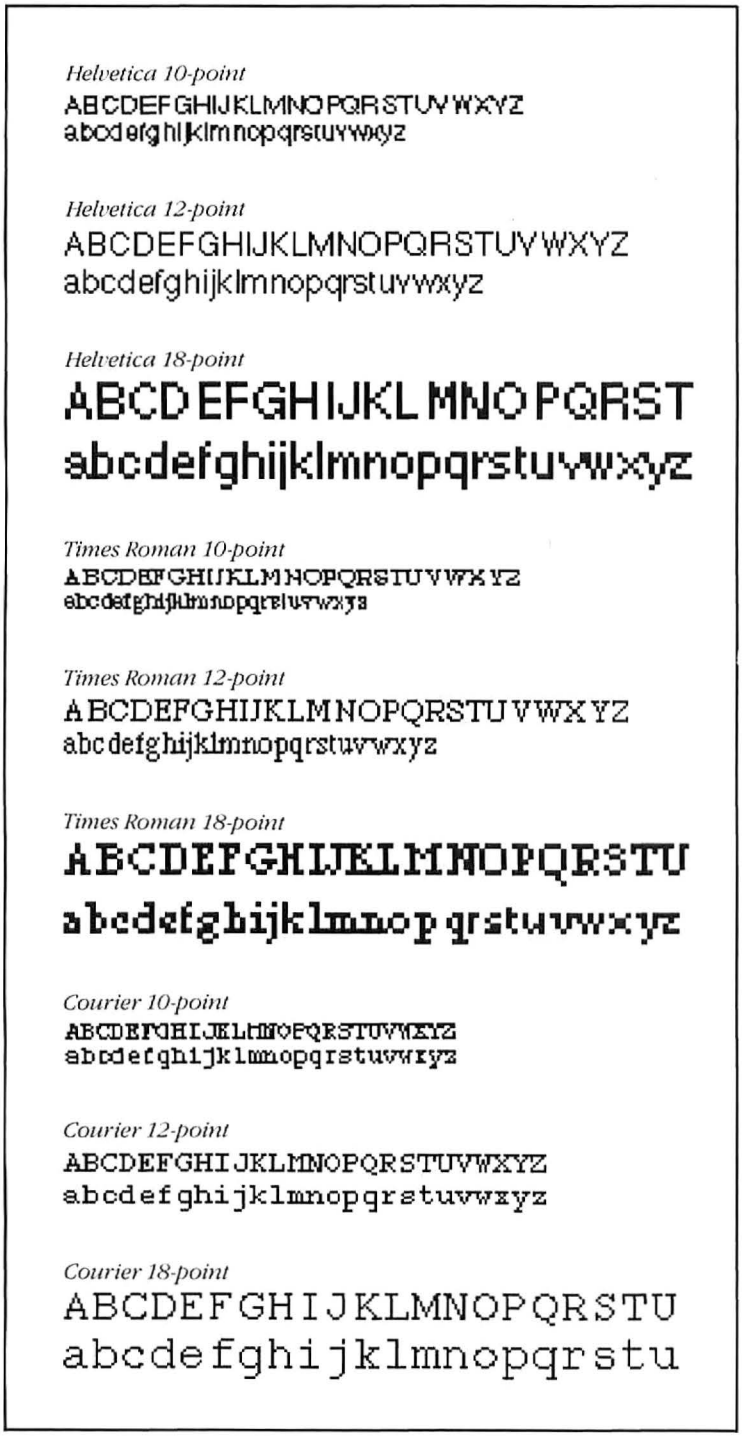

Figure 9
Designing screen fonts that are both easy to read and representative of the font style is a difficult job. Because of the great difference in resolution between LaserWriter printing and the Macintosh screen display, some LaserWriter fonts look fuzzy on the Mac screen.

In addition to the AppleTalk driver and the screen fonts, the LaserWriter disk contains the LaserWriter Print Manager. The Print Manager helps your application program convert the output from the Mac into the PostScript commands understood by the printer. By copying the Print Manager file to your application disks, you enable all Mac software to run with the LaserWriter without modification. If you don't plan to use the LaserWriter for all your printing jobs, and you want to send documents to another printer such as the Imagewriter or a daisy wheel printer, you can switch between printers with the help of a new desk accessory that is also included on the LaserWriter disk.

After using the LaserWriter for a while, it struck me that the printer represents a breakthrough that in some ways overshadows the innovations of the Macintosh itself. The LaserWriter makes me think less about the Mac's mouse, pull-down menus, and other elements that make the machine so different. The new printer makes me think of using the Mac to produce finely detailed, professional-looking business documents. The LaserWriter's high-quality printing may be the key that opens corporate doors to the Macintosh. □

▲▲▲▲▲▲▲▲▲▲ *Danny Goodman is a Contributing Editor of* Macworld *and the author of several personal computing books. He has appeared as a product reviewer on the Public Broadcasting System television series "The New Tech Times."*

▲▲▲▲▲▲▲▲▲▲

LaserWriter
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
800/538-9696, 800/662-9238 in California
List price: $6995

Ready...

Keep those cards and letters coming.

The odd, original, and obscure are beginning to crawl out of the woodwork. Our suspicions were correct. Mac owners have some delightfully bizarre tales to tell.

We're beginning to get some response to our campaign to uncover deep dark original Mac secrets. But where are the rest of you?

Look, we know it's hard to talk about yourself sometimes. We know that you may be reluctant to tell the whole world what you and your Mac do when no one is looking. But believe us — it's easy. Just sit down at your keyboard and write: "you're not going to believe this but..." and the whole horrible truth and nothing but the truth will pour out. (We ought to know — that's how we write these ads.)

Or, ask your kids to help. They're always ready to add a slightly strange twist to your day. Like the time they tried using the cat as a surge protector. Or when they inadvertantly ran up a $200 phone bill on the modem.

And, while you're contemplating your future as a certifiably famous Mac person, take a look at this month's product list. Just flip the page on your right for our complete selection.

Ready, set, dial!

Wait a second. Before we can fulfill your order we have to satisfy every whim of our ravenous new mainframe. It needs to know such minor details as bill to, ship to, method of payment, method of shipment, and, of course, what you'd like to order. And we'd like to have you tell us what the small code number is that appears near our phone number on the ad you're looking at.

If you have all this information ready, we'll have you back to work (or play) and your new program/add-ons in the delivery trucks that much quicker.

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Dow Jones

Straight Talk *(Communications package for accessing on-line databases and other Macs and micros.)* . . . . . 54.

1st Byte

Smooth Talker *(Voice synthesis software for the Mac.)* . . . . . 119.

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The Sales Edge *(Helps prepare strategies for all aspects of sales negotiations.)* . . . . . 169.

The Communications Edge *(Identifies communications strengths and weaknesses.)* . . . . . 113.

The Management Edge *(Identify and evaluate management skills and discover methods for improvement.)* . . . . . 129.

The Negotiation Edge *(Develop "How To" plan by analyzing critical factors.)* . . . . . 179.

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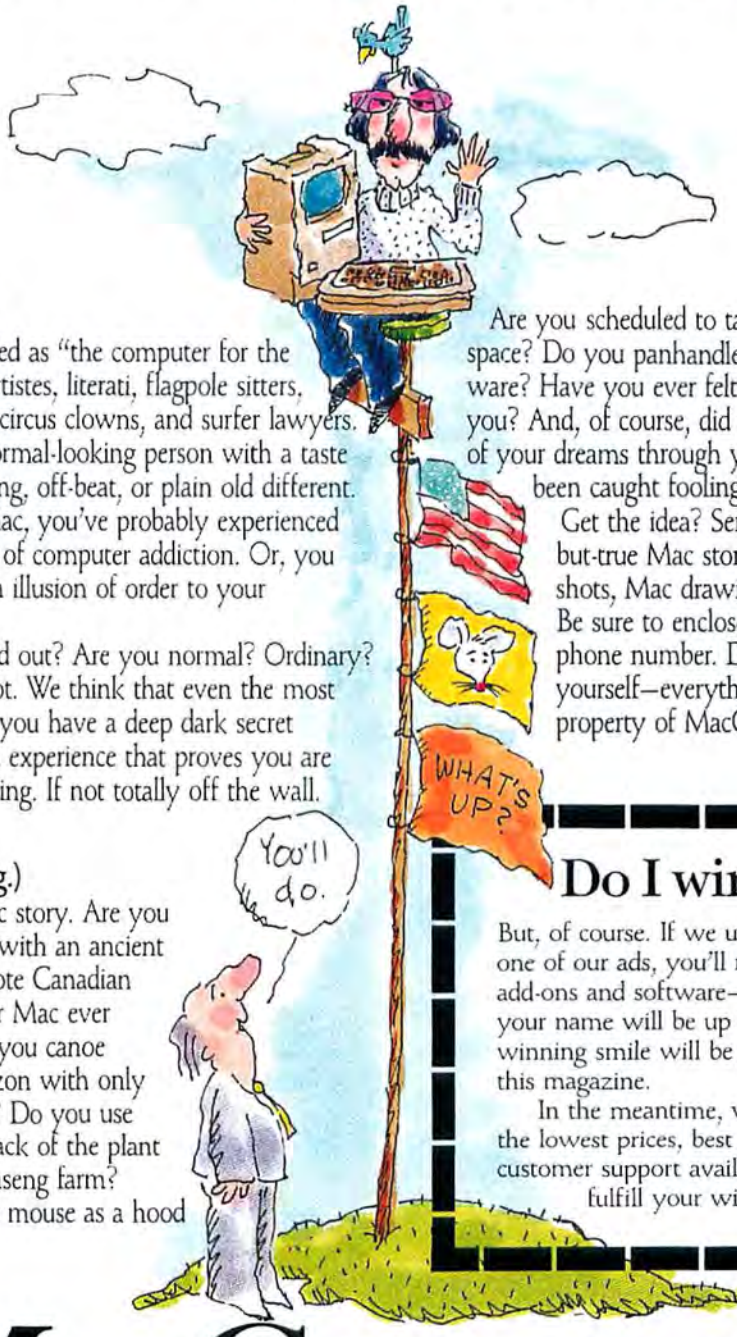

Why be normal?
The Mac was heralded as "the computer for the rest of us." For the artistes, literati, flagpole sitters, creative accountants, circus clowns, and surfer lawyers. For any otherwise-normal-looking person with a taste for the truly fascinating, off-beat, or plain old different.

Thanks to the Mac, you've probably experienced the wild-eyed frenzy of computer addiction. Or, you may have brought an illusion of order to your chaotic life.

But have you sold out? Are you normal? Ordinary? We sincerely hope not. We think that even the most straight-laced among you have a deep dark secret crying to get out. An experience that proves you are still certifiably intriguing. If not totally off the wall.

This is your life.
(Or, Mac bites dog.)
Tell us your best Mac story. Are you powering your Mac with an ancient generator in the remote Canadian wilderness? Has your Mac ever saved your life? Did you canoe solo down the Amazon with only a Mac for company? Do you use your Mac to keep track of the plant locations on your ginseng farm?

Do you use your mouse as a hood ornament?

Are you scheduled to take the first Mac into space? Do you panhandle to raise money for software? Have you ever felt that your Mac was out to get you? And, of course, did you meet the woman/man/etc. of your dreams through your Mac? (Or, have you ever been caught fooling around with someone else's Mac?)

Get the idea? Send MacConnection your strange-but-true Mac story, along with any relevant snapshots, Mac drawings, and/or newspaper clippings. Be sure to enclose your name, address and telephone number. Don't forget to keep a copy for yourself—everything you send us becomes the property of MacConnection.

Do I win a prize?

But, of course. If we use your Mac story in one of our ads, you'll receive $500 worth of add-ons and software—your choice. Plus, your name will be up in lights, and your winning smile will be gracing the pages of this magazine.

In the meantime, we're here to offer you the lowest prices, best advice, and strongest customer support available. And to help you fulfill your wildest Mac dreams.

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Just the Facts

If you're overwhelmed by the facts of life, a new file management program might help you keep things in perspective

Bill Grout

On-the-job embarrassment often arises from a simple lack of organization. Your boss, for example, may request a few facts on a project you're managing. You know the answers are close at hand, on a note you scribbled to yourself only yesterday. As you feverishly search through the strata of notes on your desktop, your boss stands over you trying to look patient. When you realize the search is going to require serious excavation, you sheepishly tell your boss that you'll send up the information "momentarily."

Factfinder brings order out of desktop clutter without requiring you to drastically change your work habits. The program replaces a cluttered bulletin board, a desk drawer jammed with dog-eared memos, lists of hastily penned reminders, and boxes of file cards. You can still jot down notes and keep track of information in the casual way you're accustomed to. But don't confuse this program with data management systems that handle large business applications such as inventory, payroll, or accounts receivable. *Factfinder* trades the power to sort and search large amounts of structured data for the freedom to record information in an unstructured way.

Factfinder models its functions on the metaphor of a memo pad. You use memo pads for notes, phone numbers, and other impromptu information that you want to remember. Once you make a note, you tear off a sheet and put it in a pile with other notes to yourself. After a while the notes stack up, and you may have to paw through the stack to find a specific note. Like a memo pad, *Factfinder* lets you record information with a minimum of structure, but it also helps you find notes later when you need them. Like a magician snatching a card from thin air, *Factfinder* deftly pulls a note from a stack and displays it on screen.

Factsheets

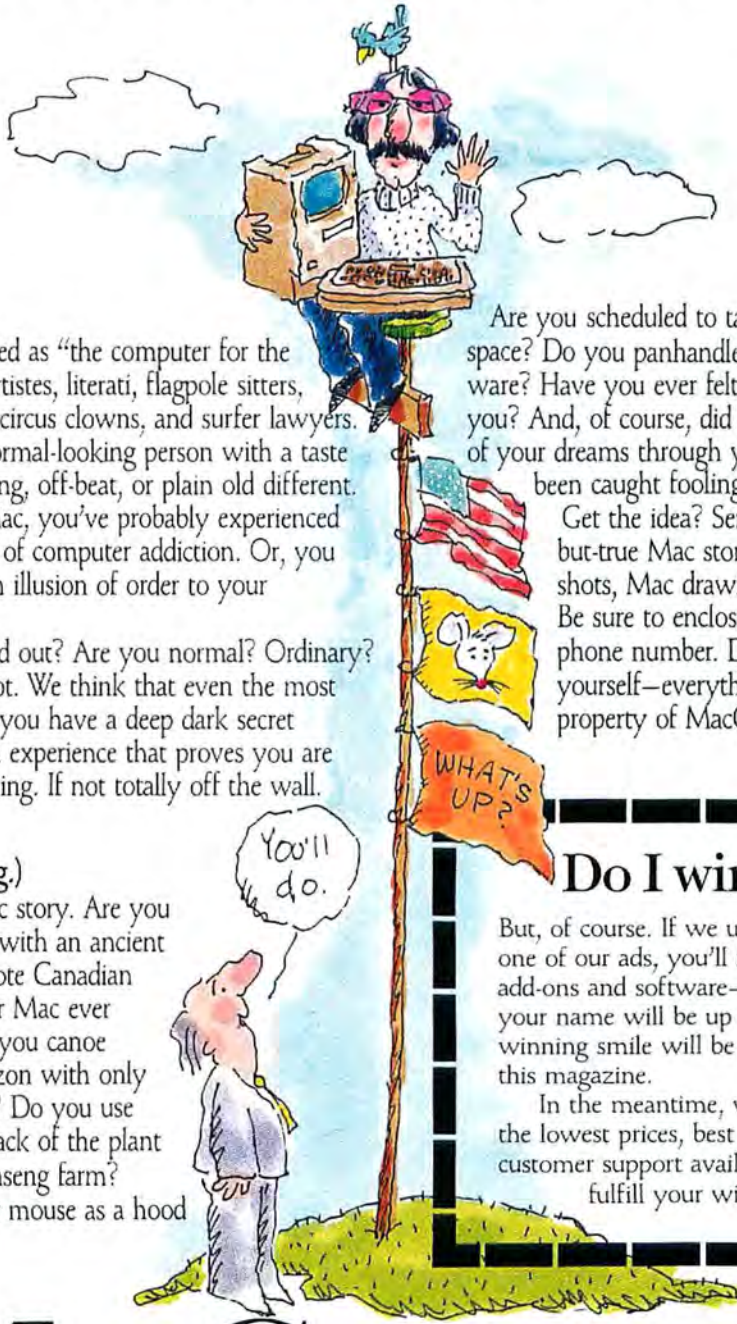
Factfinder allows you to preserve your spontaneous style of taking notes by letting you record information on notepad-like screen windows called factsheets (see Figure 1). When a factsheet first appears, it takes up about half the Mac's screen. You can stretch or shrink a factsheet the same way that you resize other windows. You can also change the size of a factsheet by clicking the button in the factsheet's lower-left corner. The first click enlarges the factsheet so that it fills the entire screen. By clicking the button a second time, you return the factsheet to half-size. The factsheet window has a scroll bar so you can view notes from beginning to end.

After you move the pointer into the note space and click the window to make it active, you can type text to your heart's content. You type and edit text like you do in *MacWrite*. Text wraps automatically to fit the current window size so that the text doesn't disappear beyond the window's right edge. Notes can be as short as a few words or as long as three to four typewritten pages, depending upon the amount of available memory.

Leaving Clues

When you've finished typing a note, you leave clues to help you find the factsheets and the information they hold. You designate keywords that represent a factsheet's contents and use them to search for it. A budget meeting memo, for example, might be given keywords such as *memo, budget, meeting,* or a specific word used in the factsheet itself. You can assign as many keywords to the factsheet as you want.

We'd like to think you're a little strange.



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Starter Pack *(Swivel, surge suppressor & dust cover in one package. Best buy.)* . . . . . 54.
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MicronEye *(Image sensor translates anything it sees into MacPaint for enhancement, printing, or storage. Let your Mac see what's going on.)* . . . 329.
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Flip Sort Micro *(Holds 40 Mac disks)* . . . . . 17.
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MAXELL
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Fuji
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3M
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Verbatim
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Microsoft
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Presentation Graphics Book *(For getting the most out of Microsoft Chart.)* . . . . . 14.
MacWork/MacPlay *(Twenty original ideas for home and business. See what's really possible between you and your Mac with MacWrite, MacPaint, and Multiplan.)* . . . . . 14.

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Zork I *(standard)*. . . . . 27.
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Zork III *(advanced)*. . . . . 35.
Infidel *(advanced)* . . . . . 35.
Sorcerer *(advanced)* . . . . . 35.
Deadline *(expert)* . . . . . 39.
Starcross *(expert)*. . . . . 39.
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Just the Facts

If you're overwhelmed by the facts of life, a new file management program might help you keep things in perspective

Bill Grout

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You assign keywords to a factsheet in the Keys window (see Figure 2). At the bottom of the window, you type a word or phrase and then click the Add button to add it to the keyword list. You can also add keywords to the list directly from the factsheet by selecting a word or phrase in the text and typing ⌘-M or choosing Mark from the Keys menu. Typing ⌘-M immediately after a word in the factsheet is another way to mark it as a keyword. New keywords appear instantly in the Keys window.

A scroll bar allows you to scroll the keywords in the Keys window, and you can delete keys by selecting them and clicking the Delete button. The top of the Keys window shows a factsheet's creation and modification dates, which can also be used in searches. *Factfinder* has a feature that automatically adds keywords to related factsheets as they're created so that you don't have to retype the same keywords.

Facts in Stacks

After you complete the factsheet, you name it and save it in a "stack." A stack is one or more factsheets that make up a file. A stack can hold as many notes as disk space allows. You can have any number of stacks, naming and organizing them as your work requires. One stack might deal with notes from business meetings, another with a business project, and others for research notes or tickler lists.

When you want to refer to a factsheet, you load the stack that holds the note and tell *Factfinder* which note you're looking for. You have three ways to review factsheets. The simplest way is to browse through them one by one. You can go forward or backward through a stack by clicking one of the full-page scroll icons located at the bottom of the factsheet window (see Figure 1).

The fastest way to locate factsheets is by using the Names Found window (see Figure 3), which lists the names of all the factsheets in a stack. Scroll through the list to find the factsheet you want and double-click its name. The factsheet should appear within two seconds.

Narrowing the Search

If you already know the name or the modification date of a factsheet, *Factfinder*'s search feature lets you call up the factsheet immediately; you don't have to page through factsheets or scroll down the Names Found list. You can also use keywords to search a stack for factsheets covering a specific topic. To perform a search, you type the search criteria in the Find window (see Figure 4). You focus the search by using combinations of factsheet names, dates, and keywords to locate specific or related groups of factsheets. You might, for example, collect all budget meeting notes by searching for the keywords *budget* or *meeting*.

In large stacks it's easy to forget the numerous keywords and names you've given to factsheets to use in a search. *Factfinder* provides an index that lists factsheet names, keywords, and creation and modification dates for each stack. The index appears in a window, and you can order information alphabetically by name or keyword, or numerically by date (see the left side of Figure 4). Clicking an item in the index automatically transfers it to the Find window for use as a search criterion.

Once you have indicated the search criteria, you choose Find Factsheets from the Stack menu, and *Factfinder* begins the search. Searches are slow, taking as long as 20 to 25 seconds to locate one factsheet in a stack of 30. Once the program completes the search, it displays the first factsheet matching the criteria as well as a Names

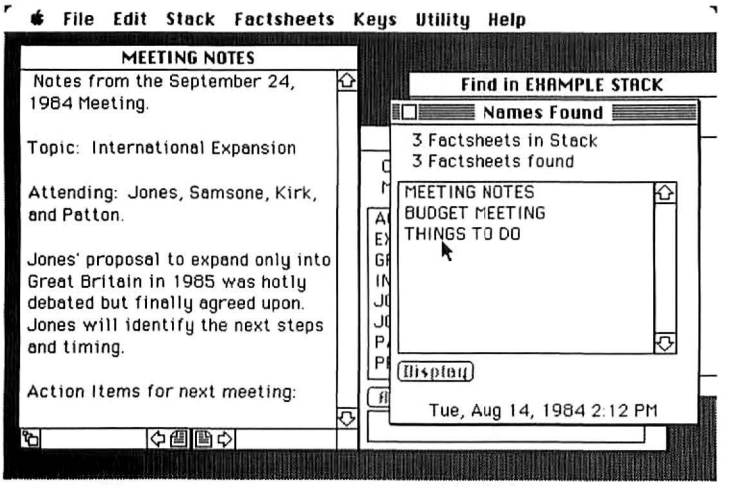


Figure 1
You type information in factsheets such as the one titled Meeting Notes on the left. A single factsheet can have up to four pages of text that can be reviewed on screen by using the scroll bar.

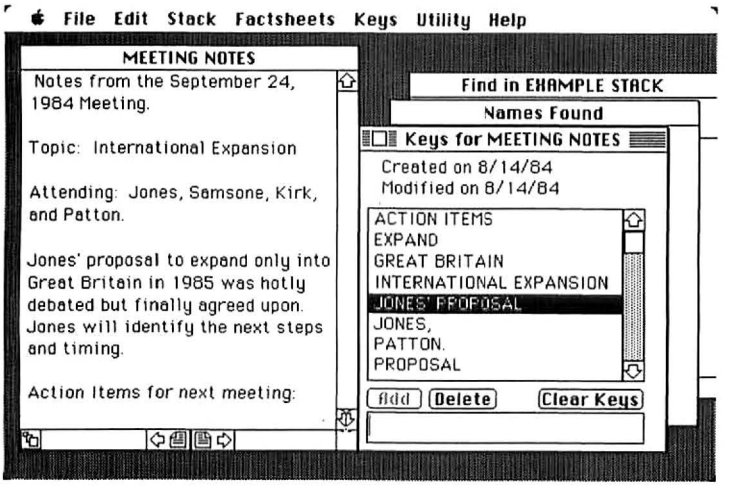
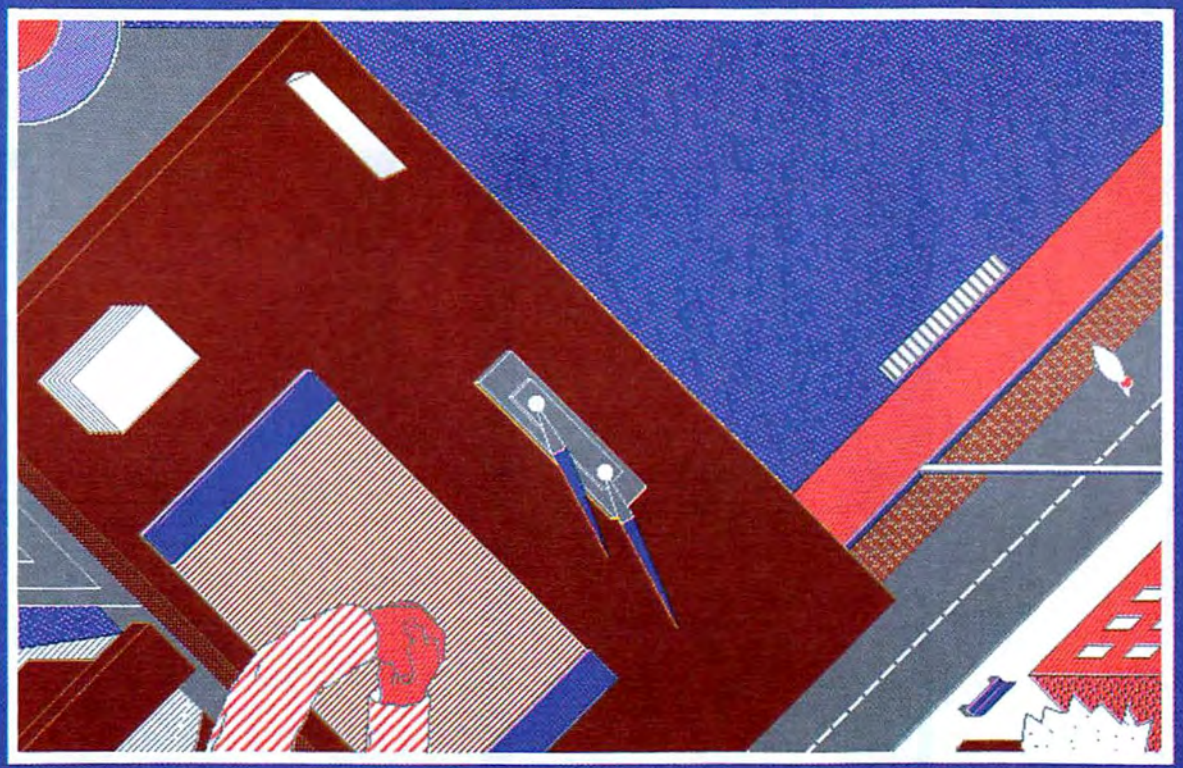


Figure 2
Keywords, such as those listed under Keys for Meeting Notes on the right, help you locate factsheets. You assign keywords to a factsheet by typing them at the bottom of the Keys window and clicking the Add box.



Found window that lists the names of all other factsheets meeting the search criteria. You can display any factsheet found in the search by clicking its name.

After you find the factsheets you're looking for, you're not limited to viewing them on screen. You can print factsheets to prepare a set of notes for an impromptu presentation or use them like index cards to form the basis of a report. If you don't want to deal with print menus, you can take quick snapshots of factsheets by pressing ⌘-Shift-4 to dump the current factsheet to the printer.

Freestyle Factfinding

Most file managers and data base programs insist that you record information in a way that maximizes the program's efficiency but may not correspond to the way you normally work. To construct a data base, you have to decide what kind of information you want to store and how you plan to organize it into records and fields. After structuring a typical data base, however, you may discover that you have unanticipated information that doesn't fit into the data base's structure.

Factfinder eliminates the problem of recording information that doesn't fit into a preconceived scheme, because it doesn't require you to categorize information into records and fields.

I like the way *Factfinder* gives you the freedom to record information in a data base however you like.

Factfinder isn't fast or powerful, but it handles random thoughts, revelations, bits of advice, and lists in the same way as the notepads most people are used to. The prerelease version of *Factfinder* that I reviewed still had a number of bugs, but assuming that the manufacturer applies the proper finishing touches, *Factfinder* might be better suited to your workstyle than a typical data base program would be. *Factfinder* lets you keep the desk clutter out of sight while keeping the facts within reach. □

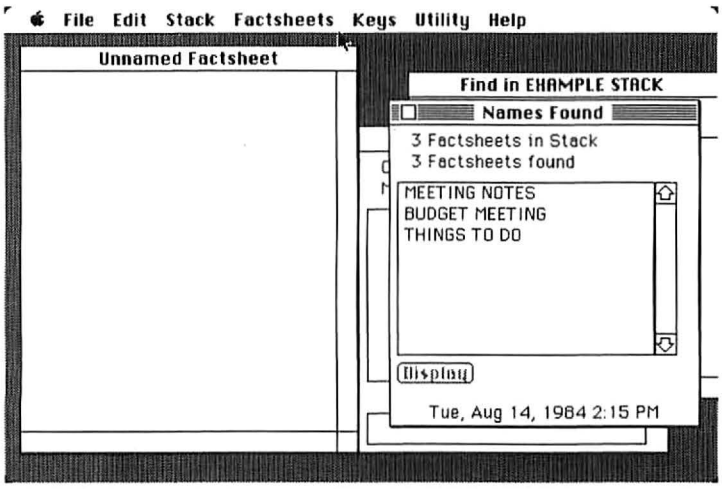


Figure 3
The fastest way to find factsheets is through the Names Found window, which lists the factsheets in a stack or those located during a search. To look at a particular factsheet, you double-click its name.

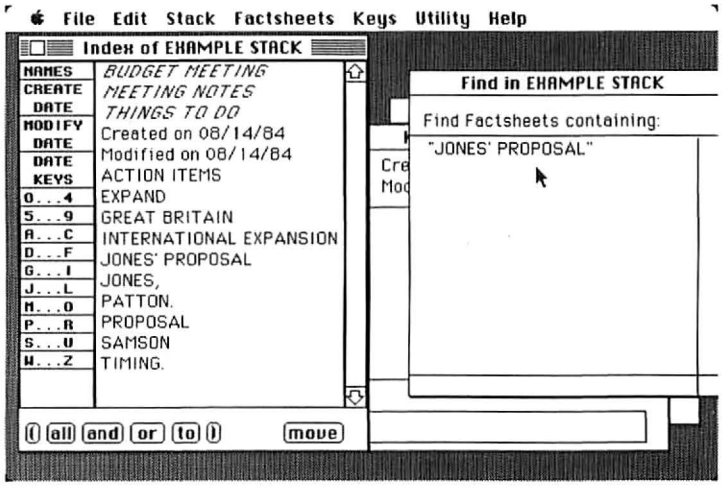


Figure 4
The Find window (right) is used when searching for factsheets based on criteria such as names, keywords, or creation or modification dates. An index (left) of current names, keywords, and dates can be called to screen.

▲▲▲▲▲▲▲▲▲▲▲ *Bill Grout reviews software for the* San Francisco Chronicle *and has two books forthcoming:* Multi-Mate and More! *from Addison-Wesley and* Symphony for Your Business *from Hayden Book Company.*

▲▲▲▲▲▲▲▲▲▲▲

Factfinder
Forethought, Inc.
1973 Landings Dr.
Mountain View, CA 94043
415/961-4720
List price: $150

What the critics see in Filevision.™

"...the single most important piece of software to show up since Lotus 1-2-3.™"

The Club Mac News, July 1984

"...for virtually the first time in human history (pardon our gushing), there's a simple way to index ideas via visual images..."

The Club Mac News, August 1984

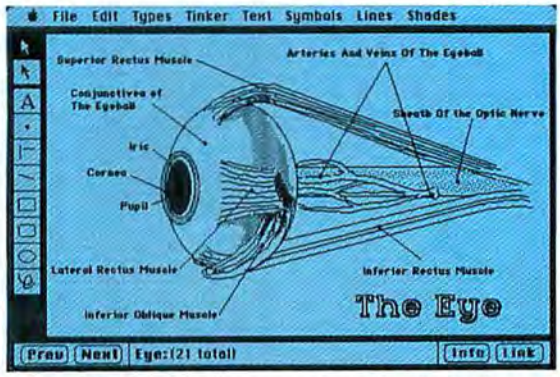
"Filevision is one of the most impressive uses of the Mac so far ...it shows off the hardware to the hilt."

"...it perfectly embodies the spirit of the Mac in making information accessible and comprehensible for the rest of us."

Esther Dyson
RELease 1.0

"Almost as importantly, it sets a standard for other developers, and consumers will come to not accept anything less."

Guy Kawasaki
"Software Evangelist"
Apple Computer, Inc.



Here's what they saw when they looked into technical drawings. Data forms connected to each object in the picture.

"It is Filevision's unique integration of object-oriented drawing and data base functions that give it the edge over other stand-alone graphics or data base applications."

MacLine, September 1984

"Filevision is a first. It's a program whose career is as a database manager, but whose heart is in art.

For business, they saw how to map sales regions and track volume. And print out sales reports, in the click of a mouse.

"Filevision...can quite honestly be called the first independently developed program to deliver on the "Macintosh™ promise'..."

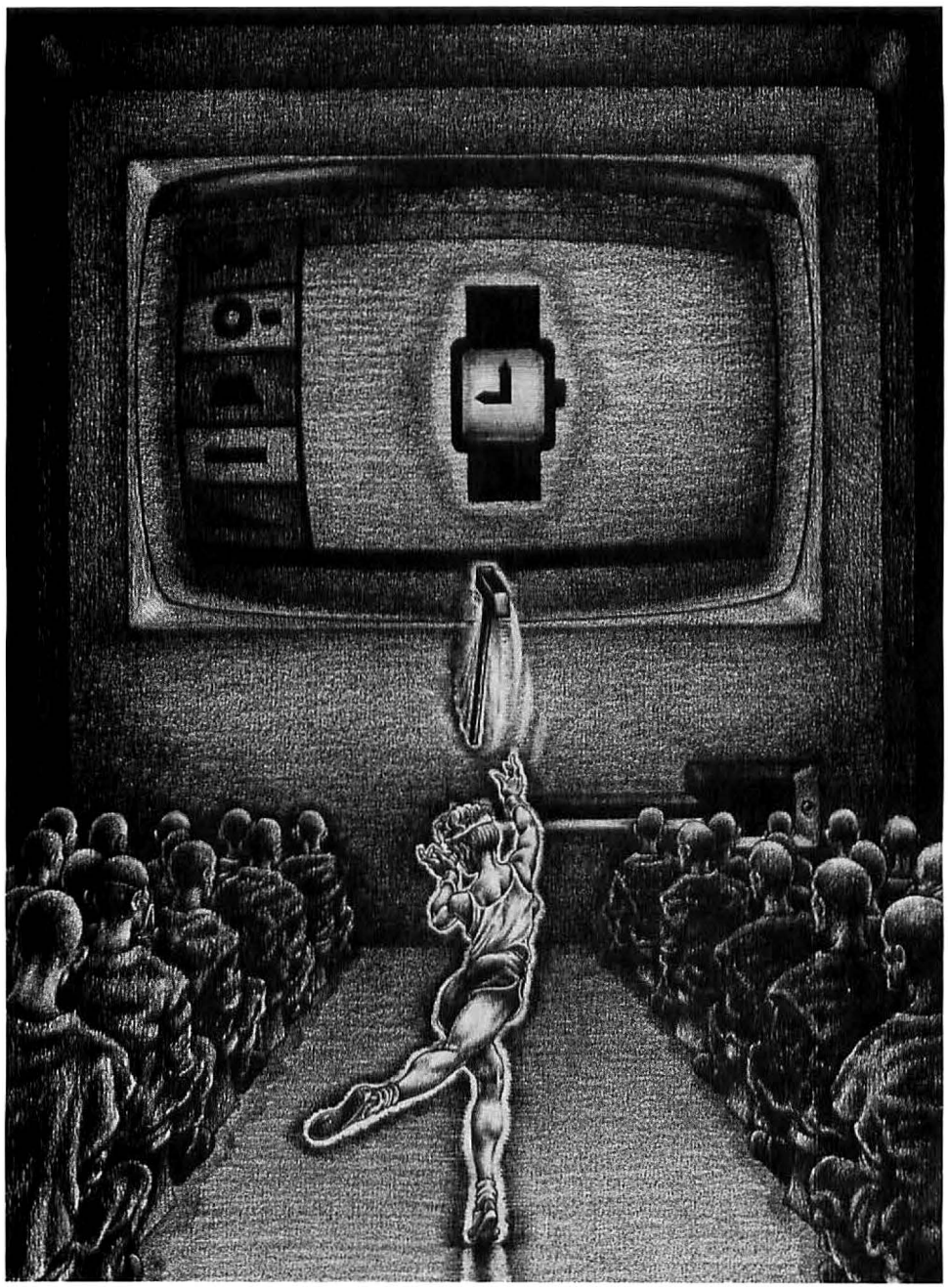
Kevin Goldstein, Softalk

To look into Filevision toll-free from anywhere in the U.S., call 1(800) 554-2469.
Within California call 1(800)368-3813.

TELOS™
SOFTWARE PRODUCTS
Software for the real world

Filevision is a trademark of Telos Software Products. Lotus 1-2-3 is a trademark of Lotus Development Corporation.
Macintosh is a trademark licensed to Apple Computer, Inc. Telos is a trademark of Telos Corporation.

Circle 54 on reader service card



Beat the clock.

Your ordinary Mac™ spends an extraordinary amount of time talking to itself. And all the while, all you can do is stare at the clock.

Which is no way for you to spend your time.

So get your Mac a HyperDrive.™ The only Winchester made to go inside your Mac.

A HyperDrive will get your Mac going at least three times faster. So for example instead of waiting 20 seconds to load MacWrite,™ you'll be off and running in under seven seconds.

A HyperDrive will hold as much data as 25 Mac floppies. So you can have more programs, more files right where you need them, whenever you need them.

And because HyperDrive is internal, there's one less component to lug around, one less wire to break, and one more port free for other things.

And yet it costs less than other Winchester systems that don't do nearly as much.

So what are you waiting for?

For the name of your closest HyperDrive dealer, call 800-422-0101.

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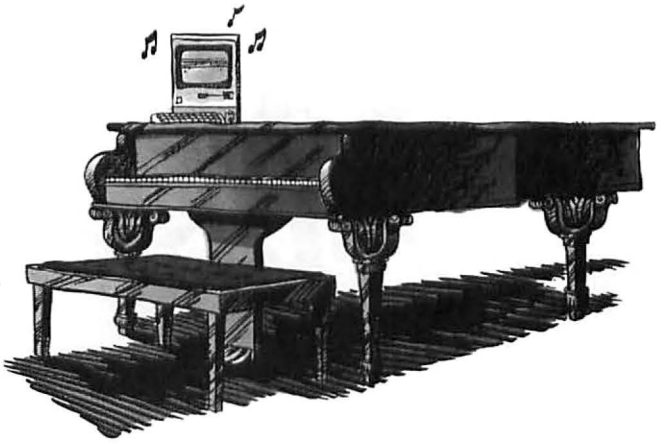
HyperDrive is a trademark of General Computer Co.

How to Mac Music



Creating original music is a joy. Creating sheet music is anything but.

With that in mind we introduce a major breakthrough in music making. Professional Composer. From Mark of the Unicorn.

Professional Composer is an easy-to-use software program that lets you score, edit and print music using Apple's new Macintosh personal computer and mouse. Developed especially for musicians (not just computer virtuosos), Professional Composer requires no computing experience whatsoever. Instead it simply requires that you know how to point.

You see, Professional Composer puts a blank piece of manuscript paper on your computer screen. Then it lets you use the Macintosh mouse, a small rolling box that controls a pointer on the screen, to enter clefs, notes, rests, time signatures and chords. Even ties, beams, slurs and note ornaments. In fact anything that would be part of a published score.

Using the same mouse, you can edit your music too. Delete and insert notes, accents, clefs, time and key signatures. Move instantly from one part of your score to another. Change keys. Even listen to what you've written. Of course you can file your music too, complete or incomplete, so it will be easily accessible the next time inspiration strikes.

But perhaps best of all is the finale. Because with Professional Composer and Mac's beautiful graphics, you can print out sheet music that's the envy of any professional copyist. And the objective of every serious musician.

If you'd like to hear more on how Professional Composer can help you make music, write Mark of the Unicorn, 222 Third Street, Cambridge, MA, 02142, or call 617-576-2760.

Professional
Composer

Mark of the Unicorn, 222 Third Street, Cambridge, MA 02142, 617-576-2760

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(Advertisement)

How to Keep Your Macintosh™ from Frying to a Crisp

Protecting Your Hardware From The 6,000 Volt Destroyer

Over 50% of all hardware and software complaints received by manufacturers have nothing at all to do with product quality. To the contrary, most damage reported is caused by surges in household or business current.

A surge is a short duration increase in voltage that can reach to 6,000 volts or more and lasts anywhere from less than a microsecond to several milliseconds. These surges occur both from line to line and line to ground.

What makes surges so insidious is that they occur so quickly that the operator is unaware of their occurrence. These surges will continue to degrade the sensitive microcircuitry and the result is lost data and, even worse, computer repairs that are often mistakenly blamed on original equipment failure.

Caused by utility switching, changes in electrical loads and lightning as far away as five miles, surges can also disrupt data transferred within the computer and can wipe out portions of memory.

30,000 Volts At The Tip Of Your Finger

Another common danger to the computer, its peripherals and software, is common static electricity. Like powerline surges, this source of raw power is often put off by the operator as being little more than an annoyance. Few people realize that their bodies are carrying as much as 30,000 volts of electrical power. This power, though not going directly through your system, can pose as great a threat as powerline surges.

The Faulty Ground

In addition to operator safety a properly grounded computer is better able to drain off charges that would otherwise create dangerous voltage levels between the computers chassis and microcircuitry. Again, the operator is typically not aware of whether the outlet is properly grounded and therefore risks both the operator's safety and hardware damage.

RFI Can Play Havoc With Your Image

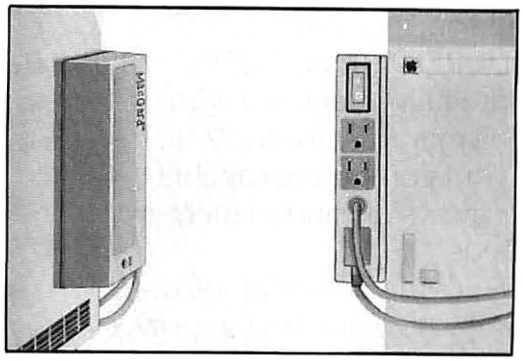
While RFI (Radio Frequency Interference) is not a source of damage to computer or operator, it can play havoc with the monitor image and to software. Caused by nearby radio stations, the operator's own radio or television, as well as other electrical devices, the RFI shows up on the monitor as a scrambled image. It may also appear as software that has been garbled while in memory. If for no other reason, the computer operator should guard against RFI simply because its effect can nullify the time-saving benefits provided by the computer.

MacGard: Real Protection For The Serious User

MacGard from Systems Control is the single most complete computer protection device available today. MacGard is designed by the same engineers who have been providing custom protection and control to the nation's power companies for two decades. From its inception, MacGard was designed with Macintosh in mind. From its quality injection molded plastic casing which compliments your Macintosh's appearance, its at your fingertips convenient placement on the side of your unit, and its combination of superior protection features, the MacGard is the ultimate system accessory for your Macintosh.

MacGard provides the serious user with a complete series of protection benefits.

- It clamps off all line to line and line to ground surges *before* they can enter your system.
- It provides an anti-static pad you need only touch to safely drain off up to 30,000 volts of harmful static.
- It provides an LED ground indicator to indicate proper grounding of your electrical outlet.
- It provides RFI attenuation to assure a clean monitor image and software safety.
- A master on-off switch provides the convenient control to power up your computer and up to two other peripherals.
- MacGard has a one year limited warranty.
- If you're not satisfied within 30 days, return MacGard for full refund.



If you're a serious user, you owe it to yourself to own a MacGard. Your MacGard can only be purchased directly from Systems Control. Cost of the MacGard is $89.95 plus $3.50 for shipping and handling. To order or request more information, call toll free, 1-800-558-2001 Ext. 115, in Wisconsin, 1-800-242-3102 Ext. 115. We accept both Visa and MasterCard. No C.O.D.

Systems Control P.O. Box 788 M Iron Mountain, MI 49081

MacGard™

Circle 177 on reader service card

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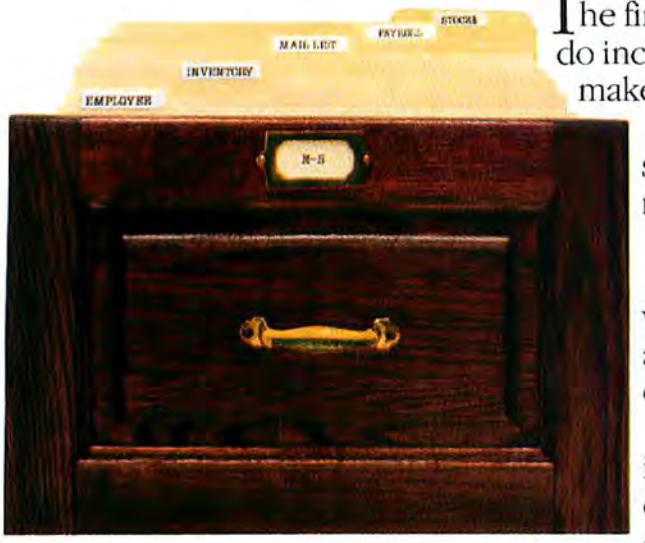
THE MOST USEFUL IDEAS ARE OFTEN REMARKABLY SIMPLE.



The first filing system was a remarkably simple way to do incredibly useful things. Like organize a business and make it work.

PFS®:FILE and PFS:REPORT are remarkably simple software programs that can help you organize your business faster and more effectively.

And both programs are amazingly easy to learn.

FILE and REPORT were designed for people without computer experience. So all instructions are easy to understand. And you can be productive quickly.

FILE lets you record, retrieve and review information like personnel records and purchase orders. Instantly. You can even cross reference by department or job or however you want.

And you can arrange information in "forms" you design yourself. Or you can take advantage of PFS SOLUTIONS which are pre-designed forms for popular applications like inventory, invoices and ledgers. Either way, you can quickly and easily create the filing system that fits your needs. Not your computer's.

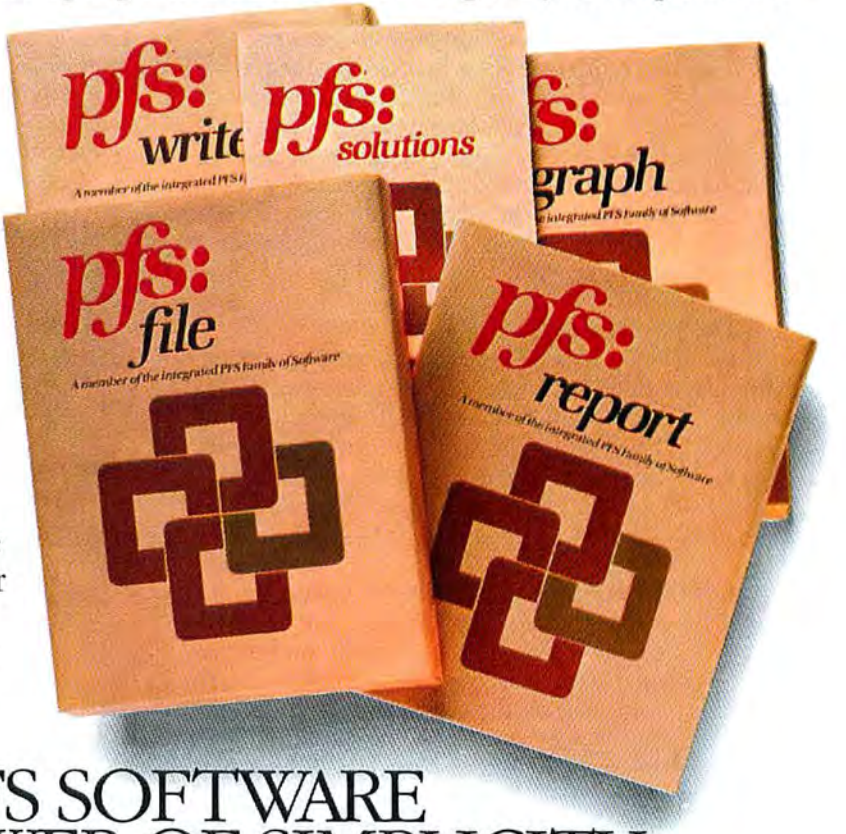
REPORT is the perfect companion program to FILE. Because it gives you the power to summarize and perform calculations on information you've stored with FILE.

With REPORT, you can create presentation quality summaries in table form in just minutes. Automatically sorted, calculated, formatted and printed!

FILE, REPORT and SOLUTIONS are fully integrated with the PFS Family of Software. Which means your computing capabilities can always expand to meet your needs.

PFS: It's the powerful software that's simple to learn. It's the power of simplicity.

See your computer dealer for more details.



PFS SOFTWARE
THE POWER OF SIMPLICITY

PFS:FILE and PFS:REPORT currently work on Apple, IBM, Macintosh,* Tandy,* Commodore,* DEC, Gavilan,* Hewlett Packard,* NEC,* Panasonic, Polo,* Texas Instruments, Compaq, Chameleon, Columbia, Corona, Eagle and Hyperion personal computers.
*Does not work with PFS SOLUTIONS

Macware News

The latest developments in Macintosh software, hardware, and accessories

Edited by Erfert Nielson

Macware News *announces new Macintosh products. Those listed here are available now or will be in the near future. We will keep you informed of developments as the number of products for the Mac increases.*

Software

■ *Abacus Concepts*

2735 Clay St. #3
San Francisco, CA 94115
415/931-7037

StatView
A visually oriented data analysis package that offers both graphic and tabular views of data and results. *StatView* provides descriptive statistics, comparative statistics, nonparametric tests, and curve fitting, as well as full arithmetic data transformations, sorting, and display of several probability values. You can cut and paste data and graphs between *StatView* and other applications such as *MacWrite* and *MacPaint*. List price: $99.95.

■ *Apple Computer*

20525 Mariani Ave.
Cupertino, CA 95014
800/538-9696, 800/662-9238 in California

Through the Looking Glass
An animated game in which you play Alice and are pursued by enemy chess pieces. You must dodge the attacking pieces, which move in actual chess patterns, and capture as many as you can. At the beginning of the game, you set the speed of play and give Alice the powers of any piece. You move Alice by clicking a pointer on legal destination squares; you can also use the pointer to select several undocumented modes of play. *Through the Looking Glass* also lets you design your own playing pieces and define their movements. List price: $39.95.

■ *Button-Down Software*

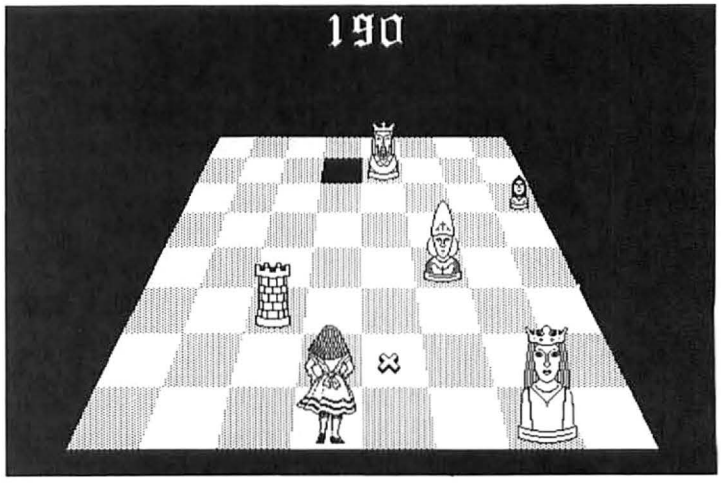
P.O. Box 19493
San Diego, CA 92119
619/462-0365

Profit Stalker
A program that performs technical analysis of stocks and commodities. *Profit Stalker* generates charts from a relational data base that stores stock and commodity price information. The charts include daily open-high-low-close, moving averages, volume line and bar, open interest, 3- to 13-day oscillators, daily most active, member trading, free reserves, money growth, and discount rate. The program requires Microsoft BASIC. List price: $150.

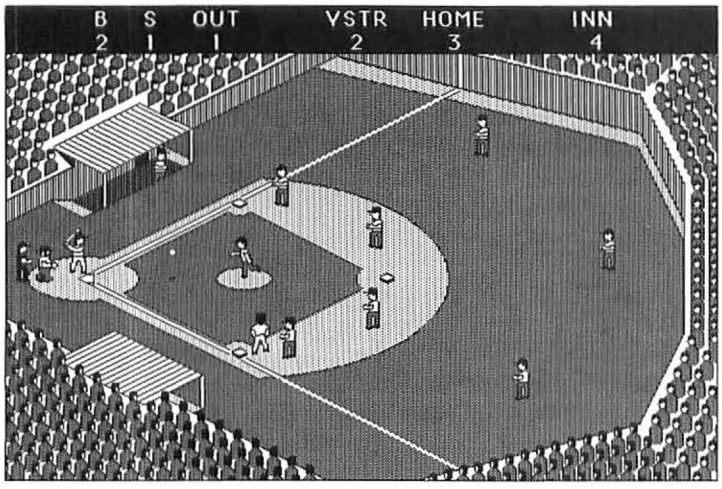
■ *Forethought, Inc.*

1973 Landings Dr.
Mountain View, CA 94043-0808
415/961-4720

Typing Intrigue
A typing course that can track up to six learners. The program provides constant updates on speed, accuracy, and problem keys, allowing users to determine which areas need work and to concentrate on exercises geared toward those areas. *Typing Intrigue* provides basic exercises for beginners as well as refresher courses for more experienced typists. The program includes a mystery story, The Case of the Missing Bathtub, to help keep learners interested. You can buy clues to the mystery with points that are awarded during the instructional portion of the program. Also included is Rain, an arcade-style game that makes use of typing skills developed in the drills and exercises. List price: $49.95.



Through the Looking Glass, Apple Computer



Star League Baseball, Gamestar

■ *Gamestar, Inc.*

1302 State St.
Santa Barbara, CA 93101
805/963-3487

Star League Baseball
An animated baseball game for one or two players. When playing against the Mac, you use the mouse to control the ballplayers' movements. In a two-player game, the player at bat uses the keyboard as a game controller and the other player uses the mouse. Players can choose a batting lineup and a starting pitcher and can bring in a relief pitcher if necessary. The batter has a choice of swinging or bunting, and the pitcher can choose among eight pitches. The game includes music and sound effects. List price: $34.95.

■ *Harvard Associates, Inc.*

260 Beacon St.
Somerville, MA 02143
617/492-0660

DeskToppers
A set of desk accessories that you can install in any application with an Apple menu. *DeskToppers* includes Calendar, which allows you to view any month of any year from 1904 to 2003; Little Black Book, which maintains up to 26 pages of names, addresses, and other information sorted alphabetically; Doodle Pad, a sketchpad that lets you add a drawing directly to a document or paste it into the Scrapbook for future use; and Music Maker, which lets you choose a xylophone, clarinet, trumpet, or organ and play notes with the mouse (tunes are recorded a .tomatically as you compose them). List price: $49.95.

■ *Hayden Software Company*

600 Suffolk St.
Lowell, MA 01853
617/937-0200

Hayden:Base
A relational data base management system that stores text, numeric data, and *MacPaint* illustrations. Variable-length data fields can contain single or multiple entries. Using overlapping windows, you can view several files at once. If you change information in one file, *Hayden:Base* automatically updates related information in up to 15 files. File size and the maximum number of records and fields possible are limited only by available memory. List price: $149.95.

■ *Layered, Inc.*

85 Merrimac St.
Boston, MA 02114
617/423-9041

Front Desk
A business calendar that can be viewed in day, week, or month format. *Front Desk* is designed to help business people gauge an office's workload, track hours spent on specific tasks, and report or project revenue generated from various activities. The program maintains schedules for up to 15 employees for up to 12 months, and provides time-accounting information (for example, how much revenue an employee produced in a given period). You can define standard hourly business rates for each resource scheduled; the program uses these rates to calculate total revenues generated from each source. You can also define up to 15 standard services (such as title search, physical examination, or report generation), which are assigned a flat billing rate or an hourly fee. List price: $149.95.

■ *Lotus Development Corporation*

161 First St.
Cambridge, MA 02142
617/492-7171

Jazz
An integrated package that includes five business functions: word processing, worksheet analysis, data base management, business graphics, and communications. *Jazz,* which runs on the 512K Macintosh, offers keyboard equivalents for common mouse actions, allowing you to keep your hands on the keyboard. The program can display multiple windows. *Jazz*'s word processing function can be combined with the data base function for mail merging, with the worksheet to create reports containing both text and tables, and with graphics to insert illustrations into text. The worksheet has 8192 rows of 256 columns; several worksheets can be opened at once. The data base can be combined with the communications function to capture and subsequently analyze information. The data base allows you to use forms to enter, edit, and view information, and includes a report generator. The program's graphics function provides six types of graphs that can display information from the worksheet or the data base. *Jazz*'s asynchronous communications function lets the Mac emulate DEC VT-52 and VT-100 terminals. You can send and receive information from *Jazz* worksheet or word processing documents, as well as convert information from *1-2-3, Symphony,* and *Multiplan* files. List price: $595.

■ *Miles Computing*

7136 Haskell Ave. #300
Van Nuys, CA 91406
818/994-7901

Mac Attack
An animated game that puts you at the controls of a Sherman tank. You must defend a city against enemy tanks and aircraft, maneuvering your tank to dodge heat-seeking missiles. You use the mouse and the keyboard to control the speed and direction of your tank as well as cannon turret aiming and firing. List price: $49.

■ *Northwest Analytical*

520 N.W. Davis St.
Portland, OR 97209
503/224-7727

NWA StatPak
A statistics package that lets you use the Macintosh for data management, data manipulation, statistical and mathematical computation, and reporting. *StatPak*'s ASCII text files are compatible with *MacWrite* and are suited to commu-

nications and network environments. In addition to data file entry and management, you can perform functions such as seasonal adjustment, lag/leading, rank ordering, subset selection, and data transformation. Computational functions include probability calculations, descriptive statistics, frequency studies, cross-tabulation, regression and correlation, means testing, distribution analysis, nonparametrics, and ANOVA. Microsoft BASIC is required, and an external disk drive is recommended. List price: $395.

■ *Scarborough Systems*

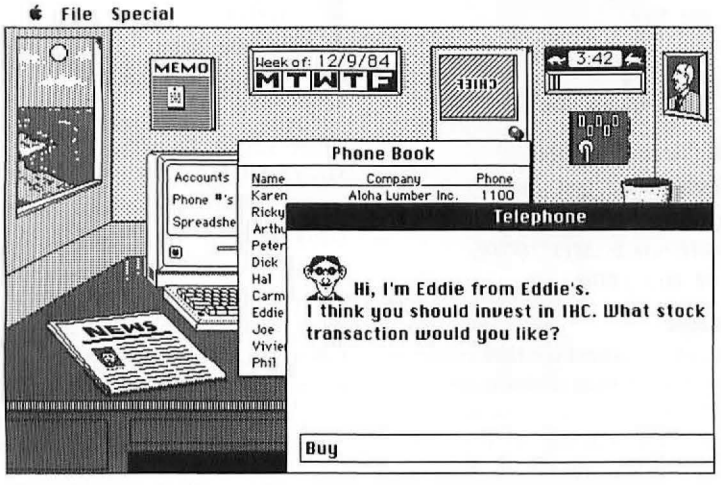
25 N. Broadway
Tarrytown, NY 10591
914/332-4545

Make Millions
An economics simulation game in which you manage a company. You make decisions regarding manufacturing, inventory, pricing, and selling; the game's object is to make your company's stock price the highest in the market. The resources at your disposal include stock quotations, newspapers, market research, spreadsheets, data bases, and business consultants. You must cope with changing economic conditions and labor relations while administering a growing team of managers and executives. As you build your business, the competition is also growing and bidding against you for scarce resources needed to manufacture products. List price: $49.95.

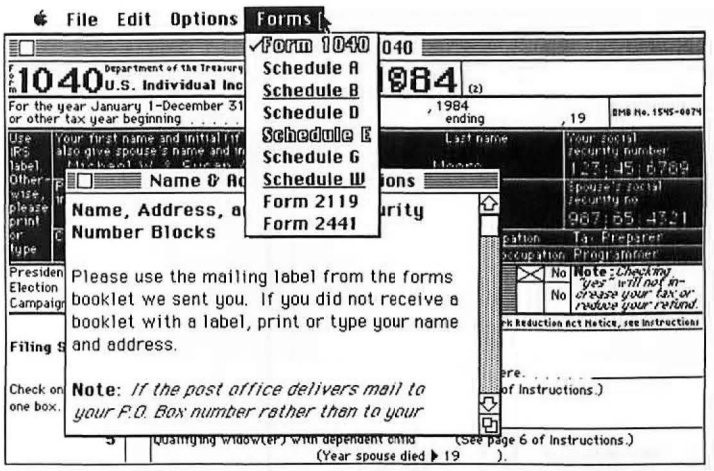
■ *Scientific Software*

2 Sequoia Tree Ln.
Irvine, CA 92715
714/786-8366

PersonalAid
Three programs that require Microsoft BASIC. FileAid is a file management program that can handle up to 15 fields. FileAid provides editing capabilities and data manipulation utilities such as search, sort, arithmetic operations on numeric fields, and tabular display and printing. WriteAid is a line editor suitable for letters and memos. FileAid files can be merged with WriteAid documents. DeskAid is a desk accessory that includes a phone book, a to-do list, a notebook, and an appointment book. List price: $34.95.



Make Millions, Scarborough Systems



MacInTax, SoftWeave Company

■ *SoftWeave Company*

400 Mobil Ave.
Bldg. D, Ste. C
Camarillo, CA 93010
805/388-2626

MacInTax
A federal income tax program for individuals. You use the mouse to move to the appropriate sections of the displayed form, then enter information. Calculations are performed automatically. *MacInTax* includes the complete IRS instruction book on disk; double-clicking an item gives you access to the instructions and worksheet for that item. Information can be printed on a standard IRS form, or the program's form, including your calculations, can be printed on a blank sheet of paper. List price: approximately $75.

■ *Textco*

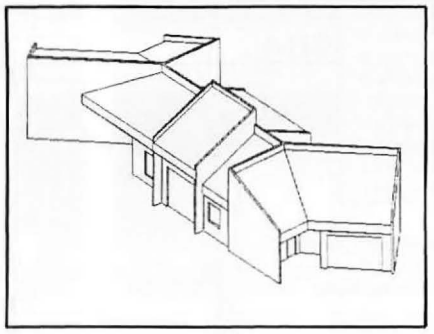
27 Gilson Rd.
West Lebanon, NH 03784
603/643-4267

DNA Inspector
A set of Microsoft BASIC programs for analyzing genes. The programs provide a rapid means of analyzing the structure of genes and manipulating different DNAs or DNA fragments. *DNA Inspector* allows recombinant DNA experiments to be designed with the computer before they are attempted in the lab. The programs can perform complete restriction enzyme and base composition analyses and can search for specific sequences, palindromes, or possible protein coding regions. Different genes or DNA fragments can be joined to produce recombinant DNAs that can be analyzed further. The package includes the DNA sequence of several recombinant DNA vectors. List price: $109.

■ *Videx, Inc.*

1105 N.E. Circle Blvd.
Corvallis, OR 97330
503/758-0521

Mac Vegas
A disk containing seven casino games: Baccarat, Blackjack, Craps, Keno, Poker, Roulette, and Slots. Players can choose house rules from among four casinos that offer variations in betting limits and odds. The games feature animation and sound, and you use the mouse to drag chips into position. The package includes an instruction manual and a book on casino gambling. List price: $59.



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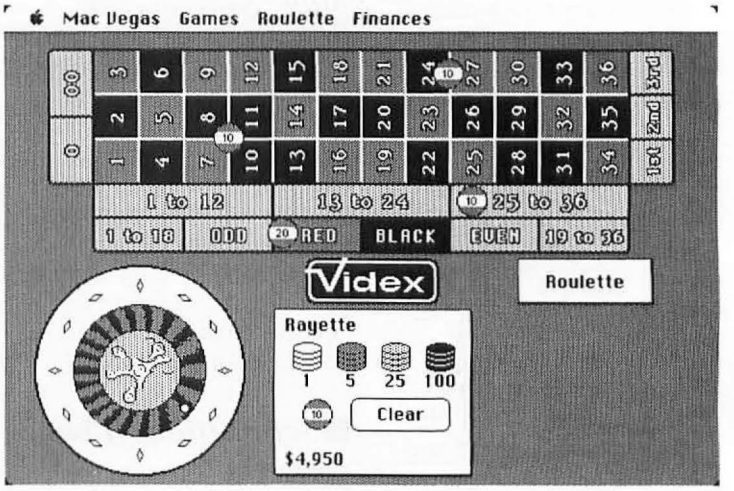

Mac Vegas, Videx

■ *Zeta Gen Software*

320 Corbett Ave.
San Francisco, CA 94114
415/864-4127

Screengen
A set of Microsoft BASIC programs that allow you to build formatted screens for your own applications. The programs allow you to enter text, select one item from a group, and toggle an option on and off. After you have designed your screen, a BASIC source file is written to disk; the file contains the code to display and capture entered data and to return it to your BASIC program. List price: protected code $39, full source code $99.

Hardware

■ *New Image Technology, Inc.*

10300 Greenbelt Rd.
Seabrook, MD 20706
301/464-3100

Magic
A camera interface that enables you to connect a black-and-white or color television camera to the Macintosh. Images captured by Magic can fill an entire screen (512 by 342 dots). Features include a fast-focus mode (five frames per second), a mouse-driven camera interface, a connector for real-time monitoring of incoming video signals, and the ability to stretch or scale incoming pictures. The program allows you to enter *MacPaint* directly, without returning to the desktop. A black-and-white television camera with a 16mm f/1.6 lens and a C-mount adapter for 35mm lenses is available. List price: interface, software, cables, and camera $495; without camera $350.

■ *Qubie'*

4809 Calle Alto
Camarillo, CA 93010
805/987-9741

212A/1200E External Modem
A 300/1200-baud modem that is compatible with Bell 103/212A standards and features auto-answer and auto-dial. The modem sends and receives information automatically with software such as *MacTerminal* or

Crosstalk. The 212A/1200E includes a user guide, a modular phone cable, and a Macintosh interface cable. List price: $329.

Accessories

■ *Alpenlite*

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Disklite Cases
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■ *Channel Productions*

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Computer Graphics Color Packet
A package containing eight 6-by 9-inch self-adhesive sheets of different colors. You can use these transparent film sheets to add color to charts, graphs, and *MacPaint* artwork. Slides of the color graphics can be used in presentations. The package includes a graphics blade for cutting the film sheets. List price: $15.

■ *Diablo Valley Design*

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MacGrid
An on-disk tutorial on using a grid system to transfer drawings or photos to the Macintosh screen. The grid enables you to maintain the proportions of the original artwork in *MacPaint*'s full 8- by 10-inch drawing area. The package includes a grid on a clear plastic overlay, which you recreate on the Mac's screen. The training disk provides tips for working with *MacPaint* and suggestions for creating ad layouts. List price: $39.95.

■ *Ferro Enterprises*

P.O. Box 2151
La Jolla, CA 92038
619/456-2213

Paper Saver
A device that stops tractor-feed paper from curling into the Imagewriter's single-sheet slot and jamming the printer. The plastic Paper Saver slips into the printer's single-sheet slot and can be lifted out when you are printing on individual sheets. List price: $6, wide-carriage model $8.

Paper Saver, Ferro Enterprises

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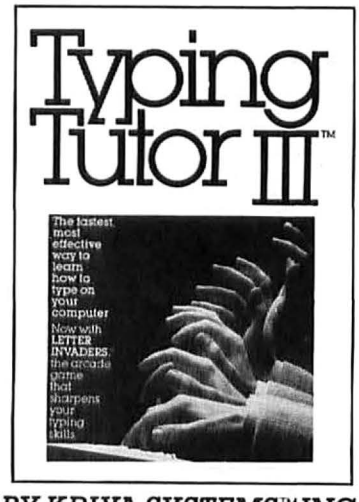

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■ *The Reference Corporation*

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Iron-On Transfer Ribbon
A black ribbon that enables you to make iron-on transfers from *MacPaint* drawings. You insert the ribbon into the Imagewriter in place of its normal ribbon and print your design onto a sheet of paper. You then place the paper face-down on a T-shirt or other article of clothing and apply a hot iron. List price: $17.50 plus $3 shipping and handling.

■ *Sharp Color*

400 N. High St., Box 175
Columbus, OH 43215
614/221-0502

Iron-On Transfer Ribbon
A black ribbon cartridge that enables you to make iron-on transfers from *MacPaint* documents. You insert the cartridge in the Imagewriter, print your drawing on a sheet of paper, and apply a hot iron to the back of the paper to transfer the image to a T-shirt. List price: $18.

Notes

■ *AppleTalk*

Apple's network, which has been referred to as AppleBus for several months, has been renamed the AppleTalk Personal Network. Each device in a network requires an AppleTalk cable connector set, which retails for $50.

■ *Do-It-Yourself Upgrade*

MassTech Development Labs is selling a 512K conversion kit for the Macintosh. The kit includes an instruction manual, a Memex-512 PC board with 16 IC sockets, a tool for removing the Mac's cover, a memory test program, and a RAM disk. You must desolder the Mac's 128K chips and solder in the new chips, which voids your warranty. The basic kit, without 256K chips, sells for $49.95 (plus $3.50 shipping and handling); the kit with 16 256K chips sells for $599.95 (plus $5.50 shipping and handling). For more information, contact MassTech Development Labs, 451 Boston Rd., Groton, MA 01450, 617/448-3450.

■ *Correction*

The price for Peachtree Software's *Back to Basics* accounting package was listed incorrectly in the November issue's *Macware News*. The General Ledger module, which is available now, sells for $175. Accounts Payable and Accounts Receivable will be available in the first quarter of 1985; at that time the three modules will be sold as a single package (owners of General Ledger will be able to upgrade their packages). The price for the three-program package was unavailable at press time. For information on prices and availability, contact Peachtree Software, 3445 Peachtree Rd. NE, Atlanta, GA 30326, 800/554-8900.

Macware News *uses information provided by manufacturers; it does not evaluate products or corroborate manufacturers' claims. Send a description and a photograph of your new product to* Macware News, Macworld, *555 De Haro St., San Francisco, CA 94107, 415/861-3861.* □

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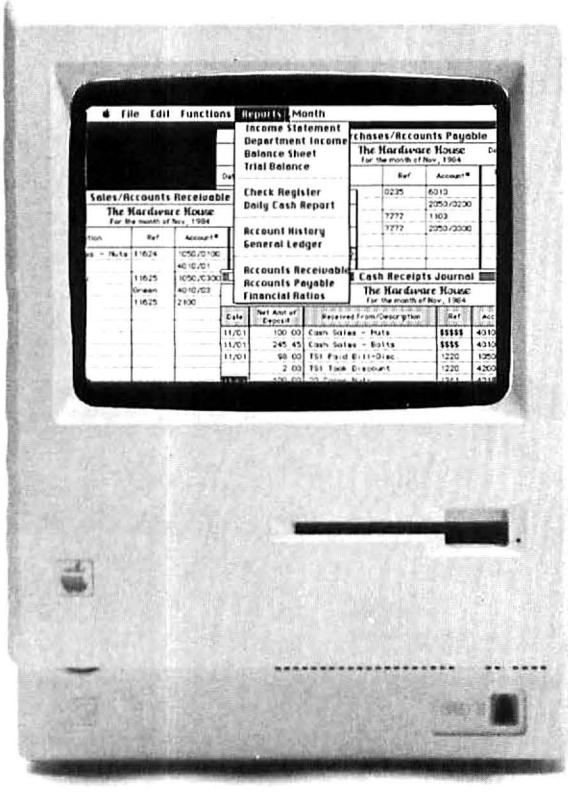

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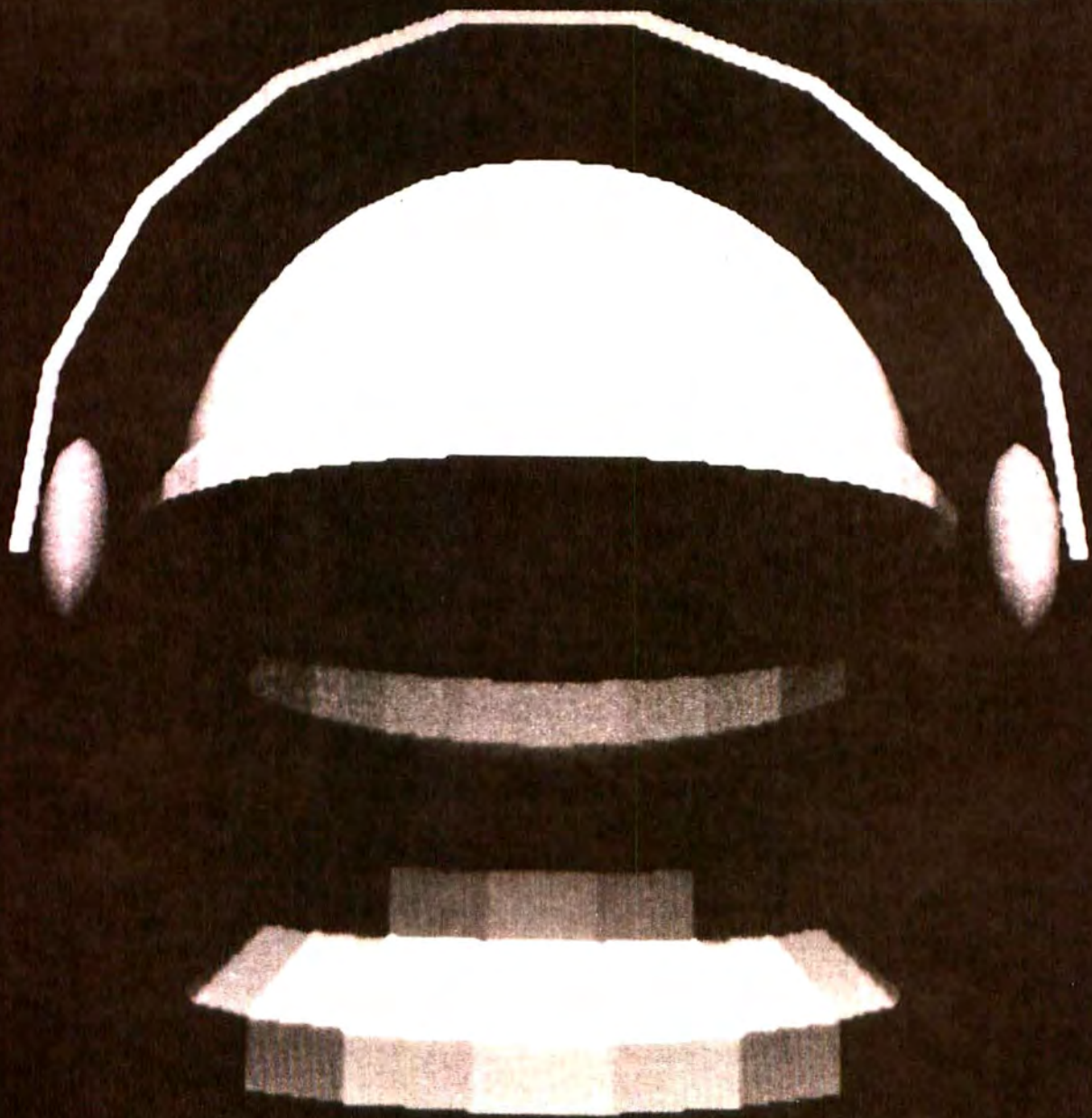

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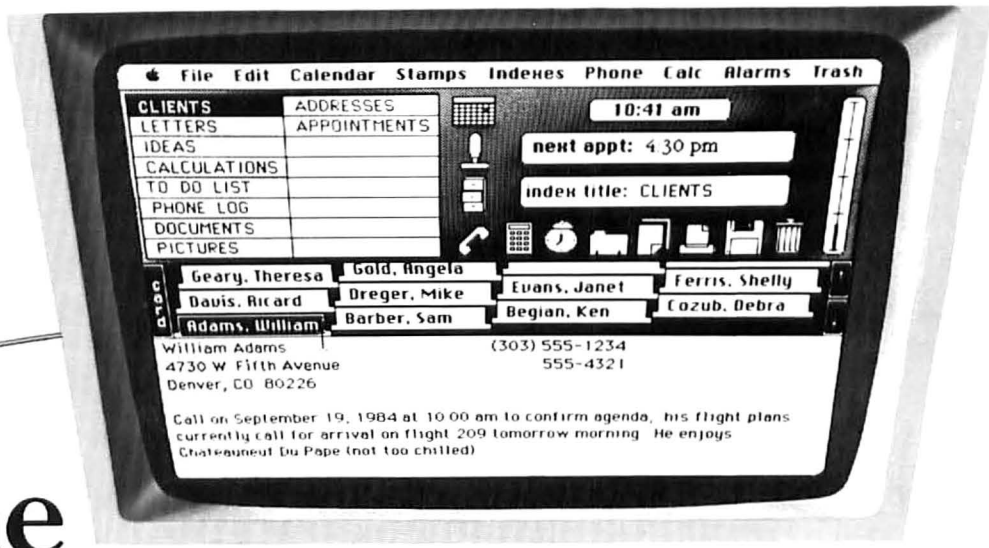

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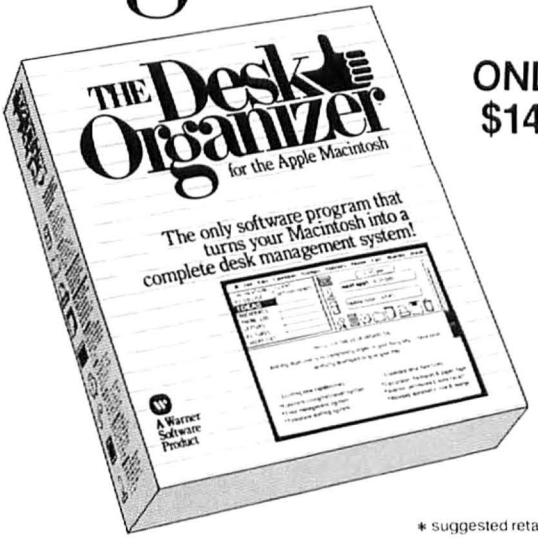

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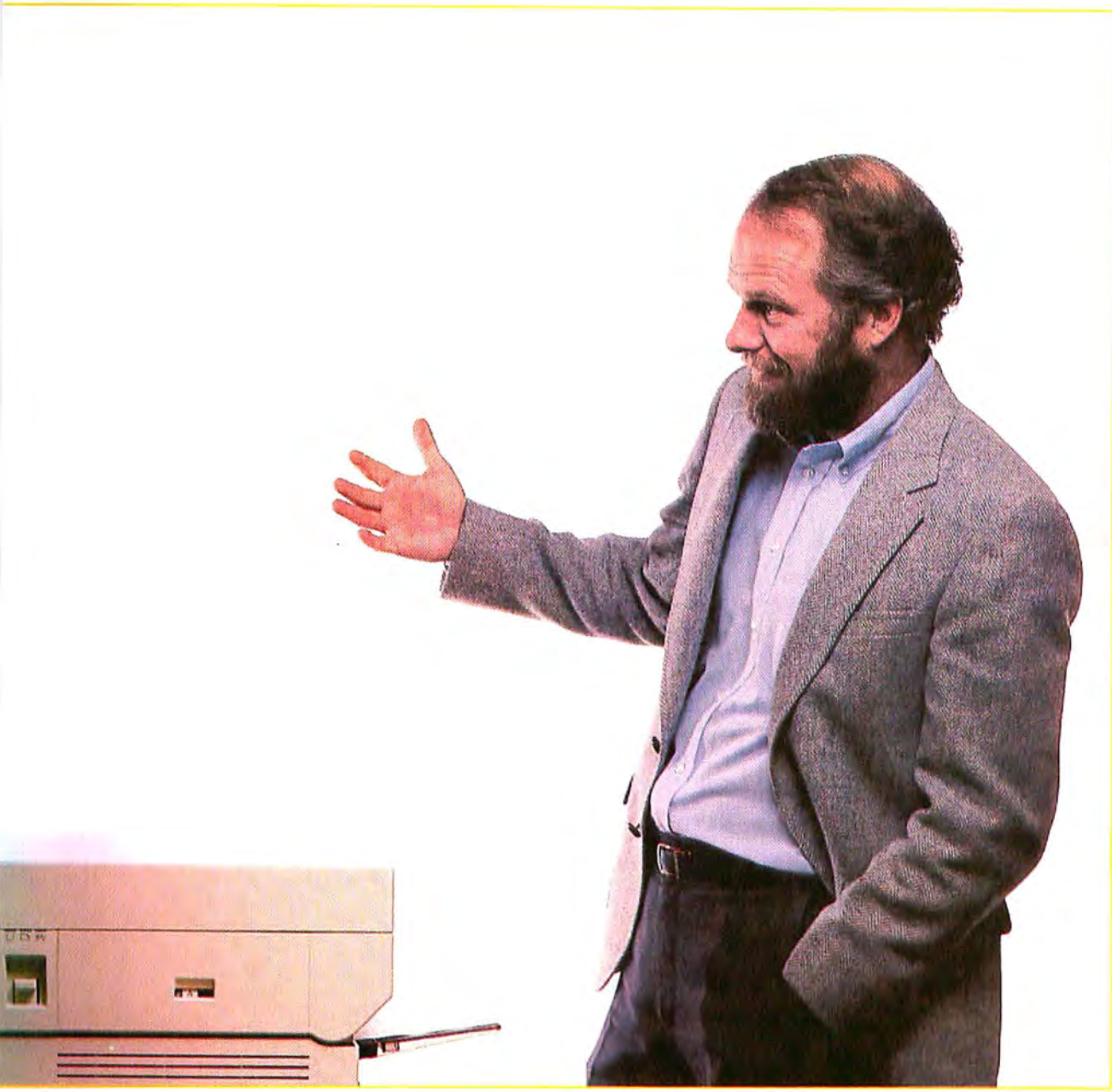
The Language that Talks to Your Printer

Richard Sprague

Typesetting the printed page is an art form requiring as much skill and attention to detail as fine sculpture or classical painting. Even the untrained eye can probably tell the difference between a poor printing job and a professional one. Compare, for example, the fine lettering and page layout of an entry in the *Encyclopaedia Britannica* with the look of your local newspaper. The structure of the encyclopedia page seems more refined.

Producing printed output of near-professional typeset quality has been a problem on printers used with personal computers. Apple's Imagewriter printer, for instance, can reproduce the fonts and graphic images you see on the Macintosh screen in almost perfect detail, but the bit-mapped fonts are still of lower quality than that required for most business and professional applications. The problem of



Producing professional-looking text and graphics on the LaserWriter is possible due to a unique programming language called PostScript developed by Adobe Systems in Palo Alto, California. Created by John Warnock (right) and Charles Geschke (left), PostScript is especially adept at describing the appearance of pages in documents. The language specifies graphics and character shapes (fonts), their orientation, and their placement on the page. It also describes graphics shapes (lines and areas) and specifies their position, scale, and orientation. Several companies, including Apple Computer, have adopted PostScript as the standard printing protocol for producing high-resolution output.

Producing high-quality output with the LaserWriter involves an ingenious language called PostScript developed by Adobe Systems of Palo Alto, California. Adobe is licensing PostScript as an interpreter to companies like Apple and Quality Micro Systems (QMS), which are developing printer devices. As a language, PostScript has been adapted as the standard printing protocol for producing high-resolution output by Apple as well as by companies such as Microsoft and Lotus Development Corporation (see "The PostScript Horizon" for a look into PostScript's future).

The Adobe Approach

The geometric algorithms required to rotate and scale graphics and text images have been used for many years by programmers working on graphics simulation programs.

PostScript is a full-scale programming language with graphics capabilities that make it ideal for drawing fonts and graphics.

Adobe's president, John Warnock, originated the idea for PostScript over six years ago and continued to develop it while he worked at Xerox Corporation and Evans and Sutherland, a graphics simulation company. Evans and Sutherland has long used high-speed computers and complex mathematical algorithms to produce the realistic simulation programs used by aerospace companies for training pilots.

Other computer scientists have been developing sophisticated word processing systems for designing fonts and typesetting pages of text. At Stanford University Donald E. Knuth designed a system named TEX that is used for typesetting books. Knuth's system provides ways to design fonts with a mathematical language called Metafont. Unfortunately, TEX and similar typesetting systems are extremely complicated and require a great deal of time to learn before they can be used effectively.

Teaming up with Charles Geschke, an expert in programming environments, and other people with extensive backgrounds in computer graphics, Warnock founded Adobe Systems to continue the development and application of the PostScript concept. Warnock and his colleagues realized that many typesetting programs were genuine languages, but with programming capabilities that were constrained to handle text only.

Many word processing programs, for example, have ways to set variables, do looping, and define macros (sequences of instructions that may be used repeatedly in a program). Most typesetting programs limit the macros you can define or allow only a fixed number of variables. The process of preparing pages for printing is divided into rigidly defined modes for lines, sentences, or paragraphs. These constraints on the languages made them difficult to use. PostScript is different from other typesetting languages: it is a full-scale programming language with graphics capabilities that make it ideal for drawing fonts and graphics.

Another problem in producing high-quality printing is that almost all printers have incompatible ways of displaying text and graphics. Most personal computer programs get around the incompatibility problem by saving documents in "print files," which are independent of the printer connected to the computer. The output is produced with the aid of a program designed to read the print file for the particular printer in use. Most applications use a *static* print file format, a sequence of fixed operators (printer control codes that determine paper motion and the placement of characters), followed by the actual data to be printed.

With PostScript, Warnock and his associates decided to use a *dynamic* print file format to make their language overcome the incompatibility problem. A dynamic format has procedures and variables that are executed by an interpreter built into a printer such as the LaserWriter. As the terms suggest, a dynamic print file is a more flexible format than a static print file. As a result, complex page images of both text and graphics can be printed more easily.

The Revolution in PostScript

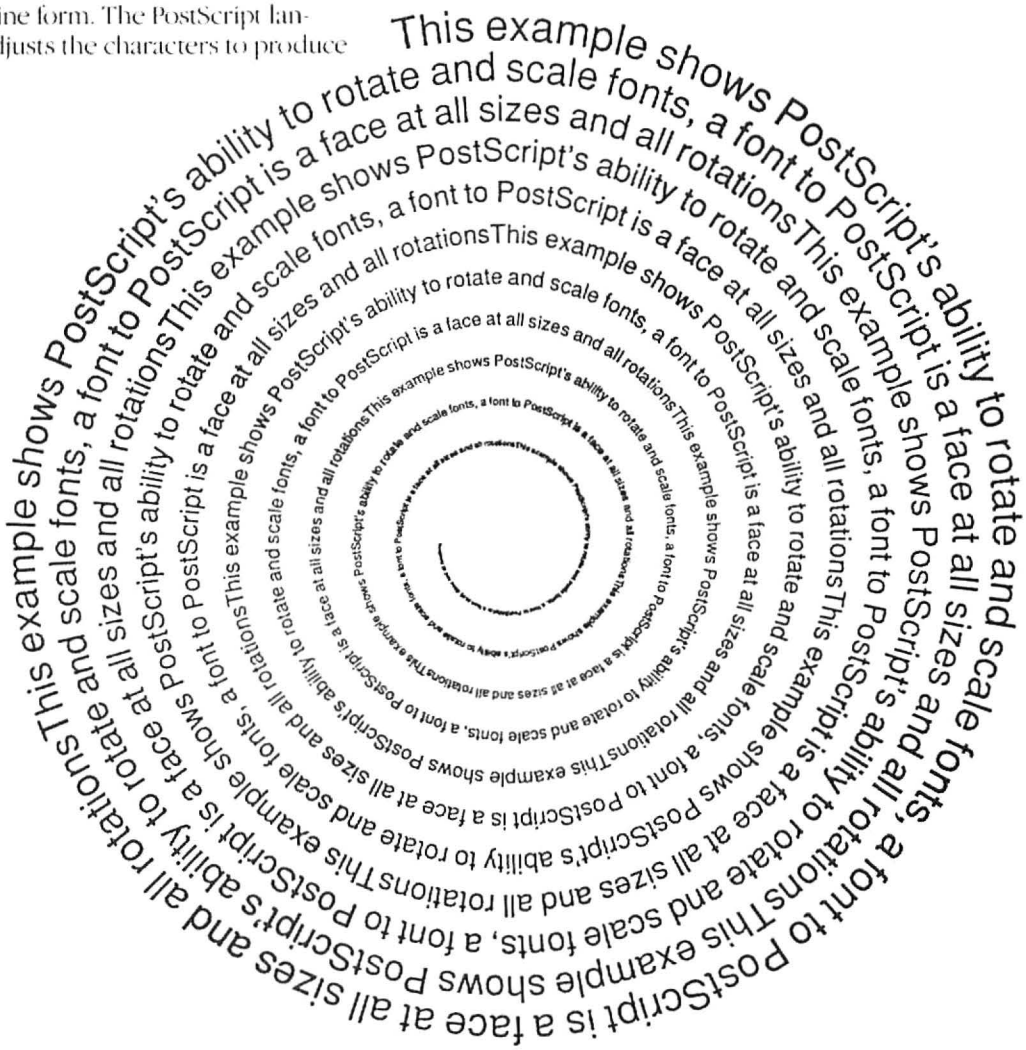
The beautiful artwork involved in creating a fine font is impressive when you consider that the traditional way of designing fonts requires that a new set of characters be created for each size and style (such as boldface or italic) of the font. If there are 100 characters in a font and you need three sizes, a total of 300 different characters must be crafted. A complete boldface set for the font requires another 300 characters—a total of 600 individual characters for one typeface in three sizes and two styles.

Most laser printers use this traditional method of designing fonts when printing text. Separate fonts must be created for a specific face, size, and rotation (such as 12-point Times Roman italic or 14-point Helvetica). Also, each character in a font is tuned, or optimized, for the printer's resolution. This method of building and tuning fonts is time-consuming, and the fonts require a substantial amount of memory for storage. Another drawback is that fonts cannot be scaled or rotated. Also, because the fonts are resolution-dependent (tuned for a particular printer's resolution), they become obsolete as technology improves to allow for higher-resolution printing.

PostScript revolutionizes the font creation process by having font characteristics represented geometrically only once in the computer. The LaserWriter's memory, for example, contains the Helvetica typeface—not the actual characters, but the attributes of the typeface in outline form. The PostScript language automatically adjusts the characters to produce them in different sizes and rotations at any resolution. Fonts can be assembled in an infinite number of ways—all perfect and completely unique to the application for which they are created.

The concentric ring of words in the figure "Infinity Circle," for example, is composed of carefully set Helvetica characters. Such a high-quality job without PostScript would cost a master typesetter many months of labor, as he or she carefully tuned each character to fit perfectly into its space on the page while still retaining its unique features.

PostScript makes creating a font image easy because the language treats character information the same way that it treats graphics information—as tiny lines or curves on the page. PostScript's font set is composed of 151 glyphs (shapes such as an *A* or a


This example shows PostScript's ability to rotate and scale fonts, a font to PostScript is a face at all sizes and all rotationsThis

comma) that allow for the creation of more than 250 characters. An object, such as a page of text, can be represented in different sizes, styles, or positions, but the essential characteristics of the object remain the same. Unlike *MacPaint,* which treats objects in terms of their individual bits on the screen, PostScript, like *MacDraw,* treats objects as structured shapes in relative locations. For example, instead of describing a particular Helvetica *T* as an object whose stem is 10 dots high topped by a crossbar 8 dots wide, PostScript captures the essentials of the Helvetica *T* by describing an object whose stem is topped by a crossbar that is 20 percent shorter. By storing font information in terms of outlines, rather than individual dots, PostScript is able

Like FORTH, PostScript is an extensible, interactive programming language in which you can build and test parts of a program.

to reproduce characters in any size or rotation by geometrically transforming the outlines. The page description features of PostScript make it ideal for "imaging" pages consisting of text, line graphics, and filled area graphics, as well as pages that contain photographic images. In fact, PostScript can define any page, no matter how complex.

Inside PostScript

PostScript is powerful because it is a true Turing-equivalent programming language, capable of many more kinds of operations than graphics output. To computer scientists, Turing equivalence means a mathematical description of the most powerful class of functions and languages known. Put more simply, a Turing-equivalent language is capable of computing any function or expression that can be computed at all. It would be possible (and actually not at all difficult), for example, to write a Pascal compiler or LISP interpreter in PostScript.

The name *PostScript* is partly a play on words–a reference to the language's use of postfix notation for passing arguments and data from one procedure to the next by means of a stack. This design is similar to FORTH, and in fact PostScript is a fairly close cousin to MacFORTH. If you're already familiar with FORTH, you'll get used to PostScript in no time at all.

Like FORTH, PostScript is an extensible, interactive programming language in which you can build and test parts of a program, step by step and in progressively larger segments, until you have a truly sophisticated system. The major difference between the two languages is that PostScript's syntax is more friendly than FORTH's. Since FORTH programs are meant to be run repeatedly, the language does everything necessary to make programs compact and efficient, even if the programmer has to do a little extra work learning the syntax. PostScript programs, on the other hand, typically run only once–to produce a final laser-printed copy of a page–so the compactness of the syntax is not a primary concern. Thus, PostScript's syntax is less obtuse and easier to read. The extra friendliness comes at only a slight cost in speed: PostScript's designers estimate that programs in the language run at a respectable one-fifth of the speed of a super-efficient C-compiled program.

PostScript contains an extensive array of built-in commands, or *operators.* The language has a full set of mathematical functions, including random numbers and trigonometric functions. A complete set of string-handling operations is available, with searching and stripping functions. The many file input/output operators make PostScript a hospitable programming environment even before you get to the graphics parts of the language. PostScript's graphics operators are divided into five major groups:

- *System control operators.* This group manipulates the Graphics State, a data structure maintained by the PostScript interpreter that holds the current graphics control parameters. These operators provide an effective way of switching between contexts defined by the other groups of graphics operators.
- *Coordinate system operators.* The Graphics State has a transformation matrix that maps coordinates that you specify into coordinates suited to the printer or other device in use. This group of operators manipulates the matrix to allow for translation, rotation, and scaling of the graphics coordinates into the printer device coordinates.
- *Path construction operators.* PostScript maintains a *current path* data structure for defining shapes and line trajectories for output. Paths represent two images: geometric outlines of areas to be filled with an image or a color, and trajectories along which lines

(continues on page 112)

The PostScript Horizon

Lisa B. Stahr

While the LaserWriter may be the state of the art in personal computer printers, it is PostScript that gives it that distinction. In time many printers will likely contain PostScript in their memories. The majority of Macintosh software, such as *MacWrite, MacPaint, Microsoft Chart, Multiplan,* and *pfs:file,* already take advantage of the LaserWriter's capabilities.

Bill McGee, product manager for the Macintosh version of *Microsoft Word,* says, "If we are to be the serious word processor for business, we need to be compatible with the LaserWriter."

In time major application programs designed for personal computers other than the Mac will make use of PostScript's power, using printers like the LaserWriter. A flurry of new programs written specifically for PostScript-equipped computers can be expected in the next year. Most of these programs will make document creation easier for novices than it is now, and they will include features that allow Mac owners to design their own stationery or to lay out pages for typesetting output.

PostScript has had a profound effect on the printing industry as well. Already some of the best-known manufacturers of printers and copiers are working on their own PostScript-equipped printers. These new printers will be faster and more dependable and will have higher resolution than the LaserWriter. Most will also take advantage of PostScript features that the LaserWriter does not, such as color printing and the ability to produce fonts as small as 1 point (the LaserWriter has a practical lower limit of 4 points). Of course these printers may cost substantially more than the LaserWriter.

One feature that PostScript-equipped printers will have is the ability to download fonts into the printer's memory. Adobe Systems plans to make the complete line of fonts from Mergenthaler, the world's oldest and largest typeface company, available to printers equipped with PostScript.

PostScript will affect typesetting as a trade. Because the language works with a phototypesetting machine as easily as it does with a printer, PostScript files, such as book manuscripts, can be generated on any personal computer and sent directly to a typesetting system. Some people think that the need for phototypesetting services will diminish as high-resolution, PostScript-equipped printers are introduced. Others believe that typesetters will become more specialized than they are today. Even the laser printers of tomorrow won't have the high-quality, 2500- to 5000-dots-per-inch resolution that phototypesetting machines already have. Likewise, although printers can spew out as many copies as needed, they will never be able to produce as fast as typesetting equipment can. In any case, PostScript will most likely become the de facto standard language for generating printed output from personal computers to all kinds of printer devices.

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(continued from page 110)

may be drawn. These operators can begin a new path or close the current path, and add straight line segments, circular arcs, and cubic curves to the current path.

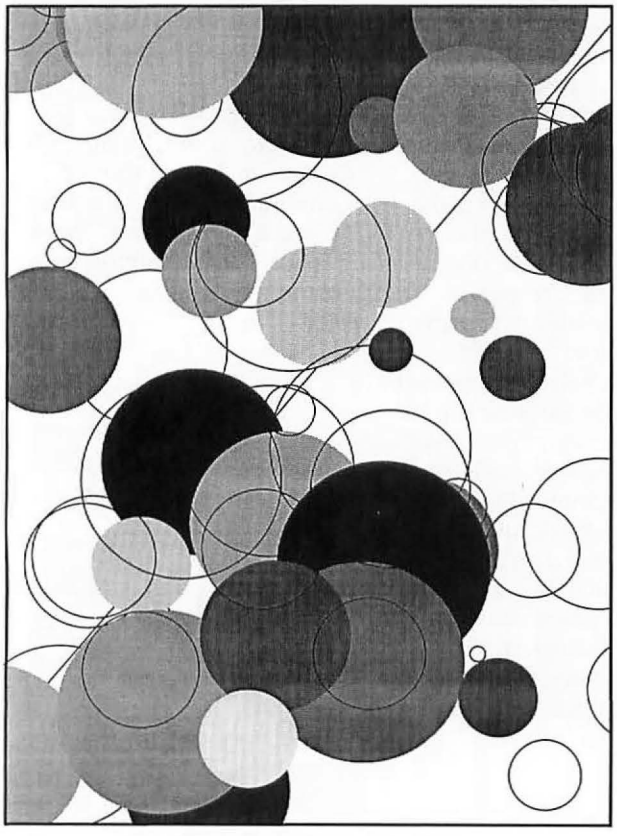
- *Color, shading, and image operators.* PostScript programs have the ability to use different color models to specify color and halftone screens. These operators define the contents of specific areas for output.
- *Output operators.* After a path is constructed and the parameters such as colors, images, character fonts, and line widths are set, these operators define the limits of the output area and produce output on a printer device.

Drawing with PostScript

The high-level graphics output operators make it very easy to draw lines and arcs, and they let you rotate, duplicate, or fill areas conveniently. The short program "Bubble Graphics" draws a random bubble-like pattern on a page. The program was written on a VAX minicomputer and downloaded directly to the LaserWriter. PostScript allows you to write programs on any computer that generates ASCII text. You could even write PostScript programs on the Mac, using *MacTerminal* to communicate directly with a PostScript-equipped printer.

To create a procedure, you first quote its name, using the / operator followed by the characters making up the name. You enclose the procedure in braces. With these two elements on the PostScript operand stack, executing the word **def** creates an entry in the dictionary that matches the *key,* or name of the procedure, with its *value,* the body of the procedure. Whenever the PostScript interpreter sees the key, it executes the associated procedure, which may be itself built from a sequence of keys or procedure definitions.

In the "Bubble Graphics" example, the word **circle** is defined to draw a circle with a radius and an *x-y* coordinate position taken from the top two elements of the stack. The definition depends on the word **arc**, which is a path construction operator that draws a counterclockwise arc with a given radius and a beginning and ending angle. The graphics output operator **stroke** tells PostScript that an independent section of a drawing is complete. PostScript then enters the section into a table of positions to be printed when the final output is ready.



Laser Bubbles
The abstract bubble designs were drawn by the "Bubble Graphics" program. The position, size, and color of each bubble were determined randomly and printed like a collage by the LaserWriter. Because PostScript treats information in terms of shapes and proportions, you could also produce randomly generated collections of perfectly formed characters.

```
/rot
 { 3 -1 roll
 } def



/genRand  % returns a random number between 0 and 1
   { rand    % returns 0 < rand < 1
     100 mod
     100 div
   } def


% returns a random (x,y) value on the page
/randPoint
  { 612 genRand mul
    792 genRand mul
  } def


% makes the bubble pattern by randomly drawing circles
% throughout the page
/bubble
  { 0 0 moveto
    70 { placeCircle } repeat
  } def



% draws a circle with the given radius at the (x,y) position
% ( radius, (x,y)-center )
/circle
  { rot
    0 360 arc

    genRand 0.5 gt          % randomly decides whether
    {genRand setgray        % to fill in the circle or not.
       fill
       0 setgray
    } if

    stroke
  } def


% place a circle somewhere on the page.
% It decides randomly how big the circle will be.
/placeCircle
  { 100 genRand mul
    randPoint circle



  } def

0 0 moveto
bubble
showpage
```

Bubble Graphics

This random bubble design program illustrates many of the important concepts behind PostScript programming. You precede a quoted name for an object with a slash, for example, **/rot**, *the first procedure defined in this listing. Next create a procedure object by enclosing a sequence of commands in braces, and then associate the quoted name with the procedure object by executing* **def**. *Once the procedure has been defined, it can be used in the same context as any of the operators in the language. Important operators in this example are defined as follows:* **moveto** *instructs the PostScript pen to move to an x-y position on the page;* **arc** *gives the instructions to draw a complete circle;* **setgray** *determines how much gray to give a circle; and* **stroke** *tells PostScript that a complete shape description has been entered. The* **%** *character is used to begin a comment and tells the interpreter to ignore information that follows on that line.*

Logo Rotate

Two important procedures in the program rotate the Times Roman characters shown in the "Laser Logo" figure. The main procedure, **logorot**, *is actually built out of other procedures defined previously. The lesser procedures,* **logosetup** *and* **rotationloop**, *are called by* **logorot** *to perform the actual rotation. Note how* **rotangle**, **rotoffset**, *and* **graylevel** *are used the way variables are in most other languages; their quoted names are associated with numbers instead of procedure objects enclosed in braces. The values are changed during the* **rotationloop** *procedure as the program adjusts the font characteristics during each loop. The rotation of the characters is done by the PostScript operator* **rotate**, *which rotates the entire page by the angle given at the top of the stack.*

```
/Q {7.2 mul} def


/rotangle 90 def
/rotoffset 22.5 def
/graylevel .9 def


/logosetup
  {(Times-BoldItalic) findfont
   [110 0 0 110 0 0] makefont setfont
  } def

/point {0 0 moveto} def          % start point for show


/rotationloop
   {gsave
    point
    rotangle rotate  % rotate the whole page by rotangle
    graylevel setgray
    (Rosebud) show

   /rotangle rotangle              % change the rotation angle
       rotoffset sub def           % for the next time through
                                   % the loop

   /graylevel graylevel            % make it a little darker
       .15 sub def                 % next time
   grestore} def


/logorot
        {gsave
                20 Q  30 Q  translate  % move user origin to (20,30)
                logosetup

                0.75 0.75 scale      % scale everything a little smaller

                5 {rotationloop} repeat

                grestore} def


logorot
showpage
```

Other operators like **rand**, which generates a random number, and **fill**, which fills the contents of a closed section, complete the definition of the procedures. The procedures can then be interactively executed. To send the drawing to the printer, you use the **moveto** path construction operator to give coordinates to PostScript. Then you run the "Bubble Graphics" program, and finally you use the **showpage** graphics output operator to finish the page and eject it from the printer. The output from one run of "Bubble Graphics" is shown in the figure "Laser Bubbles."

Another short program, "Logo Rotate," uses PostScript's text design operators. The figure "Laser Logo" shows the output of the program. The main procedure, **logorot**, is built from calls to other procedures defined previously. The procedure first calls **logosetup**, which initializes the font to be Times Roman bold italic and changes the characteristics of the font to fit correctly on the page. The **repeat** command calls another procedure, **rotationloop**, five times to produce the fanning effect of the logo rotation. In the **rotationloop** procedure the PostScript operator **rotate** tells the printer to rotate the page by the angle stored in the variable, **rotangle**. The amount of shading is stored in the variable **graylevel** and is set by the **setgray** operator before the words are "imaged" by the **show** command. Then the variables are decremented to show the values they will hold the next time through the loop.

These simple examples show the potential for printing text and graphics with a PostScript-equipped computer. Unfortunately, Adobe has no immediate plans to market PostScript as a consumer programming language to compete with Pascal, BASIC, and FORTH, so Mac owners may not have the opportunity to discover the extent of the power built into Apple's LaserWriter. □

Laser Logo
All the characters in this rotating sequence are perfectly formed Times Roman font, set at the angle appropriate for the rotation but which retain the essential features of the font. Test versions had slightly different sizes and angles of rotation. This kind of trial-and-error testing can be done in a few minutes with PostScript. Such testing might take a professional typesetter an afternoon or more.

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ *Richard Sprague is a freelance writer and programmer who studies formal linguistics at Stanford University. He also works at Stanford's Center for the Study of Language and Information.*

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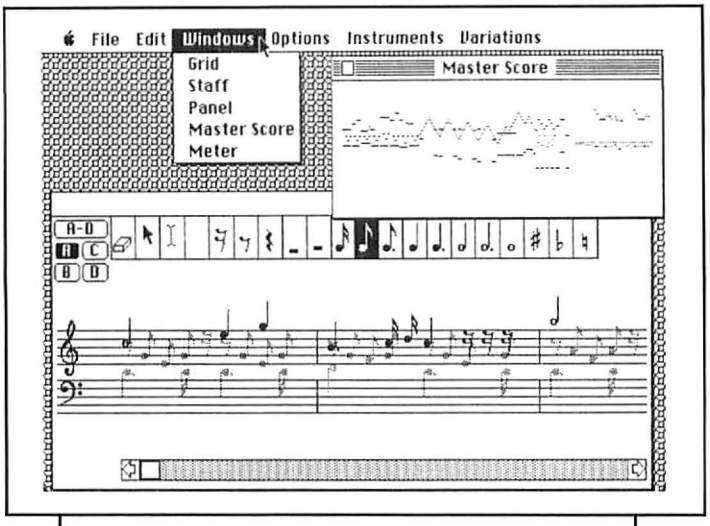

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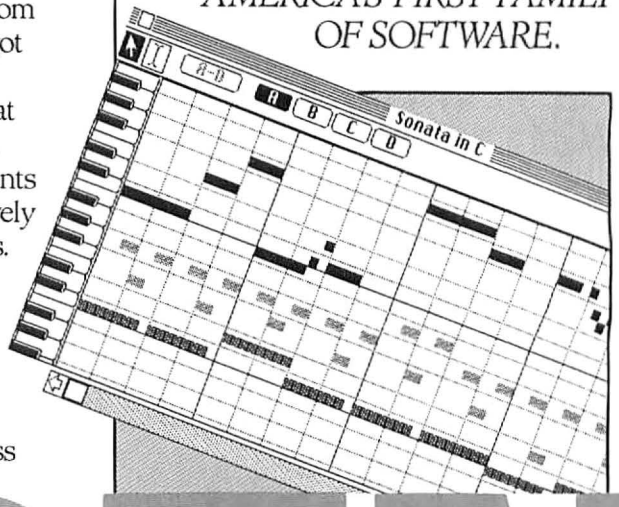

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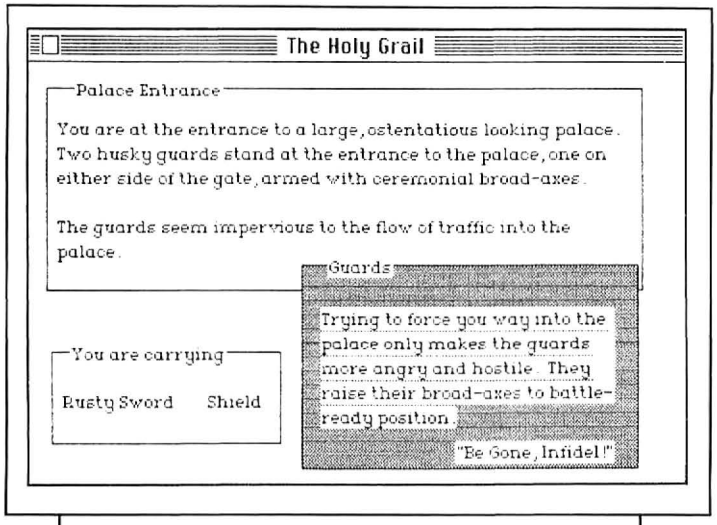

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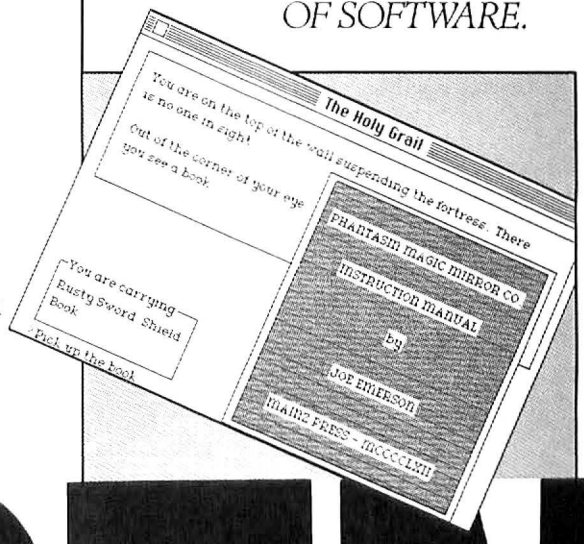

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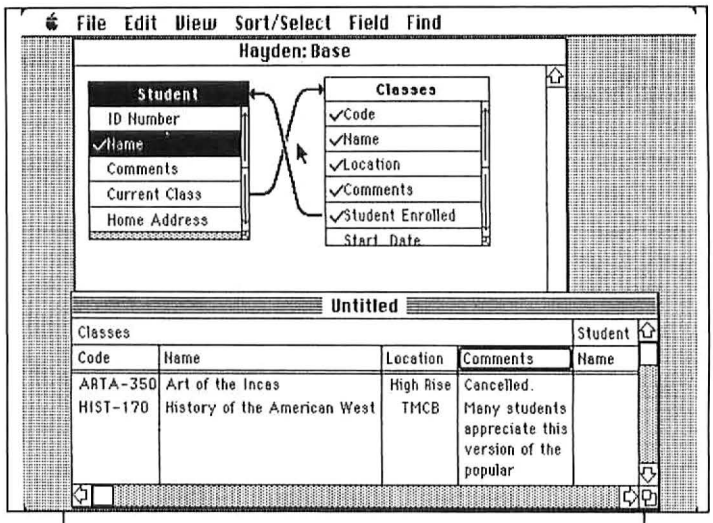

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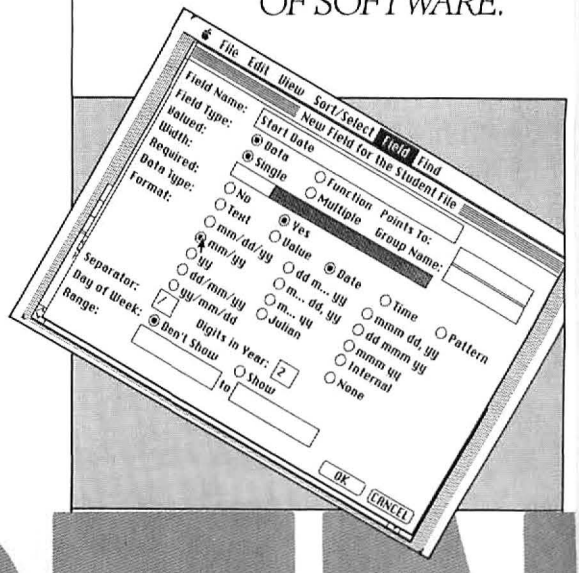

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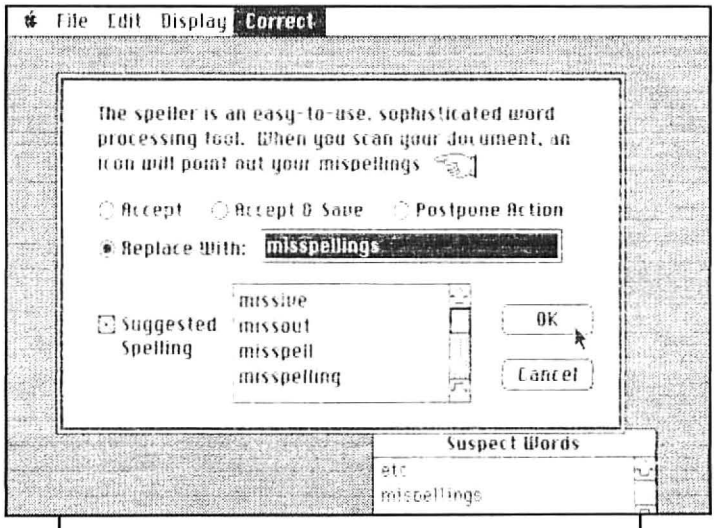

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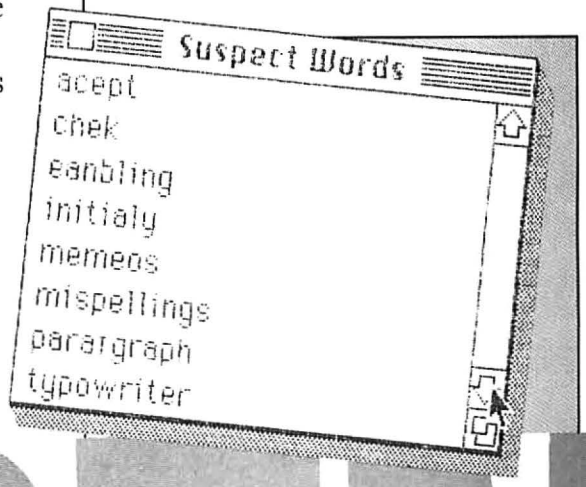

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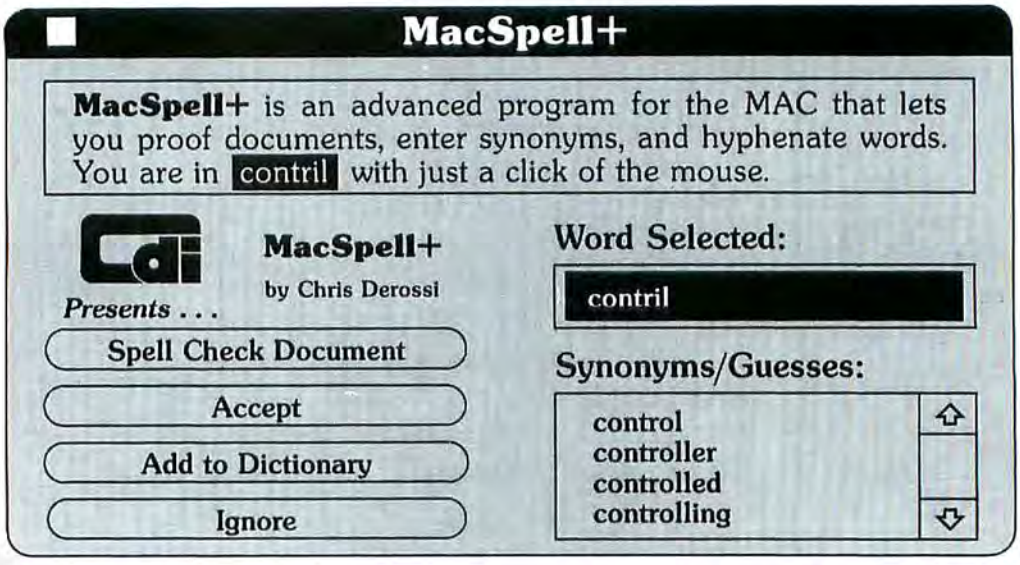

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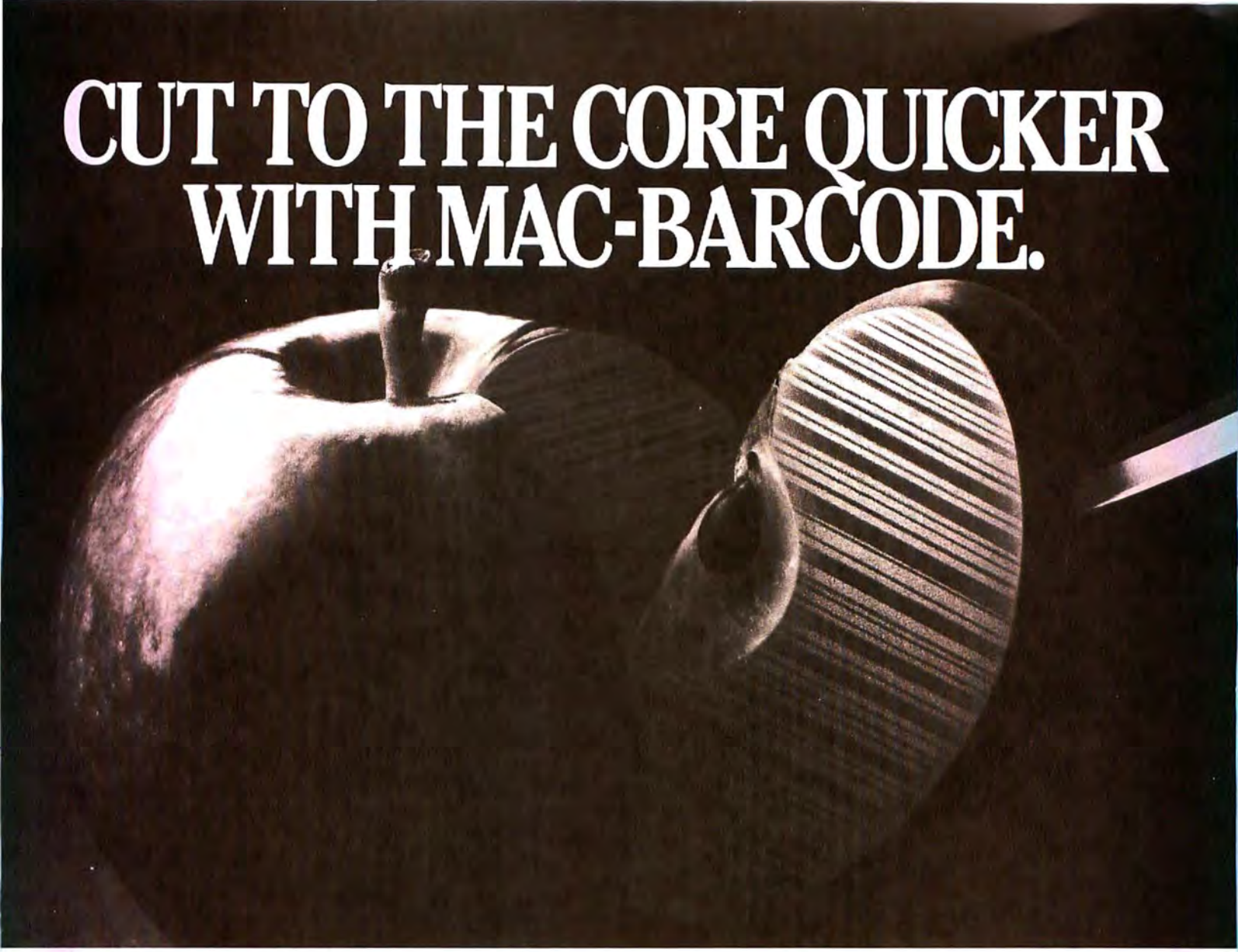

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The Elements of Graphic Design

Edited by Bill Grout

For the many people who are bashful about their drawing skills, the Macintosh is a small miracle, coaxing art out of uncertain hands and reluctant hearts. Fascinated by programs like MacPaint *and* MacDraw, *nonartists are being enticed into producing designs and illustrations. If you're one of the hesitant many, however, you might feel uncomfortable about producing artwork. You know there's more to it than holding a gaging thumb up to the screen, but you're not sure how to start.*

To help overcome your hesitation, Marjorie Spiegelman, the designer of *Macworld* and *PC World* magazines, offers some guidelines for creating graphic designs with the Mac. A designer for 14 years, Spiegelman has taught design at the University of California at Berkeley.

If you're unfamiliar with graphic design, you might puzzle over what to include in your designs. Real-life objects and information may present an overwhelming number of details. Not knowing where to start can easily block the design process. Instead of waiting for inspiration, start by analyzing the information that must be presented. Such an analysis of content will usually suggest a form, or design. According to Spiegelman, the cardinal rule, "Organize it and keep it simple," should be stamped on the hands of all artists.

"One common misconception about design," says Spiegelman, "is that you take all the pieces and push them around until they look good to you. Design isn't quite so random. Real design requires analyzing and organizing the graphic structure of the information presented.

"Think about which information is the most important," Spiegelman suggests. "Right away you have quite a few clues as to how big objects ought to be and which elements should be prominent in the picture. Often, more important elements are bigger or get placed at the top of a page. You can find other clues about size, too. If your illustrations are going to be printed in a 6-inch-wide format, for example, you already know their upper size limit."

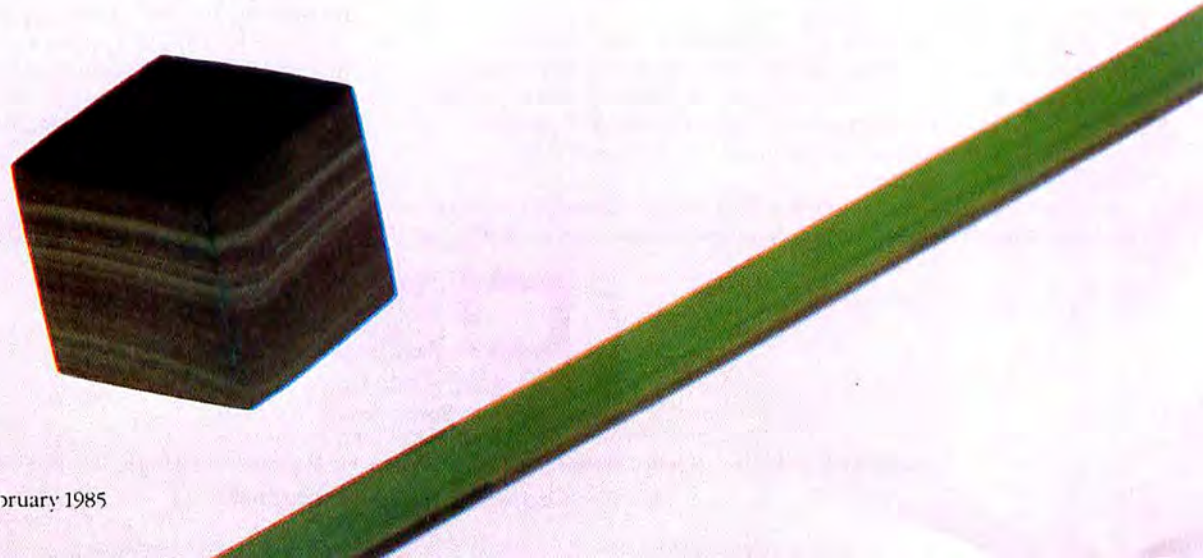


Figure 1 shows an illustration that's a casualty of poor planning. Figure 2 shows how the illustration is improved with a more understandable organization.

Another consideration is how an illustration is to be reproduced. Many people using the Macintosh to create designs will probably have their illustrations "quick printed" or reproduced on a copier. "With those methods of reproduction," says Spiegelman, "you have to think about density of pattern, size of type, and whether details will show up when reproduced. With copying machines, reproduced illustrations end up with less detail than the original art. Fine detail is lost, thin lines drop out, typeface patterns close up."

Spiegelman emphasizes that reducing designs on a copying machine can dramatically decrease their legibility. If you plan to reduce a design, keep in mind that fine detail may suffer; use thick lines and select large, easy-to-read fonts.

Strike a Tense Balance

Good design demands more than a sense of "engineering." Designs must be balanced, composed so that they entice a viewer's eye and provide information in an easily understandable way. The placement of elements in a good design is not accidental. Placement should be planned to establish an interaction or tension among the elements that provides visual intrigue. Too many elements, or groups of similar elements, should not be present, nor should any one element completely overpower another.

In setting up the interaction among elements, don't ignore the background or white space in the composition. While too little background space makes for an overcrowded, hard-to-read design, too much background space can overpower the information, resulting in a static composition that is uninteresting to the eye. A good design has balance: opposing forces or tensions entice the viewer while reinforcing the relationships among the elements, including the background.

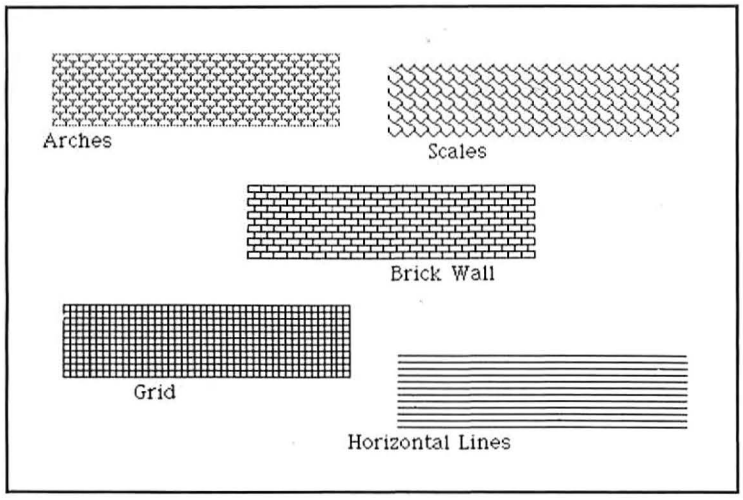


Figure 1

The rectangular patterns are misaligned and the labels placed in various positions beneath each pattern. The placement causes the reader's eye to move erratically across the page to gather information.

A natural tendency for beginning designers is to center the elements of a composition or to make everything the same size, weight, or color. The resulting lack of contrast is rarely an advantage in conveying information. Contrast and asymmetry can be very effective for making a design dynamic. "A very interesting composition," notes Spiegelman, "is one with a large, heavy element at the top [see Figure 3], that suggests a potential energy to the viewer." Figure 4 shows a design that suffers from a lack of contrast.

Suppose you begin an abstract design by placing a huge circle at the top of the composition. A small dot, properly sized and positioned below the circle interacts with the circle and balances its potential energy. The dot also interacts with the edges of the composition, reinforcing its own energy while at the same time working to activate the surrounding white space. You could also add a line to reinforce the relationship between the circle and the dot. In this design every element–the circle, the dot, the line, and the white space–takes part in the overall dynamic of the composition. The relationships of the forces or tensions among all the elements are such that no single element overpowers another. In other words, the design is balanced.

A simple way to check the balance of elements in a design is to turn it upside down. "By viewing a design upside down, you may see that the picture overall

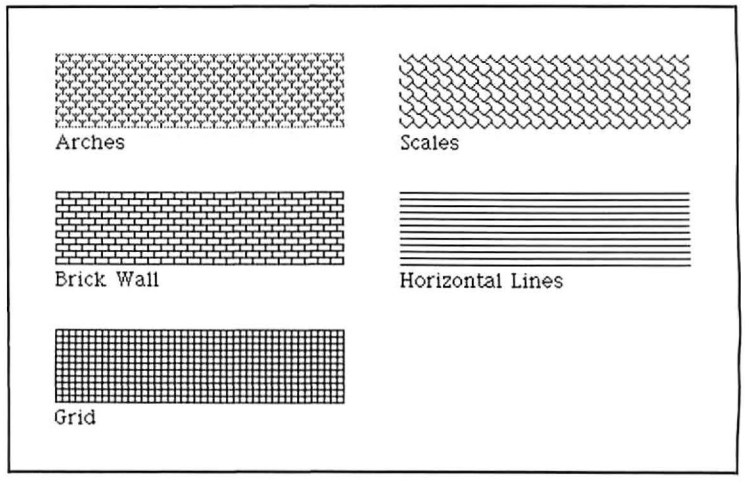


Figure 2

In this design the rectangular patterns are aligned both vertically and horizontally, and labels are placed in the same location beneath each pattern. The reader easily sees the organization and can pick out desired information.

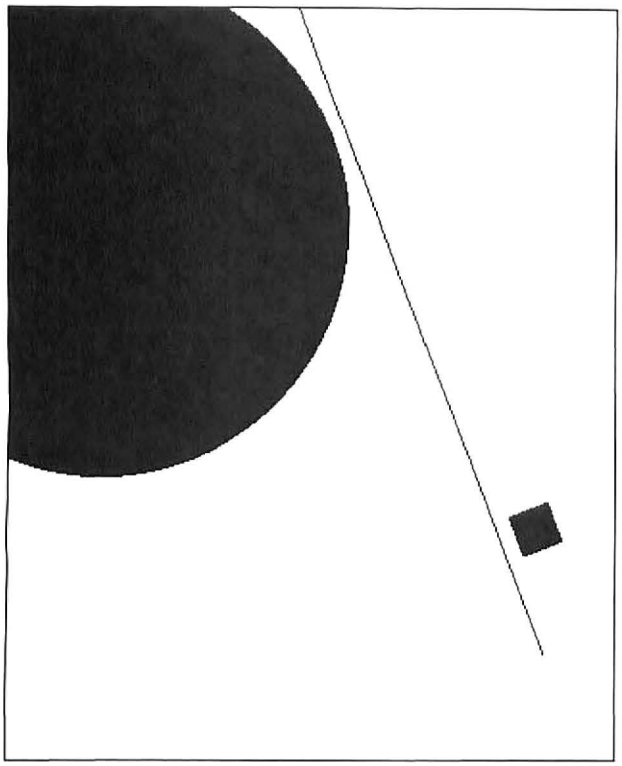


Figure 3
The viewer's interest is piqued by this design, which shows objects seemingly about to collide. Notice how the small square balances the large partial circle yet holds the viewer's interest.

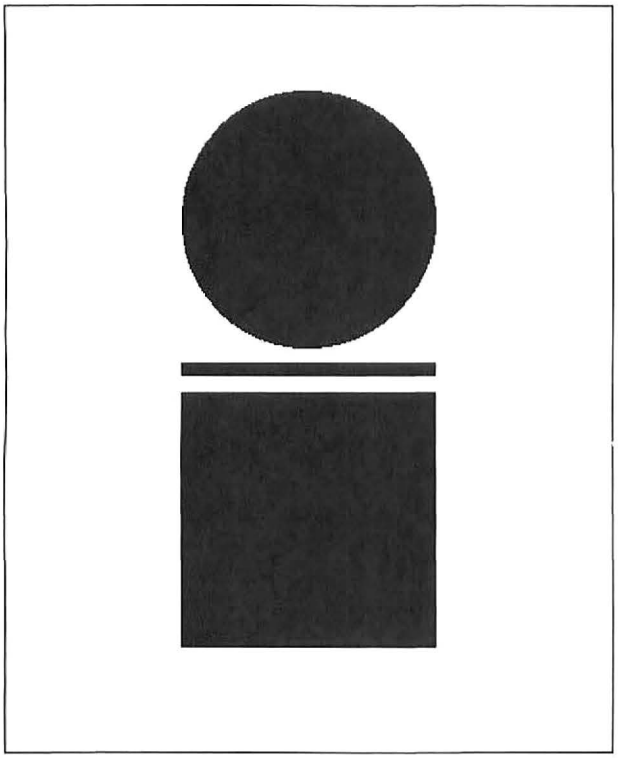


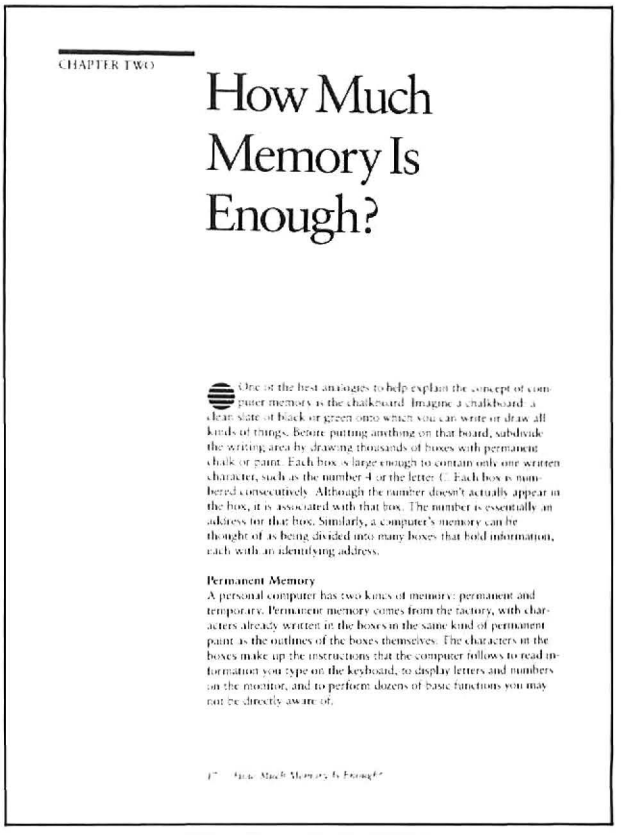
Figure 4
This design uses common shapes, all in black, stacked symmetrically. None of the three shapes stands out by itself in this stable and uncontrasted arrangement.

presents a lopsided impression or that it contains too many elements. Go with what looks good to your eye. Some designs I've turned upside down and left that way," laughs Spiegelman.

Avoid Visual Competition

Macintosh graphics can tempt budding artists toward a flamboyance that results in confusion. Misapplied special effects in programs like *MacPaint* sometimes result in visual elements of unequal importance competing for attention. Flashy outlined fonts, for instance, may draw attention away from important aspects of a design.

To avoid confusion, Spiegelman recommends organizing the information according to levels of importance. Once you determine the levels, begin creating the design by assigning visual signals to each level. Three main visual signals can be used: color, size or weight, and placement on the page. For instance, the most important information might be positioned at the top of the page and appear in color in the largest typeface.



CHAPTER TWO

How Much Memory Is Enough?

One of the best analogies to help explain the concept of computer memory is the chalkboard. Imagine a chalkboard: a clean slate of black or green onto which you can write or draw all kinds of things. Before putting anything on that board, subdivide the writing area by drawing thousands of boxes with permanent chalk or paint. Each box is large enough to contain only one written character, such as the number 4 or the letter C. Each box is numbered consecutively. Although the number doesn't actually appear in the box, it is associated with that box. The number is essentially an address for that box. Similarly, a computer's memory can be thought of as being divided into many boxes that hold information, each with an identifying address.

Permanent Memory

A personal computer has two kinds of memory: permanent and temporary. Permanent memory comes from the factory, with characters already written in the boxes in the same kind of permanent paint as the outlines of the boxes themselves. The characters in the boxes make up the instructions that the computer follows to read information you type on the keyboard, to display letters and numbers on the monitor, and to perform dozens of basic functions you may not be directly aware of.

[illegible] Much Memory Is Enough?

Figure 5
The large chapter title at the top of the page and the presentation of paragraphs with subheads provide a clear organization. Notice how the broken circle allows the reader to spot quickly the beginning paragraph.

Creating Likable Labels

MacPaint has greatly increased the ease with which you can label graphics. No longer do clumsy "nonartists" have to worry about aligning fragile transfer letters neatly on paper. *MacPaint* provides a good selection of typefaces and sizes for labeling illustrations, and the erasable screen quickly forgives mistakes. But you should avoid arbitrarily planting labels around a picture.

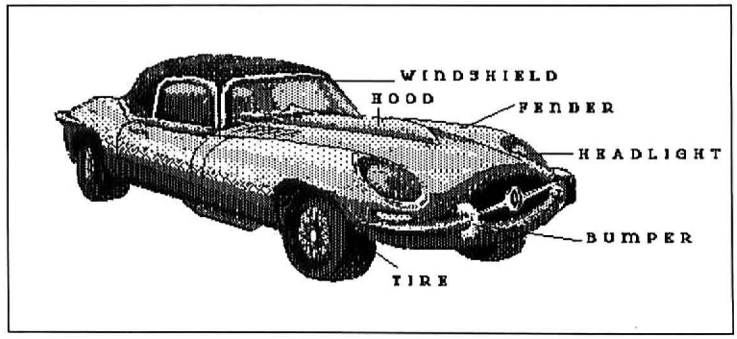
The labels in a graphic design should be planned, not hastily added after the artwork is done. The organization should be as consistent as possible. If you can place all the labels for a diagram in one accessible area–aligned flush left of the artwork, for example–you create a constant starting point for reading each label. The viewer doesn't have to search all over the diagram to find the necessary information.

In addition, the diagram's caption can be aligned flush left with the labels. Placing the caption on the same vertical axis as the labels increases the clarity of the information, making the viewer's job easier.

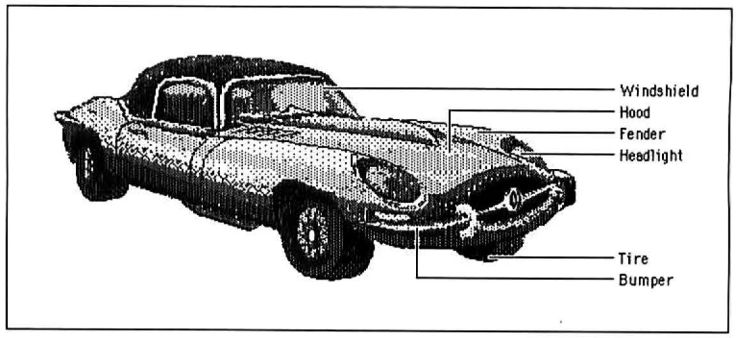
A plain old fat typeface reproduces better than some of the fancy outlined fonts. Many people use all capital letters more often than they should. Alphabets aren't designed to be used with all capitals. The best legibility is achieved with initial capital letters and lowercase. Unlike book titles or newspaper headlines, in which all important words are capitalized, labels are easier to read when only the first letter of the first word is capitalized. Capitalizing every word creates an uneven texture and decreases legibility.

Another mistake is spreading words out across the page by putting extra space between letters. Such spacing makes the words difficult to read. Labels should not be placed too close to the artwork, and the letters in a label should not run over actual art lines (see the figure "Labels and Lines"). Visual competition between lines and labels destroys the shape of the letters and detracts from legibility.

It's a good idea to use only one typeface for all the labels in a design, since a hodgepodge of different fonts and sizes makes a design look disorganized. Using the same labeling method consistently within a design, as well as in a series of related designs, can add to a sense of unity and ease of access. Arbitrary changes in type style can be confusing.



Labels and Lines
The labels in this design compete for attention with the image of the car. All the letters are capitalized, making the labels more difficult to read than if only the initial letters were capitalized.



Labels and Leaders
The clear organization of labels does not detract from or compete with the car's image. The leaders are used consistently and begin at the same position relative to each label.

When labeling a design, you must also be careful with leaders, those lines that extend from a label to a corresponding part of an illustration, connecting verbal and visual information. Since it's tempting to send lines in rubber-band stretches across the Macintosh screen, leaders can easily be misapplied so that they detract from a design's visual effectiveness. Leaders should be consistent in width and placement. In other words, they should appear to have the same thickness; while they may be horizontal, vertical, or angled, they should be consistent within a design.

Be careful with those leaders that travel across the page at an angle. Ideally, angled leaders should be drawn at the same angle (the easiest one to draw on the Mac is a 45-degree angle). Also, be aware that an angled line will seem thicker than a vertical or horizontal line because of the "staircase" effect of certain Mac graphics. If you have to combine angled leaders with horizontal or vertical leaders in one diagram, draw an angled leader first, then draw horizontal or vertical leaders to look like the angled one. That way all the leaders will match, helping to convert information easily for the viewer. The figure "Labels and Leaders" shows how the design in "Labels and Lines" is improved with the consistent use of labels and leaders.

A clear application of visual signals occurs on the opening page of a book chapter (see Figure 5). Book chapters are organized into chapter titles, introductions, text headings, and text. These different kinds of information are assigned visual signals which show their importance. Usually the chapter number and title are the biggest and are placed at the top of the page. Introductory text may be in a different type style, and the text headings and text may be printed in similar type styles, with headings bolder than the text. Each type size or style as well as each position on the page is a visual signal. Figure 6 shows the same principles applied to a nonverbal design.

State It with Empty Space

A 1-inch square on typing paper may be a small rectangle to the mind, but to the eye it may seem to be a box floating on a lonely universe of white. The background of a design is an element to consider. You create a design when you put a dot on a piece of paper. Relationships exist between the dot and the edges of the paper, and you can't ignore them. You have to ask yourself if the relationships are correct: have you left so much white space around your design that it's lost on the paper? Have you left so little space that the design isn't set apart from nearby text?

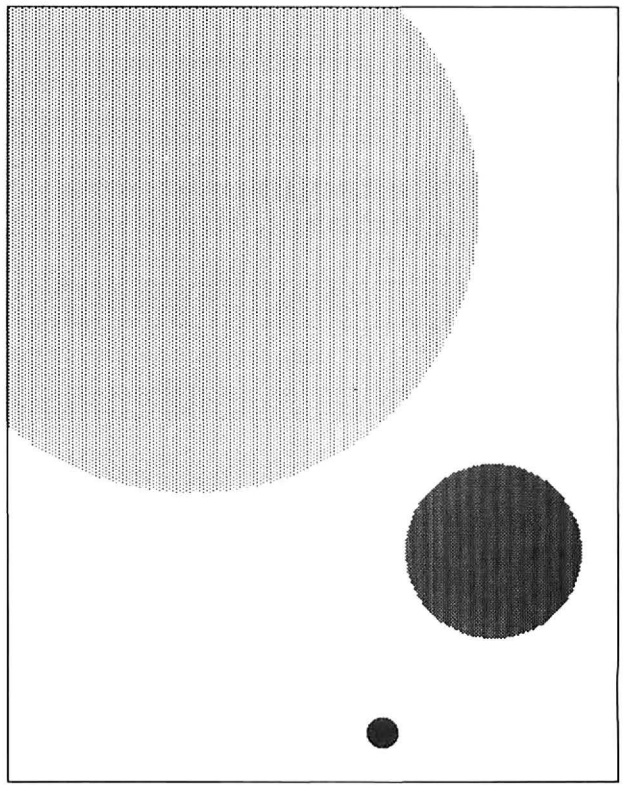


Figure 6

The circles in this design are ordered visually according to their size and shading. The viewer's eye moves from the small black circle to the middle-size circle and finally to the larger, light gray circle.

Appropriate spacing between elements in a design is as important as proper space around the design as a whole. One method the eye uses to gather information is to group things by proximity. A small space between elements in a design can imply a relationship between the elements, while a large space between them can be used to signal a break. Spacing is particularly important in designing charts and tables, where information must be distinguished easily. A viewer may be confused by unrelated graphic elements or pieces of verbal information placed too close to one another. Figure 7 shows an example of inappropriate spacing. The organization of information that should be read horizontally appears confusing because of the vertical placement of lines. The problem can easily be resolved by placing more white space between lines and horizontally tightening them as shown in Figure 8.

Catch an Eye

Metaphorically speaking, each design should have a tiger's eye, burning bright–a point that you see immediately. Says Spiegelman, "You need to create a focal point, where the viewer can start looking at the image. The focal point doesn't have to be anywhere in particular." An illustration about a specific key on the Mac keyboard might have the entire keyboard shaded in gray with the key in question shown in color or solid black. The emphasized key is the focal point. Figure 9 shows a design lacking a focal point. Notice how the problem is resolved in Figure 10.

Printing Features	ProPrint	Letter-Ware
Underlining	Yes	Yes
Boldface	Yes	Yes
Subscripts	Yes	Yes
Spacing	Yes	No

Figure 7
The information in this table is spaced inappropriately. Since the table is meant to be read horizontally, the reader will have difficulty because the design gives a strong impression of vertical columns.

You can create a focal point by assigning a visual element a prominent size or position. "Place the important image where it can easily be seen, and make sure the background isn't cluttered with competing visual signals," explains Spiegelman. The focal point should have at least one visual signal that will not be used with any other elements. For instance, even when all the elements have to be the same size, the focal point can have a different color or pattern. When possible, you might further emphasize the focal point by giving it one or two more visual signals: position it in a different place on the page or make it a different size.

Scale or size changes are a useful way of creating a focal point. Given a number of bar graphs on a page, for example, you might make one of the graphs three times larger than the others. Try to arrange the page with one large graph and three graphs in the same smaller size. This way you set up a contrast between two sizes, instead of four. You also simplify the design by composing a page with two main groups of visual elements. Another advantage is that each of these groups contains an odd number of elements (one and three), which is more visually interesting than an even number of elements.

Bring Out the Important Facts

Contrast is important to the impact a design has on the viewer. It can be created in several ways, but most often by varying size, color, and position. With its variety of brush types and patterns, *MacPaint* offers simple methods of creating contrast. You must develop an eye, however, for effective contrast. "You need contrast to set information apart," says Spiegelman. "Yet too much contrast may cause images to overpower one another. You have to develop a sensitivity. You have to look, because there's no practical way to apply

Printing Features	ProPrint	LetterWare
Underlining	Yes	Yes
Boldface	Yes	Yes
Subscripts	Yes	Yes
Spacing	Yes	No

Figure 8
Information in this design is easy to decipher because the horizontal spacing of the information has been emphasized. The reader can easily look across the table to find information.

mathematical concepts or steadfast formulas to contrast." Figure 11 shows how contrast can be used to bring out important facts. Figure 12 shows how too much contrast can detract from a design.

Legibility is a major concern of designers who need to communicate specific information. Contrasting shades and patterns in a design should serve the intent to communicate, improving legibility. But how much contrast is too much?

Spiegelman replies that the amount of contrast to use depends on "the structure of the design itself and the context in which it will be viewed; for example, whether it's an illustration in a book or a poster on the wall. If you want to make a design look good, you have to do what every designer does: learn how to see. You must step back from what you are creating and look at the design as well as its context."

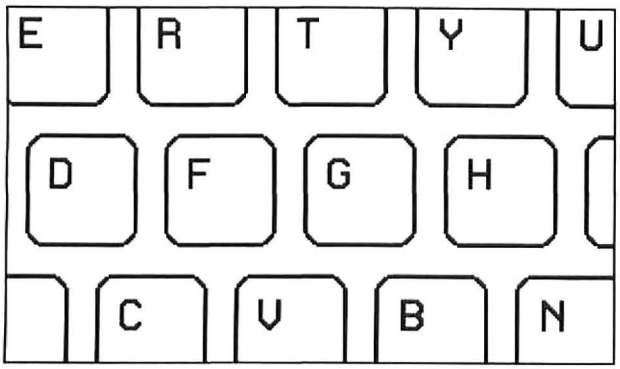


Figure 9
Because the keys in this design do not stand out from one another, the reader's eye is not drawn to any one

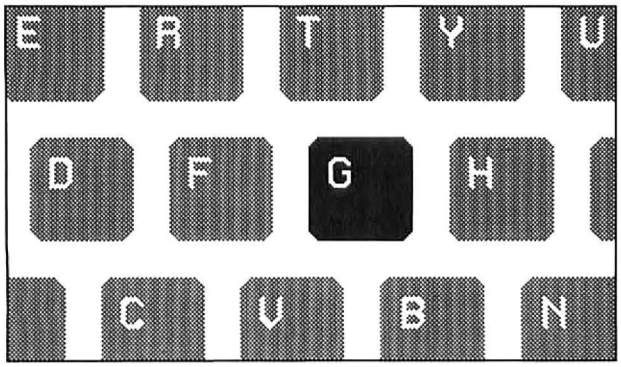


Figure 10
The G key is the focus of this design and stands out because of contrasting shading. The viewer can easily pick out the key being emphasized.

Between Doodles and Degas

If your design skills fall somewhere beyond doodles and short of Degas, you may soon attempt artwork on the Macintosh that you wouldn't have tried with paper and pencil. Spiegelman's guidelines for organizing information, creating focal points, maintaining spatial continuity, and using contrast effectively are important to recall as you work. Whether you intend to create first-class designs for yourself or rough sketches for a graphic arts department, your Macintosh can help you communicate visual information effectively. □

Bill Grout is a columnist for the San Francisco Chronicle, *author of* MultiMate and More! *(Addison-Wesley), and coauthor of* Symphony for Your Business *(Hayden Book Company).*

aaaaaaaaaaaaaaaaaa
bbbbbbbbbbbbbbb
ccccccccccccccccccccc
ddddddddddddddddd
eeeeeeeeeeeeeeeeeee

Figure 11
The row of bold letters in this design contrasts with the other rows. The reader senses that more importance is placed on this row of letters than on the others.

aaaaaaaaaaaaaaaaaa
bbbbbbbbbbbbbbbbb
ccccccccccccccccccc
ddddddddddddddddd
eeeeeeeeeeeeeeeeeee

Figure 12
Each row of letters in this design is in a different font, yet no row is emphasized over the others. Designs with too many contrasting elements make the reader uncertain about what he or she is supposed to look at.

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(Freight minimum $1 per item)

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MACTYPE FROM PALANTIR. THE TYPING TUTOR THAT IS

F

FIRST

Palantir knows that if your Macintosh™ is to be fruitful, you must first conquer the keyboard. And for many, that means learning how to type. So, Palantir created MacType. It's the first typing tutor for the Macintosh to put to use benefits of proven teaching techniques that speed up learning. Simply, MacType uses mental patterning to reinforce manual exercises. It teaches your fingers and your brain rather than your eyes, and you learn more quickly. If one of your first tasks on the Macintosh is to learn how to type, think of MacType first.

A

ADVANCED

Palantir designed MacType to be the most advanced typing tutor for the Macintosh that is available today. MacType takes full advantage of Macintosh's flexible screen displays and the simple functioning of its mouse to teach you how to type. All the know-how that has gone into the most complex Palantir Software was used in the development of MacType. You're getting state-of-the-art technology even in this basic program. It takes advanced skill to create a fundamental program that is both fun and mental for the user. And you get MacType's advanced features at a price that is very competitive.

S

SIMPLE

Palantir has also designed MacType so that it is amazingly simple to learn and use. Because of the teaching principles inherent in the program, you will get up to an effective typing speed in a very short time. You can also use the skills you learn on MacType to operate any typewriter keyboard, not just the Macintosh. Compared to the other typing tutors, MacType will actually let you enjoy learning. You may like it so much that even after you've mastered its touch-typing technique, you'll go back to the MacType exercises to sharpen your skills and increase speed. MacType shows that working smart can be working simple.

T

TESTED

Palantir thoroughly tested MacType to insure that it will work for you. With it you will learn to type fast. MacType should be your first choice. It is based on advanced programming technology and is still simple to learn. MacType is another quality, "No Bull" product from Palantir. If you want to learn more, contact

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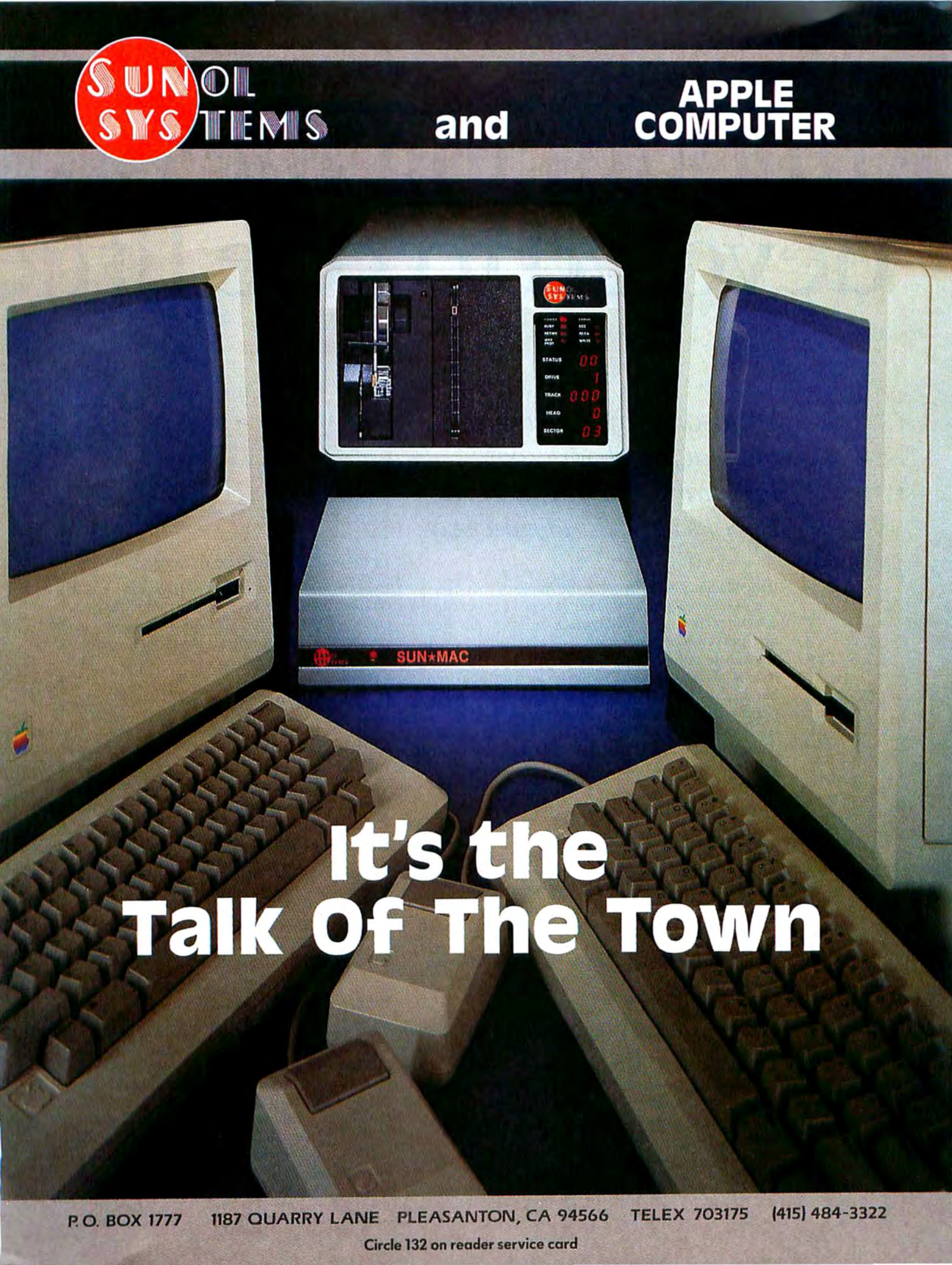

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Announcing the only devoted to one little

Sponsored by Macworld, the Macintosh Magazine
February 21-23, 1985
Brooks Hall, San Francisco

If the Macintosh has become the Apple of your eye, you won't want to miss this very special, very exciting computer show–the *Macworld Exposition.* It's the first and only computer festival devoted entirely to the Macintosh–a three-day, fun filled, hands-on event! This is your chance to take a Macintosh for a test spin, see hundreds of product exhibits, compare Mac-related peripherals and software, plus much, much more!

If you're interested in what this little box of computing dynamite can do for you, join us at Brooks Hall, February 21-23.

Special Show Schedule

Thursday, February 21–Trade and Press Day
Open to the trade, press, and corporate users only. A day of opportunity! *Resellers*–strike your deal with manufacturers. *Press*–your chance to analyze the market and see new products. *Corporate users*– your chance to see how the Mac can help your business.

Friday and Saturday, February 22-23–Open to the Public
Your chance to participate in:

- The Gallery of Mac Art
- The Mac Playground filled with Macs for you to play with
- The Mac Clinic–a problem-solving workshop
- Conference programs filled with information to meet every need
- Plus, visit an Exposition Hall filled with Mac-related products

Take a Mac for a Test Spin

Hundreds of Macintoshes will be on the floor for everyone to use! Potential buyers can get a hands-on test drive. Users of other micros can compare the Mac to their own machines. See just what the Mac can do for you!

Free Mac Software Clinic

Experienced Mac users and software experts will be on hand all three days to answer your Mac questions and help you find the products that will best fit your needs. The Software Clinic is *free* with your paid admission!

Over 100 Mac Exhibits

Come see the newest hardware, software, and peripherals being developed for your Macintosh. See for yourself–all in one place–the many products available now that will help your Mac work faster, easier, and smarter.

Here's What You'll Learn

- All about home, office, and school software
- How to use the Mac in business
- All about Fat Mac
- Getting the most out of your spreadsheet programs
- When and how to use MacBasic
- Plus hundreds of other Mac tips

Who Should Attend?

Business: CEOs, presidents, vice presidents, managers, comptrollers, owners/partners
Professionals: Doctors/nurses, bankers, lawyers, engineers, stockbrokers, real estate and insurance agents, CPAs, consultants
Education: Administrators, faculty, students
Industry: Dealers, retailers, wholesalers, manufacturers, systems houses, consultants, technical programmers, all other ISOs

big computer show computer.

Thursday, February 21:
Industry/Press Sessions

10:00-11:30– Industry forum: The outlook for the Macintosh in the office

11:30-12:00– Industry roundtable discussions

12:00-1:00– Lunch break

1:00-2:30– Industry forum: Developing software for the Mac–opportunities and pitfalls

2:30-3:00– Industry roundtable discussions

3:00-4:30– Industry forum: The outlook for the Macintosh in the home and school

4:30-5:00– Industry roundtable discussions

Friday, February 22:
Business/General-User Sessions

12:00-2:00– Keynote presentation: The future of the Macintosh and what it means to you

2:00-3:00– How to start and survive in business with your Macintosh ● Maximizing *MacPaint* ● The Mac Clinic

3:00-4:00– Interfacing the Mac with other Apples ● A guide to better business graphics ● How to create useful documentation

4:00-5:00– What the Fat Mac can do ● Maximizing *MacWrite* ● Putting LANs to work for you

Saturday, February 23:
Education/General-User Sessions

12:00-1:00– The Macintosh in the classroom ● All about MacBASIC ● Unveiling the Mac's hidden features

1:00-2:00– The Mac in higher education ● All about MacPascal ● How to write user-friendly software

2:00-3:00– Developing university courseware with the Mac ● Data base management with the Mac ● How to become a wizard at machine-language programming

3:00-4:00– Understanding the power of peripherals ● Getting the most out of spreadsheet programs ● File management tips and techniques

4:00-5:00– How to get your programs published ● What's available in Mac software ● Maximizing Mac's disk storage

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MACWORLD EXPOSITION
SAN FRANCISCO

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Introducing Typing Intrigue.™

Now there's hope even for executives hardened by years of typophobia, arcade-shocked junior high school students, and anyone else who needs to get all ten fingers working together, at last.

Typing Intrigue takes the drudgery out of improving your typing skills. It makes learning to type enjoyable, so you'll stay with it. And that makes it really *effective.*

Like a truly professional teacher, Typing Intrigue adjusts itself to your level. It recognizes you (and up to 5 other "pupils") and designs its lessons accordingly, recording your progress from session to session. It's never repetitive, never boring, and keeps you motivated.

As your skill improves, you earn clues toward solving *The Case of the Missing Bathtub.* Where might one hide a £50,000 onyx and gold antique tub? And why? How are Reginald Chumley and Lady Deirdre Dunsmire involved? Where did the worn elbow-patches come from? Do those rumors about Lord Southby mean anything?

By the time these characters help you break the case, you'll be typing at breakneck speed.

You can also improve your typing skill with a second game option—*Rain*—a fast-moving, arcade-type challenge for those who like more action.

Of course, you don't have to brave a thunderstorm or get involved with Inspector Hargreaves' puzzling bathtub case if you choose to just roar through the typing exercises undiverted. But who can resist a good thriller?

Contact your Macintosh™ dealer, or call 1 800 MACWARE to find out where you can get Typing Intrigue.

From Forethought, Inc.

MACWARE™

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These characters can teach anybody to type.

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1ne

Art Portfolio™
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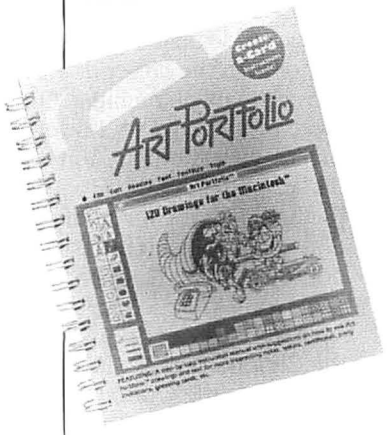
A diskfull of professionally drawn artwork with the best 100 page manual of tips and ideas available! If you like to MacPaint™ and wish to unleash your creativity, then Art Portfolio™ is for you. It includes an index of the artwork and hundreds of ideas to create exciting memo's, letters, cards, etc. All the images are the right size to use in your documents or you can expand, reduce or modify them with minimal distortion. Create-a-Card™ instructions include ideas for making your own greeting cards.



2wo

The Card Shoppe™
$59.95

Here's everything you and your MacPaint program need to get into the card-making business.
► Special drawings, ranging from the obvious to the obscure.
► A complete, exhuberant calendar of holidays and greeting card occasions, if you need one to create a card.
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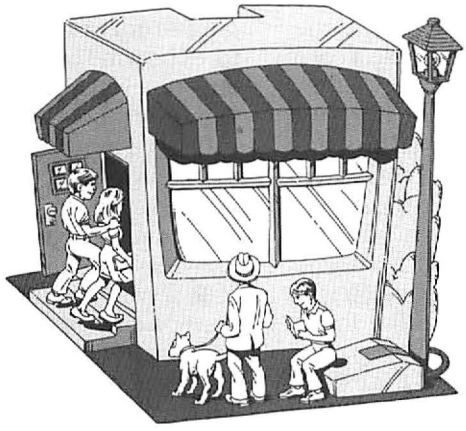

3hree

MacMatch™
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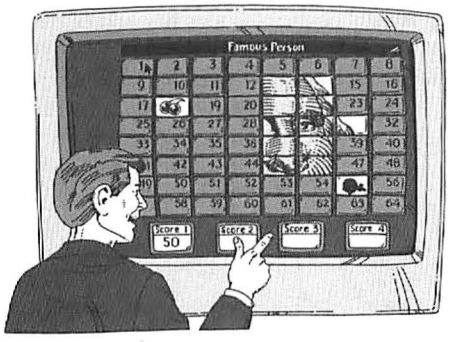
This is one of the first of a new breed: Native Macintosh games. Our software gamemakers have taken their inspiration from the tv game show, Concentration,™ and have built it on the Mac's quickness and graphics power. When you match two squares, you get clues about the hidden puzzle. It comes with puzzles, but the real beauty is that you can make up your own, as complex or simple as you like. You'll never get bored. And think what party puzzles might look like...

4our

MouseTracks™
$49.95

We put Mac's considerable graphics skills through the loops to develop an eye-popper for Mac's first mouse game. You will zoom an animated mouse through a maze-like environment avoiding a bad kitty cat intent on supper. There are plenty of perils and rewards for the skillful. MouseTracks shows everyone how much fun Macintosh can be.



5ive

Typing Avalanche™
$59.95

Since man does not live on art alone, but by lots of words that flow from the mouth of Mac, we've commissioned the first typing strategy program for the Mac. It's aimed at the poor duck who somehow got through school without learning touch typing. (The rest of us, in other words.) It's fast paced. It's fun. And it works. Play it a while, and you'll suddenly realize you are a touch typist. Someday the schools will catch up.

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Open Window

An exchange of Macintosh discoveries

Edited by Daniel Farber

Open Window *offers tips to help you use your Macintosh more efficiently. Submitted by readers, industry experts, and the* Macworld *staff, items in this department address all facets of Mac work, from applications to programming routines to capabilities of the Mac and software not covered in the documentation.*

This month's Open Window *unveils a technique for enlarging* MacPaint *images, a clever way to utilize the Note Pad, an undocumented* MacPaint *shortcut, and a few tips for using* MacWrite. *Other items include a quick way you can determine whether a file is locked, some advice for transporting your Mac when you travel by air, and a method for plotting standard deviation and standard error graphs with* Microsoft Chart. *A special feature this month is a Cairo font "Key Caps," which you can cut out or photocopy to display as a reference card.*

MacWrite: Colon

In reading your *MacWrite* manual, you may have noticed the advice that you not use a colon in a document name. This information is not strictly true. If you have an external disk drive, you can use a colon in a document name to save the document to a disk in the other disk drive. For example, if a document you are working on is on the disk in the internal drive, and you want to save the document to the disk in the external drive, choose the Save As command and type the name of the disk in the external drive, followed by a colon and the name of the document. The document is then saved to the disk in the external drive. Of course, you can accomplish the same task by clicking the external drive button and typing in the document name.

Judy A. Evans
Zion, Illinois

Enhanced Enlargements in MacPaint

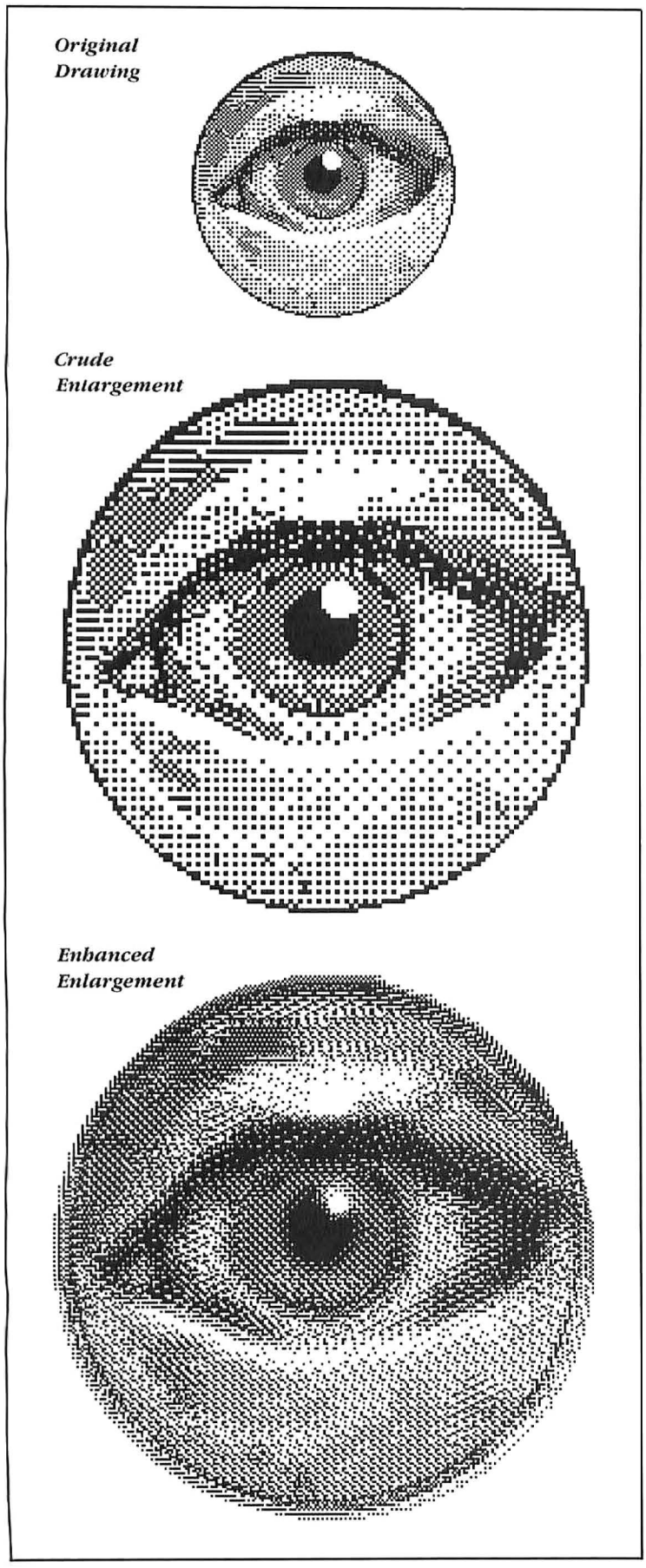
When I began creating shaded drawings in *MacPaint* [see the figure "Original Drawing"], I found that enlargements of the drawings left a lot to be desired. When I enlarged a drawing by surrounding it with the selection rectangle and dragging an edge outward, the textures became coarse and patterns uneven. For a while I contented myself with using the expanded drawing as a guide to redrawing, but then I discovered a way to improve the appearance of enlarged drawings.

To solve the problem of uneven patterns, you should keep the image to scale (hold down the ⌘ and Shift keys while stretching the image) and enlarge it in multiples of the original size. To make an image twice its original size, for example, place two copies of the drawing next to each other and enlarge the original so it just covers the copies. This procedure produces uniform dots that are twice the size of those of the original [see the figure "Crude Enlargement"].

The coarse texture of the new drawing is still a problem, however; every dot in the original drawing has turned into a large dot made up of four original-size dots. The first step in refining the chunky texture is to block out three of the four dots in each of the large dots that make up the image. To mask out the extra dots, first select the entire image and choose Invert from the Edit menu.

Then you must cover the negative image with a "masking" texture. Set the line width to the dotted line (no border), select the fifth pattern from the left in the top row of the pattern palette. Press the ⌘ key while opening up a filled rectangle over the image (this technique will not work with version 1.1 of *MacPaint*). The dots in the negative image are smaller and the patterns finer in texture than before it was masked.

Next, select the image and choose Invert again. This step produces a very light positive image made up of single dots, rather than the larger dots of the original enlargement. One more problem exists, however: the image is too light. You can darken the drawing by copying the light image over itself several times, skewed by just a few dots each time. This procedure takes some practice, so store a spare copy of your drawing in the Clipboard. Lasso the image, hold down the Option key, and drag the resulting copy just a dot or two away from the original. Release the Option key, then press it again immediately and drag a second copy a few



Enhanced Enlargements

Compare the original drawing to the crude enlargement example. As you can see, textures become coarse when enlarged. To get the crude enlargement effect, select your original drawing and stretch it by holding down the ⌘ and Shift keys while dragging the image. The image should have dots twice the original size. The enhanced enlargement example shows the final result of the process.

dots to one side. Repeat this procedure until your drawing looks satisfactory [see the figure "Enhanced Enlargement"]. You can position each copy for the textural quality, sharpness of edge, and contrast you want for the final image.

After enlarging your image and enhancing the texture, you may want to sharpen edges or redraw lines. The steps described here may seem somewhat complicated at first, but with some practice the process can be carried out quickly.

Young Harvill
Stanford, California

Right Margin Justified

Right and left margin justification is a nice feature, but sometimes large, ungainly gaps are introduced between words, interfering with ease and speed of reading. Some word processing programs recognize a hyphen as a legitimate line break, just like a space. *MacWrite,* however, does not. To circumvent the problem, insert a hyphen and a space where you want to break a word at the end of a line [see the figure "MacWrite Justified"]. This technique works well for creating short documents, but for long documents it can be a chore.

Edgar Wirt
Ann Arbor, Michigan

Note Pad Reference

I have discovered that the Note Pad can be quite useful when creating academic manuscripts. I was looking for a way to record reference citations while drafting the text of a manuscript. In my pre-Macintosh days I had a system of simply writing the reference on a 3- by 5-inch index card and alphabetizing the stack before typing the reference section at the end of the manuscript. With the Mac, I can record citations in the Note Pad. When I finish the manuscript text or fill up the Note Pad, I open a new *MacWrite* document and cut and paste the citations from the Note Pad into the newly created reference document. I usually alphabetize each page of the Note Pad before cutting it and alphabetize the reference document after each page is pasted in. By slightly raising the bottom edge of the *MacWrite* document window, I can provide

enough space for part of the Note Pad to be visible. This arrangement allows me to go back and forth between my document and the Note Pad easily, without using the menu command [see the figure "Note Pad Reference"].

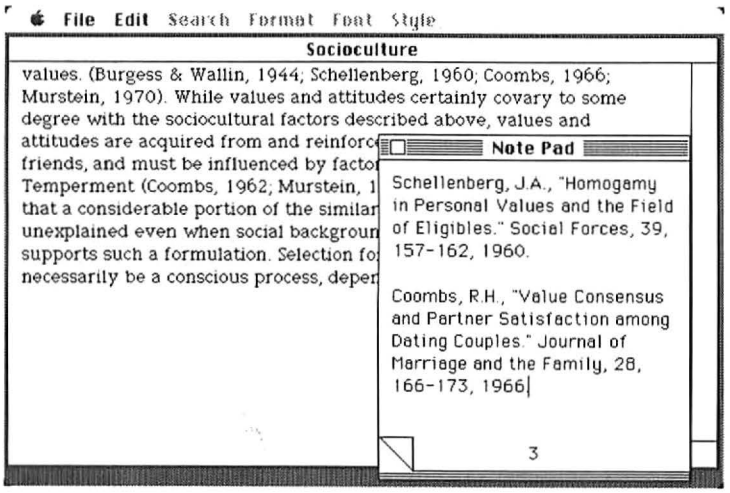
The one problem with this technique is that the Font and Style menu options are disabled when you use the Note Pad, so you can't underline or use italics for journal names or book titles. Of course, you can make all the necessary enhancements in the *MacWrite* reference document. This limitation subtracts from the overall utility of the technique, but it is a small price to pay to get rid of boxes of index cards.

Fred S. Wambolt
Madison, Wisconsin

Looking for Locked Files

Trying to throw away locked documents can be frustrating. The beep and the alert box that appears when you attempt to drag a locked file to the Trash are annoying. Even worse, if you have a single-drive Mac, the startup disk must be inserted in the disk drive so the computer can read the error message from the startup disk and show it on the screen. The Get Info window for a document indicates if it is locked, but displaying the information and restoring the desktop take time. When documents to be deleted are on the disk in the disk drive, a quick way exists to determine if the documents are locked. If more than one document is selected, click between documents so that none of the documents is selected. Then move (not drag) the cursor across the names of the document or documents you want to delete. If the cursor changes to an I-beam, the document to which the cursor points is not locked. Otherwise, the document is locked, and you must unlock it by clicking the appropriate button in the document's Get Info window.

Steve Fine
University Park, Pennsylvania



Note Pad Reference

The Note Pad can be used to record reference citations while you are writing the text of an article. When the Note Pad is full of citations, you can cut and paste them at the end of the manuscript or into a separate document.

Whether the Court will consider these practices unconstitutional has not been ascertained by our staff of legal experts.

Whether the Court will consider these practices unconstitutional has not been ascertained by our staff of legal experts.

MacWrite Justified

MacWrite *does not recognize a hyphen as a legitimate line break, so justified text often has large gaps. You can overcome this problem to a degree by dividing the first word in the second line and adding spaces so that the first part of the word jumps back to the first line.*

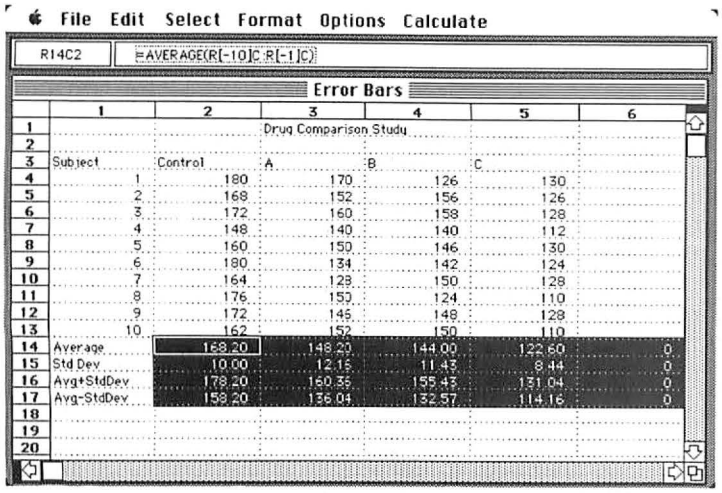
Faster FatBits

I discovered a faster, more accurate shortcut to enter FatBits than double-clicking on the pencil in the tool palette. Using the pencil, point to the exact area of the image you want to modify in FatBits. Then, hold down the ⌘ key and click the mouse once. The screen will show FatBits at exactly the area where the pencil was pointing. To exit FatBits, hold down the ⌘ key again and click once (make sure you are using the pencil). This method works better than scrolling when you have a large picture on the screen and want to work on areas of the picture that are far apart from each other. You can pinpoint the exact area you want to work on and then zoom in.

Rick Blank
Philadelphia, Pennsylvania

Packing Your Mac

I recently did some flying with my Mac, and have some advice for other people who take their machines on commercial airlines. Allow airport security personnel to x-ray your Mac. When set up for travel in an Apple carrying case (I haven't tried other types of packs), the Mac fits through an X-ray machine, and the X rays don't harm the computer. The magnets in the X-ray machine, however, can scramble the magnetic information on your disks, so have your disks hand inspected. As your Mac passes



Error Bars 1

After you type in the data from the study, use Multiplan's *built-in functions to calculate the standard deviation for each column.*

through the X-ray machine, tell the security personnel that they are looking at a computer. Otherwise, they may insist on hand-inspecting it, which could make you late for your flight.

The Mac in its case can be stowed in the overhead bin of a Boeing 737. However, it doesn't fit in the overhead bin of an older jet, such as a Boeing 727, and it doesn't fit under the seat of either type of plane. The Boeing 727 has closets, and a friendly flight attendant will usually let you store your Mac in one.

Use a collapsible suitcase dolly to get your Mac from your car to the gate. The Macintosh may be a portable computer, but it's awkward to haul one around an airport if you're also carrying a suitcase or two. And once you've got your Mac to the gate, set it up on a table near a grounded outlet and watch the crowd grow. It's a great way of passing time while you're waiting for your flight.

Richard Wanderman
Eugene, Oregon

Error Bar Charts

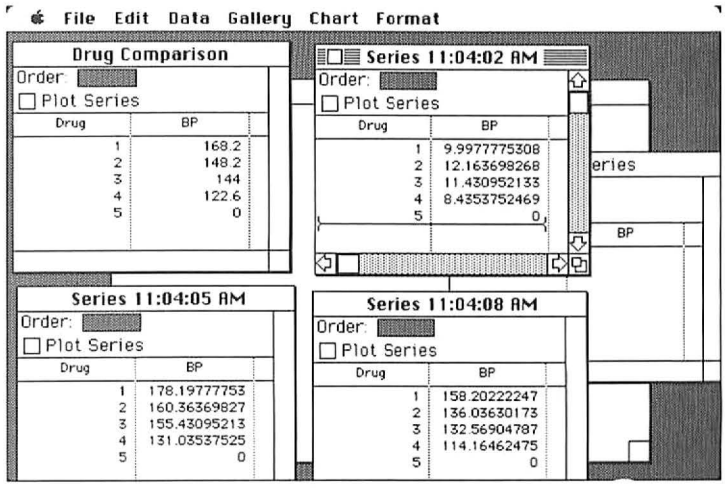
While *Microsoft Chart* is a powerful program, it lacks an important feature needed for creating scientific graphs: the ability to plot standard deviation or standard error bars. These error bars graphically indicate the degree of scatter about the average value of a set of numbers. All is not lost though, because using *Chart* with *Multiplan* yields the desired end product.

An example best illustrates the technique. Let's say you want to graph the relative effects of several drugs (A, B, and C) on blood pressure. You can measure the initial blood pressure in ten test subjects and then measure their blood pressure following two weeks of each medication.

At the end of the experiment, the results can be tabulated with *Multiplan*. First, you type in the results of the study in the worksheet. You can instruct *Multiplan* to calculate the average blood pressure for each drug and the standard deviation. (Note that the standard error, if desired, is the standard deviation divided by the square root of the number of subjects.) Then, you can calculate the sum and difference of the average and the standard deviation for each column. Next, due to vagaries in the Clipboard interface between *Multiplan* and *Chart,* it is necessary to add an extra column of zeros to the calculated data, so that the number of columns exceeds the number of rows [as shown in the figure "Error Bars 1"].

Then copy the selected area to the Clipboard, quit *Multiplan,* and start up *Chart.* After the untitled Chart document appears, select the Sequence option from the Data menu. In the dialog box, set the Series Name to "Drug Comparison," the Category to "Drug," and the Value to "BP" (blood pressure). A series window named Drug Comparison will open. Then choose the Paste command, and four new series windows will appear [as illustrated in the figure "Error Bars 2"].

Select the sequential series containing the standard deviation and delete the entire series by clearing it from the Edit menu. Click the Plot Series box for the remaining three data series. Select the default (number 1) Combination chart from the Gallery menu, and then select the Overlay Chart option from



Error Bars 2

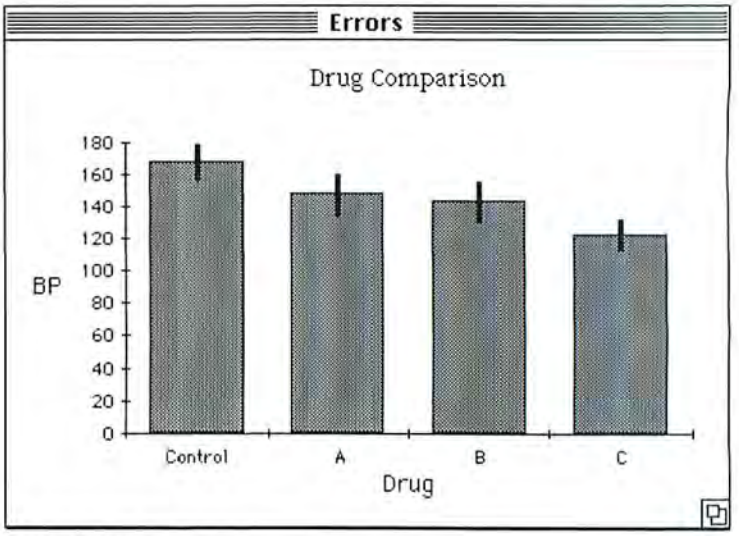
When you paste the data from Multiplan *into* Chart, *four series windows are displayed. Delete the data from the standard deviation series window by choosing Clear from the Edit menu, and then click the Plot Series box for the remaining three series.*

the Format menu. In the Overlay Chart dialog box, set the button for "Hi-Lo" lines, click off Data Point Markers and Lines Connecting Data Points, and change the Starting Series from 3 to 2. Voilà, the chart appears. The final step is to customize the labels [as in the figure "Error Bars 3"].

Ira Rampil
San Francisco, California

Cairo Key Caps

I would like to share a tip concerning the new pictorial font, Cairo. After upgrading my *MacWrite*, *MacPaint*, and System disks, I needed a way to remember the keyboard locations of the Cairo characters. I used *MacPaint* to create a keyboard similar to the one in the Key Caps desk accessory. Next, I typed what I call the "lowercase" Cairo characters and moved them onto the appropri-



Error Bars 3

The "Drug Comparison" chart was created with the default Combination chart from the Gallery menu and the Overlay chart option from the Format menu. The labels were then customized to enhance the quality of the chart.

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ate keys on the keyboard with the lasso. Then I cut and pasted the finished keyboard into the Scrapbook [see the figures "Upper Cairo Key Caps" and "Lower Cairo Key Caps"].

I followed a similar procedure in creating the "uppercase" Cairo keyboard. Whenever I want to know the keyboard location of a particular Cairo character, I open the Scrapbook and take a look. With *MacWrite*, you can keep the Cairo keyboard in view while you are working on a document. You can also print out the Cairo keyboards to create a quick reference sheet.

Burton S. Jaffe
Champaign, Illinois

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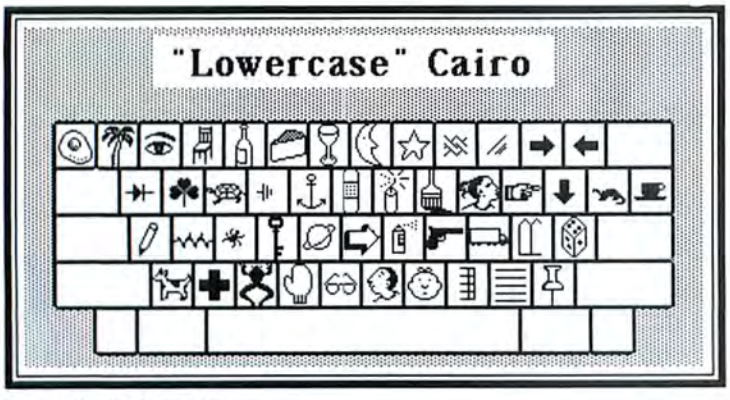
You can create a keyboard similar to the Key Caps desk accessory and then position the Cairo characters individually on the keyboard at the appropriate keys. This keyboard displays the uppercase Cairo key locations.



Lower Cairo Key Caps
You can store the Cairo Key Caps images in the Scrapbook or print them out on the Imagewriter to create a reference sheet. This keyboard displays the lowercase Cairo key locations.

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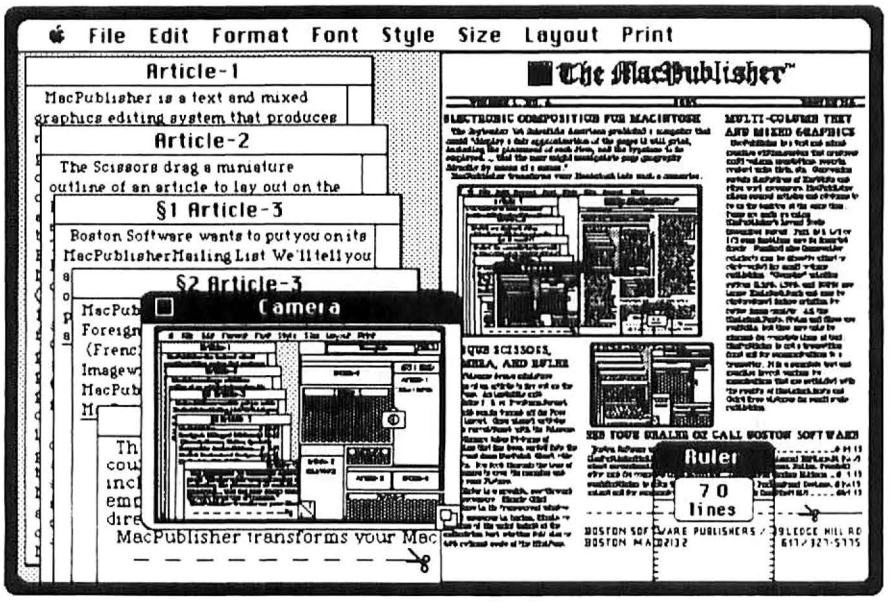

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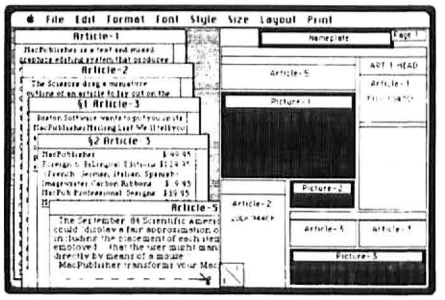

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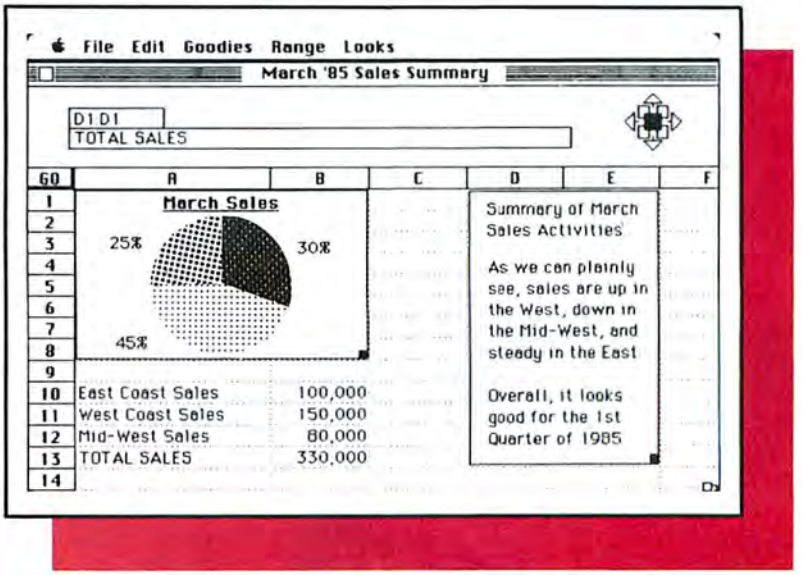

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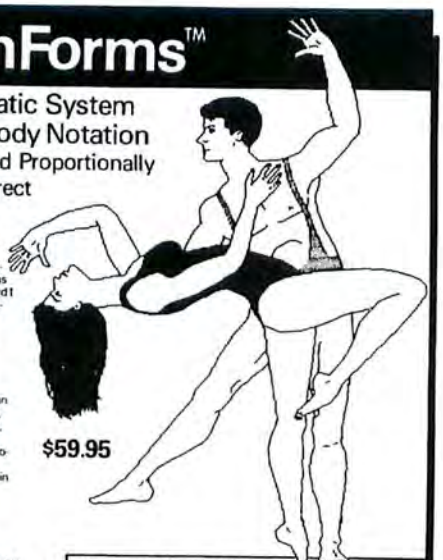

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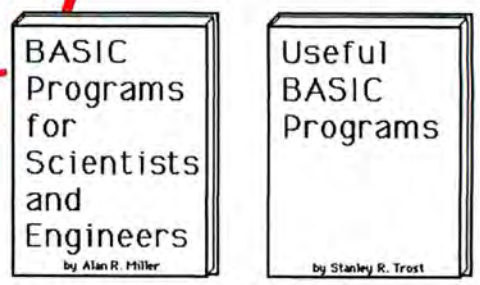

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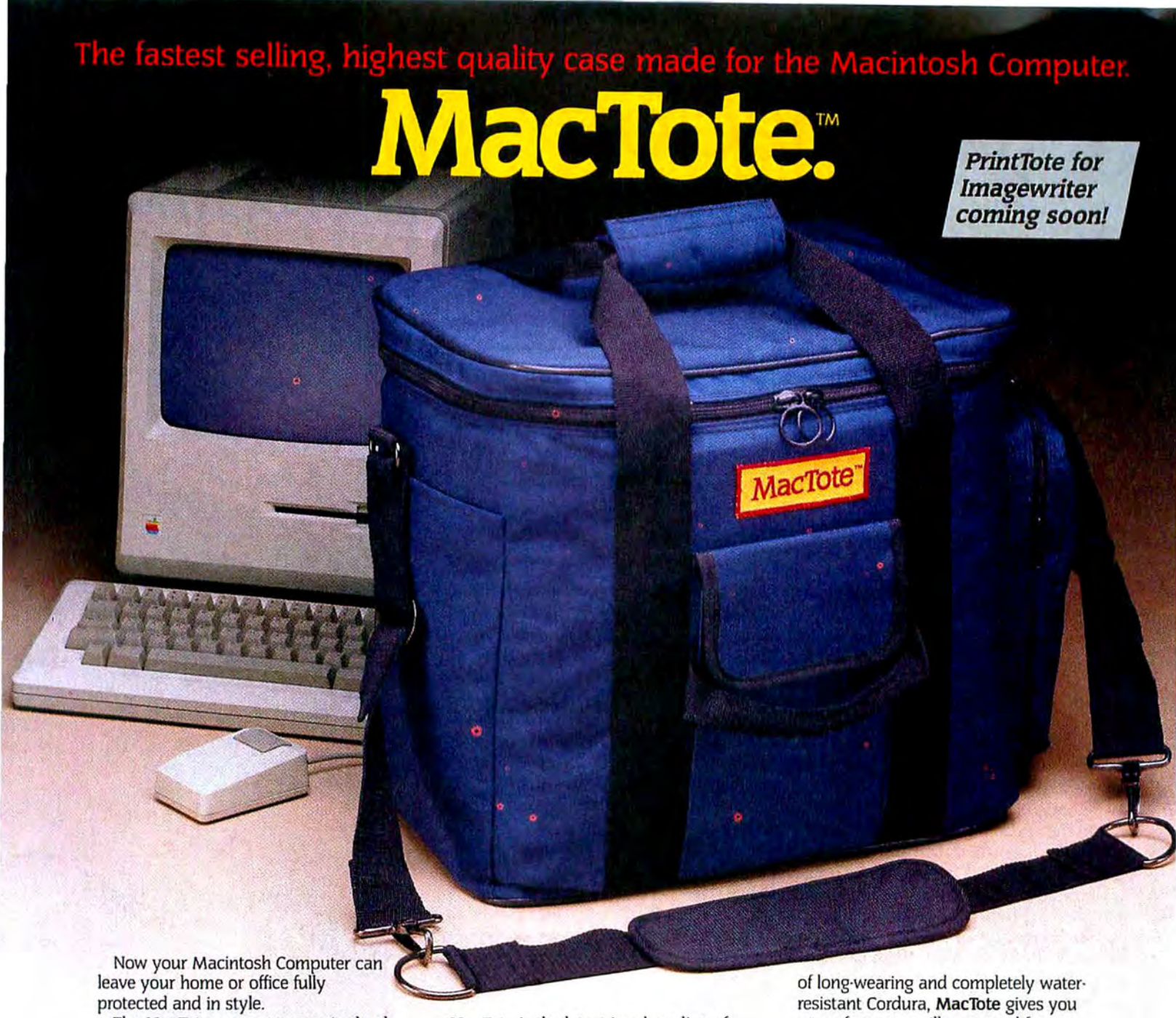

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Mac on the Audit Trail

Steve Mann

You may think of an accountant as a green-visored, anemic, bookish type who pores over long columns of numbers far into the night. Let's face it, Errol Flynn never portrayed a swashbuckling accountant, snatching a company from the throes of bankruptcy in the nick of time. Although swashbuckling *will probably never be used to describe an accountant, one firm—Peat, Marwick, Mitchell & Co.—is changing the way accountants do business.*

In January 1984, Peat Marwick announced that the Macintosh would become an integral part of its auditing practice. Replacing pencils and paper ledger sheets with state-of-the-art microcomputer tools is a radical step for a conservative profession that until now has not automated the audit process.

In the aftermath of the Crash of 1929, Congress created the Securities and Exchange Commission (SEC). One of the SEC's functions is to monitor public stock trading to help guarantee that investors have reliable, accurate information on which to base decisions. The Securities Acts of 1933 and 1934 required that all publicly traded companies file financial statements, accompanied by the formal written opinion of an independent accounting firm, with the SEC.

As a result of that legislation, all companies that are publicly traded in the United States must be audited. When performing an audit, an accounting firm scrutinizes the financial records of a business—whether they are on note cards, ledger sheets, or spreadsheets—and delivers an official "opinion," stating whether the financial statements accurately represent the business's financial condition.

Peat Marwick is one of the largest of the Big Eight—the eight largest accounting partnerships in the world, each having annual revenues ranging from $200 million to over $1 billion. The Big Eight accounting companies audit most of the largest corporations in the United States.

7:10 a.m.
Already at work as the sun rises over the bay, an audit team holds a strategy session at the Tampa, Florida, office of Peat, Marwick, Mitchell & Co. Senior manager John Huyett, managing auditor Debra Frank, and supervising manager Brad Boaz (right to left) share information on the Jack Eckerd Corporation, the client on the day's schedule. They discuss the client's internal controls and decide on sampling techniques and other tools needed for an effective audit. Preparation for an audit normally takes several sessions, each lasting a couple hours.

Peat Marwick's Tampa office has 85 people on staff, about 50 of them auditors. The staff uses 28 Macintoshes.

The Automated Audit

As conducting a business becomes more complicated and automated, it's almost inevitable that the auditing process take advantage of technological advances. Productivity, quality, and consistency can all be enhanced with the right computer tools. And because most large companies, and many smaller ones, keep financial records on computers, it is appropriate that auditors examine these records with computers.

In 1980, Peat Marwick's board of directors asked its auditing partners to define the areas of the audit process that could be computerized. In 1981 an internal advisory group identified such areas as audit administration and detailed numerical analysis for automation.

Peat Marwick initially contacted 28 vendors in search of the perfect audit machine.

Finding the Right Micro

Because audits are generally conducted at the client's location, the company decided on portable personal computers. Peat Marwick initially contacted 28 vendors in search of the perfect audit machine. In addition to choosing the right hardware, it was important to select a vendor that would be around through the 1980s so that the investment would be worthwhile. The list was narrowed to four: Apple, Hewlett-Packard, IBM, and Xerox.

The next step in the selection process was to determine what each of these companies had planned. Peat Marwick wanted a hardware-software combination that would be useful for several years. It didn't make sense to invest millions of dollars in a system that would become technologically obsolete in a short time. But none of the available products was perfectly suited to the task at hand.

In 1982 the internal advisory group offered to trade future plans with Apple, Hewlett-Packard, and IBM. IBM declined. Hewlett-Packard and Apple agreed. In May, Peat Marwick decided it had found the right personal computer for the job—the Mac. The user interface, portability, and processing capabilities of the Mac all helped tip the scales in Apple's favor. Behind the scenes, Peat Marwick began working with engineering prototypes of the Mac.

There was still a rough trail ahead. Although the Mac had not yet been released, the company decided to use Apple IIIs in the field while waiting for the Mac. At least one Apple III was installed in each domestic office, and dozens were sent abroad. Each system included proprietary audit software and specific programs from outside developers, such as *Advanced VisiCalc* from VisiCorp. This was only an interim solution, however. The programs later included with the Mac were different from those included with the Apple IIIs.

The Mac was chosen largely because it has an excellent user interface. The firm didn't want to spend exorbitant amounts of money to train auditors. The Mac requires a minimum of initial as well as ongoing training and support.

The Mac's work environment also provides benefits for the clients. The auditor can spend a few minutes with a client explaining the basics of audit software, and then let the client enter much of the required financial data, thereby lowering overall audit costs.

Close on the heels of Apple's formal Macintosh announcement in January 1984, Peat Marwick announced that it would purchase over 4000 Macintoshes. This endeavor is more complicated than buying a few thousand Macs, however. Peat Marwick intends to invest more than $30 million over the next five years for hardware, software development, and training. This ambitious undertaking encompasses three main goals: to increase staff productivity and audit quality by using personal computers efficiently, to shift mundane clerical tasks from the auditor to the computer, and to enhance the company's image by being on the leading edge of technology.

8:19 a.m.

Have Mac, will travel: Boaz, Huyett, and Frank set out for the offices of the Jack Eckerd Corporation, a major retailer in the Southeast with headquarters in nearby Clearwater. On a typical auditing expedition, a team is equipped with two Macs, a ten-key pad, an Imagewriter with a 15-inch carriage, an external disk drive, and a modem. The team also brings software components of the SeaCas (Systems Evaluation Approach–Computerized Audit Support) system, including Peat Marwick's own Financial Statement Subsystem (FSS), MacWrite, MacTerminal, *and Microsoft's* Multiplan, Chart, *and* File.

10:05 a.m.
Part of the audit procedure involves equipment inventory. The Peat Marwick audit team walks through the truck lot with Sam Bass (left), manager of inventory accounting with the Eckerd Corporation.

SeaCas

The centerpiece of Peat Marwick's audit system is SeaCas (Systems Evaluation Approach–Computerized Audit Support), a combination of hardware and proprietary software designed to simplify the auditor's job. According to Mark Miller, former SeaCas coordinator in Peat Marwick's San Francisco office, SeaCas is "Peat Marwick's structured approach to incorporating microcomputer technology into the audit practice."

There's nothing mysterious about SeaCas. An auditor doesn't key in a series of numbers and wait for the machine to render an opinion. "The computer has no judgment; the auditor has the judgment," explains Miller. "Some of the things we do are mechanical or clerical. If the computer can crunch numbers, I can dispense with those mechanics and get to the heart of the matter–the part in which I can exercise my knowledge. You might think of a calculator as a rip saw, the computer as a power saw, and the auditor as a builder."

In its current incarnation for the Macintosh, this particular power saw includes:

- A 128K Macintosh
- The *Financial Statement Subsystem (FSS),* Peat Marwick's proprietary software
- *Multiplan* and several templates
- Apple's *MacWrite* and *MacTerminal* application programs
- Microsoft's *File* and *Chart* for the Macintosh.

Each of these components is integrated into a methodology designed to relieve auditors of mundane details, such as adding columns of numbers, and allow them to concentrate on the primary purpose of an audit: attesting to the accuracy of the financial statements under scrutiny.

10:52 a.m.
Bass and the audit team in one of the client's warehouses. The Eckerd Corporation owns retail outlets including a chain of drugstores and various video, optical, and department stores. Most of the actual auditing takes place in an office provided on site by the client, where the SeaCas system is set up. A client representative is always on hand to answer questions and respond to comments that come up during the audit.

The Financial Statement Subsystem

The *FSS* is probably the most innovative part of SeaCas. With this proprietary program, an auditor can create a complete set of draft financial statements for a client, along with all the supporting detail required to document the derivation of the numbers on those statements. The *FSS* main menu is partitioned into three primary capabilities: entering a general ledger, changing financial statements, and setting up financial statements (see Figure 1).

If the auditor ever has any doubts about using the system, he or she can refer to an on-line help function, available at any time, which can be read by scrolling or topic search.

The auditor enters data in the General Ledger window. *FSS* functions like a specialized spreadsheet. The auditor enters informtion in each financial statement. Linked to each number on those statements is a set of general ledger accounts and their balances (see Figure 2). *FSS* automatically tells the auditor if the statements are in or out of balance, posts adjustments when required, and prepares printed statements for review. In the past, if an auditor had to make an adjustment, he or she had to create the proper accounting entry and then manually update several financial statements and supporting worksheets to reflect that adjustment. With *FSS*, once the adjustment is entered into the program, all the other tasks are executed automatically.

Using electronic mail for any audit-related documents is both quicker and less expensive than sending printed documents through the postal system.

FSS can store several years of data about a business. Redundant information need be entered only once–the first year that *FSS* is used for that audit. In subsequent years, only data that has changed need be modified. *FSS* is ideal for creating comparative financial statements covering more than one year, because all the data is readily available.

FSS prepares basic analytical review reports showing year-to-year financial changes. Another important feature of *FSS* is its ability to share financial information with other software, such as *Multiplan*.

Other Software Components

Although *FSS* is the flagship, the other programs are vital components of the SeaCas fleet. *Multiplan* is used for analytical reviews, or calculating ratios from the financial statements using data passed from *FSS*. Ratios can be used to reveal "big picture" aspects of a business. Analytic reviews are most valuable when they are done for successive years; the auditor can quickly determine which components of the business change from year to year. *Multiplan* is also ideal for other types of audit calculations, such as loan payment schedules, depreciation, inventory, and budgeting.

MacWrite can be used for many of the tasks involved in an audit, such as writing letters and formal opinions about financial statements, as well as reports documenting the audit. *Microsoft File* can help keep lists of depreciable assets and other schedules, and *Microsoft Chart* generates graphs to show the relationships between groups of numbers.

Communications

The Peat Marwick auditors use electronic mail and micro-to-mainframe communications. The firm subscribes to an international electronic mail service through International Telephone and Telegraph (ITT) Dialcom. Even before SeaCas was developed, this service was used for a variety of electronic tasks, including on-line special-interest bulletin boards and message transfers. Using *MacTerminal* and a modem, an auditor can generate draft financial statements for a client in San Francisco, for example, and send them for review to a partner in New York. Using electronic mail for any audit-related documents is both quicker and less expensive than sending printed documents through the postal system.

Micro-to-mainframe communications are an integral part of the audit process. For many years, Peat Marwick has used the mainframe-based package S/2190 to automate certain procedures requiring mainframe access, such as selecting specific accounts receivables records for examination purposes.

Before the days of SeaCas, auditors often had to process mainframe jobs in the middle of the night because getting time on a mainframe was often a matter of waiting in line or finding times of lowest usage. Now the auditors can set up an S/2190 job on a Macintosh during normal working hours and send it to the mainframe. The job is still processed at night, but the au-

12:30 p.m.
Audit team members have a relaxing lunch at a Gulf Coast restaurant. The midday break is an opportunity to assess the progress of the audit and to plan the rest of the workday.

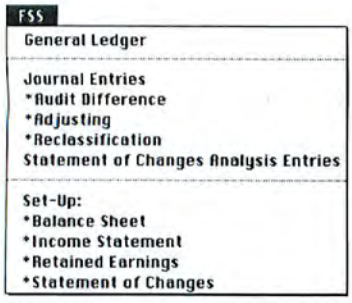


Figure 1
The FSS Main menu, partitioned into the subsystem's three primary capabilities–entering a general ledger, changing financial statements, and setting up financial statements.

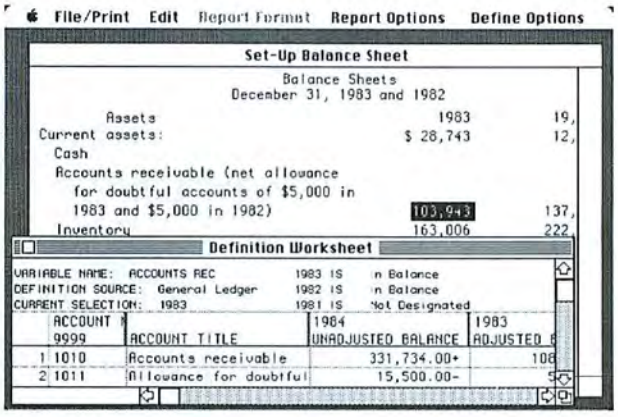
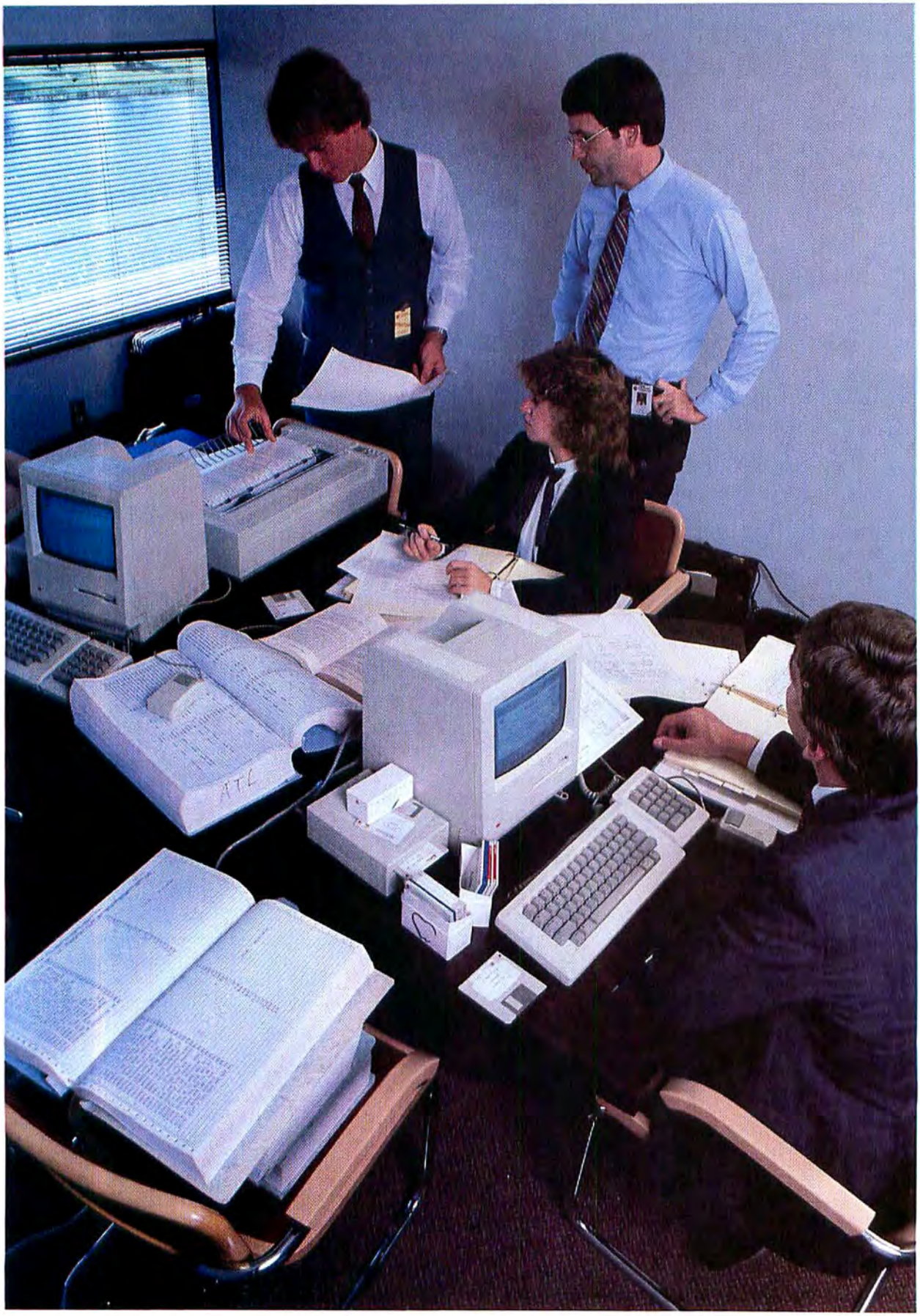


Figure 2
Setting up a financial statement. Each number on this balance sheet can be linked to a subset of the General Ledger accounts, called the definition worksheet for that number.



2:10 p.m.
Back with their Macs, the Peat Marwick auditors confer with Don Perfetto, controller of the Eckerd Corporation's drugstore subsidiary. Here they discuss the current year's sales figures by region as compared to the previous year's. One member of the team usually keys in data required for the audit, although at times the client provides personnel to do the task.

Auditing a client as large as the Eckerd Corporation can require the skills of as many as six Peat Marwick auditors working for two months, during which the Macs and the rest of the SeaCas system remain on site.

4:18 p.m.
Upon completion of the audit, Frank, Huyett, and Boaz load their equipment into her car. The three-ring binders contain client information necessary to the audit. Because documentation for the SeaCas system is on-line, the Peat Marwick team doesn't have to lug any instruction manuals around.

ditor doesn't have to be there to get the results. He or she can have a good night's sleep and review the results the next morning on a Macintosh.

Communications will certainly play an increased role in Peat Marwick's future. According to Miller, "All the volumes and volumes of professional and firm literature, standards, guidelines, checklists, and questionnaires, for example, will be available on line, so I no longer have to carry that five-pound manual with me everywhere I go."

Another benefit of communications is immediacy. A typical electronic mail communication might read as follows: "I've found a nifty way of doing that depreciation here in the Des Moines office. Would anyone else in the firm like to know how?" Miller calls the process "a competitive advantage–we have the whole firm as a[n on-line] resource."

Training and Administration

With more than 4000 Macintoshes, 8000 auditors, and several hundred locations, instituting a program as comprehensive as SeaCas is a huge, complex task. And the Peat Marwick corporate structure further complicates the endeavor. Each office functions somewhat autonomously, with direction provided, in some cases, by the New York-based executive office.

To guarantee consistency among the various offices, all software and training materials are developed in New York. Each local office has an official SeaCas coordinator, someone who is responsible for communicating with the executive group, providing local training and guidance in using the SeaCas tools, and controlling local security and administration of both hardware and software.

Security is no simple matter. The San Francisco office alone has more than 60 Macs, as well as software and training materials representing an investment of

5:52 p.m.
As evening creeps up on the Gulf of Mexico, John Huyett, Debra Frank, and Brad Boaz mark the end of another day on the audit trail.

more than $250,000. Auditors are required to check out their machines and store them in special lockers when they are not at a client's location or doing work at home. When the auditors are in their own offices, they share Macs on special desks that can be wheeled around.

The firm considers it important that every member of the audit staff, from senior partners to the newest accountants, understand SeaCas's capabilities. In 1984 all auditors received extensive SeaCas training from their local coordinators. Staff members are also required to attend an ongoing series of continuing education courses.

Each office is encouraged to initiate other procedures that the staff believes will enhance the use of SeaCas. Some of the offices have no in-house local support and have to call New York when they have questions. The San Francisco office has a monthly newsletter called *Micro Forum,* which covers SeaCas news and other microcomputer topics. That office also hosts The SeaCas Group, whose members answer internal questions and promote the effective use of SeaCas.

Yes, but Does It Work?

Is Peat Marwick's SeaCas approach to auditing successful? The auditors seem to think so. As Miller puts it, "It's exciting to our professionals. It's a new skill, one that they think is necessary and will be important in their careers."

But what do the clients think? Miller relates a particular case: "I had a client who was somewhat skeptical. He'd watch our progress and come in to talk with us every once in a while. Then the reports came out . . . the information came off the printer. I took it in and showed it to the client. His immediate reaction was, 'I've never seen this in this format before. This is really useful information. Would you run an extra set for me?'"

It's likely that other companies will follow Peat Marwick's example, taking the Mac along on the audit trail. □

Steve Mann is a consultant in the Information Systems and Services group of Peat, Marwick, Mitchell & Co. in San Francisco.

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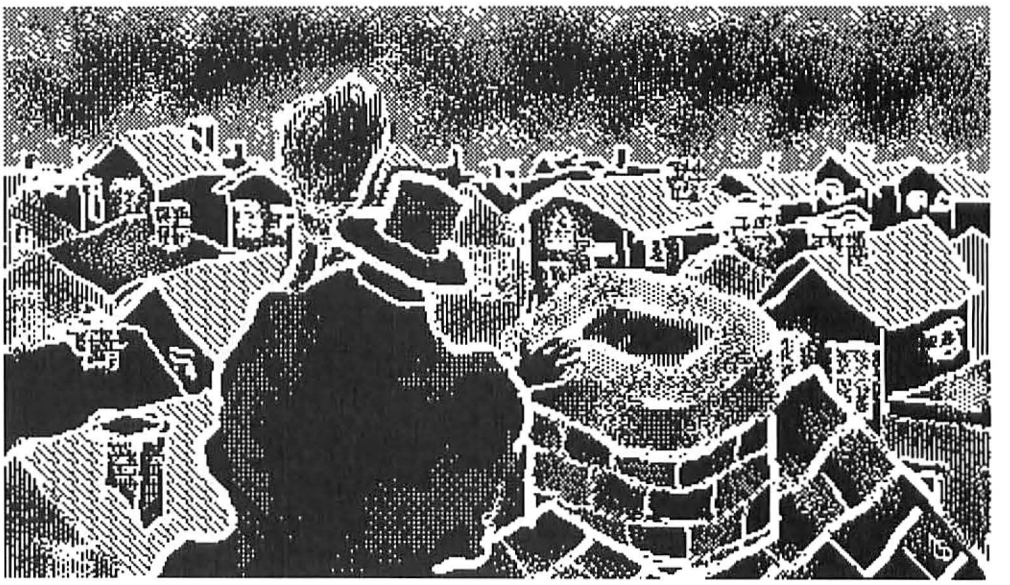
Macworld Gallery

An exhibition of Macintosh graphics

Many people have written asking for details about the Macworld *Art Contest, so here they are. The contest is co-sponsored by* Macworld *and Apple Computer. All original drawings submitted to* Macworld Gallery *are eligible for the contest, so you can simply send a paper copy of your drawing and a description of how you created it to* Macworld Gallery, *555 De Haro St., San Francisco, CA 94107. If your drawing is selected, we will ask you to send a copy of it on disk.*

Drawings are viewed each month by a panel of five judges, who choose one winning drawing ($500 is awarded) and two runners-up (two $250 prizes are awarded). In addition to the prize-winning drawings, several pieces are exhibited each month in the regular Gallery *section. Exhibitors of those drawings are paid $25 each. Regular* Gallery *exhibitors retain the rights to their drawings, but the contest-winning drawings become the property of Apple Computer. In November 1985 a grand-prize winner ($5000) and two runners-up ($2500 each) will be chosen from among the year's winning drawings.*



The Chimney Sweeper

$500 First Prize

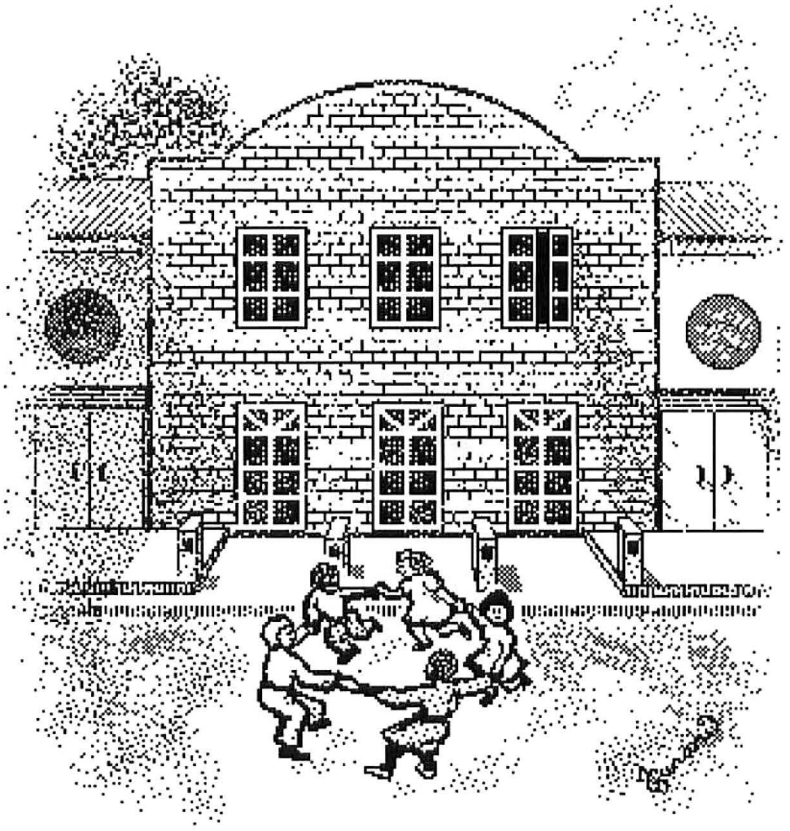
This month's contest is a little unusual; the judges couldn't decide which of the first-prize winner's two drawings they liked better, so we're running both of them.

The Chimney Sweeper
This drawing was inspired by a William Blake poem. I filled the entire screen with black from the paint bucket, then "cut" lines into the background with various white brushes, like a woodcut. I filled the roofs of the houses with a custom pattern. The sky started as a plain gray pattern, which I reworked with the spray can.

John S. Sunami
Columbus, Ohio

South Side Settlement House
This drawing was included in an invitation for an open house. I roughed in the building by putting a rectangle over a circle and then erasing unnecessary lines. Then I created the building's striped facade by applying the brick pattern with a few small brushes. I drew one door and one window and then copied them using the lasso and the Option key. I find that *MacPaint* drawings reproduce very well for use in invitations and the like.

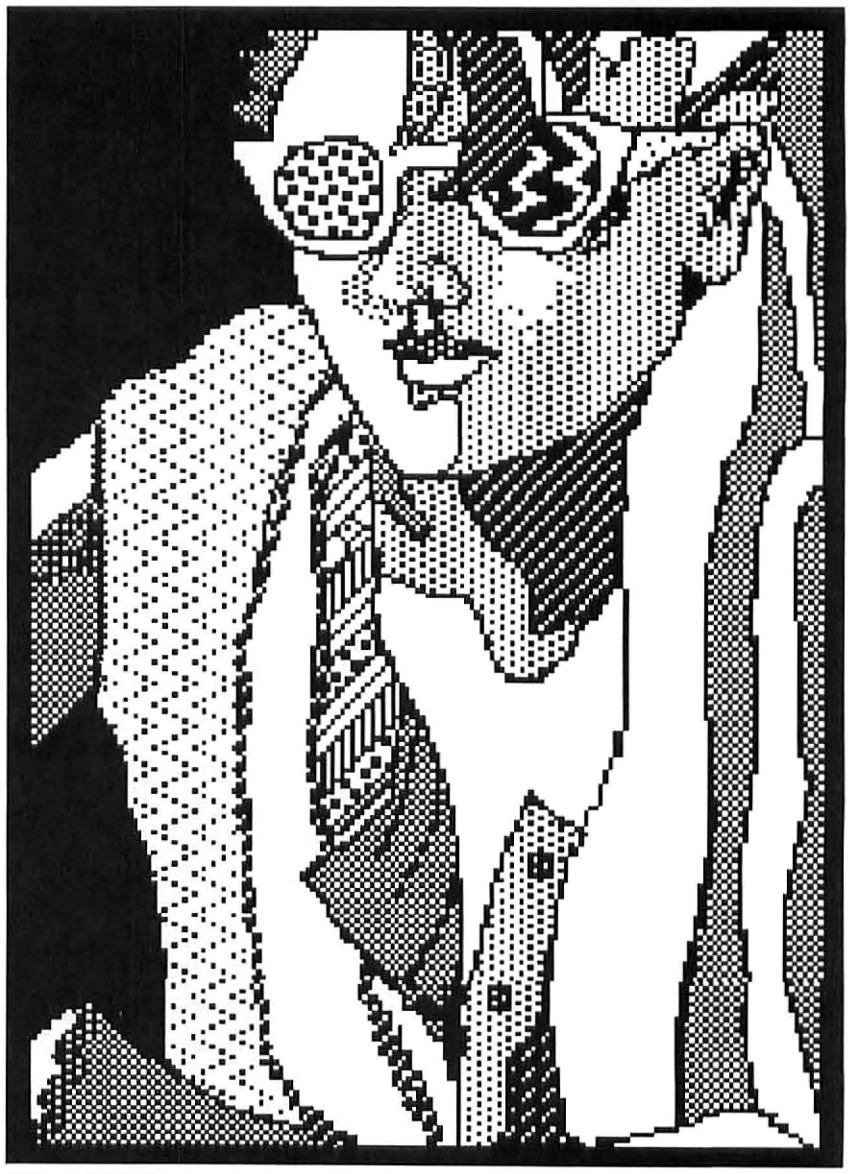
John S. Sunami
Columbus, Ohio



South Side Settlement House

When I Was in London . . .
To create this drawing I began with a small line drawing, done freehand with the pencil, of my reflection in a window. I chose various patterns, some of which I edited, to fill the spaces and add some depth. I filled some areas using the paint bucket, and others by applying a pattern with one of the brushes. Finally, I cut the drawing to the Clipboard, went into *MacWrite,* and pasted the picture into a *MacWrite* document, where I stretched it to fill nearly a full page.

Valenta de Regil
Oakland, California



When I Was in London . . .

$250 Second Prize

Spotted Dog
This is the fourth drawing I've done with *MacPaint,* so I'm still learning how to use the various drawing tools and patterns. First I used the pencil to make rough sketches of the figures. Then I selected a pattern and started filling in spaces with the paint bucket. I added some thick black lines with a paintbrush, sprayed some areas white with the spray can, and did some final editing and erasing. *MacPaint* lends itself well to spontaneity–you can immediately explore unexpected results and can always erase experiments that don't work quite right.

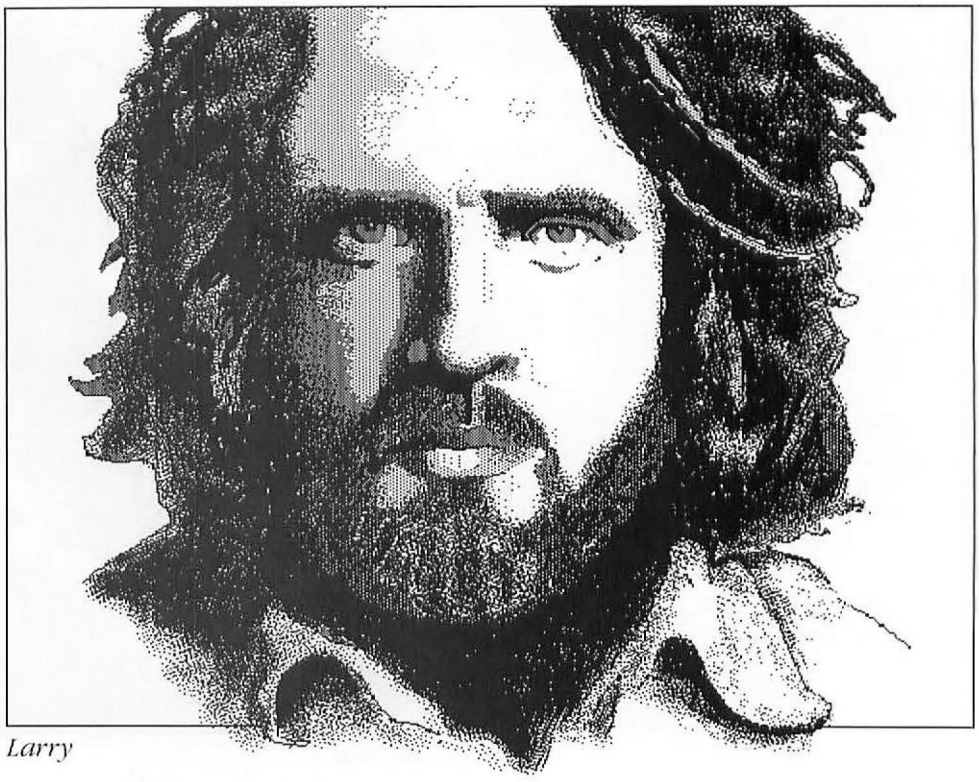
Rudy Autio
Missoula, Montana

Spotted Dog

$250 Second Prize

Larry
I'm a painter and photographer and have been using computers for several years to produce graphics. While the Macintosh is new to me, I am enthusiastic about its graphics capabilities. This drawing was done from a photograph I took of a friend. I outlined various areas and filled them with patterns from the paint bucket. Once the basic shapes were blocked in, I used the spray can to add some texture and shading. I used FatBits, of course, to work on details and touch up portions of the drawing.

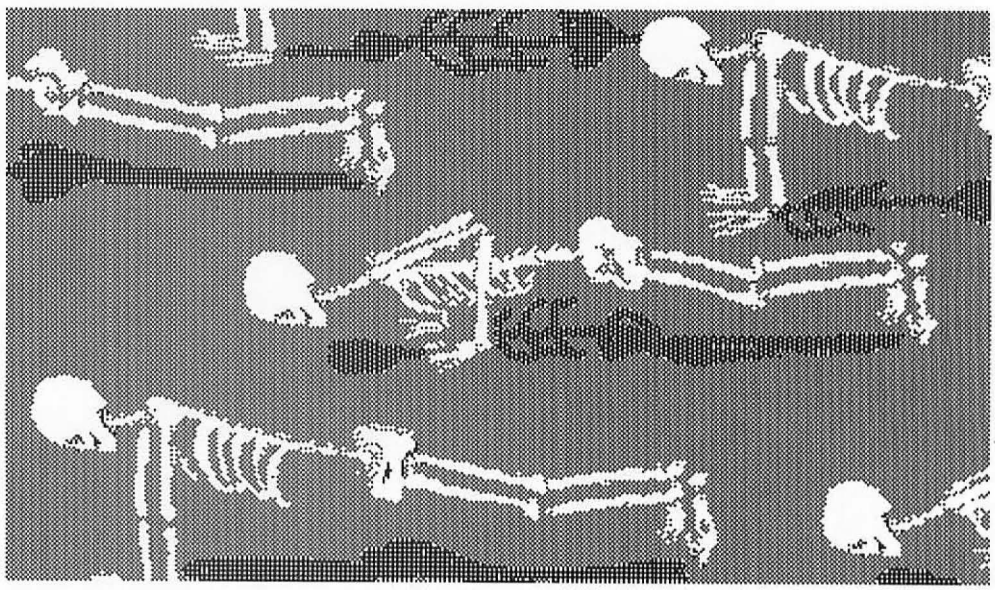
Jim Alley
Interlochen, Michigan



Larry

Morning Exercise
I drew a skeleton in black with the pencil and the small round brush, then made several copies, modified them slightly, and placed them around the screen. Next, I filled the background with gray, using the paint bucket. Then I selected the entire drawing screen by double-clicking on the marquee, and chose Invert from the Edit menu. The skeletons turned white, while the background remained gray. (Although the background pattern was also inverted, it didn't change this particular shade of gray.) As a finishing touch, I drew the shadows with the small round brush in a darker gray.

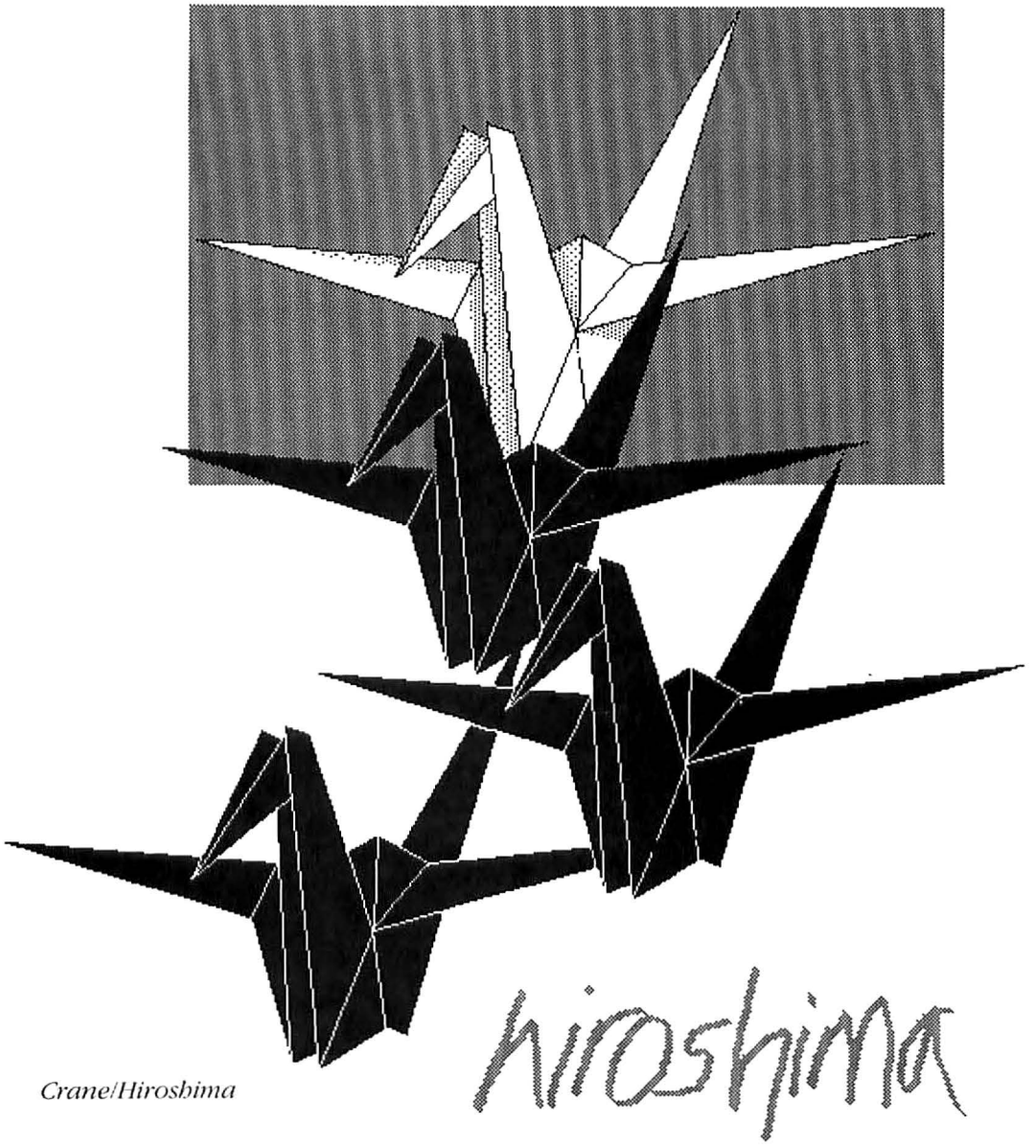
Olga Antonova
Cambridge, Massachusetts



Morning Exercise

Crane/Hiroshima
I use my Mac for designing logos, book covers, letterheads, and all sorts of things. It hasn't replaced my layout pad but instead has added a whole range of capabilities that I can use in combination with an old-fashioned pencil and eraser. I drew the initial origami crane using the straight-line tool, employing a "connect-the-dots" approach. I made three copies of the original, chose Invert from the Edit menu, and moved the black cranes into position. I added shading to the white crane using the square brush and then put in the gray background.

Al Wasco
Cleveland, Ohio ❑



Crane/Hiroshima

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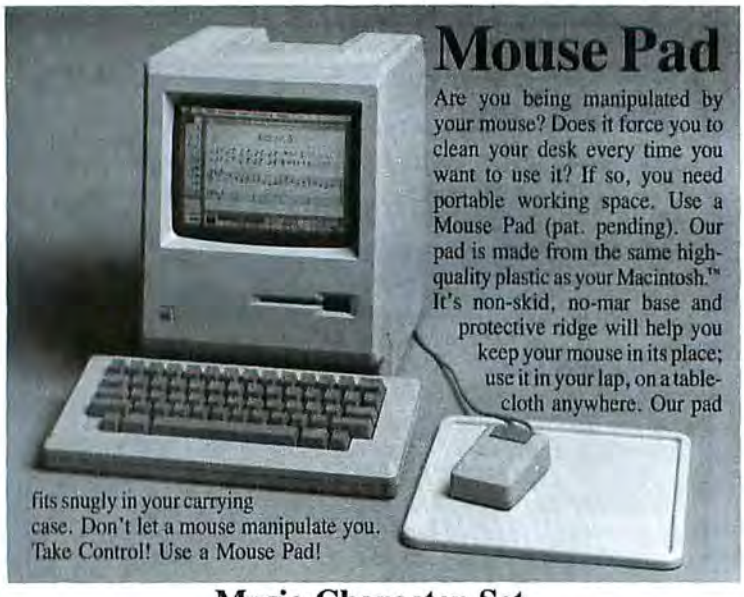

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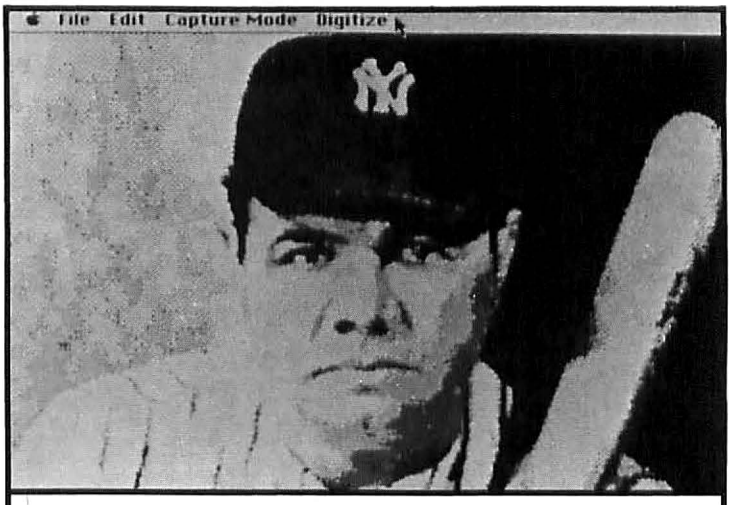

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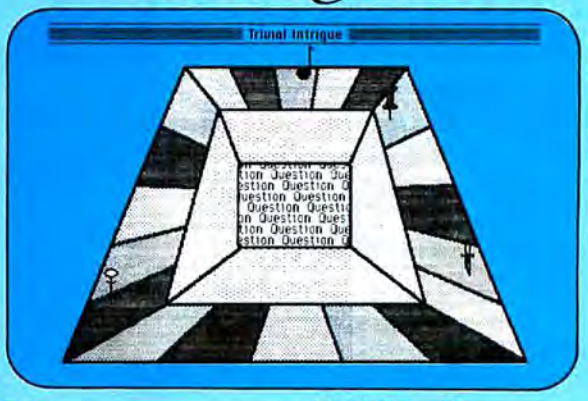

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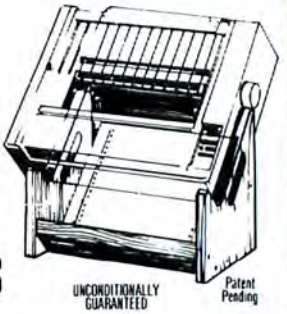

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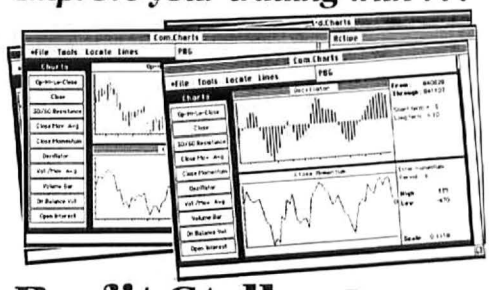

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Product Index

Reader Service Number

Software

Business

64 Creighton Development, Inc., 147
95 Creighton Development, Inc., 147
32 Haba Systems, Inc., 145
8 Intermatrix, Inc., 40-41
86 Megahaus, 51
88 Megahaus, 55
— Microsoft, 6-7
42 Videx, Inc., 33
183 Warner Software, Inc., 104

Communications

69 Dow Jones, 14
73 I O Tech, 174
203 Mycroft Labs, 54
205 Touchstone Corporation, 67

Data Management

46 Brock Software Products, 42
66 Computer Software Design, 68-69
87 Megahaus, 53
114 Forethought, Inc., 61
— Hayden Software Company, 118
8 Intermatrix, Inc., 40-41
125 Layered, Inc., 12-13
88 Megahaus, 53
13 Odesta, 26-27
38 Organizational Software Corp., 39
77 ProVUE Development Corp., 8
94 SoftDesign, IBC
— Software Publishing Corporation, 94
54 Telos Software Products, 89

Educational

93 Axlon, Inc., 137
144 Forethought, Inc., 136
74 Palantir Software, 132
198 Simon & Schuster, Inc., 100
10 Think Educational Software, 173

Entertainment/Strategy

93 Axlon, Inc., 137
138 Blue Chip Software, Inc., 65
— Hayden Software Company, 116, 117
31 Mark of the Unicorn, 92
127 Pryority Software, Inc., 29
122 Triple Play, 173
42 Videx, Inc., 33

Financial

163 Button-Down Software, 174
190 Digital Etc. Software Products, 102
169 Future Design Software, 130
189 Gamma Productions, Inc., 163
191 Interlobal Systems, Inc., 142
117 Monogram, 56
197 Number Cruncher Stat-System, 174
124 Peachtree Software, 31
49 RealData, Inc., 130
186 SoftWeave Co., 52

Graphics

204 Ann Arbor Softworks, 103
93 Axlon, Inc., 137
199 Boston Software Publishers, 144
165 Casady Company, 59
126 Design Loft, Inc., 171
88 Megahaus, 55
97 Mesa Graphics, 98
— Microsoft, 6-7
36 The Reference Corporation, 146
123 Software Apple-Cations, 172

Languages/Development Systems

56 ExperTelligence, Inc., 64
40 Hippopotamus Software, 172
112 Manx Software Systems, 10
109 Megamax, Inc., 174
— Microsoft, 11
84 SofTech Microsystems, Inc., 62
187 Tardis Software, Inc., 64

Miscellaneous

199 Boston Software Publishers, 144
175 Central Point Software, 170
89 Computer Identics, 121
196 FootstepS, 146
50 Living Videotext, 43
79 Software Arts, Inc., 78
121 South Bay Software, 171

Personal Business/Home

64 Creighton Development, Inc., 147
95 Creighton Development, Inc., 147
189 Gamma Productions, Inc., 163
— Hayden Software Company, 116
8 Intermatrix, Inc., 40-41
31 Mark of the Unicron, 92
— Microsoft, 6-7
117 Monogram, 56
181 State of the Art, 105
183 Warner Software, Inc., 104

Word Processing/ Spelling Checkers

110 Assimilation Process, 18-19
— Hayden Software Company, 119

Hardware

Digitizers

200 I/O Video, Inc., 161
102 Servidyne Systems, Inc., 172
167 Thunderware, Inc., 30

Hard Disks

206 Corvus Systems, Inc., 5
176 General Computer, 90-91
171 Iomega Corporation, 38
24 Micro-Design, 25
132 Sunol Systems, 133
14 Tecmar, 1, BC

Miscellaneous

73 I O Tech, Inc.,:172
140 Mentauris, 60
— MicroRain Corp., IFC

Modems

78 Kensington Microware, 20
72 Microcom, Inc., 101

Printers/Printer Accessories

110 Assimilation Process, 18-19
64 Creighton Development, Inc., 63
164 Diversions, Inc., 170
142 NEC, 16
135 Synergy Products, 173

Accessories

Carrying Cases

28 MacPacks, 163
— MicroRain Corp., IFC
34 Optimum Computer Luggage, 149
172 Qubie', 23

Disks

193 Echo Data Services, 173

Miscellaneous

110 Assimilation Process, 18-19
62 CO-DU-CO, 171
202 Computer Alternatives, Inc., 176
178 Frontrunner Computer Industries, 22
11 Kensington Microware, 20
— MicroRain Corp., IFC
184 Secure-It, Inc., 171
177 Systems Control, 93
188 Your Affordable Software Co., 174

Events

174 Macworld Exposition, 134-135

Mail Order

33 The Bottom Line, 24
— Business Computers of Peterborough, 163
98 Compuclassics, 143
195 Macbriefs Digest, 174
4 MacConnection, 80-83
160 Mac Underground, 170
3 Micro Flash Computer Systems, Inc., 99
4 PC Connection, 80-83
45 PC Network, 131
172 Qubie', 23
55 Telasoft, 146

Services

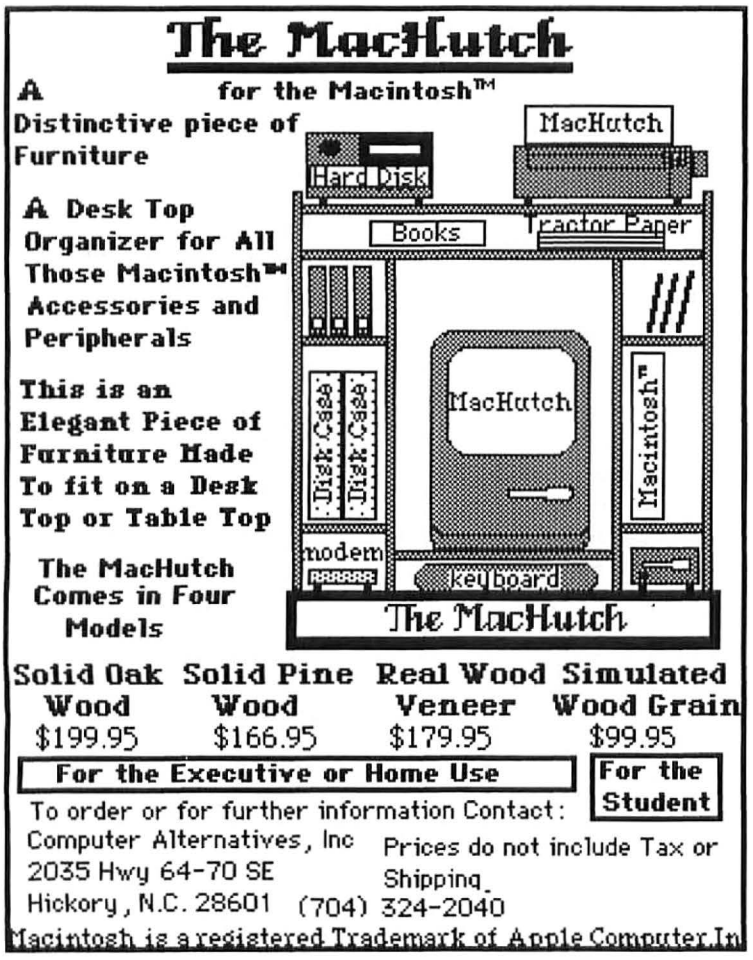
193 Echo Data Services, 173
107 International Apple Core, 162
162 MacTech, 170
182 RandM Software, 174
39 Replico Technologies, 130

Books

— Microsoft Press, 17
9 Hayden Publishing, 28

Advertiser Index

Reader Service Number		Reader Service Number		Reader Service Number		Reader Service Number	
204	Ann Arbor Softworks, 103	66	Computer Software Design, 68-69	178	Frontrunner Computer Industries, 22	74	Palantir, 132
110	Assimilation Process, 18-19	206	Corvus Systems, Inc., 5	169	Future Design Software, 130	4	PC Connection, 80-83
93	Axlon, Inc., 137	64	Creighton Development, Inc., 63, 147	189	Gamma Productions, Inc., 163	45	PC Network, 131
138	Blue Chip Software, Inc., 65	95	Creighton Development, Inc., 120, 147	176	General Computer, 90-91	124	Peachtree Software, 31
199	Boston Software Publishers, 144	126	Design Loft, Inc., 171	32	Haba Systems, Inc., 145	77	ProVUE Development Corporation, 8
33	The Bottom Line, 24	190	Digital Etc. Software Products, 102	9	Hayden Publishing, 28	127	Pryority Software, Inc., 29
46	Brock Software Products, 42	164	Diversions, Inc., 170	—	Hayden Software Company, 116, 117, 118, 119	172	Qubie', 23
—	Business Computers of Peterborough, 163	69	Dow Jones, 14	40	Hippopotamus Software, 172	182	RandM Software, 174
163	Button-Down Software, 174	193	Echo Data Services, 173	191	Interlobal System, Inc., 142	49	RealData, Inc., 130
165	Casady Company, 59	56	ExperTelligence, 64	8	Intermatrix, Inc., 40-41	36	The Reference Corporation, 146
175	Central Point Software, 170	196	FootstepS, 146	107	International Apple Core, 162	39	Replico Technologies, 130
62	CO-DU-CO, 171	114	Forethought, Inc., 61	171	Iomega Corporation, 38	184	Secure-It, Inc., 171
98	Compuclassics, 143	144	Forethought, Inc., 136	73	I O Tech, Inc., 172	102	Servidyne Systems, Inc., 172
202	Computer Alternatives, Inc., 176			200	I/O Video, Inc., 161	198	Simon & Schuster, Inc., 100
89	Computer Identics, 121			11	Kensington Microware, 20	94	SoftDesign, IBC
				125	Layered, Inc., 12-13	84	SofTech Microsystems, Inc., 62
				50	Living Videotext, 43	123	Software Apple-Cations, 172
				195	Macbriefs Digest, 174	79	Software Arts, Inc., 78
				4	MacConnection, 80-83	—	Software Publishing Corporation, 94
				28	MacPacks, 163	186	SoftWeave Co., 52
				162	MacTech, 170	121	South Bay Software, 171
				160	Mac Underground, 170	181	State of the Art, Inc., 105
				174	Macworld Exposition, 134-135	132	Sunol Systems, 133
				112	Manx Software Systems, 10	135	Synergy Products, 173
				31	Mark of the Unicorn, 92	177	Systems Control, 93
				86	Megahaus, 51	187	Tardis Software, Inc., 64
				87	Megahaus, 53	14	Tecmar, 1, BC
				88	Megahaus, 55	55	Telasoft, 146
				109	Megamax, Inc., 174	54	Telos Software Products, 89
				140	Mentauris, 60	10	Think Educational Software, 173
				97	Mesa Graphics, 98	167	Thunderware, Inc., 30
				72	Microcom, Inc., 101	205	Touchstone Corporation, 67
				24	Micro-Design, 25	122	Triple Play, 173
				3	Micro Flash Computer Systems, Inc., 99	42	Videx, Inc.,33
				—	MicroRain Corp., IFC	183	Warner Software, Inc., 104
				—	Microsoft, 6-7, 11	188	Your Affordable Software Co., 174
				—	Microsoft Press, 17		
				117	Monogram, 56		
				203	Mycroft Labs, 54		
				142	NEC, 16		
				197	Number Cruncher Stat-System, 174		
				13	Odesta, 26-27		
				34	Optimum Computer Luggage, 149		
				38	Organizational Software Corp., 39		



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272

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