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August 1986 \$3.95

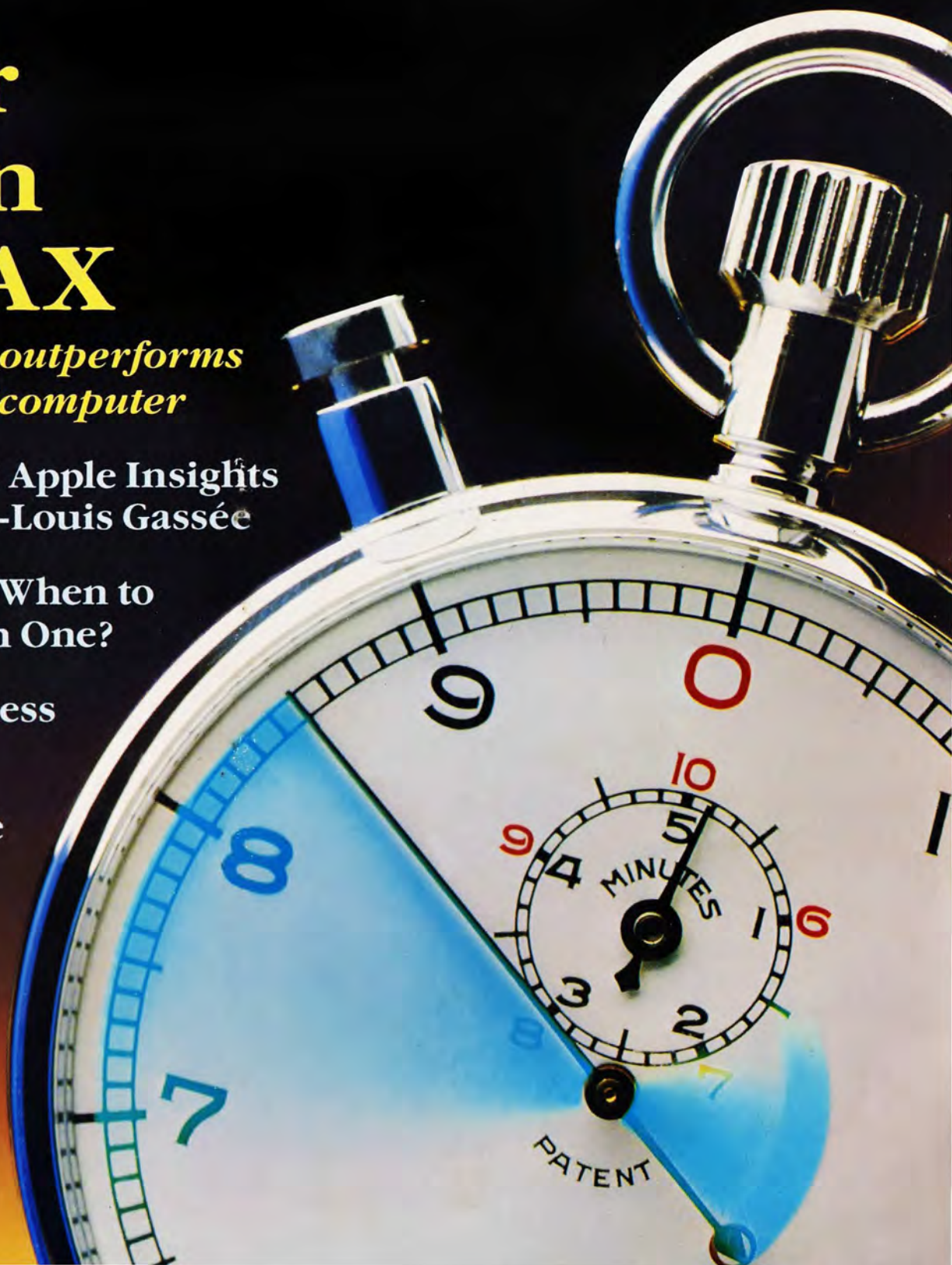
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The Macintosh™ Magazine

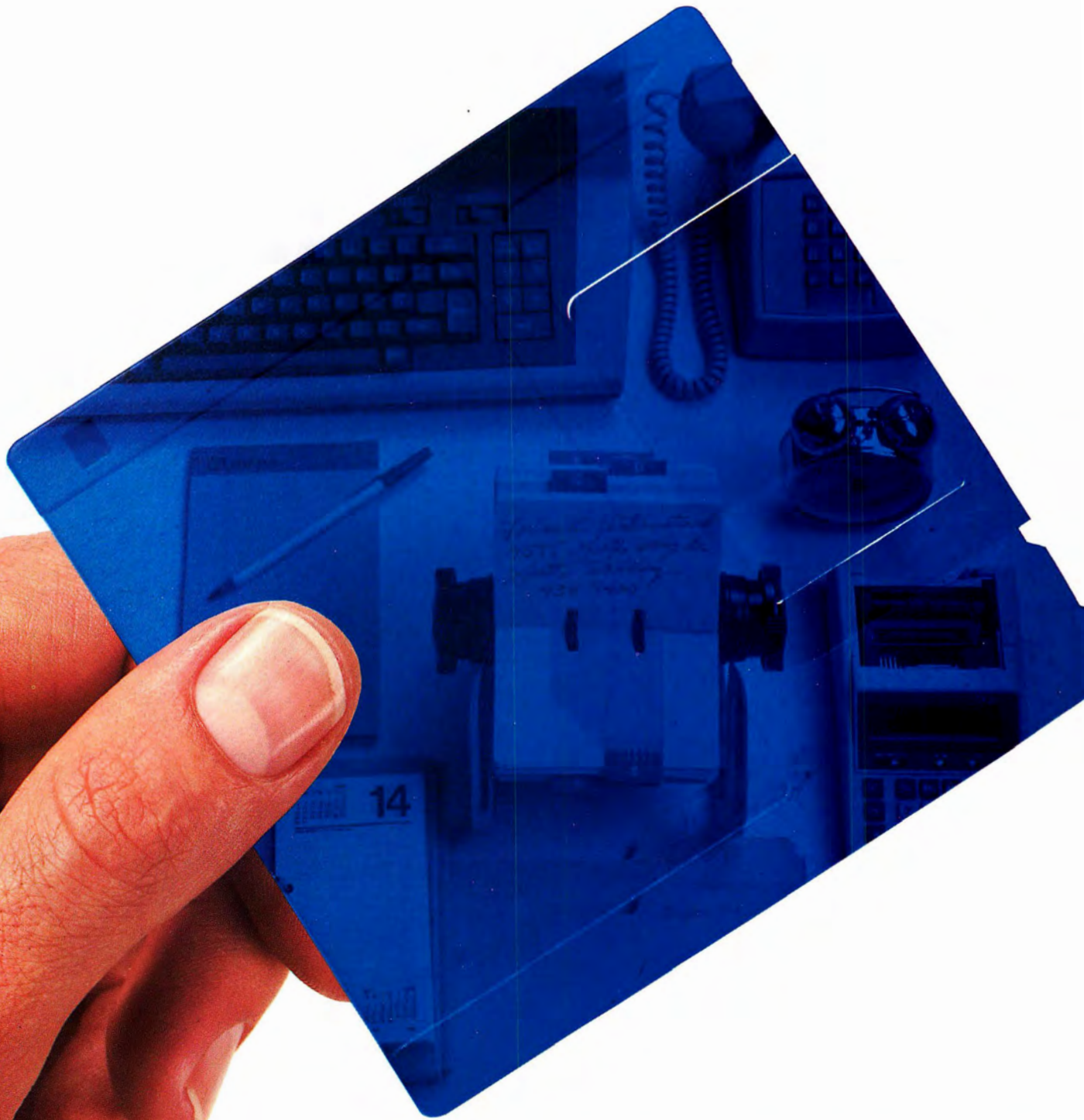
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*Mac outperforms
minicomputer*

- Exclusive! Apple Insights from Jean-Louis Gassée
- Databases: When to Buy? Which One?
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- Free Software



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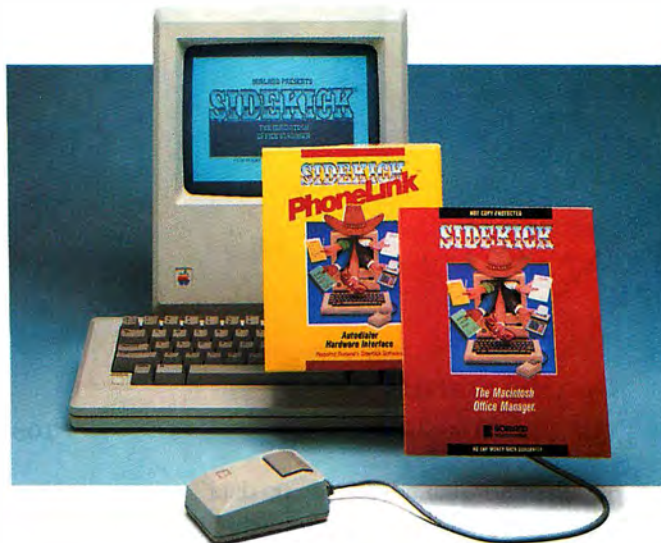
NEW VERSION 1.1

SideKick, The Macintosh Office Manager, now supports MacPlus (128K) and Finder 5.1 for the same low price—\$99.95. An upgrade is available from Borland for \$19.95. The upgrade is FREE if you purchased SideKick after 12/15/85. For more information, call (408) 438-8400.

Borland products include Turbo Pascal, Turbo Prolog, Turbo Database Toolbox, Turbo Lightning, Turbo Graphix Toolbox, Turbo Tutor, Turbo GamesWorks, Turbo Editor Toolbox, Word Wizard, Reflex, The Analyst, SideKick, SideKick, The Macintosh Office Manager, Travelling SideKick, and SuperKey—all of which are trademarks or registered trademarks of Borland International, Inc. or Borland/Analytica, Inc.

clear your desk, connect you to productivity for only \$99.95

SideKick® The Macintosh™ Office Manager™ gets rid of antiques like desktop phone directories, calculators, calendars, notepads, clocks, adding machines, and similar clutter. Sweeps all that off your desk and into your Mac. You can now bring true desktop organization, information management, and telecommunications to your Mac and do all that *while you're running other programs.*



What PhoneLink™ does for you

In true multi-tasking style, PhoneLink automatically dials for you *even while your modem is in use* on some other task, like sending or receiving a file. This one cubic-inch piece of hardware plugs into your Mac's sound port and will dial all your phone numbers for you. You can install your PhoneLink in a few seconds, and take extra pleasure in the fact that it didn't cost you anything because it came free with your new SideKick.

What SideKick does for you

- Gives you a full-screen editor and mini-word processor that lets you jot down notes, create and edit files, and/or be used in conjunction with programs like MacWrite or MacPaint.
- Provides you with a telecommunications program that sends and receives data from any on-line network or

bulletin board *while using* other applications. (You need a modem for this feature.)

- Lets you tap into a full-featured financial and scientific calculator that will let you print out a paper tape of your work.

- Offers you a print spooler that prints any text file while you run other programs.

- Shows you an instant calendar—by day, week, or month—which you can also print out.

- Reminds you of important dates/times/appointments with a "things-to-do" file.

- Alerts you to engagements with a convenient alarm system.

- Tells you what you're spending in telephone charges by calculating the cost of every call to whatever area code or time zone.

- Keeps you aware of business and travel expenses.

- Gives you a credit card file that tracks entries, balances, and limits.

- Arms you with a report generator that prints out your mailing lists, calendar, or phone directory.

- Tells you the time with a sweep-hand analog clock.

- Gives you instant on-line "Help" with one mouse click.

Get both SideKick, The Macintosh Office Manager and PhoneLink for only \$99.95

SideKick for the Mac is an electronic leap that projects you and your Mac into the real world. But you're getting much more than that. You're getting SideKick, you're getting PhoneLink, and you're getting our legendary 60-day money-back guarantee.**

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“ Take my compliments as a user. When I see SideKick, I know I want it.

Jean-Louis Gassée, VP,
Product Development,
Apple Computer

SideKick is the first product for the Mac that begins to make real the promise of an electronic desktop.

Lawrence J. Magid,
Chicago Sun Times **”**

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\$99.95

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**YES, if within 60 days of purchase this product does not perform in accordance with our claims, call our customer service department and we will gladly arrange a refund.

Minimum System Requirements:
128K
MS2



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SCOTTS VALLEY, CA 95066
(408) 438-8400 TELEX: 172373

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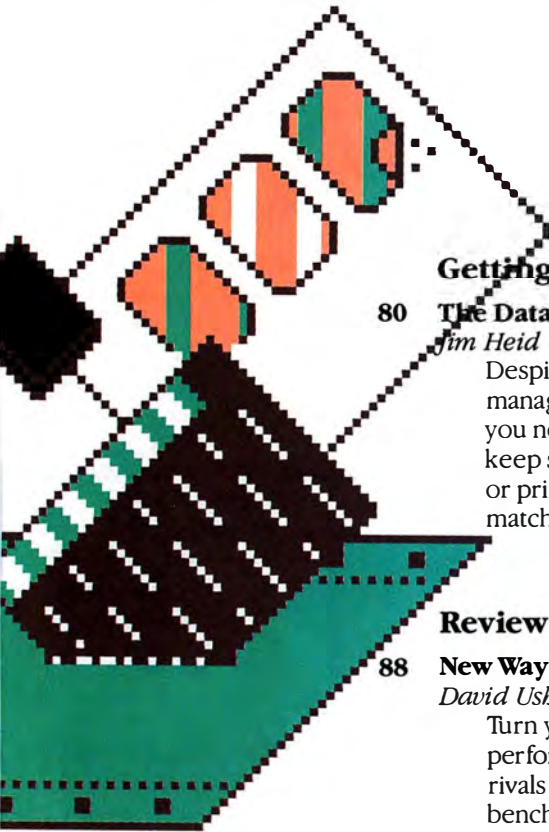
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MACWORLD

August 1986

The Macintosh™ Magazine



Getting Started

80 The Database Shopper

Jim Heid

Despite what the ads say, no data manager does everything. Whether you need to maintain a mailing list, keep schedules, analyze investments, or print invoices, this guide helps you match the program to the task.

Review

88 New Ways to a Faster Mac

David Ushijima and David L. Foster

Turn your Macintosh into a high-performance computing machine that rivals a VAX 11/780. Reviews and benchmark tests of four Mac upgrades: Novy Systems' Floating Point Accelerator; Maccelerator, from Quesse Computer; the Prodigy 4, from Levco; and General Computer's HyperDrive 2000.

96 3-D Data

David L. Foster and Reed McManus

Get a new angle on your data: *MacSpin* helps you spot trends easily with three-dimensional, rotatable graphs.

100 In the Public Domain

Robert C. Eckhardt

Editors' choices: a treasury of indispensable programs and utilities that are free for the asking.

104 Document Construction Set

Al Cini

Document Modeler goes beyond word processing to automate the production of contracts, job estimates, funding proposals, and other standardized documents.

Hands On

108 Roll 'em

Mark Stephen Pierce

Turn your Mac into a three-dimensional animation workstation using *VideoWorks* and *Easy3D*. This tutorial shows you how.

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112 So You Want to Be a Software Developer

Robert Buder

The peril and the promise of developing software for the Mac: a look at the factors that make the difference between cleaning up or being cleaned out.

120 Gassée Steps into the Limelight

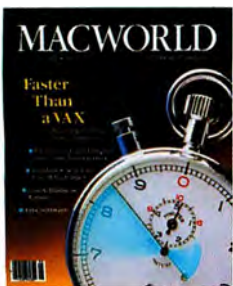
Ideas, opinions, pronouncements, and plans from Apple's flamboyant new head of product development.

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124 Is It Live or Is It Mac?

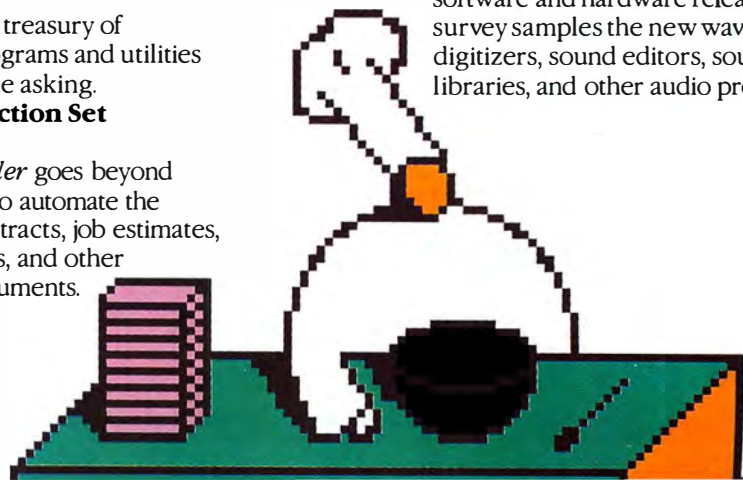
Jim Heid

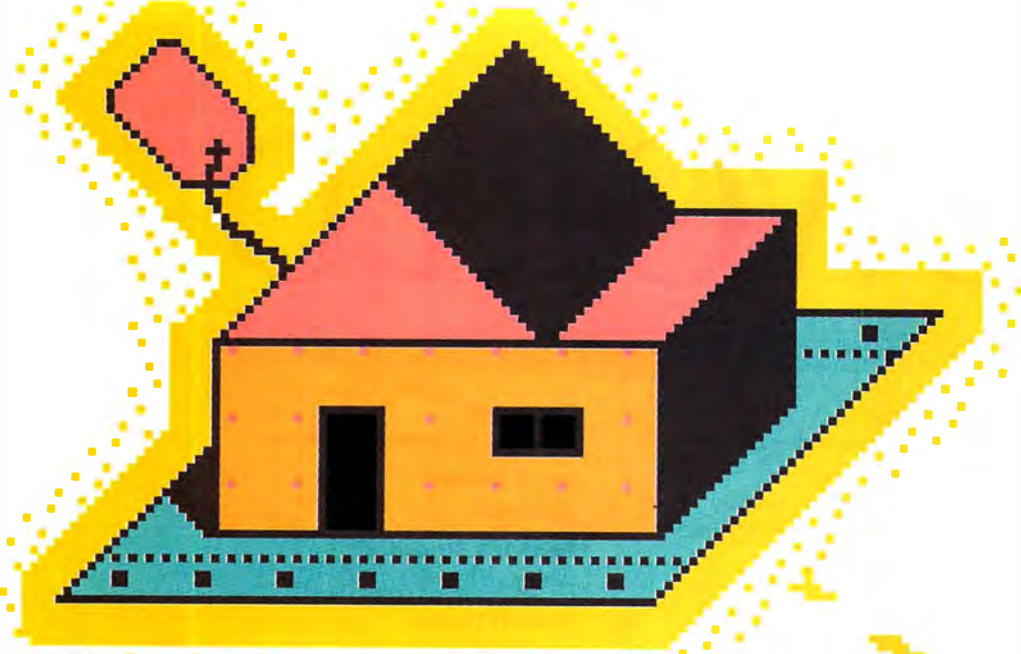
The Macintosh's unique digital audio capabilities are creating a boom of software and hardware releases. This survey samples the new wave of Mac digitizers, sound editors, sound libraries, and other audio products.



On the Cover

Beat the clock. If time is critical, make your Mac perform. See page 88.





Guy Kawasaki of Apple lets his license plates spread the word about Mac software. See page 112.

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55 Macworld View

The first Macintosh robot, how to install a second internal disk drive, four 4-megabyte upgrade boards, *ComicWorks*, the newest on-line service, and more.

65 Get Info

Macworld's tutor answers questions about Mac Plus upgrades, using the ImageWriter with an IBM PC, printing *MacPaint* pictures on the ImageWriter in high-quality mode, and other Macintosh concerns.

129 Macware Reviews

▪ *Flight Simulator* Up, up, and away—the IBM PC classic is better than ever on the Mac.

▪ *Packer and PacPaint* Let these two data-compression utilities save you disk space.

▪ *Slide Show Magician* Make silent pictures a thing of the past with this package that lets you add narration and sound effects to your presentations.

▪ *Calculator Construction Set* If you don't like the Mac's built-in calculator, build one of your own.

▪ *myDiskLabeler* Neatness counts—especially when you're looking for that lost file. A package that automatically lists and prints a disk's contents on adhesive labels.

▪ *MacGolf* If playing 18 holes in the comfort of your own home suits you to a tee, this game is for you.

▪ *The Ancient Art of War* Sharpen your strategic skills as your armies battle opponents from Genghis Khan to Napoleon.

▪ *Penmouse +* A cordless stylus for people who find the mouse a clumsy drawing tool.

151 Open Window

An exchange of Macintosh discoveries, including shortcuts for navigating the Hierarchical File System, a tip on a utility that speeds up LaserWriter printing of *MacPaint* pictures, pointers on how to produce custom shadowed text with *MacPaint*, and advice on the best paper for laser typesetting.

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August 1986

Volume 3, Number 8

Macworld™ (ISSN 0741-8647) is published monthly by PC World Communications, Inc., 555 De Haro St., San Francisco, CA 94107. Subscription rates are \$30 for 12 issues, \$50 for 24 issues, and \$70 for 36 issues. Foreign orders must be prepaid in U.S. funds with additional postage. Add \$6 per year from Canada and Mexico; add \$12 per year for surface mail or \$80 per year for airmail from all other countries. For subscriber service questions call toll-free 800/525-0643 (in Colorado 303/447-9330) or write: Subscriber Services, P.O. Box 54529, Boulder, CO 80322-4529. To place new orders, call 800/524-3200. Second-class postage paid at San Francisco. POSTMASTER: Send address changes to *Macworld*, P.O. Box 54529, Boulder, CO 80323-4529. Editorial and business offices: 555 De Haro St., San Francisco, CA 94107, 415/861-3861. *Macworld* is a publication of PC World Communications, Inc.

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READYSETGO™ Takes You Beyond Word Processing.

At one time you were satisfied with your word processor's output. But now you want a lot more.

Adding those Excel charts to your business plan would be nice. And snappy MacPaint™ creations are just begging to be included in your letters and memos.

Sure, you can put graphics in MacWrite™ or Microsoft® Word. But it isn't easy.

Neither program shows you how your page will look until you print it out.

Adding simple graphics like lines or boxes is a big chore too.

Not to mention the fact that neither MacWrite nor Word show text columns side by side.

There is an easier way.

Introducing Page Processing

Instead of merely manipulating single words, you could be working with the entire page.

By processing whole pages of text and graphics at once, READYSETGO represents the next step in document generation.



Import your MacPaint Graphics with our free Art Grabber+

Now you can import graphics, place them anywhere on a page — cropped or scaled to any desired size.

Text entry is just as easy. Built into READYSETGO is a word processor more powerful than MacWrite. With complete control over fonts and line



You can do a lot more besides newsletters — like this ad.

spacing in point sizes of up to 99. And, unlike those ordinary word processors, READYSETGO's time-saving print preview eliminates the guesswork of laying out pages.

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Yet because of the simplicity of its design, READYSETGO is *extremely* easy to use.

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You may have been led to believe that the desktop publishing revolution applies only to LaserWriter™ owners.

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In fact, with the proliferation of LaserWriter output services, you can now have your cake and eat it too!

A Complete Solution: DESK DESIGN™

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Using preformatted templates, you just enter text and presto!

Nothing could be faster.

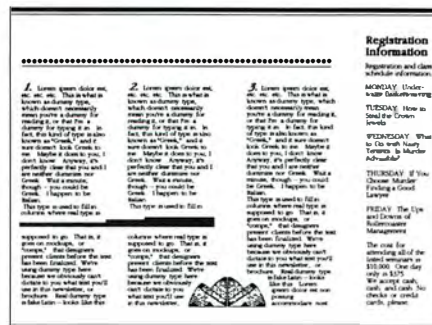
Modifying templates is

easy too. This ad was created using a DESK DESIGN template.

Last but not least, the ultimate READYSETGO page processing solution retails for less than \$265.*

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Valhalla, NY 10595
(914) 769-2800



Desk Design shows off the ImageWriter.

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Small miracles for your Mac.



- Assign your own Command keys to any menu selection.



- No more waiting for the printer. Continue to work while printing high quality text or graphics.



- Simplify applications with string macros.



- Prevent screen damage from image "burn-in."



- Protect confidential files from prying eyes.

- View up to eight MacWrite documents from within any application.



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"Unique and extremely useful... This DA can't be beat for ease of use or usefulness... superb 26 page manual. It is simple and works flawlessly... This innovative set of desk accessories will make everyone's Mac an even friendlier computer."

★★★★ MacUser Magazine

"The Apple Should Have Included It as Standard Award goes to MenuKey, one of the items in Cortland Computer's TopDesk."

A + Magazine

TopDesk. The pick to click.

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The C for the Macintosh

*"Library handling is very flexible...documentation is excellent...
the shell a pleasure to work in...blows away the competition
for pure compile speed...an excellent effort."*

COMPUTER LANGUAGES, 4/85

Why Professionals Choose Aztec C

Professionals choose Manx Aztec C development systems because they are the most powerful, portable, and professional microcomputer C development systems available. Professionals know that Manx Aztec C offers the features, dependability, and performance required for producing professional results.

Applications implemented with Aztec C development systems range from real time control of robot arms used in manufacturing, to message switching systems, to games, languages, operating systems, and business systems.

Much of the commercial software for the Apple Macintosh including top selling titles from software publishers Broderbund, Hayden Software, and Spinnaker is developed using Manx Aztec C.

Value, Performance, and Flexibility

Manx Aztec C68k for the Macintosh is available as a line of three upgradable development systems: Manx Aztec C68k-p, Manx Aztec C68-d, and Manx Aztec C68k-c. Student, non-commercial, and small business discounts are available. Whatever your budget and requirements, there is a Manx Aztec C68k development system that offers you the best value and performance for your investment.

New Macintosh Mouse Interface

The highly acclaimed, powerful, and professional Manx Aztec SHELL development environment now includes a mouse interface. Developers unfamiliar with UNIX or MS-DOS can work entirely with the mouse interface. Those interested in learning the advanced features of the SHELL can do so at their leisure. Developer's familiar with UNIX or MS-DOS can ignore the mouse, if they so choose, and work entirely in a familiar command driven environment.

Aztec C, The Most Portable C.

Manx Aztec C Development Systems are available for the Apple Macintosh, Apple II, IBM PC, PC compatibles, CP/M-80 systems, Radio Shack Systems, and the Commodore 64/128. Manx Aztec C is also compatible with UNIX and UNIX ports. Manx currently is developing systems for the Amiga and other microcomputer systems. No other C Development System for the Macintosh comes close to the portability of Manx Aztec C.

Power To Spare

In benchmark after benchmark, Manx Aztec C appears in column after column as the clear winner.

The following sieve benchmark timings are reprinted with permissions of Computer Languages, 131 Townsend Sr., San Francisco, Ca 94107 from a Macintosh review that appeared in the April, 1985 issue:

compiler	compile/link	run	size
Manx Aztec	49	7	13,274
Megamax	114	7	13,816
Softworks	201	9	46,914
consulair	152	10	17,654
Hippo 2	102	13	30,648

The following sieve benchmark timings are reprinted with permission of Macworld, 555 De Harro St., San Francisco, CA 94107, from the May, 1985 issue from "Mac Wins By a Length" in the Open Window column.

Language	Run Time
Aztec C 1.06C	6.55
McFORTH 2.0	20.01
Modula-II	71.60
MBASIC 2.00	1170.00
Pascal	1270.00

Sieve timings for Manx Aztec C68k 1.06g:

with register variables 3.37 secs 5,007 bytes
without register variables 6.02 secs 5,140 bytes

Manx Aztec C68k - Professional Tools

Manx Aztec C68k is bundled with a rich abundance of tools to help produce superior results in reasonable time frames. The following is a list of features and facilities included in Aztec C68k-d, the Developer's System, and Aztec C68k-c, the Commercial system. Items that are marked -c are unique Aztec C68k-c.

Optimized C	Mouse Enhanced SHELL
UNIX-like SHELL	Creates desk Accessories
Macro Assembler	Creates Clickable Applications
Smart Overlay Linker	Phone Support
C-PASCAL Interface	PASCAL-C Interface
Resource Compiler	UNIX Library Functions
Debuggers	Terminal Emulator (Source)
Object Librarian	Easy Access to Mac Toolbox
Mouse Editor	unlimited code size
IEEE floating point	six register variables
Inline assembly	extensive sample programs
600 page manual	hard disk support
no license fees	PASCAL type strings
MacinTalk support	AppleTalk support
code optimizer	symbolic debugger (512k-c)
MacRam Disk-c	UniTools (ul, make, grep, diff)-c
Library Source-c	One Year Of Updates-c

Summary

If you plan to program in C on the Macintosh or are currently doing so using a brand x C compiler, there is a Manx Aztec C68k system for you that offers the best value and the greatest degree of portability, power, and professional quality available.

Look around, evaluate, and compare. The more you look, the more you compare, the more you will see that Manx Software Systems has succeeded in its objective to provide you with the best C development system available at the best possible price. Then, give us a call, and join the 25,000 users who already know and enjoy the Manx Aztec C advantage.

Products and Prices

Aztec C68k-c Commercial System	\$499
Aztec C68k-d Developer's System	\$299
Aztec C68k-p Personal System	\$199
C-tree database (with source)	\$399
Lisa Kit	\$ 99
MS-DOS → Macintosh Cross	\$750

Discounts

Discounts are available for professors, students, independent developers, hobbyists, and small businesses.

How To Become an Aztec C User

To become an Aztec C user call 1-800-221-0440 or call 1-800-832-9273 (800-TEC WARE). In NJ or outside the USA call 201-530-7997. Orders can be telexed to 4995812.

Payment can be by check, COD, American Express, VISA, Master Card, or Net30 to qualified customers.

Orders can also be mailed to Manx Software Systems, Box 55, Shrewsbury NJ, 07701.

How To Get More Information

To get more information on Manx Aztec C and related products, call 1-800-221-0440 or 201-530-7997, or write to Manx Software Systems.

30 Day Return Policy

Manx has a 30 day return policy. If you don't like your Manx Aztec C development system, return it within thirty days for a refund. Refunds do not include shipping costs, and might incur a small restocking charge.

Distribution Of Manx Aztec C:

In the USA, Manx Software Systems is the sole and exclusive distributor of Aztec C. Any telephone or mail order sales other than through Manx are unauthorized. Aztec C is available from qualified retail outlets under license to Manx Software Systems.

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MANX

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**THE MACINTOSH
SYSTEM
THAT "TOTALLY
DESTROYED"
THE CRITICS IS
PLEASED
TO ANNOUNCE
COMPLETE
ANNIHILATION.**



INTRODUCING HYPERDRIVE 2000.

Last year, the first internal hard disk for the Macintosh appeared. It was called HyperDrive, and The MACazine's reviewer was "totally destroyed."

Personal Computing judged it "an unabashed winner," and A+ proclaimed it "a giant leap for Mackind."

Now the next generation of HyperDrive systems has arrived—and ushered in its own language crisis. Because a whole new set of superlatives are in order.

HYPERDRIVE
2000
GENERAL COMPUTER

THE MAC AS NUMBER-CRUNCHER.

Stated simply, HyperDrive 2000 transforms the Macintosh from an eminently efficient personal computer into an incredibly powerful one—a tool capable of manipulating unprecedented amounts of data at unprecedented speeds.

If that strains credibility, consider the following:

A Mac with HyperDrive 2000 can perform computations from 10 to an astonishing 250 times faster than a conventional Mac* (Which, by way of rough analogy, is approximately the speed differential between a station wagon and a space ship.)

It can run up to 8 different applications at the same time using Apple's Switcher. And it can run applications for which the Mac just a short time ago would not even have been seriously considered—applications like those used by engineers, software developers, scientists, statisticians, and others for whom a powerful computer makes jobs not just easier but possible.

No one who works with large quantities of information will have any difficulty understanding why we've thus modified the Mac. The remaining mystery is how.

THE MAKING OF THE WORLD'S FASTEST MAC.

HyperDrive 2000 is a delightful paradox: a system that radically enhances the Mac's performance while changing neither its appearance nor the manner in which it works.

We accomplished this by adding another microprocessor that doubles the processing speed. And we connected a huge (20-megabyte) hard disk system directly to the microprocessor.

We also equipped it with a floating point processor—this to handle the high-speed computations that knowledge workers require.

We increased the Mac's main (or RAM) memory to two megabytes (2.5 megabytes on the Macintosh Plus). And thus equipped it to run vastly more sophisticated software.

Finally, we designed the sophisticated software that melds it all together. Software that not only supports virtually all Macintosh programs but delivers all the ingenious capabilities of HyperDrive. Including file drawers that automatically shrink or swell according to what's put in or taken out. A security program that protects files from unauthorized entry. And a print spooler

that lets you go on to other jobs while your printer is churning out the one you just completed.

A NEW DIMENSION OF USER-FRIENDLINESS.

The arrival of HyperDrive 2000 enlarges to three the first family of high-quality, high-performance products installed inside the Macintosh.

It means you can choose between 10- and 20-megabyte versions of HyperDrive if you need the speed and capacity that only a hard disk can provide—and that only HyperDrive provides this well. Or you can choose HyperDrive 2000 if you also need the kind of computational prowess we've already described.

But there's one relevant computation you can make for yourself. Because in order to get performance comparable to a Macintosh with HyperDrive 2000, you'll find yourself entering a category usually populated by larger and more expensive computers.

In fact, a Mac with HyperDrive 2000 could save you thousands. Which could add a whole new dimension to the term "user-friendliness."



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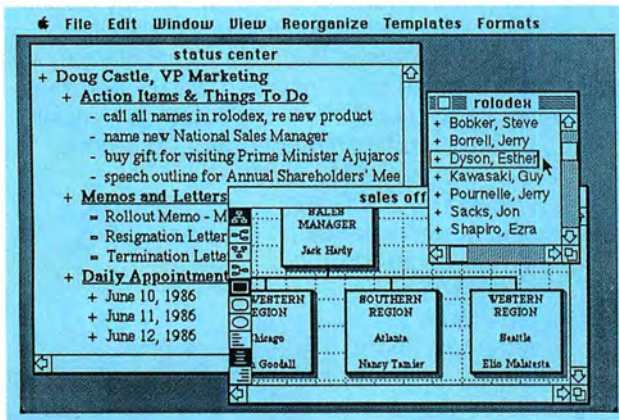
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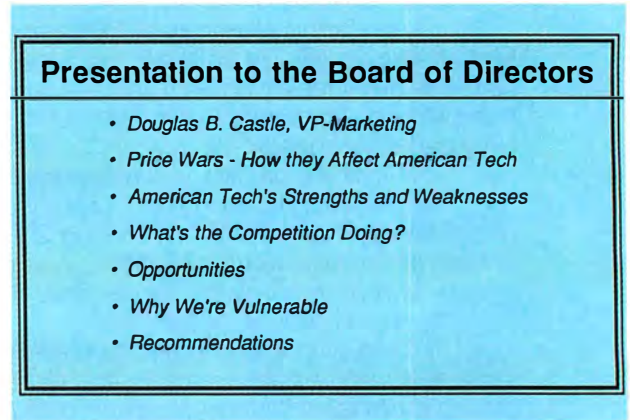
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2 MORE opens a new **desktop publishing** frontier for Macintosh: automatic display and printing of **Bullet Charts**. Your presentations and overhead transparencies look like a professional spent **hours** tinkering with MacDraw.™ This leaves you with **more time** to spend developing, reorganizing and refining your ideas.

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- *pattern matching* - context-sensitive and intelligent
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- *from Living Videotext* - the undisputed leaders in idea processing technology

MORE Desktop Publishing

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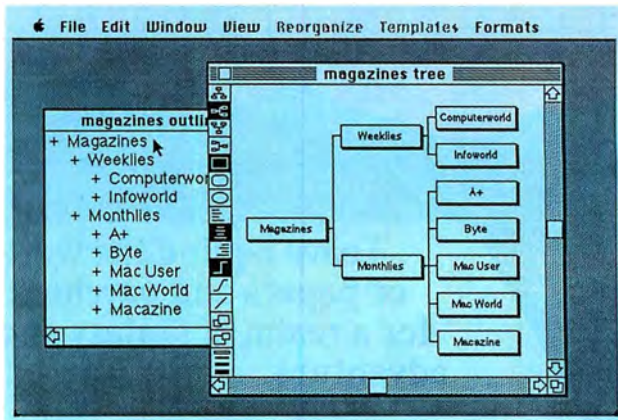
MORE Macintosh™ Power

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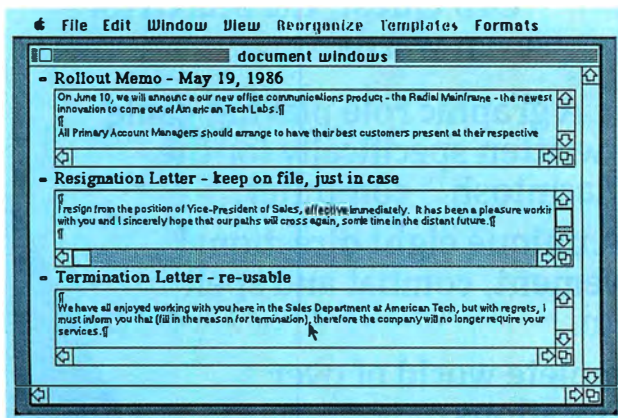
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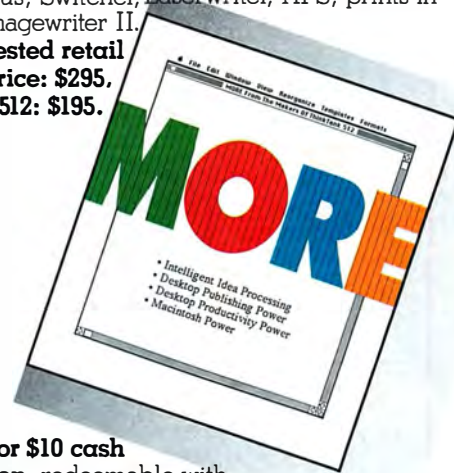
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The Making of a Precedent

The future of personal computers looks bleak indeed if we give up the fun for the Fortune 500



*Let's not forget
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the technical, but the
creative and
innovative as well.*

Do you remember that famous scene at the end of the science fiction film *Planet of the Apes* where Charlton Heston discovers the Statue of Liberty buried to the head on a beach in the distant future?

We in the personal computer industry have our own little statues of liberty, totems of technology, that have been lying abandoned in garages and workshops across the country. Their creators, like the inspired French democrats who built the Great Lady of New York Harbor, shared a vision of a new kind of freedom for humanity.

I'm referring to the earliest models of the personal computer, which were built "aeons ago," back in the early seventies. Today, most of them have almost been forgotten.

Recently, I had the opportunity to participate in a historic event that gave me a great feeling of hope for the future of personal computers. I was asked to be one of the judges for the Early Model Personal Computer Contest at the Computer Museum in Boston. The purpose of the contest was to help the museum trace the history of PCs before some of those vintage models vanished entirely from the face of the earth.

People were invited to send in early-model personal computers. Some 320 entries from 13 countries were submitted, and 190 were chosen to remain in the museum's permanent collection.

My fellow judges were Apple Computer cofounder Steve Wozniak and Oliver Strimpel, the museum's eminently micro-knowledgeable British curator. Our archaeological mission was to uncover the five most historically important micros from the ruins of early PC civilization.

And the winner is... the Kenbak-1 PC with 256 bytes, built circa 1971!

The four runners-up were the Micral, a commercial PC built in France in 1973; the TVT-1 prototype, the first PC able to display text on a screen; the VDM-1, a memory-mapped video display generator for S-100-based systems; and my own sentimental favorite (because I worked at MITS in the early seventies), the MITS Altair 8800.

The origins of the contest go back in the mists of time to when Bill Millard, founder of ComputerLand, and Pat McGovern, chairman of IDG, the computer publishing empire with over 70 publications worldwide, visited the Computer Museum together.

Millard noted that the museum had a fine collection of early mainframe computers and minis but thought it was a shame that early personal computers weren't better represented. Millard thought he and McGovern should do something about it.

He said he would be willing to put up the money to acquire the early PCs if McGovern would handle the publicity. McGovern readily agreed. Along with Gwen Bell, president of the Computer Museum, and Oliver Strimpel, they created the concept for the contest.

The public response was phenomenal, and the PC entries poured in.

So one spring afternoon, the Woz, Oliver, and I spent about four hours rummaging in a windowless storage room behind the museum. It was filled with eerie-looking metal cases containing the "pre-historic" micros. We looked closely at each one and considered such factors as how interesting it was, how significant, how early, what impact it had had on the industry, and what condition it was in.

(continues)

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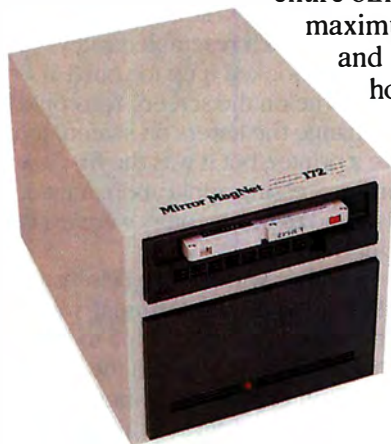
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Most of the computers had been made from kits. Others were simply homemade; people had breadboarded their own circuit boards. In fact, some of the PCs had been assembled before there were integrated circuits. I saw one of the earliest computers ever built into a briefcase.

Some people sent in complete systems. For example, there was a Southwest Technical Productions machine, an early 8-bit microcomputer system that had been constructed from a kit. It featured a printer, a keyboard, dual tape drives, and a monitor. It also had a vast selection of software.

Woz, Oliver, and I toiled long and hard before we pronounced the Kenbak-1 the winner. This computer had lights and switches on the front and could be programmed to make the lights blink in patterns. It was built in 1971, before microprocessors, and was aimed at the educational market. The Kenbak-1 was advertised in *Scientific American*, but only 40 were sold, at \$750 each.

It's interesting to note that the machine's inventor, John Blankenbaker, went on to become one of the founders of Symbolics, a company that builds workstations for artificial intelligence applications.

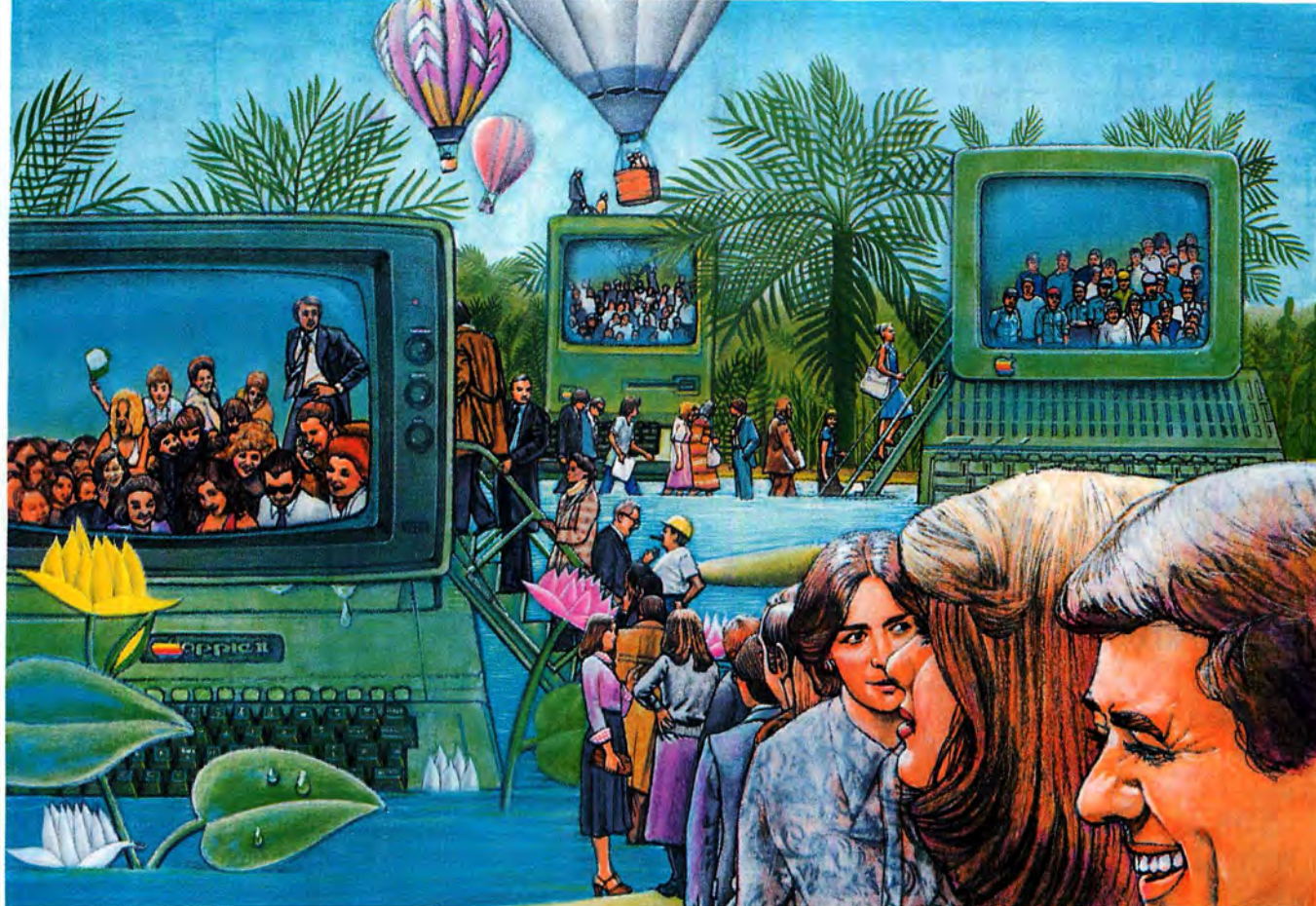
Among the four runners-up was Don Lancaster's 1974 TVT-1 prototype, known as the "TV Typewriter." You built your own terminal, which resembled a keyboard. Then you hooked it up to your TV so you could write on the screen. You could actually change the letters on screen. It didn't have a printer, but it was the first low-cost word processing application. A lot of hobbyists and experimenters were excited about that.

Another winner, Lee Felsenstein's VDM-1 video display terminal, was the first real computer terminal built to interface with a TV. With it, you had the intelligence of a computer plus the ability to connect to a printer, store programs, and so forth. Felsenstein's machine was actually a 1974 prototype of the VDM-1 built into an old Singer computer terminal case. It was remarkable.

Then there was the MITS Altair 8800. Because I started out in personal computing at MITS, when I saw the museum's Altair, I felt like I was peering into a time capsule that held an important part of my life.

The model that was entered in the contest featured an array of added circuit boards from companies like Processor

(continues)



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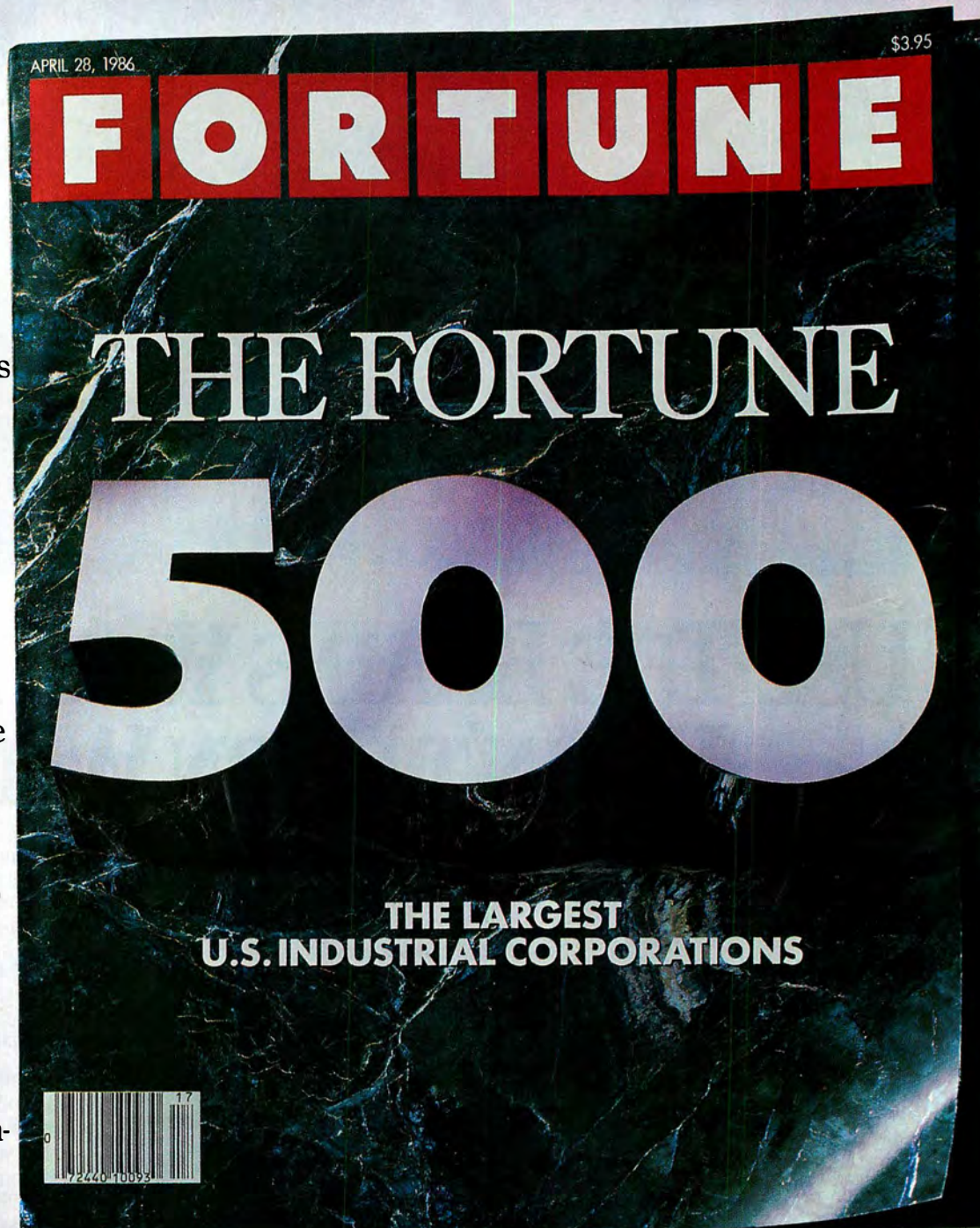
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David Bunnell

Technology, Cromemco, Polymorphic, and Vector Graphics. It showed what a powerful system the Altair could be pushed into becoming.

During the contest judging, I found Wozniak to be a true, almost pure, engineer. He's inquisitive about the real, technical problems that face computer designers. At the same time, he's intrigued by electronic devices that control stereos, lights, and home appliances.

Woz also has a wonderful, almost childlike mind. He enjoys playing pranks and telling jokes, and his creative approach is tremendously refreshing.

I remembered that in the early days of personal computing, people like Steve Wozniak freely exchanged ideas with others. The Apple II was even "designed" at a series of Home Brew Computer Club meetings. Woz and Steve Jobs would demonstrate the latest developments on the Apple II just to discuss with club members how the project was progressing.

So essentially, the Apple II was developed publicly. That spirit of sharing, that need to share technology, and the impor-



David Bunnell, Steve Wozniak, and Computer Museum curator Oliver Strimpel (left to right) pose with the first commercially available personal computer, the Kenbak-1.

tance of sharing information overrode the more commercial aspects of the business.

That same spirit was unmistakably reflected in all the products submitted to the museum.

That sense of innovation and freedom and creativity seems to be missing from today's highly structured business environments. Now that the corporate society has taken over personal computers and their development, it would appear that innovation has been strategically stifled.

I hope that the early pioneers like Wozniak, Steve Jobs, and Altair creator Ed Roberts have success in our modern personal computer environment, because we really need them. We need their spark and daring, the personality they put into the products, and their audacity in trying things others would never dream of trying. It's a spirit that borders on naïveté.

You can sense that spirit of high-tech and high jinks when you visit the Computer Museum. It's what really makes the early PC exhibit a memorial, not just to the technology of the machine, but also to the good humor and the good times that went into creating the personal computer.

I hope the museum serves as a reminder for us not to stray too far from our original vision. Otherwise, future historians of the PC might remember our civilization as the Planet of the Eight Bits, whose system crashed from an overload of arrogance. □

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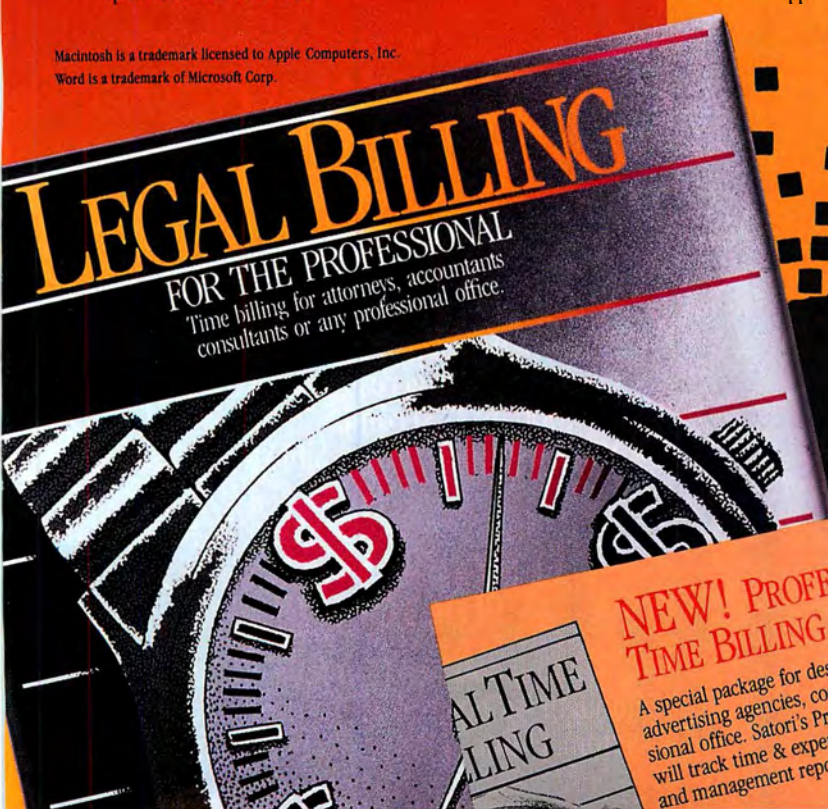
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Waiting for Alan

What's Alan Kay up to these days? It's called Vivarium

The sumptuously designed brochure that describes the faculty of MIT's ambitious new Media Lab lists a few of Alan Kay's accomplishments: member of the International Society of Organbuilders; co-designer of computers, including the Alto, the Note Taker, and the FLEX Machine; designer of Dynabook, a "notebook-sized personal computer concept." These accomplishments have been well documented (see "The Macintosh Family Tree," *Macworld*, November 1984, or Howard Rheingold's book *Tools for Thought*). Not so well documented is an issue that comes up quite often in discussions about the future of the personal computer: what is Alan Kay up to these days?

Ever since the glory days at Xerox's Palo Alto Research Center (PARC), Kay has been computerdom's vagabond visionary. Hired by Atari at the peak of that company's boom, he set up an educational research lab and was reputed to be working on products that would blow everybody's socks off. When Atari itself blew up, Kay wound up at Apple in the vaguely defined role of Apple Fellow, a title he still holds. Rumors abound on the nature of his employment.

Is he working on Apple's post-Macintosh computers? Sitting beside Apple chairman John Sculley as a high-tech Rasputin? Or does the bulk of his work at Apple consist of making lecture appearances? I have attended some of his lectures—modularly constructed set pieces wherein he drops witticisms about the state of the art

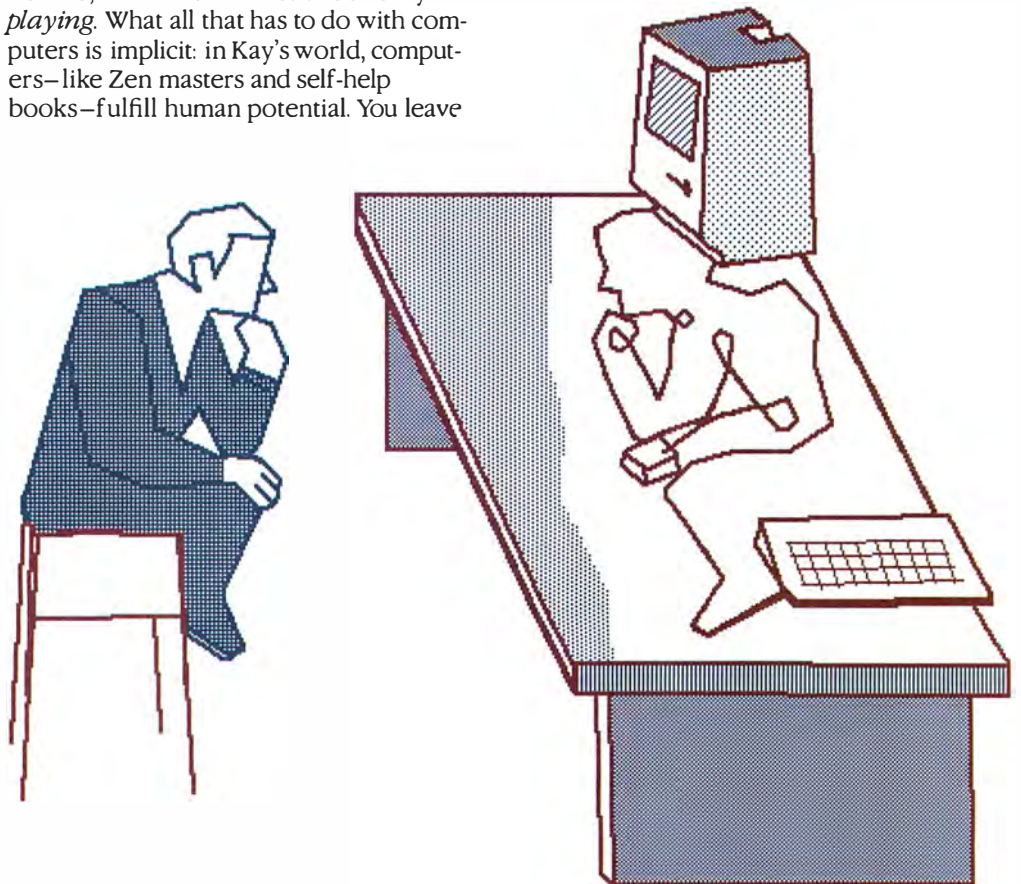
(ruthlessly mocking the IBM PC and getting applause when he praises the Macintosh as "the first personal computer worth criticizing"); clues us in on various exciting projects (like scientist Paul MacCready's astonishing flight-capable pterodactyl reconstruction); and best of all, plants ideas in our heads. The show-stopper is usually a videotape of Kay's friend Tim Gallwey, author of *The Inner Game of Tennis*, teaching tennis to an overweight 50-year-old woman who had never touched a racket in her life; within 20 minutes she's really *playing*. What all that has to do with computers is implicit: in Kay's world, computers—like Zen masters and self-help books—fulfill human potential. You leave

Kay's lectures feeling that what Kay has to contribute is important. What Alan Kay is up to means something. Maybe.

Something Wonderful Is Going to Happen

So when Stewart Brand—of *Whole Earth Catalog* fame—told me that he was teaching a course with Alan Kay at the Media Lab and that the course would deal

(continues)



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with Alan Kay's major new project, I made a point of showing up. I thought I'd see Brand and Kay team up at the head of a classroom, a historic pairing.

It was a foolish hope. My mistake was ignoring some valuable information in that aforementioned faculty brochure—the picture of Alan Kay. In that revealing shot, Kay is posed on the atrium balcony of the Media Lab building, casually dressed in chinos and a polo shirt, grinning enigmatically, and looking much younger than his 46 years. His leg is slightly bent, propping up an overstuffed travel bag that strains a shoulder strap. He is obviously on the way to, or from, the airport. Possible destinations include his nearby apartment in Cambridge, his permanent residence in Southern California, business dealings in Cupertino, or lectures anywhere from Dartmouth to Japan. In other words, somewhere you can't reach him.

So in retrospect, it should have been no surprise that when I arrived at the Media Lab, Kay was nowhere in sight.

As it turned out, not having Alan Kay around was a perfect methodology to see What Alan Kay Is Up To—because the bright young scientists, educators, and students working on the project there did not have Alan Kay around either. They are devoting months and potentially years of their lives to projects on the basis of a few hours spent with Kay last year. Some of them took a course that began, as one student told me, with Kay saying, "I'm giving you all A's because I know something wonderful is going to happen." In that short span of time, Kay was able to excite them with a vision. Just how to bring that vision about was not well covered, but then I am reminded of a bumper sticker printed by one of Kay's employers, Apple Computer, which reads, "The Journey Is Its Own Reward." As one acolyte told me, "Alan has given us the roughest possible sketch—and no direction."

But they do have a vision, one that befits the Media Lab's goal of inventing the future. The name of this vision is Vivarium.

Vivarium: What Kay Is Up To

It takes a while to get the hang of Vivarium. This project is not the stuff of Tracy Kidder's book *The Soul of a New Machine*, where someone designs a product and then people scramble to get it out the

door. Vivarium has been described to me as an umbrella under which certain concepts accumulate, a curriculum for elementary school students, and a blueprint for the hardware and software of the future. It is, of course, all of these and more. Maybe.

Alan Kay has always been intrigued by the idea of *agents*—software surrogates that take an active, quasi-intelligent role in getting things done.

Kay had been thinking about agents at Xerox PARC and did some work with them at Atari. At MIT he recently designed Newspeak, an agent that stays up all night calling information services and then organizing the data it gleans to prepare a personalized newspaper in time for breakfast. But what really got him excited was a project by Ann Merion called Aquarium, which allows kids to study the ecology of low-intelligence life-forms by creating agents that mimic them.

When Kay later visited an elementary school in Los Angeles called the Open School, he thought it would be the perfect place to run an experimental program using the best technology available—nineties technology—to broaden the Aquarium idea. This new project would be named Vivarium, which literally means an indoor enclosure for raising and observing animals.

Perhaps because of his background in biology, Kay thinks that if you're interested in artificial intelligence, you might do well to consider simulating animals with computers. Animals are not only free of the clunky complications of computer languages, but they're a lot more interesting than computer programs.

The Vivarium revolves around letting kids design living things. This kind of imaginative work, combined with biological knowledge and theory, is a sound educational project. As Kay writes in a paper called "Trial Vivarium Curriculum," "classroom discussions and research will revolve around different kinds of animal behavior—how animals survive, find each other, teach, and generally perceive the environment." What distinguishes the Vivarium from your typical schoolroom science project is that after designing the animals, the students build them and then learn from the animals' independent behavior.

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On a simple level, animal-building can be accomplished with simple things like balloons. Kay suggests that kids start by simulating protozoa (those charming one-celled creatures such as paramecia). After using microscopes to see protozoa slithering, eating, and dividing, the students will develop theories about protozoan behavior. Then students can pretend they are themselves paramecia and, blindfolding themselves, indulge in "a biological version of piñata." Next, they might take balloons and "dress them up" to look like protozoa. The simulation gets a little more complicated now. To emulate the way protozoa "feel" things, Kay suggests "a coarse hair-net of multiplexed capacitive sensors." The protozoan sense of smell would have to be done, Kay guesses, with "tiny binaural microphones." I suspect that these items are somewhat less common in a classroom than crayons.

But challenges like that are part of the Vivarium process. Kay emphasizes that "ingenious scavenging will be encouraged" in the short run. In the long run, no amount of mere scavenging will produce the necessary tools to make the Vivarium real—after all, we are talking about a sophisticated biological construction, with an interface natural enough for children to use on their own without prodding.

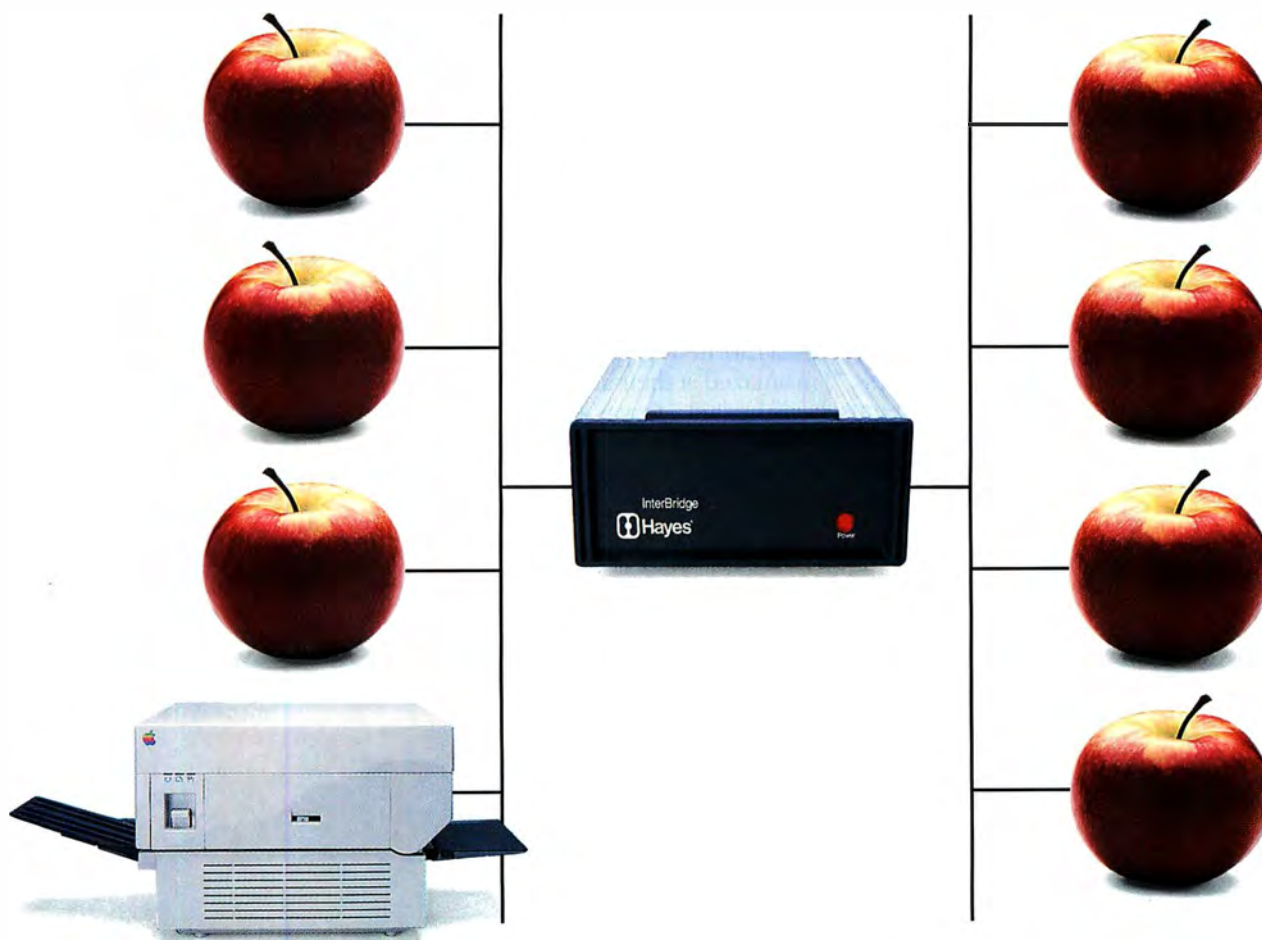
Just as Kay's earlier projects—which gave us windows, pull-down menus, portability, and the very concept of user-friendliness—provided the set of metaphors currently implemented in the Macintosh, the Vivarium will provide a new set that, presumably, will liberate us from keyboards, mice, and screens. No one is certain what those metaphors will be—just that to make Vivarium a viable product, our present set is inadequate. By necessity, a new generation of computing tools will develop.

For an early, innovative example of what these new approaches might look like, consider "A Working Paper for the Vivarium Project" by one of Kay's students, Allison Druin. In looking for "the crayons, the clay and the building blocks of another world," she sketches a computer that children can step into—"a generic animal form

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being used as an input device...[a] fuzzy CPU." She pictures children sitting "in the lap of this computer" (obviously not your traditional laptop). In her sketch the computer looks like the Muppet character Oscar the Grouch.

Staying the Course

I know... it sounds weird to me, too. But Vivarium is still at the stage in which imagination has not yet yielded to engineering considerations. Still, some people have very high hopes that Vivarium will lead to tangible gains. More to the point, Kay's boss, John Sculley, has become a true believer and has okayed significant funding of the project. Very significant funding. Apple will soon have seven full-time Vivarium researchers in Los Angeles, where Kay will administer the experimental program to the entire 526-student enrollment of the Open School. The Apple employees include Ann Merion, of the original Aquarium. There is also a board of directors that in itself reflects the personality

of Vivarium: members include Stewart Brand, Paul MacCready, Muppets creator Jim Henson, and Douglas "Hitchhiker's Guide" Adams.

Back at MIT, though, my visit revealed puzzlement among some of those in Kay's original Vivarium class. They discussed Kay's possible motives for setting them on a course and then leaving them virtually alone. They wondered when he would finally show up. I felt like I was hearing a backstage conversation between Vladimir and Estragon in *Waiting for Godot*. One student wondered whether, by staying away for so long, Kay might be subjecting them to some sort of test, seeing how far they could go without him.

An interesting concept, but not the case. When, weeks later, I finally reached Alan Kay, he confessed that his failure to appear at MIT that month was a function of geography—and the Vivarium work he was doing in Los Angeles. When he finally did drop in at the Media Lab, he was pleased at the progress. "I'm amazed at their ability to sustain themselves," he said. He was also amazed at how well Vivarium was doing in general, attributing the progress to Apple's

unexpectedly overwhelming support: "We get to use brain cells [for the project] that we usually use for paranoia." What have they done so far? "We built an infinite forest. And a thousand miles of Australian barrier reef. Also, some real-time fish."

Kay admits that Vivarium is a "very romantic" project, in what he terms the "20 percent chance of success" range. But he warns not to underestimate "the adrenaline factor—you can be more successful with a hard project than with one you could more easily rationalize."

In my more cynical moments, when I ponder the substance of Vivarium, I see miles of blue sky. On the other hand, I recall that Kay's Dynabook never shipped, yet its user-friendly idealism changed computing forever. So maybe What Alan Kay Is Up To These Days will bear valuable fruit—if not living organisms—by the nineties. I'm going to keep an eye on it. □

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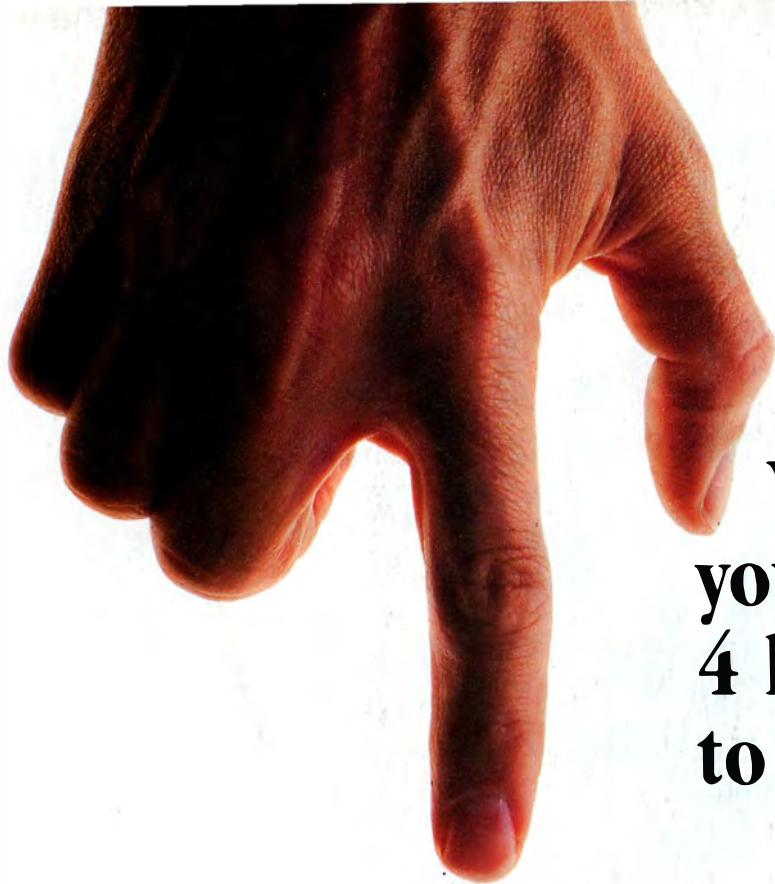


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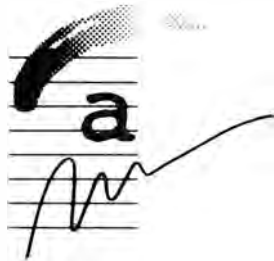
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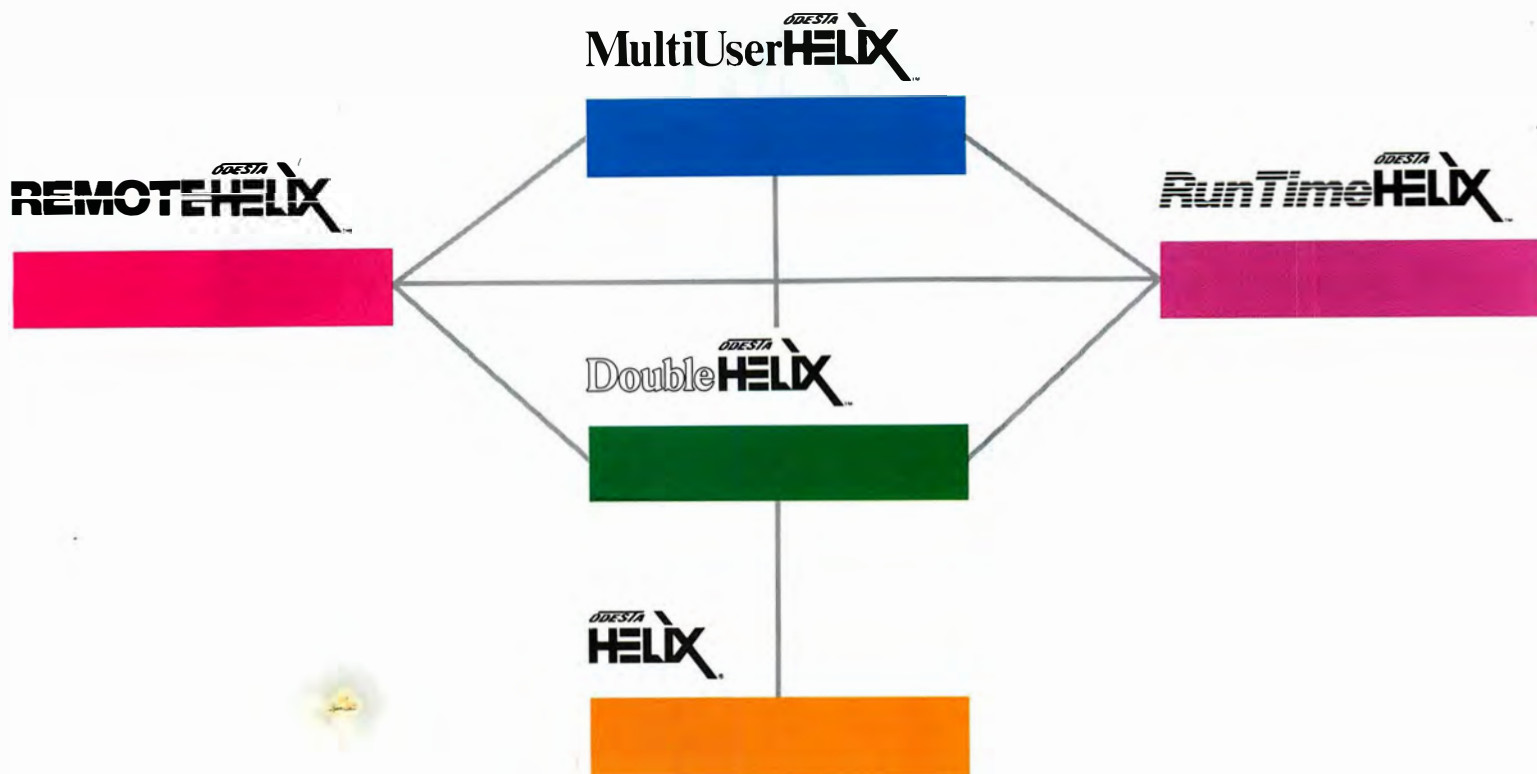
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- Then receive the real benefits of computerization — efficiency, organization, and the ability to manage, share, evaluate, and communicate information.
- Now you have a system that magnifies your strengths and deflects the thousand arrows of distracting detail and lack of up-to-date information that lead to continuous crisis management and lost opportunities.
- And you can easily develop and change that Helix system faster than you can change the paper forms you now use. So that changes in products, personnel, production, procedures, projects and pricing are made as you need them.

Letters

Jazz fans speak out, upgraders raise issues, and more

Give Back Our Options

One of the factors that convinced me to buy a Macintosh for home and for work was its keyboard configuration. For those of us who use foreign accent marks and other optional characters frequently and who want to keep up typing speed, having two Option keys is as important as having two Shift keys. Multilanguage typing efficiency decreases by up to 400 percent on the Mac Plus keyboard with its single Option key.

IBM has seen the light and modified its keyboard layout (at least in the version I saw recently in conjunction with the "Andrew" project at Carnegie-Mellon University) to provide two Alt keys, one for each hand.

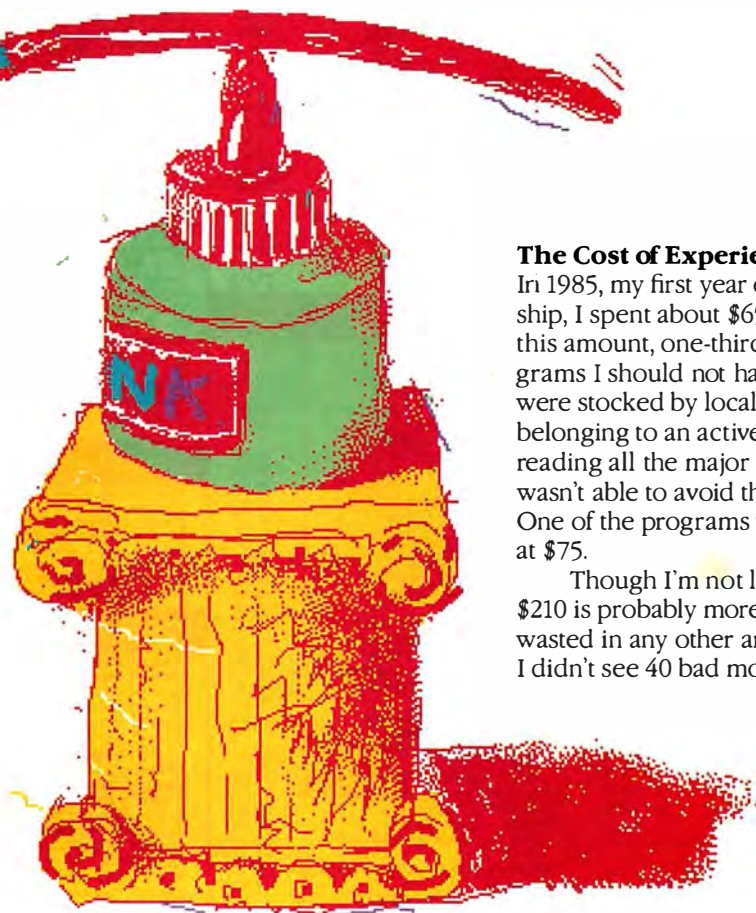
I understand the need to add cursor controls in order to perform some operations more efficiently than is possible with the mouse. But please understand, wizards of Apple, that by suppressing the right-hand Option key, you have made me a curser as well. Why retreat when you have demonstrated the foresight to advance?

Jim Vest

Memphis, Tennessee

Out of Controls

The progression from Mac to Fat Mac to Mac Plus is extraordinary. It appears to confirm an Apple policy of upgrading existing hardware. Each new product more than doubled its predecessor's power with-



out increasing the price, while faster and tighter code also became available for use on existing systems.

Although the introduction of the Hierarchical File System has created some minor problems, over which Apple probably had little control, the transition has been relatively smooth.

Nevertheless, Apple had a choice when updating the Mac's Control Panel. The new panel with cache memory and AppleTalk switches is certainly a worthy boon. But I am sorry to see that the new system's Control Panel drops the built-in clock and the ability to choose how often a menu flashes before operating.

Theo Armour

Happy Valley, Hong Kong

The Cost of Experience

In 1985, my first year of Macintosh ownership, I spent about \$650 on software. Of this amount, one-third went for three programs I should not have bought. None were stocked by local dealers, and despite belonging to an active user group and reading all the major Mac magazines, I wasn't able to avoid these three mistakes. One of the programs was a demo disk at \$75.

Though I'm not losing sleep over it, \$210 is probably more than I absolutely wasted in any other area last year. Certainly I didn't see 40 bad movies.

Solutions? The people who say "Steal it, then pay if you like it" are clearly adolescents, whatever their birth certificates say. It's embarrassing to listen to them, and I wonder at magazines that give space to sophomoric justifications of crime.

A major step in the right direction would be the wide distribution of free demo programs on Cauzin strips. Why not? Right now, the cost of a Cauzin reader and Mac cables (\$220) seems to me an appropriate amount.

Wayne Somers

Delanson, New York

(continues)

Mac Specials!

Blythe Software Omnis 3	279.00
Format Software	
Transfer programs and/or Databases in dBase III from the PC to Mac and run them without Modification!	
dMac III	395.00
Innovative Data Design	
MacDraft	139.00
Kalmar Designs	
Teakwood Roll-Top Disk Cases:	
Micro Cabinet (holds 45 3 1/2" disks)	14.00
Double Micro Cabinet (holds 60 3 1/2" disks)	21.00
Living Video Text	
Think Tank 512K	99.00
Lotus Jazz (Version 1.1)	269.00
Microsoft Flight Simulator (Version 1.0)	32.00
ODS, Inc. Consultant (Version 1.5)	109.00
Sales Consultant (Version 2.0)	149.00
ProVue Development	
OverVue 2.0	149.00
Singular Software Interface	119.00
Telos	
Business FileVision	195.00

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Apple Computer	
Switcher Construction Set	12.00
Assimilation Process	
Work 'N' Print or MIDI Composer	22.00
Mac Memory Disk or Mac Mouse Tracks	22.00
Central Point Software	
Copy II Mac	19.00
Computer: Applications, Inc.	
[[in a Mac V2.0 (Apple II Emulator)	42.00
Crystal Canyon Computing, Inc.	
The Mac Librarian	29.00
Dreams Of The Phoenix	
Quick & Dirty Utilities Vol. 1 or 2	27.00
FWB Software Hard Disk Util	59.00
Hard Disk Backup	42.00
Hayden Duo (MacroMind Utility Disk)	29.00
Hippopotamus Software Hippo-Lock	65.00
Ideaform Mac Labeler (Version 2.2)	27.00
Infosphere MacServe	249.00
Kent Marsh Limited, Inc. MacSafe	45.00
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MacBooster, Disk Ranger, or MacSpool	32.00
N' Cryptor or PacPaint	26.00
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MacBackup V4.0	49.00
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myDiskLabeler V2.1	27.00
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MacFast 20-21MB w/Tape Controller for Mac 512K or MacPlus	1269.00
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Dasch External RAMdisk (2000KB)	725.00

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Apple Personal Modem 300/1200	279.00
Hayes Microcomputing Interbridge	Call
Smartmodem 300	135.00
Smartmodem 1200	359.00
Smartmodem 1200 Mac w/Smartcom II	429.00
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Transtel 1000 Mac Accessory Kit	31.00
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Mac Modem 1200 (Hayes Compatible)	399.00
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Popcom X-100 Modem w/Straighttalk	259.00
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LaserWriter Plus Upgrade Kit	739.00
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Thinkjet, LaserJet, LaserJet Plus	Call
Juki 6100 (18cps) Daisywheel Serial	379.00
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SpinWriter 3510	759.00
SpinWriter 8810	1139.00
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NEC SpinWriter Accessory Kit	79.00
Okidata ML-192 Apple Mac/Lisa	369.00
ML-193 Apple Mac/Lisa	545.00
Toshiba	
P-321 24 Pin (216cps) Par./Ser. 10"	499.00
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Sony 3 1/2" DS/DD Disks (box of 10)	27.00
Fuji 3 1/2" DS/DD Disks (box of 10)	26.00
Maxell 3 1/2" DS/DD Disks (box of 10)	28.00
Verbatim 3 1/2" DS/DD Disks (box of 10)	28.00
3M 3 1/2" DS/DD Disks (box of 10)	28.00

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Letters

The Monitor Blues

Throughout your magazine are beautiful pictures of Macintosh computers with *blue* monitor screens. It is my understanding that the Macintosh screen is black and white, not blue. What explains the blue colors?

Jeremy E. Alperin
Weslaco, Texas

If you hold a piece of white paper against the Mac screen, you'll see that the screen background is actually pale blue. Some types of film exaggerate this blue, so when we shoot the Mac's screen we usually correct the color by adding a red filter to the camera lens. (Pictures of the Mac usually require a separate exposure of the screen, since it has its own light source and is constantly in motion.)—Ed

One-Way Glass in Open Window?

Twice last summer I sent submissions on disk to *Open Window*. Contrary to the column's printed promise, neither of the disks have been returned to me. The monetary loss of the two disks is not great, but your magazine's breach of promise demonstrates a lack of consideration for your readers.

Ames Kanemoto
Berkeley, California

We appreciate the effort readers take to share their discoveries through Open Window. And we appreciate the patience it takes to await the return of the disks. It shouldn't take more than five months for us to review and return a disk, so please let us know if your disks don't show up in your mailbox by then.—Ed.

And They Both Lived Happily Ever After

I was extremely impressed with DataPak's *My Office*, so I ordered the deluxe version, *Executive Office*. DataPak allows *My Office* owners full retail credit toward purchase of *Executive Office*. This policy rewards rather than punishes DataPak's customers—what a welcome idea!

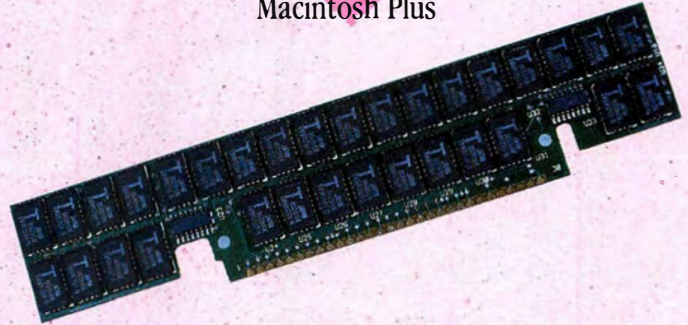
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(continues)

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Letters

Another Happy Ending

Hurray for the people at Forethought. I was pleasantly surprised recently while researching programs capable of printing commercial health insurance forms. After reading your review of Forethought's database, *Filemaker*, I contacted Forethought on its toll-free line and found out that *Filemaker* is suitable for my application.

Better than this fact, though, was the prompt and efficient manner in which my technical questions were answered. Someone from Microsoft should call and speak with Forethought's technical support rep Wendy Meyers; not only did I wait on hold long-distance for ten minutes with Microsoft (while Ma Bell smiled), but the person who finally answered my simple yes or no questions was apparently too busy to be courteous.

*Christopher J. Church
Palm City, Florida*

Dreaming

I dream about a flat Macintosh, a simple portable computer with an LCD or electroluminescent high-resolution screen as light as a copybook; it is battery powered, rechargeable, full of RAM for long notes. In my dream I replace the mouse with a light pen, voice recognition, or better still an alpha-wave transmitter/receiver that sets me free from my desk. I wish for a flat, clever printing machine—battery powered. For me, the future of computers lies in simple hardware that works invisibly, as if by telepathy.

*Serge Ouaknine
Montreal, Quebec
Canada*

Critical Support

I have just resubscribed to *Macworld*—with great reservations. Granted, *Macworld* is beautiful, but there needs to be content as well. I believe *Macworld* needs to adopt a more critical, honest stance in relation to its readers. Also, the response time is slow. Fortunately, there is occasionally an excellent article ("Hypermedia" by Jeffrey S. Young in the March issue and "Developing a Megabyte Strategy" by Danny Goodman in April are examples) that makes me hesitate to drop my subscription. I hope *Macworld* improves.

*Judy Engelsberg
New Milford, New Jersey*

We're always trying to improve the magazine. Our new editor, Jerry Borrell, has made getting solid information to the readers faster one of our top goals. We're already at work on ways to do that without sacrificing the appealing design of Macworld. —Ed.

Japanese Fonts

Is the Japanese font for the Macintosh [*Macworld View*, June 1986] available in the U.S.?

*Michele Vik
Anchorage, Alaska*

Though Apple is not distributing the Japanese Mac hardware in the States, you can use a Japanese word processor, EG Word version 2.2, on any 512K Mac or Mac Plus. The program also works with the LaserWriter. EG Word is available for \$379 from Counterpoint Systems, P.O. Box 1685, Cambridge, MA 02238, 617/576-6639. —Ed.

In Search of More Flexible Fonts

As a recent Macintosh convert who has access to an Apple LaserWriter, I have been very impressed with the quality of the LaserWriter print. However, I have a major problem with the way Apple handled the fonts for their printers. I need to have files that can be printed on either an ImageWriter or a LaserWriter. Much to my dismay, I find that there is no font that prints well on both. Geneva, my favorite font, prints poorly on the Laser; the spacing is incorrect and letters tend to run together. If I use Helvetica (a font for the LaserWriter), the results are poor on my ImageWriter. Of course, I can change fonts each time I print. However, the fonts are different enough that tabs and pagination change. Thus I have to change the font, then scroll through the document to correct tabs and pagination. Worse, I must do this each time I change printers. Apple, get your act together.

Also, despite 15 years in software and hardware, I had not heard the term *MIS manager* before I read David Bunnell's ed-

(continues)

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Letters

itorial in the March issue, and I scanned the entire editorial without discovering what that title means. Come on, it would have taken only a few words to define the term.

*William F. Russell, Jr.
Boston, Massachusetts*

There's no easy way around the font incompatibility of the two printers, but our article "Eye to Eye with the LaserWriter," October 1985, suggests ways to make the transfer less painful.

Sorry about MIS; our jargon sensors failed to catch it. The MIS manager is the "management information services" manager, the person who makes decisions about which computer systems an institution uses. —Ed.

The Stepchild of Invention

So Apple did not invent the mouse, windows, and so on ["The Macintosh Today and Tomorrow," April 1986]. So what? Did Henry Ford invent the automobile? No. He just put the nation (maybe the world) on wheels.

*Scott Peters
Potomac, Maryland*

History Repeats Itself

David Bunnell's April column gave me more evidence to support my observations on the current state of chaos in the Mac world.

The entire object of producing the Mac was, if one may use its introductory advertising as a guide, to make available for the huge world of non-computer-users a machine that would do everything a computer could without requiring special skills. If you knew how to point, you could do marvelous things with the Mac. It is to Steve Jobs's great credit that what he produced was indeed a revolution rather than mere evolution or clever repackaging.

The rest of the Mac's history up to the present is a mixed bag of shortsightedness, stupidity, greed, fraud, and worse, made bearable by the efforts and products of a few smart and dedicated entrepreneurs. What most astounds me is that all this took place at least a generation ago in the world of the mainframe, yet no one in the micro-computer world of today seems to have learned anything from the experiences of the micro's big brother.

*Nick J. Poolos
Skokie, Illinois*

Jazz Aficionado

To say—in a headline no less—that *Jazz* is nothing more than a flop shows bad judgment and a lack of information. Admittedly, Steven Levy's April column ["Jazz: Software in a Minor Key"] was accurate, but it did not tell the whole story. It is true that the power of *Jazz*'s modules suffers due to their integration, but never has it been more appropriate to speak of the whole being more than the sum of its parts.

Anyone who works with *Jazz* must notice that the product has been designed to simplify the process of manipulating data and ideas. The tremendous amount of effort Lotus put into *Jazz* becomes more and more apparent as you continue to explore the flexibility it offers. In a nutshell, despite the lackluster sales of Lotus's product, no one has a right to label *Jazz* as software "in a minor key."

*Mark David White
Washington, D.C.*

Applause for HotView

I bought *Jazz* because it reached out to me in the same way as the Mac did. Here, finally, was an integrated package that covered most of the bases needed to manage my business.

Well, it turns out that living with *Jazz* is a bit like living in New York City... you have the best and worst of everything. The program is a murderously slow memory-trasher. You can cook dinner for a small bar mitzvah party while waiting for the program to load. If you're working on a 512K Mac with an external drive, you'll develop muscles you never knew you had swapping disks. And trying to get through to Lotus's technical support is a bit like trying to call the Pope from a pay phone. It is a sin that a company of such stature doesn't offer a toll-free tech support number, especially when you just sent them around four hundred bucks.

On the other hand, the program's basic structure of integration is terrific. The windowing is dynamite. Add the Hot-View feature to the picture, and you couldn't ask for anything more. Except perhaps that the whole thing work better, faster, leaner, and cheaper!

(continues)

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The present alternative to *Jazz*, of course, is to batch your favorite single-purpose programs together with *Switcher*. But that alternative pales when you consider that you lose HotView in the process. Being able to update data in a database or spreadsheet and have that data automatically updated in a word processing document (without cutting and pasting) is heaven, though it would be nice if HotView worked in more than one direction.

As I believe in second chances, I eagerly await the second release of *Jazz*. By then I will have a hard disk and a meg or more of memory. Life will get better. And if Lotus did its homework, it may just turn out to have been worth all that suffering through people telling me I should have bought *Excel*.

B. J. Leiderman
New York, New York

Another Jazz Fan

Jazz is getting unfair reviews ["Jazz: Software in a Minor Key," April 1986]. *Jazz* has enabled me to put a lot of information together and end up with cohesive sales presentations and proposals to customers. HotView has been invaluable to my work, and it is nothing short of spectacular.

Yes, I would like macros. I would like a more powerful communications module. When you shop for a new car, you might make a wish list that amounts to the cockpit of the space shuttle. While it's nice to have such impressive instrumentation, how often do you need to put it into orbit? I'm quite happy with *Jazz*, thank you.

Michael Mazzucca
Palo Alto, California

A Critical Defense

Poor *Jazz*. Can't anyone find it in their heart to say some kind words in behalf of Lotus's *Jazz* program? I don't think it deserves the overwhelmingly negative press it receives.

In my opinion, *Jazz* is a mediocre but complete collection of the most commonly used business applications. This makes *Jazz* a cost-effective choice for computer novices who have not yet clearly defined what it is they need a computer to do. I sell Macintosh computers and software for a living, and believe it or not, many who walk into a computer store to purchase a computer do not have a clear idea of what a

computer can do, or even what they would like a computer to do, for their business. Selecting a program for this type of customer involves more than counting how many rows and columns they need in a spreadsheet. Even at \$400, *Jazz* is the cheapest way for new computer owners (who are typically not power users) to get the full complement of business applications.

Further, it isn't fair to compare *Jazz* to other multifeature programs; *Jazz*'s all-in-one philosophy puts it into a class by itself. *Excel* and *Crunch* are not databases, so why pretend that they serve this function? Their sort and select capabilities are handy features to have in a spreadsheet, but they don't constitute database capabilities.

Switcher is a good product and works—most of the time. But it is not yet reliable enough to be compared to *Jazz*.

Clearly, *Jazz* is not a perfect program; of those I have evaluated, none are. However, *Jazz* is a valid choice for many computer users who don't need all the functions offered by the single-function alternatives.

I hope that Lotus sticks it out with *Jazz*. A little more speed, macros, and the ability to dynamically link spreadsheets and databases would definitely expand *Jazz*'s appeal. On the other hand, Lotus, if you're listening, this is one *Jazz* owner who is ready to help the media twist the knife if *Jazz* 2.0 is not forthcoming and extremely impressive.

David Kelley
Anchorage, Alaska

Nous Nous Sommes Trompés

Le conjugueur was designed for the use of students and writers as a professional reference tool. As such, it accepts all irregular French verbs.

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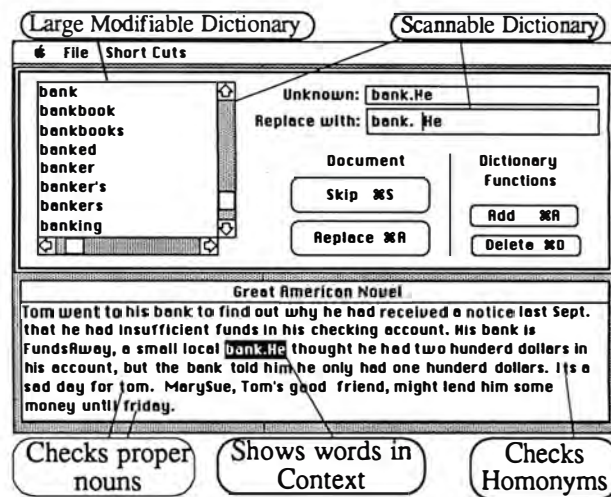
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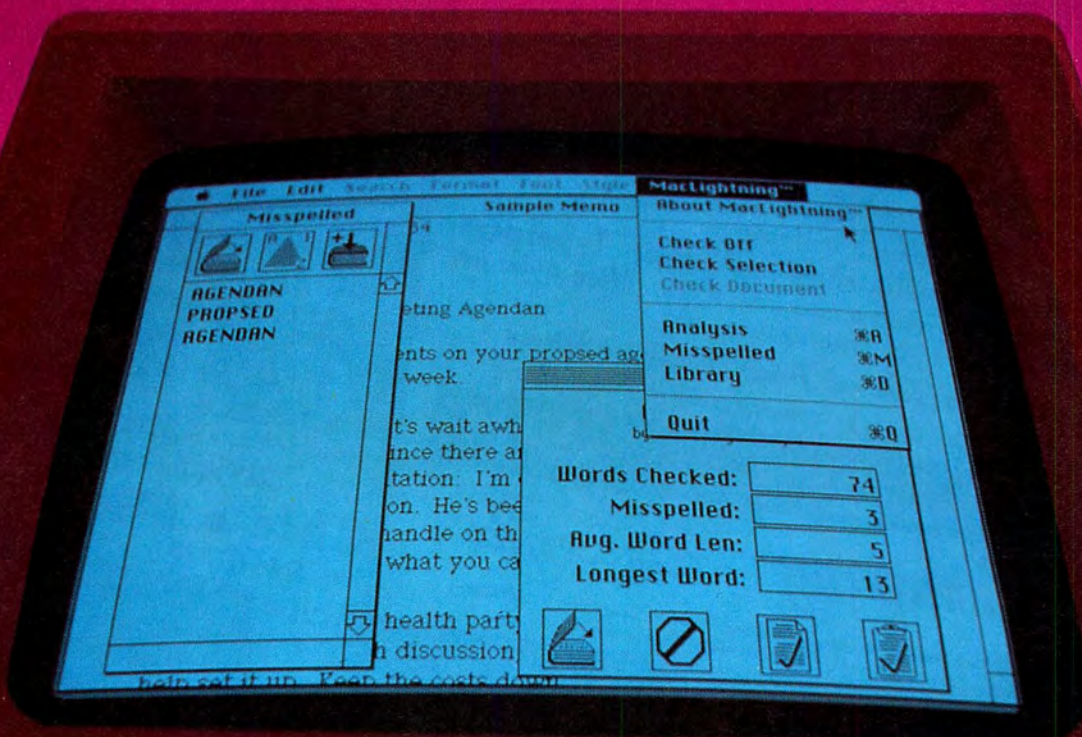
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Letters

allows it to operate correctly with *Microsoft Word* or *MacWrite* on a one-drive 128K Macintosh, without juggling disks.

The inaccuracies in the review imply that your reviewer evaluated a demonstration version of *Le conjugueur*. The demonstration version is a stand-alone application containing a large number of informational and promotional screen displays. The real product takes the form of a very compact desk accessory that includes complete instructions in both French and English.

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Louis Moreau
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Cache Compatibility

In "Developing a Megabyte Strategy" [April 1986], Danny Goodman says, in relation to disk caches, that they are "incompatible with a few programs, such as . . . *OverVue*."

I have turbocharged my *OverVue* disk and have used it for data input, analysis, and printing reports, with good results. Is there something I should avoid to prevent a software crash? What is the incompatibility?

R. L. Pendleton
China Lake, California

OverVue 2.0D works with the HFS and with TurboCharger and the built-in RAM cache you can set from the Mac Plus's new control panel. The new version also works with RAM disks and is free of copy-protection. Registered owners can obtain the new version by returning their master OverVue disks and \$10 to ProVue Development Corp., Dept. 10, 222 22nd St., Huntington Beach, CA 92648. —Ed.

Mac Plus Fine Points

"A Change for the Plus" [April 1986] leaves me with a few questions. If the owner of a 128K Mac upgrades to the 800K drive and ROM only, it appears that the already small application heap and stack get squeezed even smaller due to the addition of the

(continues)

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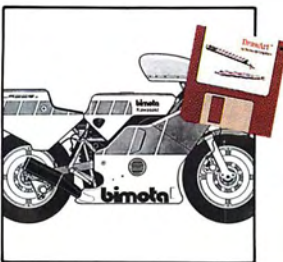
Crunch offers 74 built-in functions, including math, statistical, financial and logical; or, define your own functions. It is easy to create a variety of graphs and dynamic charts without exiting the program. You can even link Crunch spreadsheets so they share information. At this price, Crunch's power is a value you shouldn't pass up! Requires 512K or Mac Plus

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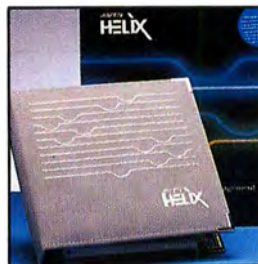
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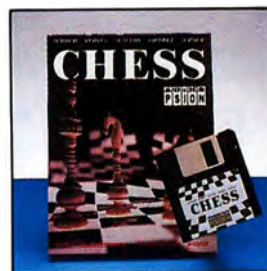
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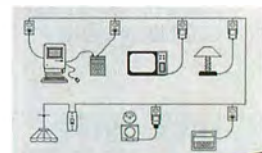
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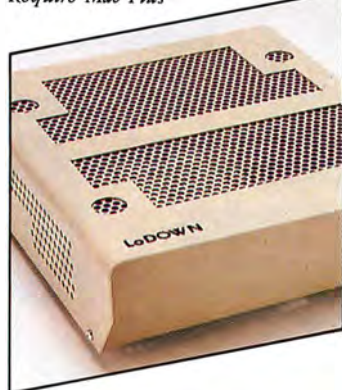
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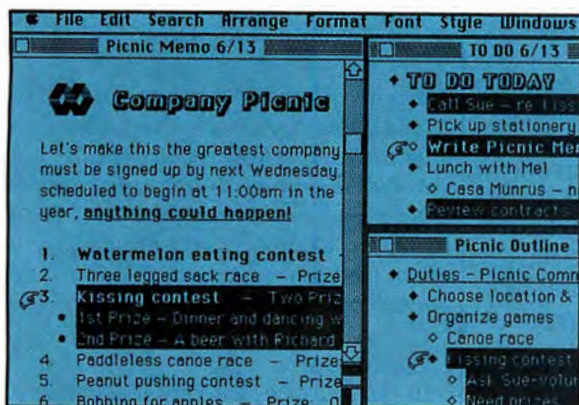
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The A+ Mouse provides many miles of reliable use—drawing high-resolution



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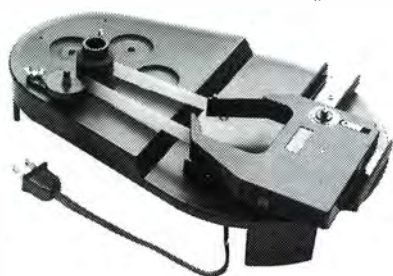
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Letters

Toolbox dispatch table and system globals.
Will this produce problems for any current
application able to run on a 128K Mac?

One final comment. At the end of
March, the Mac Plus upgrades had just ar-
rived—two months later than promised. Of
course, Mac Pluses were abundant at the
first of February. In other words, the new
user gets the new goodies, while the rest
of us who have put up with the Mac's shor
comings for so long get to wait in line.
There still exists a large group of loyalists
out there. But one day, Apple is going to go
to the well once too often, and that loyalty
will be gone.

David Atkinson
Tacoma, Washington

*You are directly on target; the globals
and the system heap of an upgrade
would be too tight a fit on a 128K Mac.
Apple recommends upgrading to a 512K
before adding a double-sided drive and
the new ROM. Incidentally, the new Sys-
tem (3.0 or greater) and Finder don't
work on a 128K. —Ed.*

Corrections

In "Hard Disks Made Easy" (*Macware Re-
views*, May 1986) we stated that Central
Point Software's *Copy II Mac* and Practical
Computer Applications' *MacBackup* re-
produce the copy-protection scheme of the
disk being copied, making them ineffec-
tive for placing applications on a hard disk.
The current versions of both programs al-
low you to install applications on a hard
disk and run them without inserting a mas-
ter disk.

Odesta Corporation, maker of *Helix*
("The Well-Tiled Abacus," June 1986), is
now located at 4084 Commercial Ave.,
Northbrook, IL 60062, 800/323-5423
(312/498-5615 in Illinois).

*Letters should be mailed to Letters, Mac-
world, 555 De Haro St., San Francisco,
CA 94107, or sent electronically to
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"Best Peripheral Device"

MacUser

The editors of *MacUser* named ThunderScan the Best Peripheral Device of 1985. Here's what they said: "ThunderScan from Thunderware is an astonishing device that transfers images to the Mac by scanning them using a snap-in device that replaces the ImageWriter ribbon... Easy to hook up and use, relatively inexpensive, this device should be owned by anyone who uses graphic images on the Mac."

"Best Graphics"

MACazine

Based upon their personal use, the readers of *MACazine* voted ThunderScan the Best Graphics System of 1985.

"Best Hardware Product"

MACazine

We didn't finish first here, but in this case we don't object to second best. Of all the hardware products on the market, ThunderScan finished second only to the Mac 512 as the Year's Best Hardware Product.

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To get the best graphics from the world's most graphic computer, experts and users agree: Nothing works like ThunderScan. Because only ThunderScan replaces ImageWriter's ribbon cartridge, scans printed images and turns them into high-resolution MacPaint documents. Just \$229 complete including our powerful image enhancement software (no video camera required). Get yours today. Or contact us for more information and sample ThunderScanned images.

ThunderScan, as shipped, is compatible with the 128K or 512K Macintosh, ImageWriter I & II and LaserWriter. Compatibility with the wide-carriage ImageWriter and Mac Plus requires accessories. Contact us directly for answers to your compatibility questions.



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Using all the extra speed and capability is a snap, too, because you get complete, easy-to-understand documentation and a quality upgrade designed to improve your productivity. MacSnap is fully compatible with all Macintosh system software, but it doesn't stop there. It comes with its own performance software package that includes Switcher, a user-configurable RAMdisk and a print spooler.

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MacSnap is fully compatible with HyperDrive and Apple's 128K ROM, too.

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Circle 498 on reader service card

Macworld View

Robots, GEnie, memory upgrades, outline processors, the ultimate composing machine, and more

Edited by Daniel Farber


Macintosh Robotics



Elfin, like R2D2 of *Star Wars* fame, spins and moves with a certain grace—a bulletlike robot about 18 inches high, with wheels on the bottom. The top pops up and down, there's a blinking red light, and the robot's panels are constructed of a high-tech white metal.

A small radio-frequency generator, which sits on top of the Mac and plugs into its modem port, controls Elfin. Controlling software lets your mouse specify where the robot goes by sketching a route on the Mac's screen. You can even draw a scale map to help direct the robot within your home. Elfin's sensors detect solid objects, and the software includes a Pascal-like visual programming language, so you can teach the robot to make environmental decisions. You can program Elfin to recognize obstacles and take appropriate action to avoid colliding with them.

(continues)



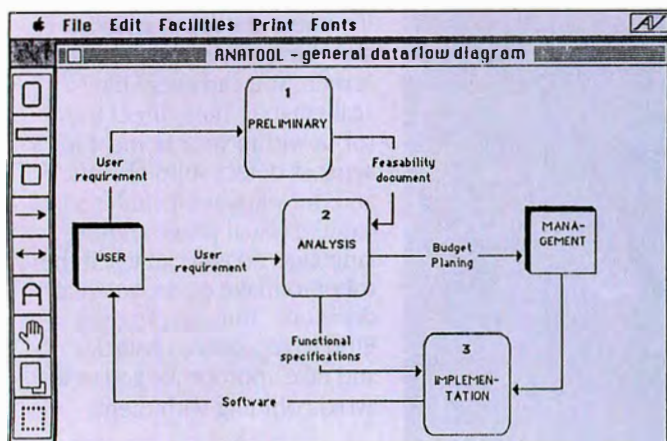
Elfin with creator Dean Hovey. "An intellectual companion rather than a high-tech servant."

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- *print automatically a final document (on Laserwriter or Imagewriter)*
- *set macro-command using a STRUCTURED ENGLISH LANGUAGE*

Macintosh Robotics (continued)

The robot's voice synthesizer converts any text (normal, not phonetic) you enter to speech—Elfin even sings while it moves about.

"There are all sorts of industrial systems, technical software, and controller robots for specific tasks," explains Dean Hovey, one of the principals of Elfin Technologies. But no one had integrated all those possible functions into one little animated character with a personality. We see Elfin as an intellectual companion, rather than as a high-tech servant.

Several microprocessors give the robot significant computing capability. It interprets data—such as sonar or video input—independently of any computer. And the robot's radio-frequency and control mechanisms are by no means dependent on a computer, either, since you could control Elfin as well from signals embedded on a compact disk or videotape. For example, an educational TV show could carry signals that would bring the robot to life in

order to interact with children.

Elfin features an expansion bus so that future developers will be able to attach peripherals such as voice recognition boxes, sonar or video "eyes," or mechanical arms. Elfin Technologies hopes to begin seeding developers with prototypes of the machine this year and expects developers to produce a wide assortment of off-the-shelf and kit enhancements.

You don't spend five years building character and an interactive software interface into a robot unless you have a pretty good idea of what your device will eventually do. "We're exploring partnerships in the entertainment industry," says Hovey. "This brand-new market is still virtually unexplored. The only thing we're sure of is that we don't want to limit Elfin's potential by not fully exercising our own imaginations."

If all that gets *your* imagination going, contact Elfin Technologies at 10430 S. De Anza Blvd., Cupertino, CA 95014, 408/725-0442. —Jeffrey S. Young

GENie

In the world of on-line services, the newest entry is GENie—the General Electric Information Services Exchange, which is offering a significant discount (about 60 percent) over CompuServe and The Source. GENie's registration fee is \$18, and the normal rate is \$5 per hour for both 300- and 1200-bps modems (prime time is \$35 per hour). A \$10 surcharge is added for 2400-bps users.

GENie's services include news and commentary, multiplayer games, real-time conferencing, electronic mail, a CB simulator, Grolier's encyclopedia, electronic magazines, the American Airlines EasySaver travel reservation service, software libraries, shopping and swapping services, and various

special-interest groups (known as RoundTables)—including one for the Macintosh.

GENie is building up its software libraries by encouraging people to upload public domain and shareware programs or files without charge. The service employs the Xmodem transfer protocol for downloading and uploading files—and GENie's Xmodem is three to four times faster than that of other systems.

As of May, GENie had about 12,000 subscribers compared to CompuServe's 250,000. But given GE's impressive teleprocessing network and GENie's strong start, competitive services will undoubtedly have to take steps to decrease costs and improve services. For more information, call 800/638-9636, extension 21.

MacDouble D-D

Custom Computer will install your external 400K disk drive as an internal drive in a standard 512K Macintosh. Installation takes two days and costs \$189.95, or you can purchase a 512K Mac with two 400K drives for \$1995. In either case, the finished product is called MacDouble D-D. Custom Computer also produces Mac Clean Air, a fan that pulls cool air through a dust filter and distributes it over the power supply board, and Mac Hummingbird, a device that reinforces the convection

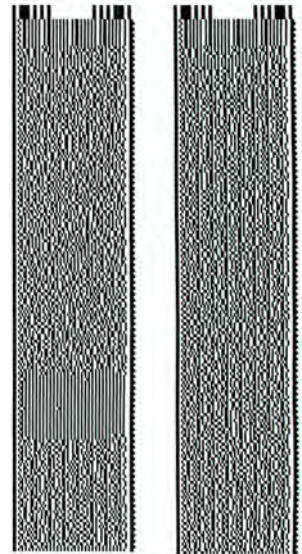
cooling of the Mac and counteracts the buildup of potential hot spots. Both products are recommended with a MacDouble D-D conversion.

The company also plans to install 800K drives in the Mac Plus and Mac 512K Enhanced. For further information, contact Custom Computer, 3601 Parkview Ln. #1-C, Irvine, CA 92715, 714/786-3418.



Outside in. The MacDouble D-D conversion internalizes a 400K external drive.

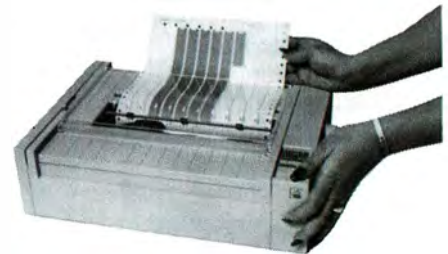
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TECH SPECS

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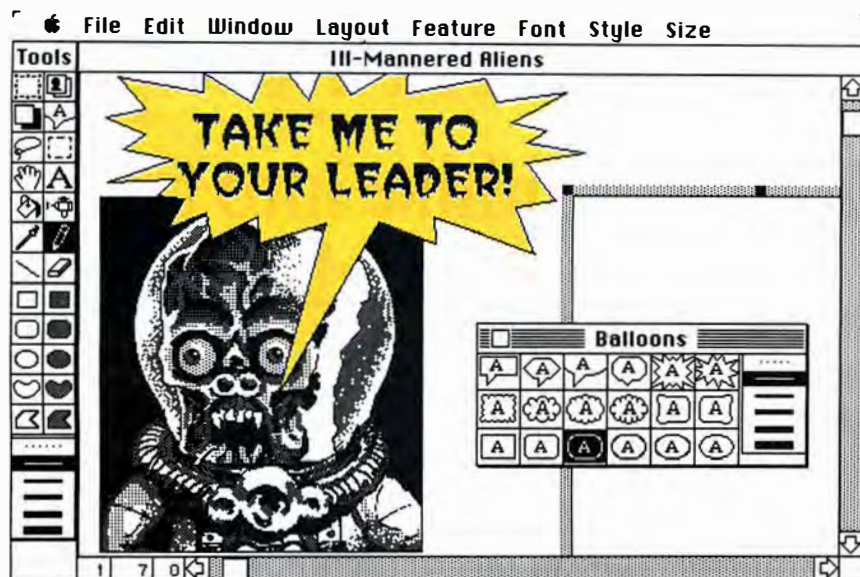
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ComicWorks



In the beginning, it was the word processor. Then came *ThinkTank*, the first outline processor. Now we have the ultimate in software specialization: the comics processor. MacroMind, the creator of *MusicWorks* and *VideoWorks*, has just completed *ComicWorks*. Published by Mindscape, *ComicWorks* is a free-form text and graphics editor that lets you create comic books.

ComicWorks is a hybrid that incorporates *MacPaint*-like bit-mapped graphics, *MacWrite*-like text-editing capabilities, and object-oriented graphics à la *MacDraw*. In addition to the usual *MacPaint* capabilities, the program offers special features such as a facility for making dialog balloons (no relation to dialog boxes) in a variety of shapes, an airbrush with an adjustable nozzle, a resizable grid, a poster-making utility,



ComicWorks

A combination graphics and text editor, *ComicWorks* lets you create newsletters, posters, and of course, comics.



and fonts such as Crypt and Vampire.

The package includes comic book story lines and artwork by Mike Saenz, creator of *Shatter*, the first comic book produced on the Macintosh. *ComicWorks* does more than just comics. You can also use the program to produce newsletters, posters, greeting cards, or just about anything that combines graphics and text.

Racing for Megabytes



With the introduction of megabyte machines from Apple and third-party developers, it was inevitable that 4-megabyte machines wouldn't be far behind. At last count, four manufacturers—MacMemory, Micro Conversions, Micah, and Super-Mac—were offering 4-megabyte boards for the Mac and the Mac Plus.

The communications module is similar to *MacTerminal* and allows you to store up to eight telephone numbers per communications document. Up to ten files of any four applications can be open at once, making it easy to cut and paste data between documents.

In all, *Works* offers a lot more features and speed than *AppleWorks* for a similar price. At \$295, *Works* should sell well to first-time Macintosh buyers who want to combine four applications into one.—Charles Rubin

MacMemory's MaxPlus is a 2- to 4-megabyte upgrade that uses 256K RAM chips and plugs into the Mac Plus's Single Inline Memory Module (SIMM) slots. MacMemory's Max2 for the 512K or 128K Mac gives you a choice of 2 megabytes (using 256K chips) or 4 megabytes (using 1-megabit chips).

The 1/2/4 Megabyte Upgrade, from Micro Conversions, uses 256K chips to upgrade a 128K or 512K Mac to 1, 2, or 4 megabytes. For the Mac Plus, Micro Conversions offers the PlusPlus, a 2- or 4-megabyte upgrade that plugs into the Plus's SIMM slots.

Micah offers a 2- or 4-megabyte upgrade for the Mac Plus that can be installed with or without Micah's internal 20-megabyte hard disk. The upgrade adds an internal expansion chassis that attaches to the Plus's SIMM connector via a ribbon cable.

(continues)

Microsoft Works



Microsoft is hoping that its long-awaited entry into the all-in-one software market, *Microsoft Works*, will replicate the phenomenal success of *AppleWorks* in the Apple II world. The program has four integrated modules: word processing, spreadsheet, database, and communications. Like *AppleWorks*, *Microsoft Works* is designed to please most of the people most of the time. This philosophy and the functionality of the modules make the program suitable for first-time

users, small-business owners, and managers and executives with casual computing needs.

The *Works* word processor falls somewhere between *MacWrite* and *Microsoft Word* in features. It can merge with database files and produce form letters, and it includes a feature that draws lines, circles, and boxes around or on top of text. You can produce four types of charts with the spreadsheet, but you cannot link spreadsheets. Database files store up to 60 fields, and calculated information appears on screen.

Earth will be destroyed in 12 minutes to make way for a hyperspace bypass. Should you hitchhike into the next galaxy? Or stay and drink beer?

Slip the disk in your computer and suddenly you are Arthur Dent, the dubious hero of *THE HITCHHIKER'S GUIDE TO THE GALAXY*, a side-splitting masterwork of interactive fiction by novelist Douglas Adams and Infocom's Steve Meretzky. And every decision you make will shape the story's outcome. Suppose for instance you decide to linger in the pub. You simply type, in plain English:

>DRINK THE BEER

And the story responds:

YOU GET DRUNK AND HAVE A TERRIFIC TIME FOR TWELVE MINUTES, ARE THE LIFE AND SOUL OF THE PUB, THEY ALL CLAP YOU ON THE BACK

AND
TELL YOU
WHAT A GREAT

CHAP YOU ARE AND
THEN THE EARTH GETS
UNEXPECTEDLY DEMOLISHED. YOU
WAKE UP WITH A HANGOVER WHICH LASTS
FOR ALL ETERNITY. YOU HAVE DIED.

Suppose, on the other hand, you decide to:

>EXIT THE VILLAGE PUB THEN GO NORTH

In that case you'll be off on the most mind-bogglingly hilarious adventure any earthling ever had.

You communicate—and the story responds—in full sentences. So at every turn, you have literally thousands of alternatives. If you decide it might be wise, for instance, to wrap a towel around your head, just say so:

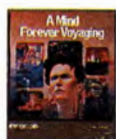
>WRAP THE TOWEL AROUND MY HEAD

And the story responds:

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Racing for Megabytes (continued)

bon cable. Up to 16 memory modules populated with 256K chips can plug into the expansion chassis.

SuperMac's president claims that the Enhance upgrade with external SCSI port overcomes the Mac's 4-megabyte limit by adding 2 to 6 megabytes of RAM to a 128K or 512K Mac. Because Enhance doesn't share its memory with the screen-refresh circuitry, programs running in the upgrade's memory should run faster than in a Mac Plus.

RAM memory prices are changing rapidly due to the recently imposed import tariffs, so check with the manufacturers for the latest prices.—David Ushijima

Outline Processors



For over two years, Living Videotext's *ThinkTank* reigned as the best-selling—in fact the only—outline processor for the Macintosh. The company claims to have more than 50,000 Macintosh *ThinkTank* users. But not content to rest on its laurels, it has been working on the Rolls Royce of outline processors for the last two years. The program lets you generate bulleted and tree-structured charts automatically, export data directly into most Mac programs, print documents in color, and create templates. Known as *More*, it also provides graphics tools for enhancing outlines or charts, extensive searching and outline-manipulation capabilities, a

Desktop Communications



Occasionally, a word can be worth a thousand pictures. The word *desktop*, for example, is like a banner for the Macintosh. Apple is creating a consistent image with its desktop concept, leveraging on the prominent success of desktop publishing to boost future desktop programs.

Apple's *desktop communications* marketing drive, for example, is already having success in promoting the Mac and AppleTalk products. By the end of June, Apple had sold over 125,000 AppleTalk nodes, mak-

ing AppleTalk the most popular networking system.

In an effort to increase awareness about desktop communications, Apple has supplied retail dealers and sales reps with Infosphere's network server *MacServe* as well as Think Technology's electronic mail program *InBox*, Symmetry's graphics database *PictureBase*, and Tangent Technologies' IBM PC AppleTalk board PC MacBridge. "That means over 1000 Apple dealers can demonstrate real-time net-

working as a way to solve problems," says Peter Friedman, manager of desktop communications at Apple.

Evan Solley, president of Infosphere, claims that *MacServe* was installed in over 10,000 networks by late June (including *Mac XL/Serve*).

Guy Mariande, president of Tangent Technologies, says that his company had shipped over 2400 PC MacBridge boards by the end of May.

And Apple has announced its intention to offer the UNIX and MS-DOS operating systems as options on future Macintoshes to increase compatibility. In any case, desktop communications has the potential to become more than a marketing phrase.



"More than 30 percent of all AppleTalk networks use MacServe," says Infosphere president Evan Solley.

slick window-management scheme, and "more."

By introducing its large installed base to this well-designed product, Living Videotext should be able to command a leadership position in marketing outline processors. For more information, write to Living Videotext, 2432 Charleston Rd., Mountain View, CA 94043.

MaxThink, a program similar in function to *ThinkTank*, has been out since last spring. While not quite as elegant, *MaxThink* is less than half the \$195 price of *ThinkTank*. For more information contact MaxThink, Inc., 230 Crocker Ave., Piedmont, CA 94610.

Acta, a new outliner from Symmetry, has the primary outline processing and limited word processing features of *ThinkTank* and *MaxThink* but works as a desk accessory. This \$59.95 program lets you save outlines in *MacWrite* or text formats, paste in pictures, and sort entries. Target Software, publisher of the spelling checker *MacLightning*, also plans to publish a desk accessory outline processor. Contact Symmetry at 761 E. University Dr., Ste. C, Mesa, AZ 85203 and Target Software at 14206 S.W. 136th St., Miami, FL 33186.

Calliope, from Innovision, takes a different approach to

outlining. This \$59.95 program uses icons to represent ideas that have been typed into separate windows. The icons can be linked together to form "idea maps," providing a visual method of organizing a document. You can contact Innovision at P.O. Box 1317, Los Altos, CA 94023.

When you shop for an outline processor, the choice won't be as easy as it once was. But with the variety of programs available, odds are you'll find one to suit your needs and budget.

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Circle 466 on reader service card



Sound engineer Bryan Bell includes the Mac in the mix when he tours with Carlos Santana.

The Ultimate Composing Machine



Bryan Bell is a self-described high-tech engineer specializing in live-sound mixing and instrument design. Over the past 11 years Bell has worked with John McLaughlin, Al DiMeola, the Berkeley Jazz Festival, and Earth Wind and Fire. Bell's father, a composer and record producer, helped his intrepid son engineer his first album—*The New Mexicans*—at age 11.

While working with Herbie Hancock, Bell worked on 15 albums. In 1980 he built an electronic composition system for Hancock; systems of comparable sophistication are only now becoming available commercially. Recently, Bell worked on Carlos Santana's New Santana

Band's album *Songs of Freedom*, and he is currently touring with the band.

For complex functions and for generating musical notation, Bell uses the Macintosh. "I could have used Atari or Amiga, but I chose a 512K Mac on the basis of familiarity, ease of use, and software availability," says Bell.

On tour, the Mac provides daily communication between the promoters and trucking, sound, and lighting contractors via electronic mail. Bell uses a modem for calling musician-oriented bulletin boards like PAN (Professional Artist's Network) on Delphi.

Bell is also a partner in Synth-Bank, a Portland-based on-line sound-file publishing company that's slated to be on PAN as a special interest group. Synth-Bank offers libraries of public domain sounds, many of which have been contributed by users free of charge. The company plans to make sound files and sound effects from major artists and programmers available for a fee.

Bell is still searching for the ultimate composing machine—one that lets you just think about the music, while it writes the parts and does the recording. In the meantime, the Macintosh more than suffices.

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Macworld Best-Seller Software

This month	Business	Last month	Months on chart
1	Microsoft Excel, <i>Microsoft</i>	1	5
2	Microsoft Word, <i>Microsoft</i>	2	13
3	MacDraw, <i>Apple Computer</i>	4	10
4	PageMaker, <i>Aldus</i>	6	1
5	Jazz, <i>Lotus Development</i>	7	9
6	MacProject, <i>Apple Computer</i>	5	10
7	Microsoft File, <i>Microsoft</i>	3	12
8	Filevision, <i>Telos Software</i>	—	2
9	Microsoft Multiplan, <i>Microsoft</i>	9	13
10	MacTerminal, <i>Apple Computer</i>	—	8
10	Omnis 3, <i>Blyth Software</i>	8	4
12	Habadex, <i>Haba/Array</i>	—	2
12	Smartcom II, <i>Hayes</i>	—	0
14	Dollars and Sense, <i>Monogram</i>	10	13
14	Back to Basics, <i>Peachtree</i>	—	3

Source: InfoCorp survey of over 200 retail stores

Software Watch

Editors' choice: other recent software of particular interest

Word Handler, Advanced Logic Systems
Word processor

Micro Planner Plus, Micro Planning Software, USA
Project management

Double Helix, Odesta
Database

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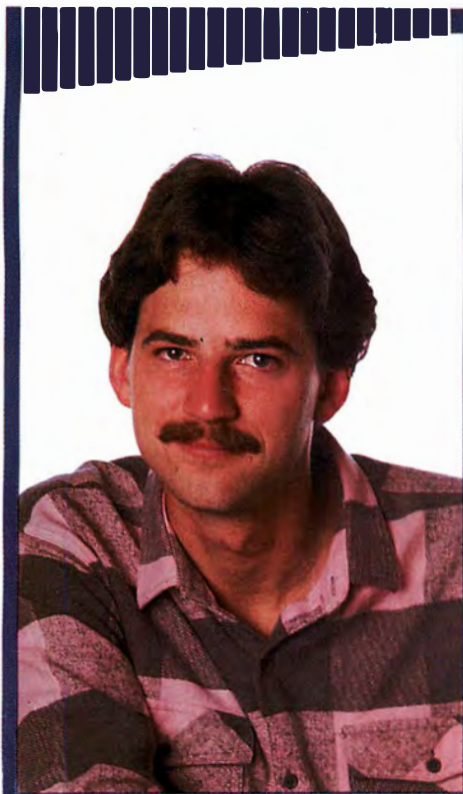
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Get Info

Questions on upgrading to the Plus, printing graphics documents, installing icons in menus, and more

Lon Poole



This month I answer questions about upgrading from a 512K Mac to a Mac Plus, using an ImageWriter with an IBM PC, what can be done about the disparity in printing quality between text and graphics in MacWrite, why the Mac waits for a new sheet of paper to be inserted when the printer is loaded with continuous paper, how to add icons to menus using ResEd, and where to get technical notes, software supplements, and other technical materials.

Q. After reading an article in *Macworld* [*Macworld View*, March 1986] that described the three-step upgrade from a 512K Mac to a Macintosh Plus, I have many questions. Generally, I'm wondering when each of the three upgrade steps needs to be done and how each step affects the way I use my Mac. Specifically, can I add the keyboard without any other changes? Can I add the 800K internal disk drive alone? Will my single-sided disk drive still work? What are the logical steps in having the upgrade done if I can't afford it all at once? What happens if I stop along the way? Are there any additional expenses, such as cables and software? Will all of my software perform as usual . . . only better?

Charles W. Bartlett
Ferndale, Washington

A. If you're going to upgrade a 512K Mac to a Mac Plus in stages, start with the \$299 Macintosh Plus Disk Drive Kit, which replaces the original 64K ROM and single-sided (400K) internal disk drive with the 128K ROM and double-sided (800K) internal disk drive. For less than the cost of an external disk drive, you get everything a Mac Plus has except the additional 512K of RAM memory and the SCSI port. All your

existing cables and your single-sided external disk drive will still work, and your single-sided disks will work in either drive. The only extras you have to buy are double-sided disks.

You can add the \$129 keyboard any time after the ROM exchange. Your original keyboard will work fine, so there's no point in buying the new one unless you need the arrow keys or you do lots of numeric work that would make a ten-key pad handy. Don't bother getting the new keyboard until you have the new ROM, though, or some of the keys on the keypad won't work properly.

When you can no longer live without a megabyte of RAM and a SCSI hard disk, go back for the \$599 Macintosh Plus Logic Board Kit. The new logic board has small round modem and printer connectors, so you have to get a couple of \$20 cable adapters. Now the only difference between your upgraded Mac and a Mac Plus is the front-panel nameplate.

Apple's logic board kit is not the only way to add more memory and a SCSI port. Many companies, including Levco, Beck-Tech, Micro Conversions, MacMemory, and SuperMac, offer competitively priced upgrades of 1 to 4 megabytes with or without a SCSI port. SuperMac and Peripheral Land offer an add-on board containing just the SCSI port. These upgrade alternatives do not involve swapping the logic board, so you don't need adapter cables for the modem and printer ports.

(continues)

Apple's logic board kit is not the only way to add more memory and a SCSI port.

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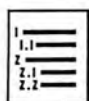
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Get Info

Software compatibility is most affected by the disk drive and ROM upgrade. A few applications have trouble with the Hierarchical File System (HFS), which is used on double-sided disks and hard disks. You can sidestep HFS by running programs from the single-sided disks until you obtain a software upgrade from the publisher. Also, you may have trouble transferring copy-protected software from single-sided disks to double-sided disks or to a hard disk unless you buy a utility program such as *Hard Disk Util* from FWB Software or *Copy II Mac* from Central Point Software. For specific information about your software, including upgrade availability and price, check with the software publisher.

Double-Duty ImageWriter with IBM PC

Q. Please describe how I can connect my wife's ImageWriter (original model) to my IBM PC.

Joel Narod
Lincoln, Massachusetts

A. Your IBM PC must be equipped with a serial port, either an asynchronous serial board or a multifunction board that includes an asynchronous serial adapter. The ImageWriter doesn't work if you attach it to a parallel port such as the one on the standard IBM Monochrome Display and Printer Adapter.

The cable that connects the ImageWriter to the serial port on the IBM PC requires female DB-25 connectors on both ends. Almost any standard null modem or modem-eliminator cable with those connectors works. If you want to make your own cable, wire it as shown in Figure 1.

Every time you turn on the PC or reboot it by pressing Ctrl-Alt-Del, you must configure the serial port and tell the PC to send printer output there instead of to the normal parallel printer port. The following two PC-DOS MODE commands do the job:

MODE COM1:9600,N,8,1,P
MODE LPT1: = COM1:

The first MODE command sets the transfer rate, parity, word length, number of stop bits, and continuous-retry settings. The second MODE command redirects printer output from the parallel port to the serial port. In both MODE commands, use COM2: if your IBM PC has two serial ports and you attach the ImageWriter to the second. You can also put the two MODE commands in a batch file. If you make them

PC	ImageWriter
1	1
2	3
3	2
6	2
7	7
20	6

Figure 1

To attach an ImageWriter to a PC, connect the wires as shown here.

part of the special batch file AUTOEXEC.BAT, they are automatically executed whenever the PC is started or rebooted. Batch files are discussed in the DOS manual that comes with the PC.

Before starting a PC application, you can test the ImageWriter by pressing Shift-PrtSc, which copies the text on the screen to the printer. If nothing happens, switch the ImageWriter off and back on again. Try retyping the two MODE commands. Make sure you're using the right cable and that the cable connections are tight. The settings of the two banks of small switches under the ImageWriter's cover should be the same as for printing from the Macintosh: all the switches in SW1 should be open except for SW1-6; SW2-1 and SW2-2 should be closed; and SW2-3 and SW2-4 should be open.

In addition, each PC application you print from must be set up to use the ImageWriter. An application that was written for the ImageWriter is able to take advantage of its special features such as character pitch selection, boldface, underlining, headline type, custom characters, and graphics printing. Otherwise you have to settle for plain text printing by instructing the application to treat the ImageWriter as a teletype, or TTY-type, printer.

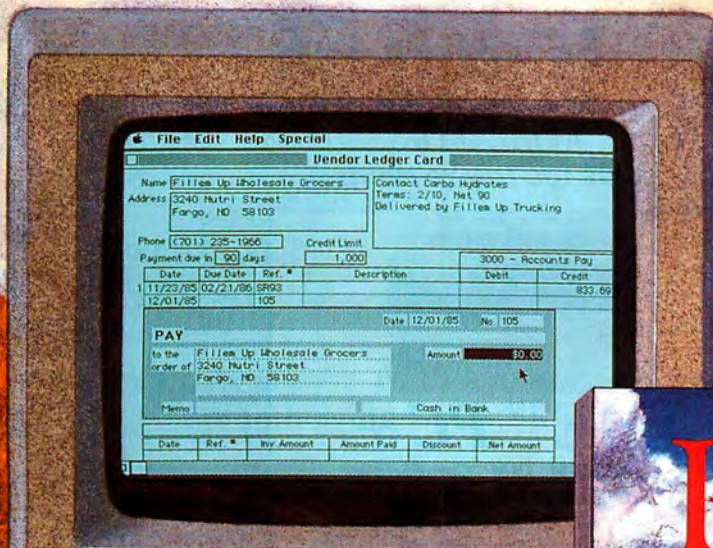
Printing High-Quality Graphics

Q. When I print in standard quality, pictures pasted in from *MacPaint* to *MacDraw* or *MacWrite* come out fine. But when I print in high quality, the pictures come out poorly. I would like to print combined graphics and text in high quality with both looking reasonably good. What can I do?

Richard D. Johnson
Oneonta, New York

(continues)

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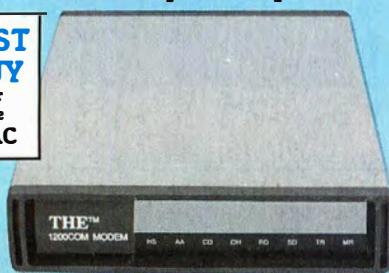
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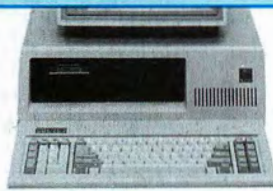
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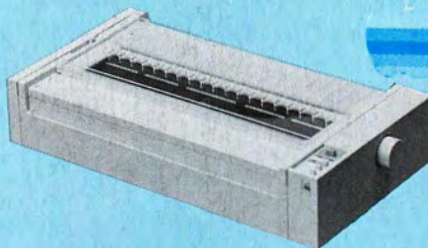


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Get Info

A. After you choose high-quality printing, or best quality as it's now called, the Mac doubles the image size for each printed page. To make the doubled image the right size on paper, the number of dots the ImageWriter prints per inch is doubled.

In most cases, text and graphics are treated differently. The Mac doubles text size by substituting a font that is the same as the original but twice the point size. When the double-size font is scaled down by the printer, the reduced font almost matches the original in size and looks better. The larger point size is more refined, and the characters are denser.

However, graphics created in *MacPaint*, which are called bit-mapped images, generally look worse if they are doubled and then reduced. Each dot in the original bit-mapped image ends up expanded to a cluster of four dots in the printed image. The original ImageWriter can't print such a dense image well because its dots are larger than the spaces be-

tween them. For example, a gray pattern would end up black. To prevent loss of detail, the Mac thins the expanded bit-mapped image by removing three of the dots in each cluster of four. This is preferable for most bit-mapped images, although the thinned graphics do come out lighter than the unthinned text.

As you've discovered, some bit-mapped images look better without thinning. Application programs can tell the Mac not to thin a specific bit-mapped image, but few programs offer this feature. A desk accessory called *FixPic* modifies *MacPaint* graphics that you've cut or copied to the Clipboard so that they are not thinned. *FixPic* was written by Michael A. Casteel, and it's available free from user groups, including MAUG on CompuServe. It works with *MacWrite* and *Microsoft Word* but not with *MacDraw*.

For a solution that works with all applications, replace your ImageWriter with an ImageWriter II. The latter prints smaller dots, so the Mac does not thin bit-mapped images that are to be printed using best quality.

Printing Bureaucracy

Q. I have a 512K Mac and an ImageWriter II printer. Whenever I choose Print from the File menu and go through the usual selection process, the screen displays the message "Printing in progress." The disk spins but no printing takes place. When the disk stops, the Mac says, "Insert another sheet of paper." When I do that and click OK, the printing finally begins.

I have asked for help from my dealer, a major department store, but people there don't have any ideas or much interest. Can you give me some idea what is going on and how to cure it?

*William D. McCaleb
Fresno, California*

A. It sounds like you're selecting the wrong paper-feed method. The dialog box that appears right after you choose Print from the File menu almost always gives you a choice of two paper-feed methods: Auto-

(continues)



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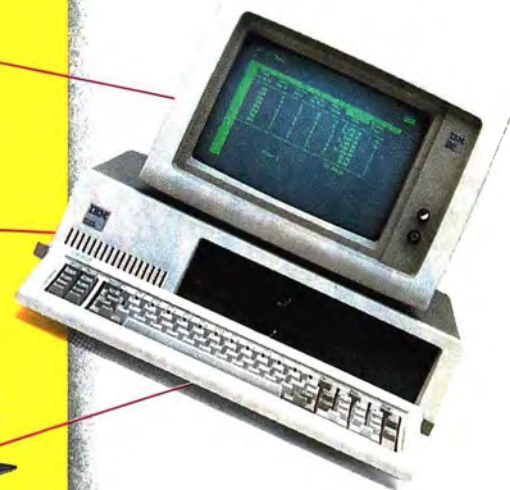
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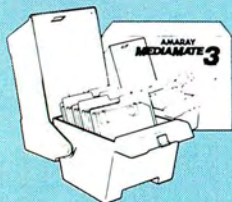
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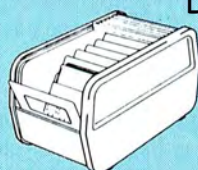
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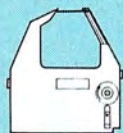


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Circle 373 on reader service card

Get Info

matic or Hand Feed. The options are called Continuous and Cut Sheet if your startup disk contains an older version of the printing resource, the ImageWriter icon. If you're using continuous pin-feed paper, or a cut-sheet feeder attachment on an ImageWriter II, select the Automatic or Continuous option. Choose the Hand Feed or Cut Sheet option only if you're inserting paper by hand, one sheet at a time.

If you select the Automatic or Continuous paper-feed method and the Mac still asks you to insert another sheet of paper, something may have corrupted the printing resource on your startup disk. Replace the printing resource by dragging the ImageWriter icon from the System Folder on another startup disk into the System Folder on the disk that's causing problems.

Icons in Menus

Q. I have become fairly adept at modifying resources using *ResEd*, though I have had no success at all adding icons to menus. Would you please explain how to accomplish this feat?

Les Olinger
Houston, Texas

A. Few application programs use icons in menus, probably because the icons take up so much space. But any menu item can have an icon. It appears to the left of the menu item, or by itself if there is no text.

The icons used in menus are ICON resources. The icon for a particular menu item is identified in a MENU resource by a number equal to the ICON resource ID number minus 255. For example, an icon whose ICON resource ID number is 256 has an icon number of 1 in a MENU resource. The icon number in the MENU resource must be between 1 and 255 (an icon number of 0 means the menu item has no icon).

The first task to accomplish in adding an icon to a menu is to define the icon as an ICON resource with an ID number between 256 and 511. You can do this using Apple's resource editor program, *ResEd*. First, make a copy of your application disk. Experiment on the copy, never on the original.

(continues)

Get Info

1. Start *ResEd* and insert a copy of the disk containing the application to whose menu you want to add an icon. A small window appears for each disk you insert, listing all the applications and documents on the disk.

2. Find the application in the appropriate disk window and double-click on it (the file may be inside a folder on an HFS disk). Another small window opens, listing all the resources in the application by their four-letter code names.

3. Look for the resource named ICON in the application window. If it's not there, choose New from the File menu. In the dialog box that appears, type ICON. A blank ICON resource window opens. Skip to step 6.

4. If the application does have an ICON resource type, double-click it while pressing the Option key. A general-format resource window opens, listing resource ID numbers currently used by ICON resources. Make a note of the resource ID numbers between 256 and 511 that are already in use, and close the resource window.

5. Double-click the ICON resource type (this time without pressing the Option key). A resource window opens, showing pictures of the ICON resources.

6. To create a new icon, choose New from the File menu. A blank icon-editing window appears. Alternatively, you can use Icon Switcher from PBI Software to create your own icons; if you do, skip to step 9 next.

7. To use an existing icon as is or to edit one, click on it to select it and choose Duplicate from the Edit menu. A copy of the icon appears in the ICON resource window.

8. If you want to use the duplicate icon as is, skip to step 10. To edit the duplicate icon, double-click it, and an icon-editing window opens. The ID number in the title bar should be different from the original icon's ID number. If they're the same, you've opened the original instead of the duplicate, so close the editing window and try the other icon.

9. Edit the icon as if it were in *MacPaint*'s FatBits. Click on a black dot to make

it white and click on a white space to make a black dot. Close the editing window when you finish editing.

10. Click the icon you want to use in the menu to select it, and choose Get Info from the File menu. An information window appears.

11. Change the ID number to some unused ID number between 256 and 511, and close the information and ICON resource windows.

After preparing the ICON resource, you have to enter the icon number, which is the resource ID number minus 255, in the MENU resource. Locate the menu you want to modify as follows:

12. Find the resource named MENU in the application window and double-click on it. A resource window opens, listing the ID numbers of the menus present in the application.

13. Each menu is a separate resource whose ID number indicates its location on the menu bar. ID number 1 is the Apple menu, ID number 2 is usually a File menu, and so on. Double-click the ID number of the menu in which you want to put the icon, and a menu-editing window opens.

14. Make sure you've got the right menu by checking the title in the box labeled "title." If not, close the editing window and repeat step 13.

15. Use the scroll bar to find the command you want; its name will be displayed in a box labeled "menuItem." Right below it is a box labeled "icon#." Enter the icon number (not the ICON resource ID number) in that box.

16. Close the menu-editing window, the MENU resource window, and the application window. Answer yes when *ResEd* asks whether you want to save your changes.

Where to Get Technical Materials

Q. Whom do I contact to receive Apple's Software Updates and Supplements and other utilities such as *ResEd*? I am not a subscriber to CompuServe or any network.

Rick Schmid
Philadelphia, Pennsylvania

A. You can order technical materials such as Macintosh Software Supplements, Inside AppleTalk, Inside LaserWriter, and the Lisa Workshop C System from the Ap-

ple Computer Mailing Facility, 467 Saratoga Ave. #621, San Jose, CA 95129. You can call 408/988-6009 for pricing, availability, and other information; the facility does not accept phone orders. The Software Supplements include Macintosh and Lisa Workshop disks that contain *ResEd* and many useful software developer utilities, example programs, and interfaces. They also include drafts of new chapters of Inside Macintosh, and other technical documentation. Inside AppleTalk contains detailed hardware and software information about the AppleTalk network. Inside LaserWriter contains information and software for advanced developers who are working with the LaserWriter.

In addition, Apple's Technical Support Group publishes a set of Macintosh Technical Notes on topics ranging from system resources to pinouts to HFS compatibility. to the Break/CTS device driver event structure. Subscriptions are available on a calendar-year basis. Send \$25 to Macintosh Technical Notes 1986 at the Apple Computer Mailing Facility address listed above. You can also buy a set of the notes issued last year. Send \$45 to Macintosh Technical Notes 1985. The notes are also posted on electronic bulletin boards including the MACDEV SIG on CompuServe and the ICONtact database on Delphi. Apple claims they want the notes distributed widely and is encouraging people to copy them, so you may be able to photocopy a set from your local Mac user group's library.

Get Info answers questions about the Macintosh and how it works. When you need advice about using the Mac, drop me a line. I cannot respond to all letters, but I will answer the most representative questions. Send your question about the Macintosh, Macintosh software, or Macintosh programming to Get Info, Macworld, 555 De Haro St., San Francisco, CA 94107. Send electronic mail to CompuServe 70370,702 or The Source BCW440. All published submissions become the property of Macworld.

Lon Poole is a Contributing Editor of Macworld. □

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SOFTWARE

Addison-Wesley

Smart Eyes (*speed reading tutor*) \$36.

Affinity Microsystems

Tempo (*power user's macro utility*) 79.

Altsys

Fontastic (*create your own fonts*) 27.

Ann Arbor

FullPaint (*open four documents at once*) 55.

Assimilation

MIDI Composer (*music record/playback*) 22.

Mac•Spell•Right (*40,000 word dictionary*) 69.

Right•Word (*spell checker & thesaurus*) 69.

ATI

Teach Yourself Multiplan 39.

Jazz Training 39.

Excel Training 39.

Batteries Included

The Mac BatteryPak (*desk accessories*) 27.

Borland International

Sidekick (*unprotected*) 39.

Sidekick w/Phonelink 59.

BPI Systems

General Accounting 299.

BrainPower

PowerMath (*requires 512k*) 52.

StatView (*statistics package*) 99.

Designscope (*electronic circuit design*) 129.

StatView 512+ (*reqs. external drive, 512k*) 179.

CAMDE

Nutricalc (*diet & nutrition analysis*) 49.

Casady Company

Fluent Fonts (*two-disk set*) 29.

Central Point Software

Copy II Mac (*includes MacTools*) 20.

Challenger Software

Mac3D (*3D graphics, CAD features*) 115.

Chang Labs

Rags to Riches Ledger 99.

Rags to Riches Receivables (*reqs. 512k*) 99.

Rags to Riches Payables (*reqs. 512k*) 99.

Rags to Riches Three Pak 249.

Creighton Development

MacSpell+ (*requires 512k*) 55.

Datavis

MacLink (*transfer Mac/IBM files*) 89.

Desktop Graphics

DrawArt (*MacDraw artwork, 512k*) 27.

DrawForms (*requires MacDraw*) 30.

Digital, etc.

Turbo Maccountant 325.

Dow Jones

Straight Talk 59.

Spreadsheet Link 62.

Market Manager PLUS 125.

Dreams of the Phoenix

Day Keeper Calendar 27.

Quick & Dirty Utilities Vol. 1 27.

Quick & Dirty Utilities Vol. 2 27.

Twelve-C Financial Desk Accessory 27.

Electronic Arts

Financial Cookbook 32.

Deluxe Music Construction Set 32.

Enabling Technologies

Easy 3D (*create solid 3D objects*) 89.

EnterSet

Quickpaint (*find MacPaint files fast*) 27.

Quickset (*icon-driven accessory*) 27.

Quickword (*word processing tool*) 32.

MacGAS (*requires 512k, external drive*) 55.

1st Byte

Speller Bee (*spelling-learning tool*) \$39.

KidTalk (*"talking notebook"*) 39.

Smoothtalker (*version 2.0*) 49.

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Fortnum/Southern

Macnooga Choo-Choo (*reqs. 512k*) 21.

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FWB Software

Hard Disk Util 57.

Great Wave Software

ConcertWare+ (*music composition*) 39.

Instrumental Favorites 12.

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Haba/Arrays

Home Accountant (*reqs. external drive*) 52.

Hayden Software

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I Know It's Here Somewhere 20.

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MacLabeler (*print disk labels*) 29.

Innovative Data Design

Paste-Ease (*requires MacPaint*) 35.

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Type Fonts for Headlines (*reqs. 512k*) 42.

Layered

Notes...For Excel 42.

Notes...For Jazz 42.

Front Desk (*scheduling & organizer*) 77.

Legisoft/Nolo Press

WillWriter (*prepare your own will*) 27.

Linguist's Software

Tech (*1000 different symbols*) 59.

FOREIGN LANGUAGE FONTS

MacCyrillic 39.

SuperFrench/German/Spanish 39.

MacArabic 59.

MacKana/Basic Kanji 59.

MacSemitic/Coptic/Devanagari 59.

MacKorean 59.

MacGreek 59.

MacHebrew 59.

MacHieroglyphics 59.

LaserGreek 79.

MacGreek/Hebrew/Phonetics 89.

Living Videotext

ThinkTank 512k (*outline processor*) 99.

Magnum

McPic - Volume 1 28.

McPic - Volume II 28.

The Slide Show Magician 34.

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Learning Multiplan and Chart \$39.

Chart 1.0 72.

Logo 1.0 75.

Basic 2.1 89.

Multiplan 1.1 105.

File 1.02 111.

Word 1.05 111.

Fortran 2.1 169.

Excel 1.0 225.

Miles Computing

Mac the Ripper - Volume III 27.

Mindscape

The Luscher Profile 24.

The Perfect Score: SAT 47.

Monogram

Forecast (*tax planning*) 41.

Dollars & Sense 81.

Nevins Microsystems

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New Canaan MicroCode

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Odesta

Helix (*requires 512k, external drive*) 125.

Double Helix (*relational database*) 279.

Palantir

MacType (*supports Dvorak keyboard*) 26.

MathFlash (*math flash card drills*) 26.

WordPlay (*crossword puzzles*) 26.

Inventory Control 69.

inTouch (*communication to emulation*) 79.

PBI Software

Icon Switcher 14.

Icon Fun & Games Library 14.

Icon Business Library 14.

Peachtree

Back to Basics General Ledger 89.

Accounts Payable 89.

Accounts Receivable 89.

Polarware

Graphics Magician 49.

Practical Computer Applications

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Satori

BulkMailer (*mailing lists*) 75.

Sierra On-Line

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MacOneWrite (*general ledger*) 137.

Silicon Beach Software

Accessory Pak 1 21.

Silicon Press (*printer utility, 512k*) 42.

Simon & Schuster

The Mac Art Department 24.

Paper Airplane Construction Kit 24.

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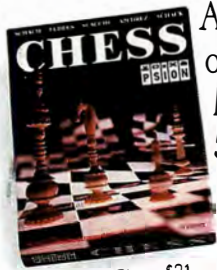
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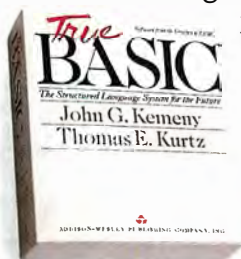
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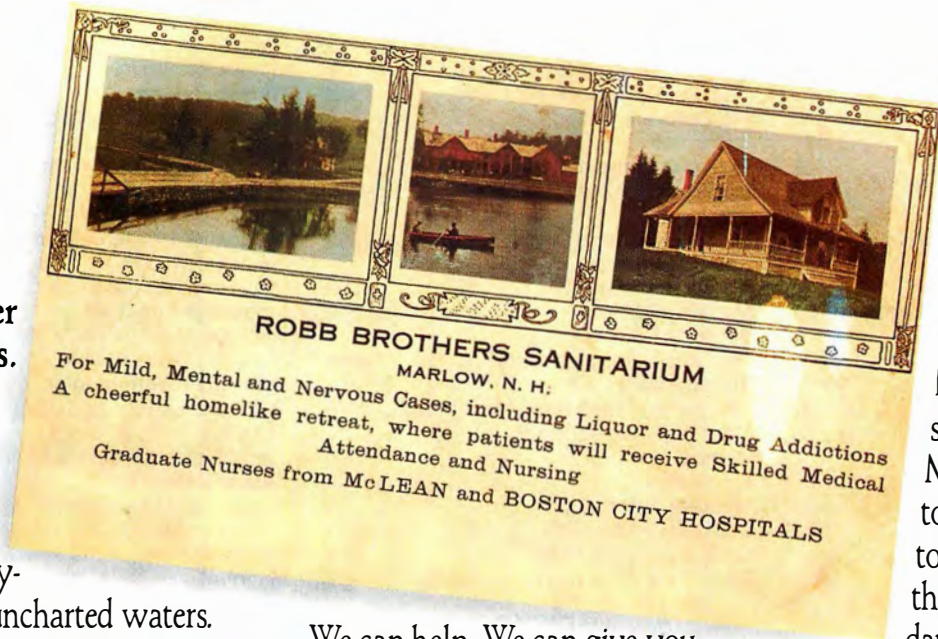
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T/Maker

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Click Art Letters . . . 29.
Click Art Effects . . . 29.
Click On Worksheet . . . 46.

Target Software

MacLightning (*reqs. 512k, external drive*) . . . 53.

Telos Software

Business Filevision (*512k, external drive*) . . . 209.

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Mind Over Mac . . . 28.
MacEdge II (*math & reading*) . . . 28.

TML Systems

TML Pascal . . . 69.

TrueBasic

True BASIC . . . 109.
Pre-calculus utility . . . 36.
Calculus utility . . . 36.

Vindex

MacCalendar (*incl. reminder system*) . . . 52.

GAMES

Activision

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Hacker (*you're on your own!*) . . . 27.
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Suspended (*expert*) . . . 29.
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Mouse Stampede (*addictive!*) . . . \$22.

Miles Computing

Fusillade (*arcade-maze*) . . . 21.
MacAttack (*3D tank simulation*) . . . 27.
Harrier Strike Mission (*3D flight simulation*) . . . 27.
MacWars (*3D space simulation*) . . . 27.

Mindscape

Rambo: First Blood Part II . . . 24.
James Bond 007: "A View to a Kill" . . . 24.
Stephen King's "The Mist" . . . 24.
Racter (*converse with your Mac!*) . . . 27.
Balance of Power (*world politics*) . . . 30.
Brataccus (*requires 512k*) . . . 30.
Uninvited (*mystery adventure*) . . . 30.
Deja Vu (*murder mystery*) . . . 33.

Origin Systems

Exodus: Ultima III (*fantasy adventure*) . . . 38.

PBI Software

Strategic Conquest (*war strategy*) . . . 29.
Fokker TriPlane Flight Simulator . . . 35.

Penguin

Crimson Crown (*sequel to above*) . . . 24.
The Quest (*beware of the dragon!*) . . . 24.
Xyphus (*role playing adventure*) . . . 24.

Practical Computer Applications

MacGolf (*requires 512k*) . . . 36.

Psion

Psion Chess (*3D and multi-lingual*) . . . 31.

Scarborough Systems

Make Millions (*business simulation*) . . . 29.

Sierra On-Line

Frogger (*classic video game*) . . . 24.
Championship Boxing . . . 24.
Ultima II (*role playing adventure*) . . . 35.

Silicon Beach Software

Airborne! (*digitized-sound war game*) . . . 20.
Enchanted Scepters (*text & graphics*) . . . 21.

Sir-Tech

Mac Wizardry (*fantasy*) . . . 36.

Spectrum Holobyte

GATO (*submarine simulation*) . . . 26.
Orbiter (*requires 512k*) . . . 27.
Tellstar North Level I (*reqs. 512k*) . . . 27.

Unicorn

Futura (*sci-fi adventure*) . . . 24.
Utopia (*science fantasy game*) . . . 24.
Animal Kingdom (*ages 6-12*) . . . 27.
Decimal Dungeon (*math, ages 9 and up*) . . . 27.
Fraction Action (*arcade style math game*) . . . 27.
Mac Robots (*pre-school program*) . . . 27.
Read-A-Rama (*reading, ages 5-8*) . . . 32.

Vindex

MacCheckers/Reversi . . . 28.
MacGammon/Cribbage . . . 28.
MacVegas . . . 34.

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Circle 4 on reader service card

The Database Shopper

Jim Heid

Data managers come in a variety of designs because people use them for literally hundreds of applications, from keeping greeting card lists to maintaining accounting systems. Despite what you read in advertisements, no single data manager handles all tasks equally well.

The key to choosing a data manager is first to look at the way you work with information and then to identify the products that meet your needs. What follows is a general framework for matching database management applications with the programs best suited to these applications.

Product features and applications often overlap, making it impossible to create cut-and-dried categories for data managers or to make



comprehensive product recommendations. But by understanding data management applications and the kinds of features that each application requires, you can best match the products to your work.

Electronic Index Cards

Applications: *Mailing lists, simple inventory, address books, expense account records, research notes.* **Products:** *FileMaker, Microsoft File, Record Holder.*

Perhaps the most common application for database managers is as electronic replacements for index card files or address books. And database managers make fine replacements, thanks to their ability to sort and to search for specific entries. A list of client names and addresses, a club newsletter or mailing list, a collection of research notes or article abstracts, an inventory of personal possessions and their serial numbers—these are the kinds of applications best handled by filing programs.

Since the data manager will replace easy-to-use paper items like note cards or address books, products in this league have one paramount requirement: simplicity. This type of program shouldn't mire you in a lengthy setup procedure; you should be able to define the fields you need and immediately start entering data. You also need a program with sorting and searching prowess in order to find what you store. Text-oriented applications, such as a database of research notes, require a program that allows lengthy text fields with word wraparound. And for mailing-list applica-

tions, a program that prints more than one label across a page gives you more choices when purchasing labels.

One program that fulfills these requirements is Software Discoveries' *Record Holder*. *Record Holder* provides useful features for quickly locating data, it can print more than one label across, and it doesn't cost much more than a few notebooks and a Rolodex. *Microsoft File* is a more expensive alternative, but it is more versatile in the way it lets you look at data (see "File, Macintosh Style," *Macworld*, May 1985). You can design numerous entry and display layouts and switch between them with a click.

Forethought's *FileMaker* is another capable filer (see *Macware Reviews*, *Macworld*, December 1985). With *FileMaker*, defining a database is as easy as typing field names, and you can browse through records by clicking the pages of a book icon. Like *File*, *FileMaker* is a talented forms generator.

Informed Forms

Applications: *Printing invoices, insurance forms, personnel forms.* **Products:** *FileMaker, Helix.*

A variation on the filing theme occurs when you want the printed product to resemble paper forms. Typical form-oriented jobs include printing invoices, personnel forms, and insurance-claim forms. To complete such tasks, the data manager combines information from the database with a form of your design, eliminating the need to fill out individual forms by hand. Data-

Figure 1 shows a screenshot of a Macintosh-style window titled "Real Estate". The window contains a form for "HouseFinder" which is designed to look like a paper form. The form has a sidebar on the left with buttons like "First", "Prev", "Next", "Last", and "Field". The main area of the form has sections for "Property Address", "Description", and "Bedrooms", "Bathrooms", "Square feet", "Appliances", and "Garage". To the right of the form, there's a separate section titled "HouseFinder" and "Kelly Real Estate" with contact information and a list of features. At the bottom right, there's a box that says "Asking: \$330,000".

Figure 1

Form-oriented data managers let you create screens that mimic paper forms and provide a precise measuring system for accurately aligning the form's text and graphics elements.

Forethought's *FileMaker* meets these criteria; its "T squares" measuring system is accurate to $\frac{1}{1000}$ inch. At right, the *LaserWriter Plus* output from this database.

Choosing a Database

	Business Filevision	Double Helix	FileMaker	Helix	Interlace	Microsoft File	Omnis 3	OverVue	Record Holder	Crunch, Excel, Jazz
Electronic filing	2	3	1	3	2	1	3	1	1	3
Forms generation	1	1	1	1	2	2	3	3	2	4
Data analysis	3	2	3	2	1	3	3	1	3	1
Storing pictures	1	1	4	1	4	1	4	4	4	4
Typing- intensive applications	2	1	3	2	1	2	1	1	3	3
Large applications	2	1	2	1	1	2	1	3	2	3
Relational applications	4	1	4	1	1	4	1	3	4	4
Turnkey applications	4	1	4	4	4	4	1	3	4	4

Choosing a Database

Use this table as a starting point for determining which data managers can best serve your needs. A 1 indicates that the product's features make it ideally suited to the task in question. A 2 means the product can be used for the task but may lack complete features or require lengthy setup time. A 3 means either that the product has some but not all the features

needed for the task, or that the product's setup procedure may be too complex to make the product practical for simple applications. In short, other products are far better suited to the application. A 4 means simply that the product cannot be used for this task.

base management programs take advantage of the Mac's visual operating style to make the database's entry screens look more like paper forms, which makes working with a database less intimidating to non-technical users (see Figure 1).

The dominant requirements for forms applications are design features that allow easy and accurate positioning of graphics and text. On-screen rulers allow precise positioning and are especially important for printing on preprinted invoices, insurance forms, or express courier airbills. For giving forms that paper look, line- and box-drawing tools similar to *MacPaint*'s let you create a box for a shipper's address or lines that separate each item in an invoice. A form-oriented program should also fully exploit the Mac's fonts and type styles. Some programs let you embellish a form by adding pictures to the background.

Some database managers permit you to design a number of different forms that use the same data. You could, for example, enter your inventory on one form

and later print a sales report from the same data, without modifying the basic structure of the database. This type of flexibility lets a form-oriented database manager take on many faces.

Forethought's *FileMaker* is an excellent example of a form-oriented database. *FileMaker* boasts a measuring system accurate to $\frac{1}{1000}$ inch—overkill even for the LaserWriter's $\frac{1}{300}$ -inch resolution. *FileMaker* also lets you add graphics, such as logos, to a form.

For form-oriented applications that require advanced file-management features, such as linking separate files in a relational database, Odesta's *Helix* is ideal (see "Files of Icons and Tiles," *Macworld*, November 1985). Because its additional features and unique icon-oriented approach to data management take time to master, *Helix* is best suited to complex tasks requiring relational capabilities and data-analysis features rather than simple filing applications.

Business Filevision, *File*, and *Interlace* are other database management programs that have good form-design features.

Analyzing Data

Applications: *Stock portfolio analysis, financial analysis.* **Products:** *Crunch, Excel, Interlace, Jazz, OverVue.*

For many people, managing data means analyzing it. Such people use built-in functions to spot trends; to find averages, maximums, and minimums; and then create reports that summarize the information. Stock market players need to track the performance of the stocks in their portfolios. Managers and business owners need to evaluate their departments' or companies' performance, producing everything from day-to-day sales figures to quarterly reports to year-end summaries. To solve cash-flow problems, accountants need to digest data on everything from loans and depreciation to assets and liabilities.

Data analysis requires a healthy library of built-in functions: preprogrammed formulas that take arguments—such as the length of a loan, its interest rate, and number of payments—and return an answer. Also helpful are calculated fields, which process the values in other fields according to a formula. Speed is another important requirement for a data-analysis program. When you ask a lot of “what-if” questions, you should spend a minimum of time remodeling the database or waiting for the program to recalculate information.

Reporting features that let you create table-style reports with column summaries are essential to data analysis applications. And because a chart often shows trends or financial performance better than a table of numbers, a chart-generating feature is a big asset.

ProVue Development's *OverVue* is one data manager that measures up to these criteria. The program is swift and allows you to quickly sort records and select those that meet your criteria. *OverVue*'s responsiveness, a valuable asset when you're manipulating data, results from the efficient way the program stores all data in memory. As long as a database's size does not exceed the limits of your Mac's RAM, *OverVue* performs excellently. A macro feature lets you automate repetitive tasks, and built-in graphics commands let you create five types of charts.

In some cases the best data manager for analysis may be a spreadsheet program. Spreadsheets like *Excel*, *Jazz*, or *Crunch* are, after all, database managers endowed with analysis and graphics features (see

“The Spreadsheet Choice,” *Macworld*, September 1985). *Jazz*, for example, has a nice feature that lets you make specialized charts demonstrating stock performance. Despite their number-crunching talents, however, spreadsheets have drawbacks. Like *OverVue*, their storage capacity is limited to the amount of available memory (less of a restriction with the Macintosh Plus), and they have limited form-design capabilities. Moreover, spreadsheets often lack useful database management features such as the ability to search for specific information, relational capabilities, and data-entry shortcuts.

One powerful database manager that provides excellent data-analysis features without limiting storage to available memory is Singular Software's *Interlace*. *Interlace* combines a spreadsheet's head for figures with a data manager's form- and file-handling skills (see “New Relations,” *Macworld*, May 1986). *Interlace*'s library of functions compares with that of a spreadsheet program, yet the product provides good form-layout features. The program is also relational, with the ability to link up to 15 separate files and access the data in each. At \$95, *Interlace* is an exceptional value considering the program's relational power.

Picture This

Applications: *Real estate listings, maps, inventory and personnel databases.* **Products:** *Helix, Filevision, Microsoft File.*

In some databases a picture is worth a thousand fields. The Mac's graphics skills make pictorial databases a reality: a real-estate agent's database shows pictures of available houses; an inventory database shows each item in stock or the item's bar code; a personnel data-



Figure 2

Data managers that can store graphics in fields make pictorial databases possible. Here, Microsoft File is used to store a personnel database containing a digitized employee photograph and signature for identification.

Database Database

The following software is mentioned in this article. For further information on these products, contact your dealer or the manufacturer.

Product	Company	Phone	List Price
Business Filevision	Telos Software Products	800/554-2469 800/368-3813 in CA	\$395
Crunch	Paladin Software Corp.	408/970-0566	\$295
FileMaker	Forethought, Inc.	800/622-9273	\$195
Helix, Double Helix	Odesta Corp.	800/323-5423 312/498-5615 in IL	\$395, \$495
Interlace	Singular Software, Inc.	800/626-8392 800/826-1585 in CA	\$139
Jazz	Lotus Development Corp.	617/577-1100	\$395
Microsoft Excel	Microsoft Corp.	206/882-8080	\$395
Microsoft File	Microsoft Corp.	206/882-8080	\$195
Omnis 3	Blyth Software Inc.	415/571-0222	\$495
OverVue	ProVue Development Corp.	714/969-2431	\$295
Record Holder	Software Discoveries, Inc.	800/437-5200 op. 229 800/638-8890 op. 229 in MD	\$49.95

base contains employee pictures or signatures (see Figure 2).

For such applications, you need a database manager that provides picture fields, into which you paste graphics from the Clipboard. *Microsoft File*, *Helix*, and *Business Filevision* all provide picture fields. *Filevision* goes beyond just storing pictures, allowing you to link icons and pictures to data (see "Filevision Gets Down to Business," *Macworld*, March 1986). Click on a town in a map you've drawn in *Filevision*, and the program displays the town's statistics. Click on a machine icon in a factory drawing, and you get a maintenance history for that item. You can even purchase specialized templates; Strategic Locations, for example, makes map templates for *Business Filevision*. This unique approach to data management isn't for everybody—icons for each entry in a mailing list would be of little

value, for example. But for applications in which the overall database can be expressed in graphic terms, this ability is invaluable.

Typing Tasks

Applications: *Large mailing lists, accounting.*

Products: *Helix, Microsoft File, Omnis 3, OverVue.*

Typing is a necessary evil for applications such as maintaining a mailing list or making daily entries into an accounting system. Perhaps someday entering data will be a matter of saying it; for now, the most you can hope for are products that offer shortcuts to reduce typing.

One such shortcut is the field preset. This feature lets you preset any field with a constant value that you can override by simply typing a new value. A good ap-

plication for field presets are mailing lists that have many entries in the same city or state.

Another shortcut is a "ditto" command, which copies the contents of a field in the previous record to the record you're currently creating. Some programs furnish a variation on the ditto theme by giving you the option of not clearing the fields in a data-entry screen when you move to the next record.

Speed and entry checking are two more factors to consider for typing-intensive applications. You shouldn't be drumming your fingers while waiting for a program to sort and save one record before you can enter the next. Typing-intensive tasks are also more prone to data-entry errors. Entry-checking facilities ensure accurate databases by proofreading each entry before accepting it.

OverVue shines in the data-entry department. Through a unique capability the company calls "clairvoyance," the program watches what you type into a field and compares it to entries in previous fields. As soon as *OverVue* can identify a match, it copies the value from the previous field—which you can still override—into the current field. You can also set up entry-checking specifications.

Blythe Software's *Omnis 3* lets you specify field presets and boasts the most comprehensive entry-checking capabilities of all data management programs. Odesta's *Helix* lets you specify that a field not be cleared when the next record is entered, and with *Double Helix* you can also specify entry-checking values. *Microsoft File* lacks an entry-checking facility, but you can ditto the contents of a field in the previous record by typing % and an apostrophe.

Large Databases

Applications: *Marketing surveys, accounting and inventory systems, catalogs of article abstracts.*

Products: *Helix, Interlace, Omnis 3.*

Some tasks demand databases of gargantuan proportions. Maintaining a subscriber list for a magazine, tracking a video store's tapes, managing a disk version of a library's card catalog, or storing reams of research notes—tasks like these impose their own set of requirements on a data manager.

The most important factor controlling a product's ability to maintain huge databases is its storage approach. Products that keep an entire database in memory are better suited to small and medium-sized databases. A 4-megabyte Macintosh could conceivably hold massive databases in memory, but it might still lose data during a power failure or system error. When it comes to reliable handling of immense databases, the

ideal program saves records to disk as they're entered or modified. *Helix*, *Interlace*, and *Omnis 3* all follow this procedure.

A variation on the storage theme is the multifile, or relational, database. Some data management applications benefit from storing data in separate but linked files. No sharply defined border separates relational applications from nonrelational ones. Generally, you should consider a relational program if you find you're reentering information for different organizational tasks.

For example, an accounting application might be subdivided into files for accounts receivable, accounts payable, and client addresses. This setup allows you to print invoices and receipts without entering a client's name and address twice. An inventory database might link an items-on-hand file to a suppliers file—a scheme that could generate purchase orders for out-of-stock items. Because they eliminate duplicated effort and allow separate files to work together to form a database, relational programs handle complex data management tasks more efficiently than single-file managers.

A relational database manager needs a lot of file-handling muscle to keep numerous files open simultaneously and to establish links between files. *Interlace* has this muscle, and its Overview window, which graphically depicts the links between files, simplifies file linking for relational database newcomers (see Figure 3). *Interlace* also offers entry-checking capabili-

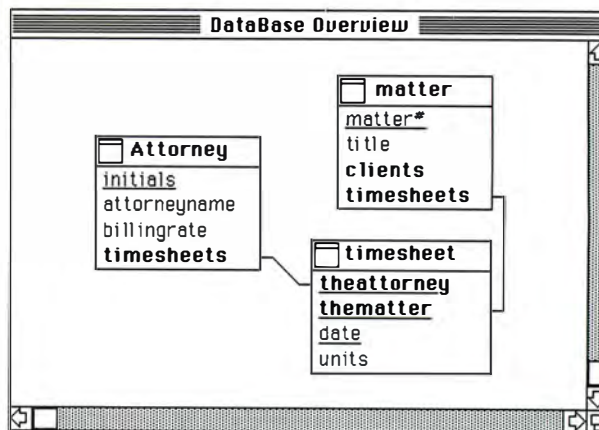


Figure 3

Relational data managers can link separate files for additional flexibility and power for demanding business applications. *Interlace* is an ideal program for relational tasks. Its Overview window, shown here with files that make up a client billing system, simplifies file linking for relational database novices.

ties and is loaded with functions for data analysis.

Helix and *Omnis 3* are other relational database managers that can manage large databases.

Application Generators

Applications: Clerical data entry, time billing, medical records, retail point of sale, accounting, scheduling. **Products:** *Double Helix*, *Omnis 3*.

The most sophisticated data managers are *application generators*. They let you or a programmer create menus, dialog boxes, and custom commands that put a friendly face on a database. To a certain extent any database manager can be used to design custom templates for specific applications, such as accounting or legal billing. But application generators let someone with experience design data management applications that can be used by others who don't need to understand the underlying structure of the database and the manager itself. The final user need not master the program's searching, sorting, and reporting commands; instead, the application designer builds commands into the application for searching and reporting.

Any business task that requires a relational data manager and that might be performed by clerical staff is a candidate for an application generator. The disadvantage of having a custom turnkey application is that users can only access the database in the ways provided by the application designer. A change in business operations or in searching or reporting needs leaves unskilled users waiting for the application designer to modify the application. People who plan to interact with the data manager themselves and who will frequently modify databases may not require all of the advanced features of programs that develop turnkey systems.

An application generator for the Mac should let you create your own pull-down menus for invoking report definitions or displaying data-entry screens. A password-protection feature is also necessary to keep unauthorized personnel from viewing and altering the application's structure and files. The ideal security system permits highly specific control and grants access to users who need to build custom search specifications. And because an application may be used by people with little database experience, an applications generator should also provide entry-checking features.

The most powerful application generators provide a programming facility for offering choices based on the information users enter. For example, in a video store's database, entering "yes" in a New Tape field might activate a data entry screen requesting information about the tape.

The availability of "run-time" and network versions is also an important consideration when you

are purchasing a database manager in the applications generator class. With run-time support, the manufacturer makes restricted versions of the program available to applications developers. These restricted versions run custom applications but do not provide access to the program's development tools. Network versions permit multiple users to work conveniently with the same data and the same program over a network.

Odesta's *Double Helix* lets you create custom menus that summon *Helix* forms and templates. *Double Helix*'s form-oriented approach also lets you create custom entry screens that are stylistically suitable for specific applications. You could, for example, design a purchase order form that simulates your business's paper form, making it easier for personnel to transfer its hard-copy experience to a computerized database.

Omnis 3 is more complex and requires more time to set up than *Helix*, but it provides a procedural programming facility. *Omnis 3*'s programming language lets you design applications that respond to data that users enter. *Omnis 3* also provides the most sophisticated password protection features of any Macintosh database manager. Both *Helix* and *Omnis 3* offer run-time support, and at the time of this writing both products' manufacturers were planning network versions.

Finding the Perfect Fit

Your quest for the right data manager doesn't end after you've identified the products that meet your needs. The next step is to try out each program to find one that fits your tastes. Programs can perform the same tasks in different ways, especially on the Macintosh. The style in which a data manager implements its features is crucial. For a classic example of the way different styles affect the choice of a data manager, compare the approaches of *Helix*, *Interlace*, and *Omnis 3*. Although all three are powerful relational database managers, each is quite distinct.

To find a program you can live with, test the programs that seem suitable. Take time to locate the product's weaknesses before you buy, rather than running into them after you've entered a thousand records. In short, be a smart shopper: know what you're looking for and shop with a critical eye. Follow these rules, and you'll dramatically increase your chances of finding the database manager that best matches your requirements. □

■■■■■■■■■■ Jim Heid is a
Contributing Editor of Macworld.

New Ways to a Faster Mac

David Ushijima and David L. Foster

High-performance computing has long been the domain of minicomputers and mainframes whose specialized hardware allowed them to calculate at speeds most microcomputer owners could only envy. Applications such as computer-aided design and engineering require computer graphics and numeric analysis—both computationally intensive tasks. To date the Macintosh has been barred from these markets, but advances in processor technology promise to bring the Mac into high-performance applications.

Whereas calculation-intensive software demands processors capable of well over a million calculations per second, the Motorola 68000 chip that powers the Mac executes only approximately 600,000 instructions per second. With an improved central processor or special math chips, however, the Mac can compete with the likes of a Digital Equipment Corporation VAX 11/780, a \$230,000 system.

In this article we look at four products that boost the Mac's processing power: Novy Systems' Floating Point Accelerator; Maccelerator, from Quesse Computer; the Prodigy 4, from Levco; and a preliminary version of General Computer's HyperDrive 2000. Human Touch and Micrographic Images have also announced products that reportedly speed

up the Mac. And MassTech and Micro Conversions are working on faster Mac products. However, we were unable to test these products in this review.

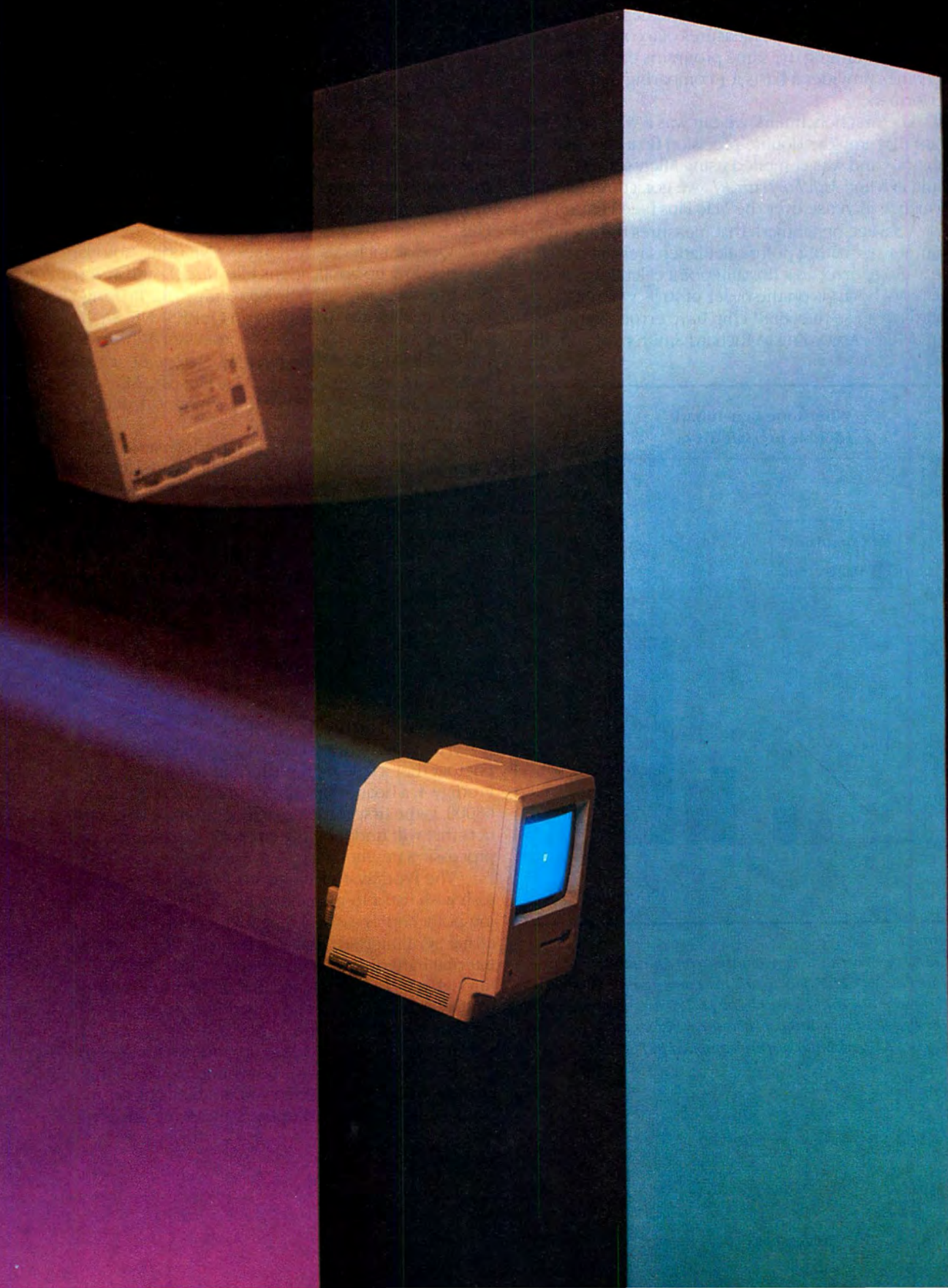
Boosting Performance

Manufacturers have taken two approaches to speeding up the standard Macintosh: Novy and Quesse add what is called a floating-point coprocessor chip to the existing 68000, while Levco and General Computer replace the Mac's 68000 processor with a higher-performance chip and add a coprocessor. Floating-point coprocessors are designed to execute numeric calculations. Their sole purpose is to crunch numbers, relieving the 68000 from such time-consuming chores as multiplying two floating-point numbers (see "A Penchant for Numbers"). On the other hand, replacing the Mac's 68000 processor with a faster but still functionally equivalent chip results in an overall performance boost (see "Building Processor Power").

The Novy Floating Point Accelerator

The Novy Floating Point Accelerator (FPA) is an add-on circuit board that contains the National Semiconductor 32081 numeric coprocessor. The Novy board clips onto the Macintosh's 68000, but there's no need to modify the Mac's digital board, and the add-on can be removed easily. While the FPA fits into a HyperDrive-equipped Mac, it won't fit into a Mac Plus.

Novy offers two software alternatives that let the Mac access the 32081's number-crunching abilities: Absoft's run-time library, *MacFortran/RL*, for



programs written in Microsoft FORTRAN or a collection of assembly-language routines that are compatible with Apple's MDS Assembler. Replacing FORTRAN's standard run-time library with the one modified for the Novy board routes all floating-point calculations to the 32081 chip.

To gauge the performance of the Novy board, we ran two benchmark programs. While benchmarks are not necessarily accurate measures of a computer's performance, running the same programs on different machines provides a basis for comparing machine performance.

The first benchmark we ran was a Whetstone program that employs double-precision floating-point calculations and was compiled using Microsoft FORTRAN. Using FPA and *MacFortran/RL*, we got a threefold performance increase over the Mac Plus (see Figure 1).

A Savage benchmark that measures the speed and accuracy of floating-point calculations revealed that the average error in a floating-point calculation with the Novy board is on the order of 10^{-14} , whereas boards that use the 68881 chip have errors on the order of 10^{-19} . According to Richard Smith of Absoft, the

difference could be attributed to the 64-bit accuracy of the National chip versus the 80-bit accuracy of the Motorola part. However, because the magnitude of the error is so small, the difference will affect only those whose calculations must be painstakingly precise.

While the Floating Point Accelerator speeds up calculations for programs written in Microsoft FORTRAN or assembly language, most commercial applications have no way of taking advantage of the FPA card, because the FPA does not intercept SANE calls.

The Quesse Maccelerator

Quesse's Maccelerator board, like Novy's FPA, contains the National 32081 floating-point coprocessor. The Maccelerator board clips onto the Mac's 68000 and can easily be removed. Unlike the Novy board, however, Maccelerator is small enough to mount in a Mac Plus.

Quesse includes the QuickSANE utility software for speeding up applications like *Mac3D* and *MacSpin* that use the Macintosh's SANE routines for floating-point calculations. After you run QuickSANE, SANE calls are routed to the 32081 coprocessor. When we ran QuickSANE and then ran a Whetstone benchmark written in Consulair C for the Mac Plus, the Maccelerator made almost three times more calculations than the Mac Plus.

We obtained the the largest performance increase when we ran benchmarks recompiled with Consulair's Direct Access C Compiler for the Maccelerator. The Whetstone benchmark employing double-precision floating-point calculations showed a tenfold increase in performance over a Mac Plus.

Quesse also provides assembly-language routines so you can access the 32081 coprocessor using Apple's MDS development system.

Like the Novy FPA, the Maccelerator produced an error of about 10^{-15} on the Savage benchmark—not surprising, since both boards use the 32081 chip.

Levco Prodigy 4

The wizards at Levco have done it again: they've put together a true high-performance monster. The Prodigy 4, a board that clips onto a 128K or 512K Mac's 68000, is the first of the next generation of Mac products that will undoubtedly employ the Motorola 68020 processing engine.

The Prodigy 4's list of features reads like a Macintosh wish list: a 16-megahertz 68020 CPU, a 68881 floating-point coprocessor, 4 megabytes of RAM, and an internal SCSI interface that attaches to Levco's OverDrive internal hard disk or to an external SCSI hard disk through a 25-pin connector that mounts in the Mac's battery compartment. The only things missing are a larger screen and color.

After you operate a Mac upgraded with the Prodigy 4, you'll appreciate just how underpowered the current Mac really is. When you double-click on an icon, windows don't just open, they spring out at you.

(continues)

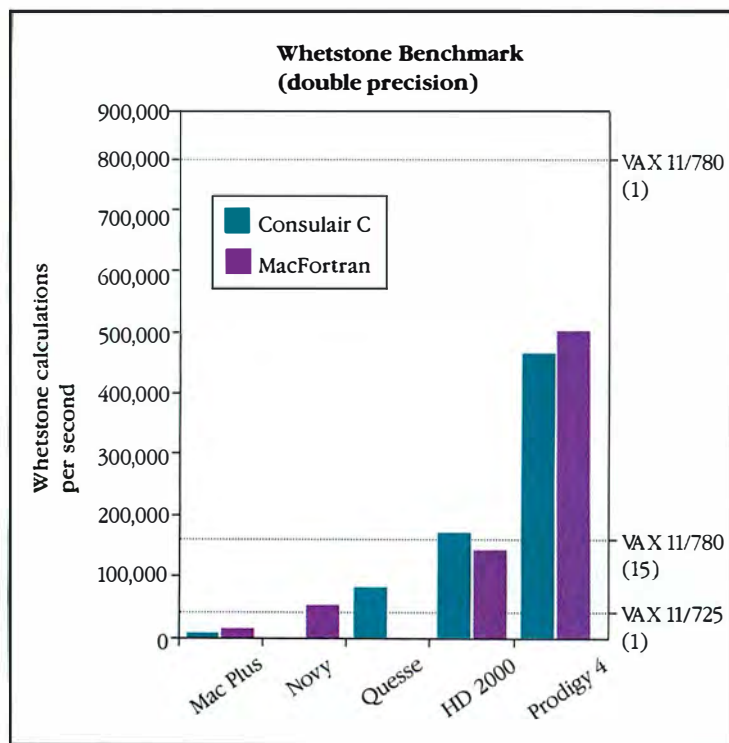


Figure 1

We used the Whetstone benchmark to pit four modified Macs against the VAX 11/725 with one user and against the VAX 11/780 with one and 15 users. The 11/780 was equipped with a dedicated floating-point coprocessor, whereas the 11/725 was not. The VAX benchmarks were compiled in FORTRAN.

A Penchant for Numbers

Numbers of extremely large and small magnitudes are represented in a form known as floating point. The detailed rules for floating-point operations have been standardized by the IEEE (Institute for Electrical and Electronics Engineers). Apple has adopted the IEEE standard and given it the name SANE (Standard Apple Numerics Environment). The Macintosh contains all the routines necessary to implement SANE in two resource packages, which act as extensions to the Toolbox.

To allow for varying degrees of accuracy, SANE calculates numbers in four different precisions: single precision, double precision, comp, and extended precision. Single-precision numbers are represented by 32 bits, double-precision and comp by 64 bits, and extended precision by 80 bits. The more bits used to represent a number, the more accurate the result.

Living without SANE

Whenever the Mac encounters a floating-point instruction in a program, it calls the appropriate SANE routine in the Toolbox. The 68000 then executes the code that performs that particular operation.

Several software companies—Microsoft for one—deemed the SANE routines too slow and incorporated their own floating-point software into their programs. For instance, Microsoft's *Excel* and Microsoft FORTRAN do not use the Mac's SANE routines.

Number-Crunching Engines

A solution to the floating-point performance bottleneck is to add special floating-point hardware—either the National 32081 floating-point coprocessor chip or the Motorola 68881. Third-party manufacturers have taken this approach with the Mac.

The 68881 was designed to execute floating-point operations quickly and accurately—it can multiply two 80-bit floating-point numbers in 17.75 microseconds and is a natural match for the 68020 (see "Looking at the Next Generation"). The National 32081, on the other hand, can execute a 64-bit floating-point multiplication in 18 microseconds, but can represent numbers with only 64 bits of accuracy. Because the National chip was not designed for the 68000 family of chips, floating-point operations with the 32081 involve more software overhead and thus run more slowly than the 68000/020-68881 connection.

Taking Advantage of the Speedup

Regardless of which coprocessor chip is installed, a mechanism must be set up to invoke the coprocessor for floating-point operations. The mechanism enables the coprocessor to execute the floating-point instructions rather than having the 68000 execute the Mac's built-in SANE routines.

The easiest way to take advantage of a coprocessor is to install SANE replacement software. In general, software of this type diverts SANE calls to routines that control the coprocessor chip. Programs

that use SANE and execute floating-point calculations generally run faster without any modification. Programs that don't use SANE, on the other hand, show no performance gains.

The greatest speed increases result from recompiling a program using a compiler that is tailored for a particular coprocessor. Consulair takes this approach with its Direct Access compilers for the Prodigy 4, HyperDrive 2000, and Maccelerator. Absoft's MacFortran/020 compiles FORTRAN programs for the Prodigy 4. TML is also working on versions of the TML Pascal compiler for the HyperDrive 2000 and the Maccelerator.

For those with a penchant for assembly language, Quesse and Novy provide routines for accessing the math coprocessor from Apple's MDS (Macintosh Development System).

Absoft takes another approach with Absoft-Microsoft Fortran/RL. Absoft ships a special run-time library containing floating-point routines that are tailored for the Novy board. Placing the modified run-time library on an application or program disk enables programs written in FORTRAN to take advantage of Novy's coprocessor speedups. The Microsoft BASIC compiler, scheduled for release in July, will also work with Absoft's run-time library.

Ironically, the Prodigy's speed can take some getting used to; the screen scrolls at a dizzying pace, and occasionally a message that used to linger on the screen will flash by in an instant.

Existing programs take advantage of the Prodigy 4's features with no modifications. Not only does the 68020 speed up overall performance (see Figure 2), but the Prodigy 4 intercepts all SANE calls and routes them to the 68881 so that applications using the SANE floating-point routines take advantage of the 68881.

But the real benefits appear when you run programs compiled specifically for the 68020 and 68881. We ran benchmarks that were compiled with Consulair's Direct Access C Compiler for the Prodigy 4 and Absoft's MacFortran/020, a FORTRAN compiler tailored for the 68020 and 68881.

The Whetstone benchmark that was compiled in Consulair Direct Access C ran about 75 times faster on the Prodigy 4 than on the Mac Plus. The Whetstone benchmark that was compiled using Absoft's MacFortran/020 ran even faster than the Consulair version.

We also ran the Whetstone benchmark in FORTRAN on two Digital Equipment Corporation (DEC) VAX superminicomputers. The Prodigy 4 performed about 2.5 times more Whetstones per second than the 11/125. It was about 36 percent slower than an 11/780, but the 11/780 is often shared among 10 to 15 users. With 15 users sharing the 11/780, the Prodigy 4 outperformed the DEC machine.

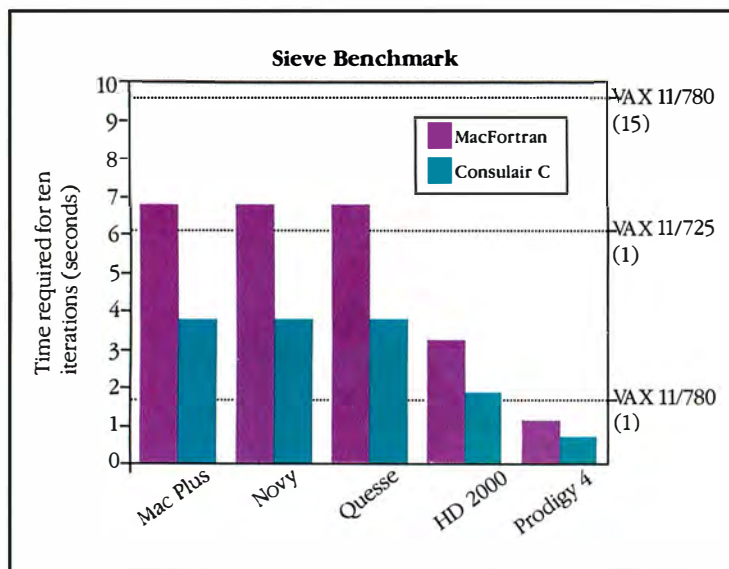


Figure 2

We ran the sieve of Eratosthenes, a program that does no floating-point calculations, to get a rough indication of general performance. The HyperDrive 2000 and the Prodigy 4 both posted times that were comparable to a VAX 11/780.

As a general test of overall performance, we opened a 112K *MacWrite* document with *MacWrite* 4.5 and the document in a RAM disk to eliminate the effects of the hard disk drive. Oddly enough, we opened the document in 13.4 seconds on the Prodigy 4, whereas on the Plus, the same operation took 5.5 seconds. Randy Wigginton, of Encore Systems (creator of *MacWrite*), could not explain *MacWrite*'s slow performance, but he stated that Encore is working on a version of *MacWrite* specifically for 68020-equipped Macs.

We also measured the time it took to rotate a three-dimensional *MacSpin* model consisting of about 2000 points—a process that requires a lot of floating-point calculations. On the Prodigy 4, one rotation of the model took 24 seconds. On the Plus, the same rotation took 125 seconds.

Prodigy 4's compatibility with Macintosh software is good. For the most part, the board is no less compatible with current software than Apple's new Hierarchical File System (HFS). Even though we tested more than 50 major application programs, including *Microsoft Excel* 1.0, *Microsoft Word* 1.05, *Omnis* 3, *Odesta Helix*, *ThinkTank* 512 1.2, *MacPaint* 1.05, and *MacTerminal* 2.0, only *OverVue* 2.0D, *MacForth*, and two spelling checkers (*Mac Spell Right* 1.2 and *MacLightning* 1.0) exhibited any difficulties.

To run software that is incompatible with the Prodigy upgrade, you can restore the Mac to a 128K, 512K, or Mac Plus environment by pressing both the reset and interrupt programmer switches. Of course, by doing so you forfeit the upgrade's speed increase.

We found only one hardware incompatibility with the Prodigy. The board failed to work with a Paradise Mac 20 hard drive. According to Levco engineer Doug Gilbert, because the 68020 runs much faster than the

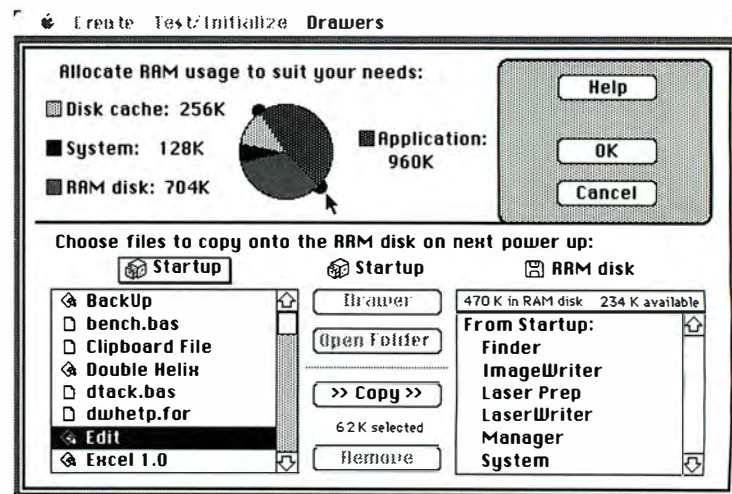


Figure 3

The HyperDrive 2000 Manager application lets you apportion RAM memory for a disk cache and a RAM disk. Furthermore, you can select programs to be loaded into the RAM disk when you start up the machine.

Building Processor Power

The Mac's central processing unit (CPU), the Motorola 68000, comes in several flavors. The version shipped with the 128K Mac, 512K Mac, and Mac Plus is rated at 8 megahertz (MHz). Much as the rpm figures for a mechanical engine measure revolutions per minute, megahertz ratings reflect the number of cycles or operations per second a chip performs internally.

One way to increase performance is to speed up the processor. Faster versions of the 68000, such as the 12 MHz version used in the HyperDrive

2000, execute more instructions per second than the standard 8 MHz 68000.

The Next Generation: 68020

After a certain point, speeding up the CPU becomes impractical due to design limitations. Further performance gains require major architectural changes to the chip's design, which is what Motorola did with the 68020—the logical successor to the 68000.

The 68020, though it runs at 16 MHz, twice the speed of the Mac's 68000, is more than just a faster clone. First, the 020 addresses up to 4 gigabytes, more than 60 times the memory addressed by the 68000. Second,

information travels 32 bits at a time to and from the 020 versus 16 bits at a time with the 68000. Third, the 020 includes a built-in coprocessor interface that works with up to eight dedicated coprocessor chips for tasks like floating-point calculations, graphics processing, and fast disk transfers.

Because the 68020 executes the same instructions as the 68000 plus a few new instructions of its own, most programs that run on a 68000 should run on the 68020.

standard 68000, some external hard drives may be incompatible since they use time-dependent hard disk software drivers. One caveat: test the hard disk that you plan to use with the Prodigy 4.

General Computer's HyperDrive 2000

With the release of the HyperDrive 2000, General Computer Corporation (GCC) should retain its reputation for significantly enhancing the performance of Macintosh computers. The HyperDrive 2000 includes a 68000 processor that operates at 1.5 times the speed of the Macintosh Plus's processor. The upgrade offers 1.5 megabytes of memory, a 68881 numeric coprocessor, and a lightning-fast 20-megabyte hard drive.

Like all HyperDrives, the HD 2000 comes equipped with software that lets you partition its hard disk into "drawers" that dynamically grow and shrink as files are added or deleted. As with file cabinets, the contents of drawers can be locked away from prying eyes. Using the Manager application, you can assign passwords to each drawer. This feature is particularly nice if you share your HD 2000 or if it's attached to a local area network as a file server.

You can use the HD 2000's Manager application to allocate portions of the 2000's 2-megabyte memory to both a RAM disk and a RAM cache (see Figure 3).

The RAM disk creates a HyperDrive drawer in RAM, with the added feature that its contents usually survive all but the most serious system errors. Even more conveniently, the Manager can be used to designate files, including the System file and the Finder, that the HD 2000 will automatically copy to the RAM disk when you turn on the Mac. The RAM cache keeps a

copy of the data you use most frequently in RAM, a feature that cuts down significantly on disk accesses.

The HyperDrive 2000 we tested was a preliminary model that included Apple's 128K ROM. The HD2000 supports both the HFS and the older file system (MFS), and you can specify either system when you create a drawer.

The HyperDrive 2000 was much faster than the Macintosh Plus, even when several nearly full drawers were mounted on the desktop. Our benchmarks placed the HyperDrive 2000's performance between Levco's Prodigy 4 and the Macintosh Plus. Although the HyperDrive 2000 was clearly a distant second in sheer computational speed, its extremely fast hard drive, RAM disk, and cache memory environment provided a significant performance increase. In fact, with *MacWrite* and a 112K document in the RAM disk, the HyperDrive 2000 opened the document in 3.6 seconds—over 1.5 times faster than the Mac Plus.

Because the HyperDrive, like the Prodigy 4, intercepts SANE calls and routes them to the 68881 coprocessor, applications that call the SANE for floating-point calculations benefit from the 68881's performance increases. We rotated the 2000-point *MacSpin* model on the HyperDrive 2000 and found that it took 63 seconds, almost twice as fast as on a Mac Plus.

Again, as with the Prodigy 4, running programs compiled specifically for the 68881 resulted in significantly faster floating-point performance. We ran the Whetstone benchmark (compiled with Consulair's Di-

rect Compiler for the HyperDrive 2000) and found that it ran 63 percent slower than the Prodigy 4, but still 28 times faster than on a Mac Plus.

How compatible is the HyperDrive 2000 with Macintosh software? Our test unit successfully ran all the applications we tested on the Prodigy 4. Because our unit was using unreleased software, we did encounter a few problems that General Computer says will be corrected in the final release. For the most part, the HyperDrive 2000 seemed at least as compatible with Mac software as the Macintosh Plus. Nevertheless, check to make sure the machine is compatible with the software you want to run.

Speed for Sale

Scientists and engineers who plan to either develop new or adapt preexisting software written in C, assembly language, or any language that accesses SANE can attain more performance for a minimal investment by adding Quesse's floating-point accelerator board.

The Novy board offers a similar choice for FORTRAN programmers, its only drawback being that it doesn't fit in a Mac Plus. Both the Quesse and Novy boards are limited to the 64-bit accuracy of the 32081 chip, so those whose calculations demand the utmost in floating-point accuracy should probably consider one of the 68881-based products.

The HyperDrive 2000 would seem best suited for the business user who wants or needs high performance yet doesn't require the superminicomputer power of the Prodigy 4. The HyperDrive 2000's fast disk drive access makes working with large spreadsheet and database files a breeze, and the built-in RAM cache and recoverable RAM disk let you easily optimize 2 megabytes of memory to fit your individual work environment.

The Prodigy 4 is unquestionably the hottest—albeit the most expensive—Mac upgrade on the market, exhibiting speed that didn't impress, it awed. Anyone seeking a microcomputer that runs as fast as a superminicomputer need look no further. With the FORTRAN and C compilers available from Absoft and Consulair, the Prodigy 4 can transform the Mac into a true, high-powered scientific and engineering workstation.

Although the Prodigy 4's current price places this upgrade beyond the reach of most casual users, it's well in line with its capabilities. If you need the power provided by the Prodigy 4, you're probably already using a computer costing 10 or 20 times as much, and more than likely you're sharing that computer with just as many users. □

◆◆◆◆◆◆◆◆◆◆ *David Usbijima is Macworld's Technical Editor. David Foster is a biochemist in the biology and medicine division of the Lawrence Berkeley Laboratory, University of California, Berkeley.*

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Consulair Direct Access C Compiler for HyperDrive 2000, Prodigy 4, and Maccelerator; Consulair Mac C and Mac C Toolkit

Consulair Corp.

140 Campo Dr.

Portola Valley, CA 94025

415/851-3272

List price: C Compiler \$500, \$200 as an upgrade; Mac C Toolkit \$425

HyperDrive 2000

General Computer Corp.

215 First St.

Cambridge, MA 02142

617/492-5500

List price: \$3195

Maccelerator with QuickSANE software
Quesse Computer Co., Inc.

P.O. Box 922

Issaquah, WA 98027

206/392-7701

List price: \$495, \$995 bundled with the Consulair Direct Access C Compiler and installation kit

MacFortran/RL, MacFortran/020

Absoft Corp.

4268 N. Woodward

Royal Oak, MI 48072

313/549-7111

List price: RL \$149, 020 \$995

Macintosh Number-Cruncher

Novy Systems Inc.

69 Ravenwood Ct.

Ormond Beach, FL 32074

904/427-2358

List price: \$449

Prodigy 4

Levco

6160 Lusk Blvd. #C-203

San Diego, CA 92121

619/457-2011

List price: \$7000

TML Pascal

TML Systems, Inc.

P.O. Box 361626

Melbourne, FL 32936

305/242-1873

List price: \$99.95

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- Scripts Invoked by Button Menu
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- Scripts have full logic constructs
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- Documentation by Neil Shapiro

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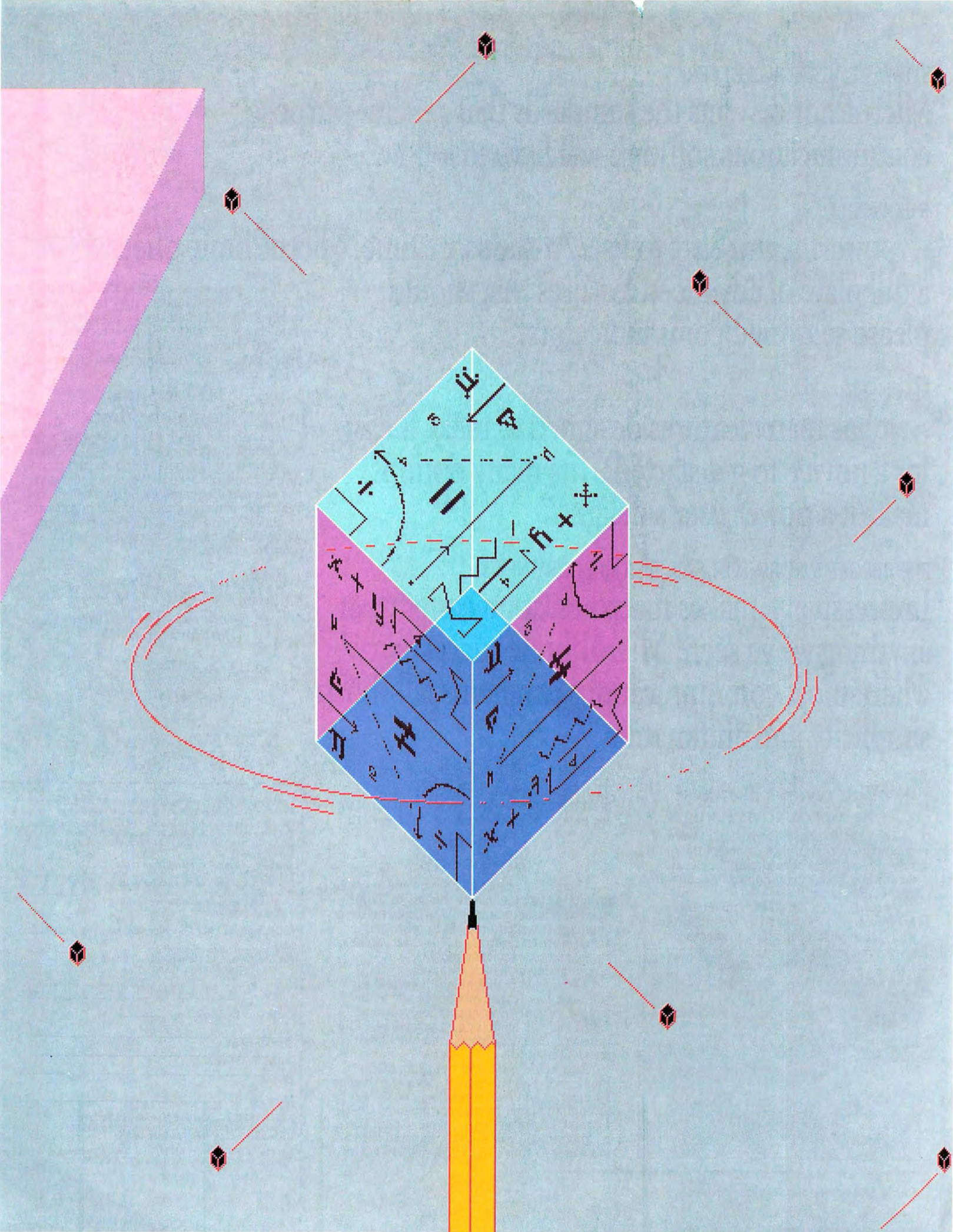
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3-D Data

David L. Foster and Reed McManus

Seeing is believing. MacSpin produces easily deciphered three-dimensional graphs from piles of abstract data.

More often than not, the insight that helps solve a complicated problem comes only after you've examined data from every possible angle. Try this using abstract mathematical equations and you face a time-consuming task. *MacSpin*, D² Software's innovative data analysis program, provides a visual perspective by projecting data on screen as a three-dimensional graph that you can rotate to view data from any angle. *MacSpin* has a number of interesting features that can help you to visually identify patterns, isolate and study interesting points, and change variables to test assumptions.

Although most data can be observed with two-dimensional analysis—a simple graph of the federal deficit plotted against time is a good example—a 2-D projection merely shows what has happened, not why. Add a third variable, such as the foreign trade balance, and the graph becomes an interpretive tool. *MacSpin* makes visual sense of data involving three or more variables (what statisticians call *multivariate data*). Multivariate analysis is essential in

science and engineering, where complex data is the rule. For example, a geologist using *MacSpin* can look at the relationships between the location of earthquakes (their longitude and latitude coordinates) and key measurements such as depth and magnitude.

A *MacSpin* graph doesn't earn its keep standing still. With the help of six on-screen icons, you can rotate the graph clockwise or counterclockwise along vertical, horizontal, and polar axes to view your data's "point cloud" from any perspective (see Figure 1). You can impart an uncanny perception of depth to the data by displaying points close to the viewer with two pixels and points farther away with one. You can also judge depth with an optional tripod that shows the graph's three axes. Unfortunately, the axis lines don't provide ruler marks, which would be helpful for judging distance.

Out for a Spin

Seven excellent sample data sets put *MacSpin* through its paces. One of the most intriguing displays earthquake measurements in the South Pacific and provides visual clues to the workings of plate tectonics. Because the earthquake data is spatial—containing the geographic coordinates of quake epicenters—its point cloud is fairly easy to comprehend in two dimensions. However, most data projections are statistical rather than spatial. For example, the various factors that make up housing values or the characteristics of potential customers for a new product offer no spatial context. These abstract analyses benefit greatly from *MacSpin*'s three-dimensional projections.

Regardless of the type of data being viewed, the process is the same: click on a rotation icon and spin the graph while

looking for patterns and points that provide clues to the data's underlying structure. A "normal" cloud with unrelated, equally distributed points gives you little to go on. More challenging distributions show remarkable shapes, such as stripes, wings, rods, and clusters (see Figure 2). Graphic oddities may give you an early indication that your data sample is skewed, exhibiting what are called catalog effects (see Figure 3).

Identification On Demand

You can investigate patterns without leaving the graph using *MacSpin*'s Identify and Locate commands. Clicking a specific data point highlights its text label in the Events window and vice versa. Hold down the Option and ⌘ keys while clicking, and the point's label and all its measurements are displayed. If you can't find a desired point in a dense cloud, you can zoom in on it using the Display menu's High Resolution command.

Click on the tip of an axis to get information about its minimum and maximum values, and click on the animation slider and arrows for the range's minimum and maximum values. A text search command and identification commands for variables and subsets should be available in version 1.1.

Beyond Three Dimensions

Animation takes you one step further, allowing you to test the relationship of any fourth variable on the three graphed variables. Animation operates in two modes. Masking sets a threshold for the interaction between the hidden variable and the primary variables. Only those data points whose fourth variable is greater or less

than the designated threshold are displayed. Slicing looks through a window at the three primary variables: only those data points that fit within the fourth variable's defined range will appear. In both modes, scrolling the animation slider provides a frame-by-frame "movie" showing the effects of different values for the fourth variable, with data trends showing up as drifting point clouds (see Figure 3). You can designate whether a masking threshold sets a ceiling or a floor on observed data and specify the range of data seen through the slicing window. The Animation variable can be changed by clicking on a variable in the Variable window and dragging it to the Animation bar.

Getting Deeper

If a group of observations appears to behave differently from the rest, you can save it as a subset and subject it to closer scrutiny. Stretch a rectangle around any desired points, click on a text label or range of labels, or isolate a subset while looking at an animation variable; the captured data points will be highlighted on the display. Select a symbol from the Markers menu and multiple subsets can be displayed on the same graph (see Figure 4). You can

focus on a subset or exclude it altogether from the display. A focused subset enlarges to fill the entire screen, allowing you to scrutinize the simpler components of complicated structures. Identify, Locate, and Rotate commands work with all subsets.

Turning Data Inside Out

Intricate data manipulations are made possible by transforming variables. Without manually entering data, you create a new variable that makes a data pattern easier to see or explain (see Figure 5). Transformation subjects any variable to 22 monadic mathematical operations (involving one variable only) or five dyadic operations (affecting two variables, one of which can be a constant). Transformed variables can be saved without altering their source variables.

You can also create a variable without transforming an existing one. It can be a random subsample of a large data set, useful for thinning out dense data sets, or a serial numbering of each observation in the data set, useful for observing data trends over time. Version 1.1 will allow you to create variables from the coordinates of the data points, as seen from any selected view, and from linear combinations (weighted sums) of existing variables.

In Perspective

MacSpin does not have the mathematical wherewithal to replace statistics programs or spreadsheets, but it is a valuable addition to any number-cruncher's toolbox. Statisticians can use *MacSpin* to get a graphic overview of unfamiliar data before moving on to a statistics program for mathematically intensive calculations.

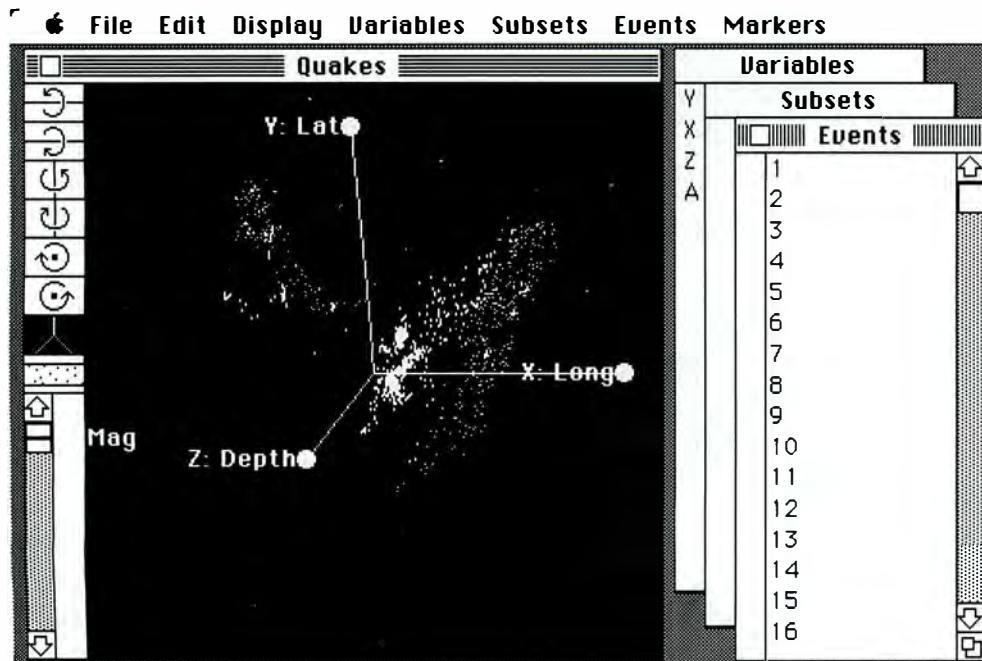


Figure 1
The main stage for the rotating point cloud is the Dynamics window. To its left are the six rotation icons, the tripod switch for displaying the graph's

three axes, and the animation mode switch and scroll bar for testing the effects of a fourth variable.



Figure 2
Stripes, clusters, and wings. Here, stripes indicate underlying patterns in what was thought to be a random distribution of numbers. Clusters indicate distinct groups of data, with different properties in each group. Wings indicate subsets sharing some attributes.

At the end of a project, *MacSpin* provides a presentation-quality visual confirmation of complex results.

The program invites creative experimentation—something unheard of with mainframe packages. Once you learn how to load data into *MacSpin*, you can pick up most of the program's fine points simply by working with it. The program avoids statistics terminology, which may or may not please those familiar with statistics. The documentation is excellent, providing thorough explanations of complex concepts and program features.

MacSpin lacks the most memory-gobbling features of its mainframe counterparts, such as automatic searching of interesting data points ("projection pursuit") or a function that draws lines between data points ("connectivity"). *MacSpin* does not tie in to a statistics package, but loading text files created with a database, spreadsheet, or statistics program is not difficult. Or you can type data directly into a *MacSpin* worksheet. Version 1.1 will allow you to transfer data sets through the Clipboard to and from programs such as *Excel* and *MacTerminal*.



Figure 3
This striking three-dimensional projection of over 2000 galaxies shows markedly fewer galaxies seen from the Southern Hemisphere (lower right) than the Northern (upper left) and virtually no galaxies in between. Rather than signifying a lack of galaxies, these anomalies point to a lack of data: there are simply more observatories in the Northern Hemisphere than the Southern, and it is difficult to observe galaxies through the dust and gas of the Milky Way.

MacSpin also lacks three helpful features admittedly rare even among mainframe packages: multiple data windows and stereo or color printouts. Color would provide the most obvious way of identifying subsets in a dense point cloud, while stereo images could be displayed on a stereoscope to create a three-dimensional image. Multiple data windows will probably have to wait for the arrival of a beefier Mac, but color and stereo are within reach given the ImageWriter II's color capabilities and the LaserWriter's attention to crisp detail.

Printing and Performance

As of this writing, printing is *MacSpin*'s weak link. To print a worksheet, you must create a screen dump by typing ⌘-Shift-3 or ⌘-Shift-4 , or create a text file and return to the data set's original application. To print the Dynamics window, you must create a screen dump. Your best bet is to call up the image as a *MacPaint* file and trim unwanted system graphics before printing. A spokesperson for D² said that version 1.1 will print on the ImageWriter and the LaserWriter.

MacSpin runs on as little as 128K but benefits greatly from 512K and an external drive. Operating on a 512K Mac, it handles as many as 600 data points ("events") with smooth rotation and can get smooth animation with data sets containing 1000 to 1500 data points. D² claims this performance is comparable to a mainframe sys-

tem operating in multiuser mode, although it's not as fast as a dedicated mainframe system. *MacSpin* can handle much more than 1500 data points, but not without a cluttered screen. Approximately 5000 events can be processed, with the number of variables and subsets limited only by memory. A 2000-point, 15-variable data set requires approximately 240K. The copy-protected program works well on a Mac Plus and with *Switcher* (with a recommended 224K allocated to the program).

Overall, *MacSpin*'s value lies in its ability to present abstract data in a comprehensible, visual form while performing impressive data manipulations. For professionals neck-deep in statistics and those venturing into complex data analysis for the first time, *MacSpin* is a sight for data-sore eyes. □

David L. Foster is a biochemist in the biology and medicine division of the Lawrence Berkeley Laboratory, University of California, Berkeley. Reed McManus is a free-lance writer based in Oakland, California.

MacSpin, version 1.0
D² Software
3001 N. Lamar Blvd. #110
Austin, TX 78705
512/482-8933
List price: \$99.95, upgrade from version 1.0 to 1.1 \$10

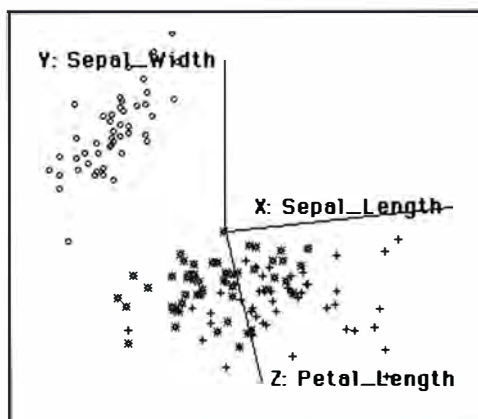


Figure 4
Markers let you identify multiple subsets in a graph. This graph displays three species of iris, two of which have overlapping characteristics. To identify each, mask on the species variable. As the slider moves along the Animation bar, each species is shown in turn. Mark each category with a different symbol.

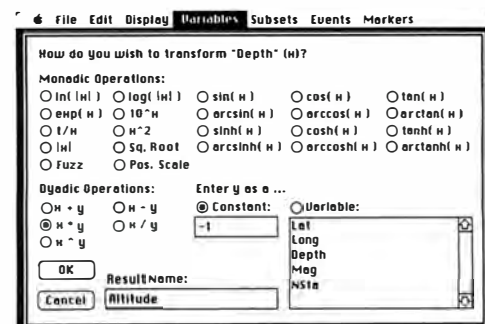


Figure 5
The earthquake data's depth variable can be confusing when its axis is pointing up: deep quakes (with large values) will appear above shallow ones (with small values). Multiplying depth by -1 creates a new variable, altitude, that makes the graph easier to interpret.

Gems from the Public Domain

Robert C. Eckhardt

A sampler of nine public domain programs selected by Macworld's editors

It may be true that there's no such thing as a free lunch, but there is free software for the Macintosh, and lots of it. The programs available in the public domain are not only free; they're innovative, useful, and sometimes nothing less than essential. *Macworld's* editors have been collecting and using public domain software ever since Dennis Brothers started giving away copies of *MacTep*, the first communications program for the Mac. The editors selected the following programs as noteworthy examples of public domain offerings.

All of the programs described here—and a great many more besides—can be obtained from a variety of sources. CompuServe's MAUG (MicroNet Apple User's Group) is usually the first place new public domain programs appear. (See "Shopping the Electronic Software Shelves," *Macworld*, June 1985, for details on downloading software from MAUG.) Some user groups collect public domain programs and make them available on disk or

through their electronic bulletin boards. And commercial operations such as the Public Domain Exchange maintain large program libraries from which you can order disks by mail at modest fees. No matter where you look, you're bound to find some favorites of your own.

RamStart

A RAM disk is a portion of memory that has been instructed to act as if it were a floppy disk in a disk drive (see "The Invisible Disk," *Macworld*, March 1985). There are advantages and disadvantages to RAM disks: the main advantage is increased speed; the main disadvantage is the ease with which files can be accidentally erased. Many people with a 512K (or larger) Mac and a penchant for speed feel that the pros outweigh the cons. If you are in this group, you'll find *RamStart* 1.1, by George A. Nelson, one of the best RAM disk programs available.


RamStart automatically creates a RAM disk, copies all the files in the folder containing *RamStart* to the RAM disk, establishes the RAM disk as the startup disk (if the System files were copied to the RAM disk), and ejects the boot disk containing *RamStart*. You can set aside up to 374K for the RAM disk on a 512K Mac, up to 891K on a 1-megabyte Mac, and up to 1930K on a 2-megabyte Mac.

By the time you read this, a new version of *RamStart* that uses scripts should be available. These scripts instruct the program to create a RAM disk, load files from one or more folders, and open a particular application. Hard disk owners can create a different script for each volume, drawer, or application folder. Double-clicking on a script icon causes *RamStart* to perform the

chosen script; if a document icon has been selected, the script's startup application opens that document.

Transfer and Waystation

People who change applications often during a work session will appreciate *Transfer* 2.0, by Greg Frascadore. This desk accessory lets you bypass the Finder when changing from one application to another. When you select Transfer from the Apple



Both Transfer and Waystation are more flexible than Switcher for changing applications.

menu, a dialog box appears; choose an application on a disk or hard disk volume and click Open, and *Transfer* closes the current application and opens the new one.

Unfortunately, *Transfer* is incompatible with a few programs (most regrettably *MacWrite* 4.5), causing a fatal system error if you attempt to use the program. Closing all documents before selecting Transfer should alleviate this problem, however.

Waystation 1.9B, by Steven Brecher, uses a different method to bypass the Finder. This program replaces the Macintosh desktop with a window containing 27



application buttons and 2 function buttons labeled Finder and Other (see Figure 1). Use the File menu to place the names of your applications on the application buttons. To start an application, click on the appropriate button. If all 27 buttons are in use, click on Other to open a dialog box that operates like *Transfer*. When you quit an application, the program returns you to the *Waystation* window, where you can open another application. *Waystation* is similar to Apple's MiniFinder, but there are a few differences. The MiniFinder opens documents as well as applications, and it holds only 12 items, compared to *Waystation*'s 27.

Although neither *Transfer* nor *Waystation* is as fast or as smooth as Apple's *Switcher* for changing applications, both

are more flexible. *Switcher* can handle no more than four applications at once on a 512K Mac. With *Transfer* or *Waystation*, you can switch among as many applications as disk space allows.

PaintMover

Bill Atkinson, whose main claim to fame is *MacPaint*, has been at work for some time on a sister program called *PaintMover*. A still unfinished and somewhat buggy work (the version number at press time was 0.03), the widely available *PaintMover* is nonetheless a valuable addition to anyone's *MacPaint* tools. Alas, the present version of *PaintMover* doesn't work under *Switcher* or on a *RamStart* RAM disk—oversights which will, I hope, soon be corrected.

If you've ever tried to move a *MacPaint* image that's larger than the *MacPaint* window, you'll immediately appreci-

ate *PaintMover*'s ability to handle images as large as 8 by 10 inches. *PaintMover*'s main screen has two windows, each the size of *MacPaint*'s Show Page window. One window, marked Input, contains the *MacPaint* document from which you want to move an image. The other, labeled Output, is the new document to which you move the image. First, using a selection rectangle, choose the part of the Input document you wish to transfer; then drag the rectangle into position on the Output page. You can easily rearrange images from the original document, or you can open other documents in the Input window and transfer images from those documents to the Output window.

PaintMover can perform a number of minor miracles during the transfer process. The program can enlarge a selection to as much as 16 times its original size (see Figure 2). It can also flip, rotate, or invert (reverse black and white in) a selection. You have the option of treating the background as solid or transparent, smoothing the jagged edges of enlarged images, or thinning lines and letters that are too thick after the enlarging process. Also, *PaintMover* can print a *MacPaint* document as a poster up to 16 pages long and 8 pages wide.

FKEY Installer

The Macintosh comes with four predefined function-key combinations (⌘, Shift, and a number key pressed simultaneously). These combinations eject a disk from the internal drive, eject a disk from the external drive, save a screen image to disk, and print a screen dump. Why no one immediately leaped in to fill the void represented by the other six number keys is a mystery; function keys are, after all, widely used on many computers. This oversight has been rectified with a program called *FKEY Installer* 1.1, by William Bond.

FKEY Installer looks and operates much like Apple's *Font/DA Mover*. With *FKEY Installer*, you can set new function-key combinations or remove, rename, reposition, or save to a new file any function already assigned.

A relatively recent arrival in the public domain library, *FKEY Installer* offers only a few functions so far. Some examples: Sleep blanks out the screen until you press the mouse button; Date Key types the current date; and BigCursor enlarges the pointer, making it easier to see. While these examples are less than spectacular, the potential for *FKEY Installer* is enormous. No doubt a wide variety of new functions will be available soon.

FreeTerm

Many excellent telecommunications programs are now available for the Macintosh, both commercially and as shareware (unlike public domain programs, which are available free of charge, shareware programs come on a try-before-you-buy basis:



Figure 1
Waystation lets you switch between applications without returning to the Finder. You can establish up to 27 application buttons in the Waystation window.

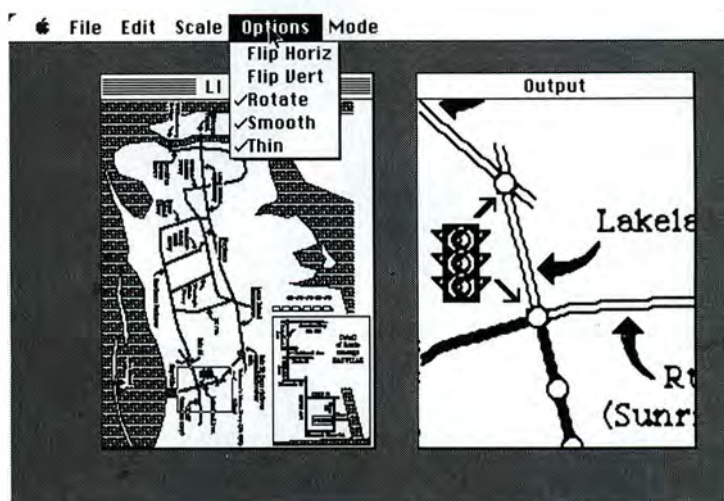


Figure 2
PaintMover enables you to enlarge a piece of a *MacPaint* document, rotate it, and remove the jagged edges and thick lines that result from the enlarging process.

you pay for a program only if you decide to keep it). Why bother, then, with a relatively simple program like *FreeTerm*, also by William Bond? Two reasons: it's free, and it has all the telecommunications features that most Macintosh owners need.

FreeTerm lets you connect a modem to either the printer port or the modem port, and you can telecommunicate at 300, 1200, or 2400 bits per second. Two file-transfer options are provided: ASCII transfers with no error correction, and Xmodem, a common error-correction system. The program also senses if a file is in MacBinary format and responds appropriately. MacBinary is a time-saving, Macintosh-specific protocol that transfers icons, names, creation dates, and other information along with each file.

Although it doesn't provide advanced features like autopilot or macros, *FreeTerm* is easy to use. And since it supports Mac-

Binary transfers, *FreeTerm* is an excellent choice for downloading Macintosh files—such as other public domain programs—from electronic bulletin boards.

Games

Just when you thought it was safe to replace the puzzle in the Apple menu with something more businesslike, a number of new desk accessory games have appeared (see Figure 3). *KnockOut*, written by Andy Stadler, is a variation on *Pong*, complete with sound effects. The game provides a break from any application that supports desk accessories.

Bagels 1.1, by Steve Christensen, is another desk accessory game patterned after a classic—the board game Mastermind. The object of the game is to guess a secret four-digit number. Each time you guess, the

game tells you how many digits of your guess are correct and how many are in the correct position, but that's it. Clearly, a studied retreat to logical deduction is your only defense. And while there is no score in the usual sense (you either succeed or fail in figuring out the number), consider

The showpiece of public domain games converts the Mac's screen into a pool table.

yourself an expert if you succeed before your guess list starts to scroll off the top of the screen.

Another desk accessory game by Steve Christensen, *3D Tic-Tac-Toe* 1.2, is a challenging exercise in visualization. The game consists of four grids of four cells by four cells each. Theoretically, the grids lie one on top of the other; what you see, however, is four grids side by side. Since a row of four Xs or Os at any angle wins, to prevail over the program, you must be able to visualize three-dimensional patterns based on the two-dimensional slices, as well as play a good game of tic-tac-toe. If you get tired of being beaten by a machine, the game has an option that allows you to play against another human.

The showpiece of the public domain game collection is *Billiard Parlour*; an impressive simulation that converts the Mac's screen into a pool table (see Figure 4). Created at Reed College by Richard Crandall, Scott Gillespie, and S. Lew using the Rascal development system, *Billiard Parlour* lets you play pool, billiards, eight ball, nine ball, or snooker. When you line up a shot and release the mouse-controlled cue, the balls roll in surprisingly realistic paths, accompanied by the appropriate clacking sounds as they collide.

The game's verisimilitude doesn't stop there: You can place balls on the table with a hand pointer, add English to a shot, tally

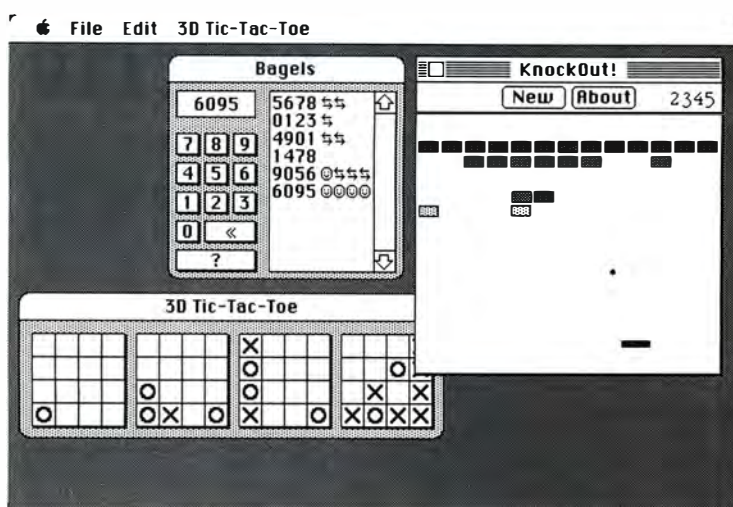


Figure 3

If you're tired of the standard Mac puzzle, you can install three new desk accessory games in its place. For a real challenge, place all three on the screen and play them in rotation.

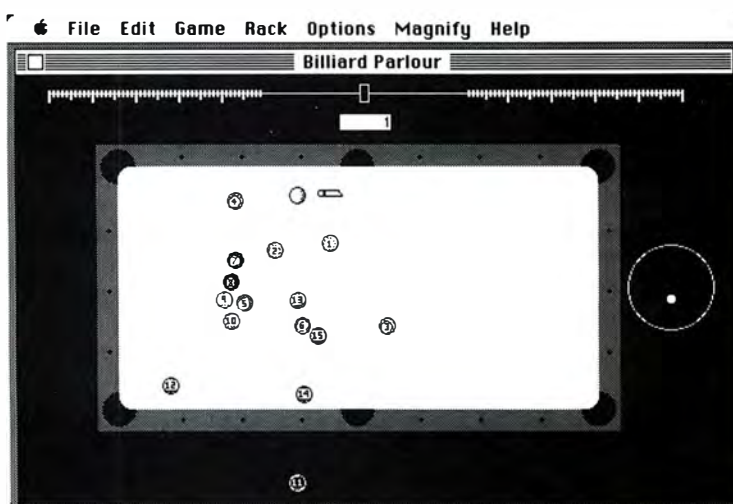


Figure 4

The mouse controls the speed and direction of the ball. You add English to the ball by clicking the desired area in the circle on the right.

points on a scoring rack, and lag the ball to see who shoots first. And if you hit the cue ball too hard, it hops, just like an actual cue. If you're having trouble setting up the proper angle for a shot, *Billiard Parlour's* magnification option allows you to zoom in and make careful adjustments.

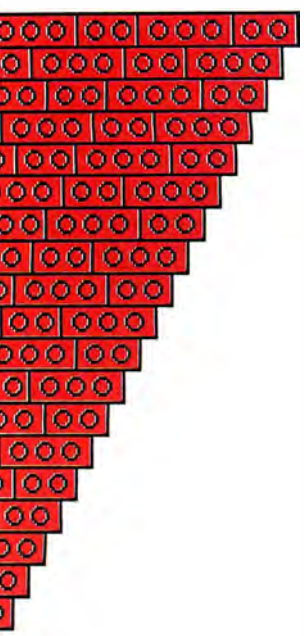
For interested programmers, a Help file explains some of the Rascal routines used to produce *Billiard Parlour's* realistic animation. Besides instructions on how to play the various games, technical information about the program code is on line. The game takes up 79K, so you won't be adding it to all your work disks, but *Billiard Parlour* is a worthwhile addition to any Mac game library.

The programs described here are only a small sample of those available in the public domain. Perhaps now you'll venture on line or see what software your local user group has to offer. Why not? It's free. □

▲▲▲▲▲▲▲▲▲▲ Robert C. Eckhardt is a free-lance writer and editor.

▲▲▲▲▲▲▲▲▲▲
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Document Construction Set

Al Cini

Document Modeler lets you create templates to mass-produce your standard documents

Attorneys, engineers, and executives, and other professionals often have to contend with crushing loads of complex but basically repetitive paperwork. Typically they spend hours working with word processing and forms-generation programs to produce legal contracts, sales agreements, investment proposals, job estimates, and other standard documents. Word processors and forms generators let you paste "boilerplate" text into documents and merge information into templates, but these programs can't select the correct piece of text from a series of possible phrases and insert it automatically into a document. Moreover, forms generators and word processors don't allow professional staff to lighten their load by delegating tasks to support staff, since decisions regarding content frequently require technical expertise.

Document Modeler, from Modern Office Systems, is an interactive program that constructs customized documents from templates. You can prepare a template that contains all the text that might be included in a final document as well as instructions that guide a nonprofessional in customizing the document for individual clients or situations.

Document Modeler consists of two programs: Template Maker and Document Maker. Using Template Maker, a professional writes a specialized program, or template, in *MacWrite*. The template includes generic text, which stays the same from document to document, and variable text that is inserted as appropriate, based on the final user's responses to questions. You can embellish the template with graphics from *MacPaint* or *MacDraw*, such as company logos, charts, or illustrations. The professional also adds reference material that defines variable terms or gives background information, such as relevant case law. This reference information helps the person assembling documents make informed decisions on which text to select. Finally, the template contains commands that tell the program how to assemble the manuscript. Document Maker builds documents from the template by inserting the generic text, the appropriate variable text and graphics, and the answers supplied by the final user.

Don't expect to produce a contract in your first hour with the program. *Document Modeler's* programming language takes a week or two to learn. In addition, analyzing and designing a template and checking it for errors is no small task. After this initial investment, though, both professional and clerical staff can save time when producing repetitive documents.

Scripts to Templates

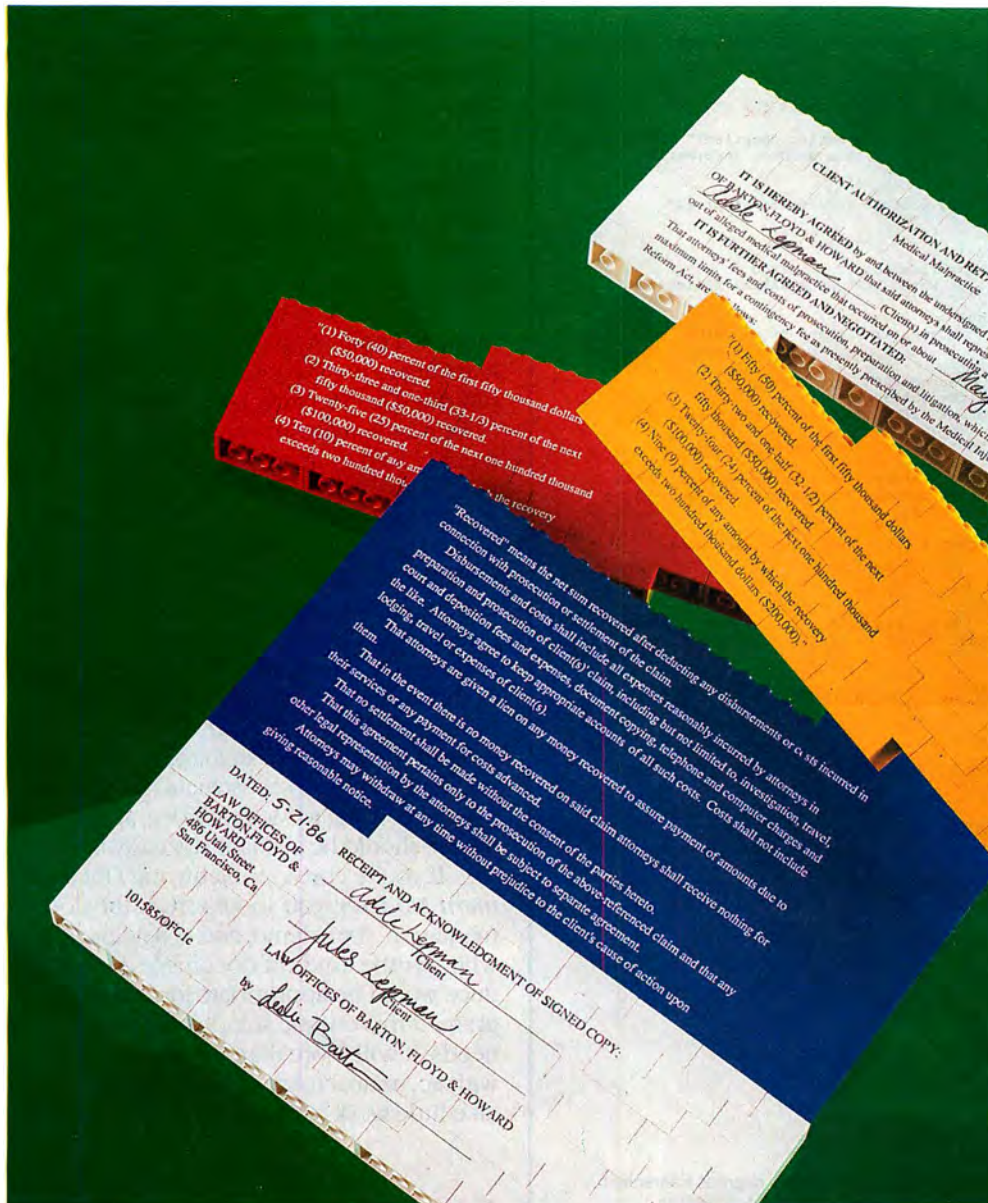
The template is the blueprint that Document Maker follows in constructing a document. You create the template script in *MacWrite* and then run Template Maker to turn the document into files that Document Maker uses to produce a final document. Template Maker divides a template script into four sections: .NAME gives the

title of the file, .DATA defines the variable text, .REFERENCE provides explanations for the final user, and .COMMAND includes the generic text and instructions for combining the text (see Figure 1).

To write a template script, you have to enter the generic text, decide which text will be variable, and develop the instructions for assembling the text in Document Maker. In our example, a chemical products manufacturer uses *Document Modeler* to list products' chemical properties and health hazards in a format specified by the government. The template script (see Figure 1) includes the government-mandated product safety warning text, variable text for such items as the product name and ingredients, and the rules that specify which variable items are included in which documents.

After you write the generic text, you define the variables that will later appear as choices in Document Maker's prompt window. Template variables may be text, calendar dates, true/false values, or numeric data and mathematical expressions. When the template is used, Document Maker may ask the user to type a value, select a value from a multiple-choice list, or answer yes or no, depending on the variable type the template designer has specified.

The template designer enters explanations for the .DATA variables in the template's .REFERENCE section. This information then appears as on-line help in Document Maker's reference window (see Figure 2). For example, at the same time that the program prompts the user to enter a product's ingredients, a statement ap-



appears in a scrollable reference window requesting that the user list the ingredients, separating them from each other with commas. The program then offers several examples. *Document Modeler* does not restrict the amount of reference text in a template. By making liberal use of this feature, template designers can help users make informed choices.

The template commands tell the program to perform calculations, display choices in the prompt window, and insert text depending on the user's responses. In the safety sheet example, a particular product may be flammable or toxic. If it's flammable, its chemical properties will determine the appropriate extinguishing

procedures. If it's toxic, its characteristics will dictate the correct treatments or antidotes.

Once you've written the template commands, you have a finished script that Template Maker can compile into files for use with Document Maker. If you've made any syntax errors in your script, Template Maker reports them to you. Since Template Maker contains no text editor of its own, you must return to *MacWrite* to correct any errors in the script and then rerun Template Maker. Fortunately, Template Maker works with *Switcher* and fits in memory with *MacWrite* on a 512K Mac. Especially during the development of complicated templates, the ability to switch quickly back and forth between Template Maker and *MacWrite* to correct and recompile scripts is a practical necessity. Accord-

ing to Model Office Company, a future version of the program will display diagnostic messages and allow you to make template script changes without leaving Template Maker. This feature should cut template development time dramatically.

Theoretically, templates can be as large as you like. The scripts can be segmented into separate files and then merged using the template language's .INSERT command. In practice, however, available disk space and the time it takes to compile large scripts into templates limit the scope of your efforts.

Templates to Documents

Preparing the template is the hard part. Once that's done, Document Maker uses the template text and instructions to write a document for you. Document Maker constructs the document from the template by transferring text from the script into the display window and inserting the user's responses from the prompt window. You can copy information from the reference window to respond to questions asked in the prompt window.

The document window is for display only; the program does not let you edit documents while they are being generated. A finished document can be saved and later edited as a *MacWrite* file. If you've incorrectly entered information in the prompt window, you have to wait until the document has been compiled and then make the necessary changes in *MacWrite* or rebuild the document from scratch by rerunning Document Maker.

Figure 1

Template variables for a generic product safety sheet are listed in the .DATA section. The definition for BURN_TEMP establishes BURN_TEMP as a numeric variable (.NUMBER) corresponding to the Fabrenbeit burning point of the substance PRODUCT_NAME. The formula $0 < X < 10000$ tells the program to accept an answer between 0 and 10,000 degrees Fabrenbeit.

```
.NAME Product Safety Sheet;;
.DATA
{General product information variables}
PRODUCT_NAME "What is the product's name?"
PRODUCT_INGREDIENTS "Please list the ingredients for
<<PRODUCT_NAME>>."
DATE PREPARED "When was this safety information compiled?" .DATE(2)
EXPIRATION_DAYS "In how many days will this product information
expire?"
    .NUMBER(, .0 0<X<365)
EXPIRATION_DATE "When will this product information expire?"
    .DATE(2)

{Fire prevention information}
FLAMMABLE "Is <<PRODUCT_NAME>> flammable?" .YESNO
BURN_TEMP "Temp (degrees F) at which <<PRODUCT_NAME>> flames?"
    .NUMBER(, .0 0<X<10000)
EXTINGUISH "Extinguish using"
    .ONEOF "spray with water" "cover with foam" "stomp with feet"

{Poison control information}
TOXIC "Is <<PRODUCT_NAME>> poisonous?" .YESNO
ANTIDOTES "If swallowed, do the following"
    .ONEOF "drink water" "drink milk" "patiently await death"

;;
{Text to be displayed in the scrollable reference window}
.REFERENCE
Descriptions of flammable products must include the temperature at
which they catch fire (given in degrees Fahrenheit). Select
appropriate fire-fighting measures.

Toxic product descriptions must include antidotes or remedial
action.
;;
.COMMAND
.GENERATE 1
.IF FLAMMABLE: .GENERATE 10 .ELSE ~FLAMMABLE: .GENERATE 11 .ENDIF
.IF TOXIC: .GENERATE 20 .ELSE ~TOXIC: .GENERATE 21 .ENDIF
;;
1 .TEXT


    Product Safety Information

Product:    <<PRODUCT_NAME>>
Prepared:   <<DATE_PREPARED>>

;;
2 .TEXT
Expires:    <<EXPIRATION_DATE>>

Ingredients:
            <<PRODUCT_INGREDIENTS>>

Hazardous Properties:
;;
10 .TEXT

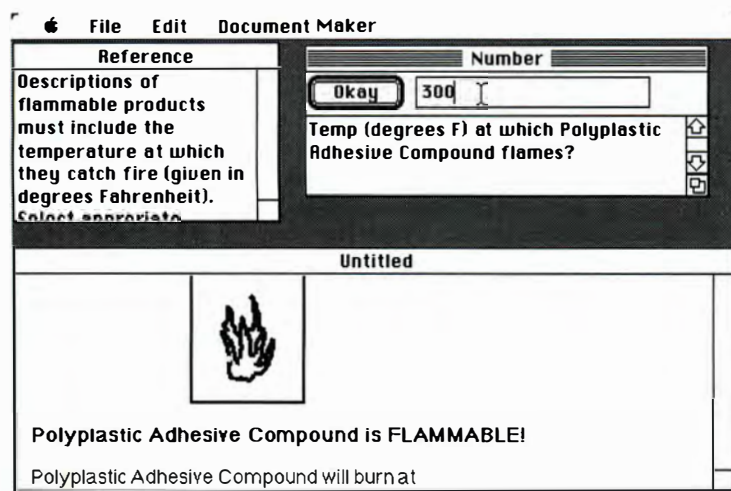
    

    <<PRODUCT_NAME>> is FLAMMABLE!

    <<PRODUCT_NAME>> will burn at <<BURN_TEMP>> degrees Fahrenheit
    (<<"555556" * (BURN_TEMP - "32") >> degrees Celsius). To extinguish,
    <<EXTINGUISH>>.
```

Figure 2

Document Maker constructs the product safety sheet document. The dialog box at the upper right prompts the user for product information.



Beyond Word Processing

Document Modeler goes beyond word processing to automate and simplify document compilation. Organizations that produce large volumes of complex documents will find *Document Modeler* an effective document-generation tool. *Document Modeler* might also interest value-added resellers who want to design expert document processing systems.

Keep in mind that the initial investment of a professional's time and effort in learning to use Template Maker can be significant. Despite fairly clear documentation (I found the manual's step-by-step Agreement of Sale example particularly helpful in getting started), Template Maker's document language is somewhat challenging to learn. For example, the rules for defining variables involve unusual punctuation: commas and parentheses are used to specify retained decimal places, valid ranges, and number placement. The Model Office Company is developing a template-making utility called *Script Writer* that will hide most of the template language's punctuation and command constructs from the user. According to Model Office, *Script Writer* should be available by early fall.

If you're considering buying *Document Modeler*, you should study the documentation, try a demo, and consider whether the kinds of documents you produce would be appropriate for the program. If this unique solution fits your needs, it will more than repay your efforts with accurate, customized documents that take little work to create. □

▲▲▲▲▲▲▲▲ Al Cini is president of Computer Methods Corporation, a software consulting firm based in Marlton, New Jersey.

▲▲▲▲▲▲▲▲

Document Modeler, version 5
The Model Office Co., Inc.
The Gooderham Flatiron Building
49 Wellington St. E
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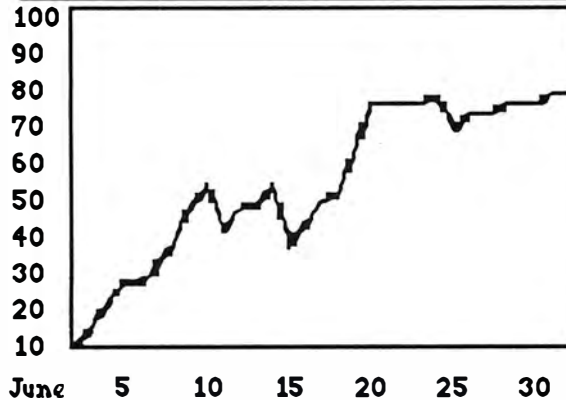
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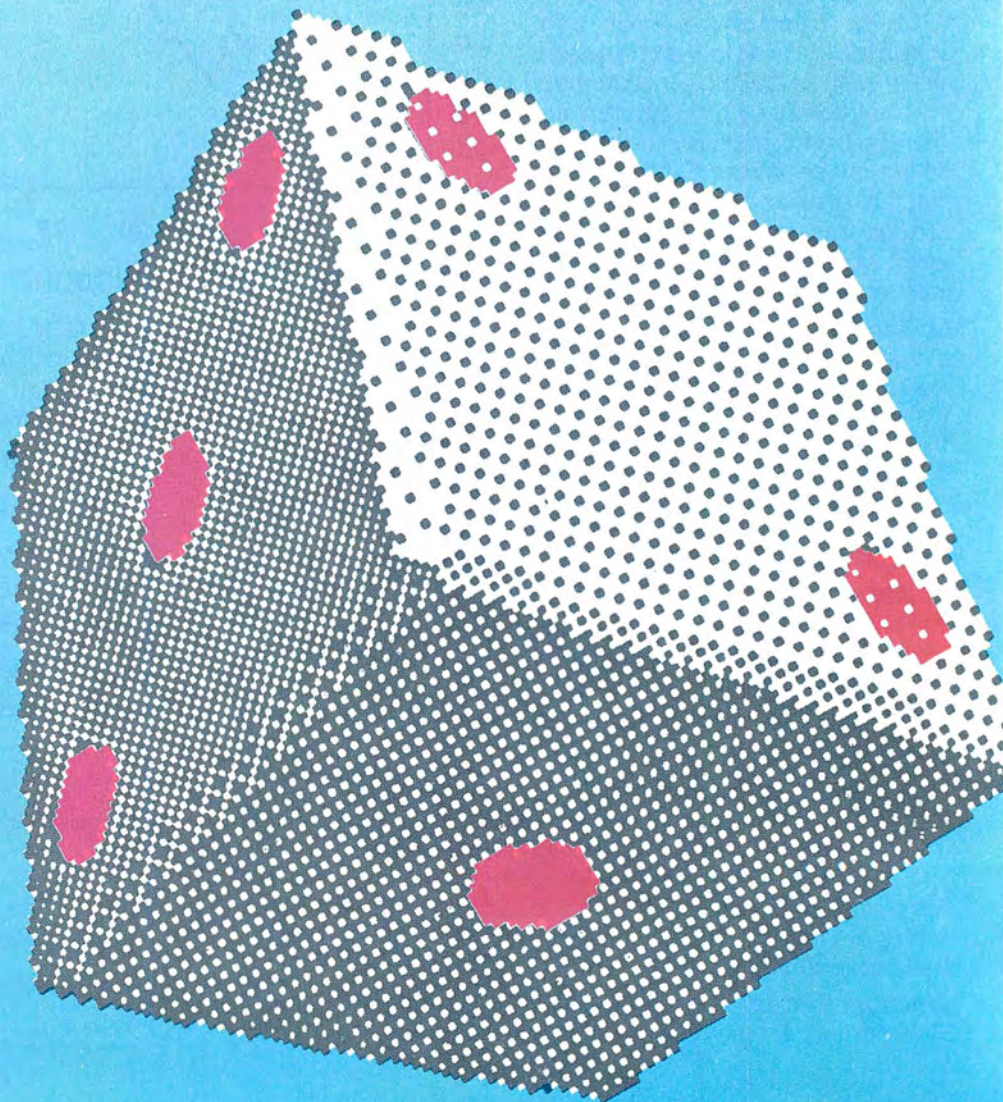
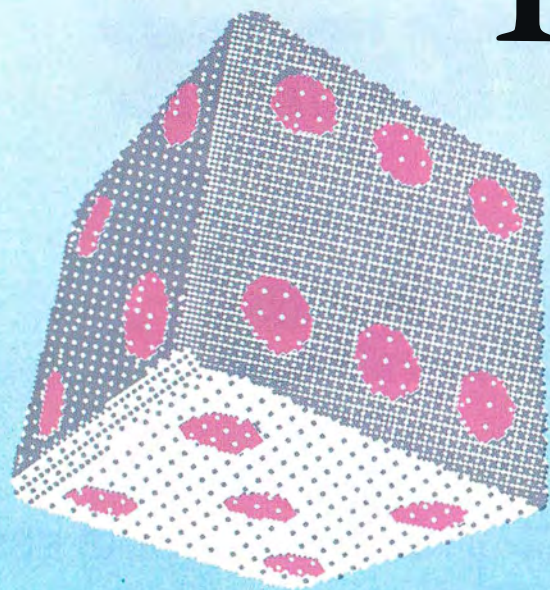
Circle 523 on reader service card


Roll 'em

Mark Stephen Pierce

Bogart and Bacall. Tracy and Hepburn. VideoWorks and Easy3D. Well, maybe the last two don't rank among the immortal couples of moviedom, but they do make an excellent team when it comes to producing movies on the Macintosh screen. Easy3D allows you to rotate and resize three-dimensional objects, change the viewer's perspective, and adjust a scene's lighting. You can use these features to automate the job of creating frame-by-frame animations in VideoWorks. If you closely follow the steps outlined here, you will be rewarded for your efforts with a short but smooth animation.

The star of the show: this die was created as a solid object in Enabling Technologies' Easy3D and then sized and rotated to create the illusion of motion.





For this project you need *Easy3D* from Enabling Technologies, *VideoWorks* from Hayden Software, a 512K Mac, and a few hours. This tutorial assumes you're familiar with *Easy3D* and *VideoWorks*. Both programs come with excellent manuals; after spending a few hours with their respective tutorials, you should be able to tackle the following animation.

An Object Lesson

In the sample animation, a die tumbles toward the viewer, growing larger as it bounces into the foreground. You can create and animate a die as you follow the instructions in this tutorial, or you can dream up your own three-dimensional object—perhaps a spinning globe or a rotating logo—and animate it using the same techniques.

Here's an overview of the procedure you'll follow to animate a 3-D object: First, create the object using *Easy3D*. Then rotate and enlarge the object and copy the new view to the Scrapbook. Repeat the procedure, rotating and scaling the object and copying the next view to the Scrapbook, until you have a series of images. You then copy the Scrapbook full of rotated images onto the *VideoWorks* disk and paste them frame by frame into an animation.

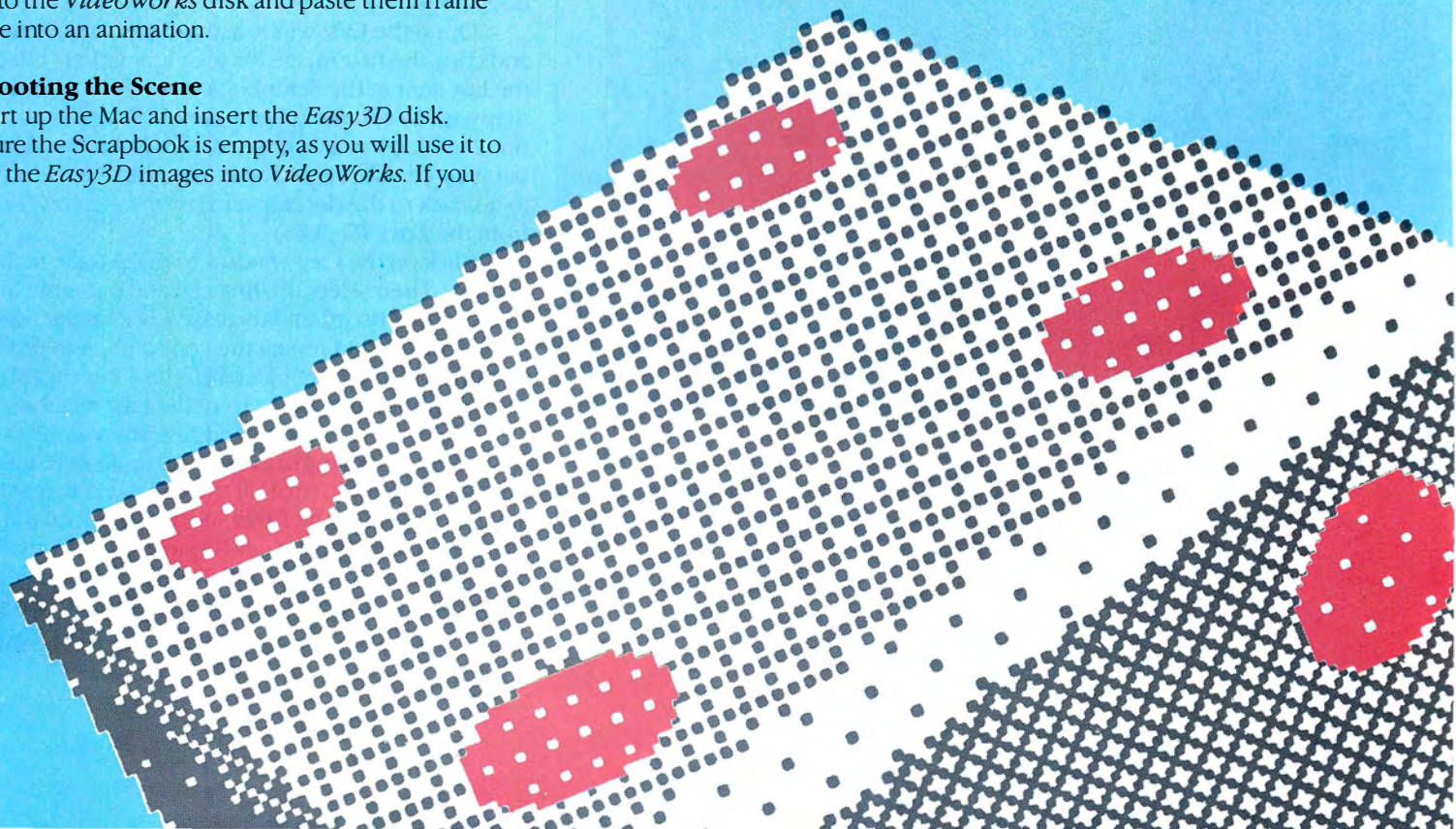
Shooting the Scene

Start up the Mac and insert the *Easy3D* disk. Make sure the Scrapbook is empty, as you will use it to transfer the *Easy3D* images into *VideoWorks*. If you

wish to keep the items currently in the Scrapbook, open *Easy3D*'s System Folder and copy the Scrapbook file icon onto another disk. Then throw away the Scrapbook file icon on the *Easy3D* disk; the program will automatically create a new Scrapbook later. Transfer other files, if necessary, to free at least 30K on the *Easy3D* disk, and you're ready to begin.

First you must produce the white cube that will become the die. Open a new *Easy3D* document and select Object Shade from the Create menu. Slide the scroll box to the right, toward white (don't move the box all the way to white, however, or your picture will be overexposed, washing out all shadows). Then select Cube from the Create menu; a light-gray cube appears.

To create the spots on the die, turn a small black cylinder on the lathe, make several copies with the Clone command, and emboss the cylinders onto the faces of the die. (The Emboss command is explained in the "For Advanced Designers" section of the





Easy3D manual.) As you did when making the cube, select Object Shade before creating the cylinder, this time moving the scroll box to black.

After you have created the die (or other object), select Camera as your viewing window. In the Draw menu, set the background to black and select Frame Thin and Shade. (Selecting the black background ensures that each Scrapbook image is the same size and automatically centers the image in the Scrapbook window. This technique results in a smooth animation, without the need for a lot of tweaking in *VideoWorks*.) You may also want to adjust the lighting with the commands in the Light menu. Push the Home button to center the object in the Camera window.

Because the Scrapbook can hold images no larger than 4K in *Easy3D*, you should perform a simple test to make sure your largest image doesn't exceed 4K. Copy the object in the Camera window to the Clipboard by selecting Screen>Clip from the Edit menu. Open the Scrapbook and select Clip>Scrap from the Edit menu. If your object appears in the Scrapbook window, you're ready to proceed. If a dialog box informs you that the image is too large for the Scrapbook, return to the Camera view and shrink the object with the Overall Size arrow until the image fits in the Scrapbook. Once you've completed this test, throw out any images left in the Scrapbook by choosing Remove from the Edit menu.

Scale the die by 50 percent using the Overall Size icon (the arrow in the bottom-left corner of the screen). The reduced version of the die now appears

in the center of the Camera window; this is your starting view.

Save the image in the Camera window. Then copy and paste the image to the Scrapbook by selecting Screen>Clip, opening the Scrapbook, and finally selecting Clip>Scrap.

Spin the image 10 degrees to the right with the Revolve icon. Rotate down 10 degrees with the Rotate Down arrow at the top of the Camera window. Rotate left 10 degrees (the indicator will read -10 degrees) with the Rotate Left arrow on the right side of the window (see Figure 1). Move the Overall Size icon until it reads 105 Percent. Copy the rotated and scaled image to the Scrapbook as outlined above.

Repeat the steps just described, saving each consecutive rotated and scaled image. A hint to help you keep under budget on the filming of your first epic: as you save each image, keep a list, using paper and pencil, of each Scrapbook entry number along with the rotations and scale factors. Then, if the phone rings or you spill your coffee, you'll know where you left off and won't have to go back to square one. If you need to halt the recording process, simply save the file in the last position you shot; the next time you open the file, the object will be in that position. When you have 16 entries in the Scrapbook, you're ready to quit *Easy3D* and begin to animate your three-dimensional object.

The Die is Cast

When you return to the desktop, copy the *Easy3D* Scrapbook file to the *VideoWorks* disk. If you wish to keep any items in your current *VideoWorks* Scrapbook, be sure to transfer it to another disk; otherwise, the *Easy3D* Scrapbook you just created will replace the *VideoWorks* Scrapbook. Make sure you have about 45K free on the *VideoWorks* disk for your animation. Now open a new *VideoWorks* document.

Open the Cast window, then select the Scrapbook and copy the first image for your animation—which is the last item in the Scrapbook—to the Clipboard. (You may wish to cut the image instead of copying it. Cutting the image frees up space both in RAM and on disk but is more risky; if you make a mistake, you may have to go back to the desktop and recopy the Scrapbook from the *Easy3D* disk.)

Click on the Cast window to make it the active window. Then select the first cell and paste the image from the Clipboard into the cast. Click on the Scrapbook window and repeat the copy-and-paste procedure until you have placed all the 3-D images from the Scrapbook into the cells of the Cast window.

Close the Scrapbook and save the *VideoWorks* document. Your animation will be more striking on an all-black screen, so turn off the light switch next to the speaker button in the Panel window. Click on the first castmember to select it, and choose Place from the Options menu (or use the ⌘-T shortcut). Center the image on the screen and add the first frame of your an-

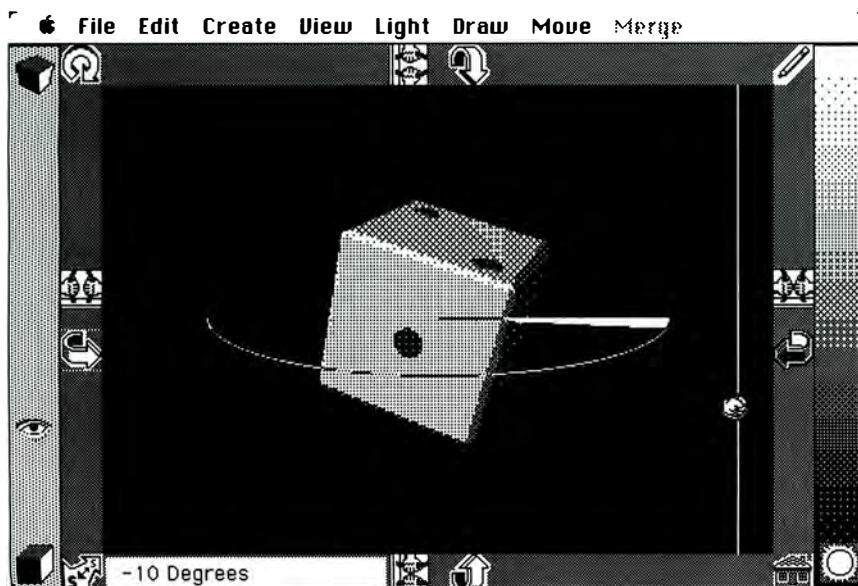


Figure 1

Easy3D revolves, rotates, and resizes objects, saving you the time-consuming task of redrawing each frame of an animated sequence. The program also lets you adjust a scene's lighting to produce fade-outs or other special effects.

imation by selecting Add from the Options menu (or pressing ⌘-A). Click on the second castmember and select Switch (or use ⌘-E) from the Options menu; the image on the screen switches to the currently selected castmember. Then add the second frame to your animation with the Add command (⌘-A) and repeat the select, ⌘-E, ⌘-A routine for all the remaining castmembers (see Figure 2). When you get to frame 16, your task is finished.

Movie Time!

You're about to be rewarded for your efforts as an animator. Rewind to frame 1 and select Play. As you watch your film, you can adjust the speed and add special effects and perhaps a sound track. If you wish, you can touch up your images in CheapPaint or add footage; you might want your animation to feature a pair of dice, for example. To lengthen your creation from a short subject to a feature-length film, you can return to *Easy3D* and continue shooting where you left off.

If you found this an easy project, you may want to try a more ambitious animation. Transferring images with the Scrapbook is convenient, but its 4K-per-image limit may cramp your style. Fortunately, *Easy3D* lets you save larger images as *MacPaint* files; simply hold down the ⌘ key before and during the selection of a Print option from the File menu. You could thereby save a series of *MacPaint* documents rather than Scrapbook images and paste them into *VideoWorks* with the Art Grabber accessory.

Although *Easy3D* speeds up the *VideoWorks* animation process considerably, the steps involved in revolving, rotating, and resizing an image over and over can be tedious. There is hope, however. At the time of this writing, Affinity Microsystems' *Tempo* macro-writing program wasn't fully compatible with *Easy3D*. Perhaps a future release of *Tempo* or a similar program will enable animators to automate some of the drudgery of moving three-dimensional objects.

While a 512K Mac is certainly adequate for the task described here, a Mac Plus or a Mac with a megabyte or two of memory could run both programs with the *Switcher*. A hard disk would greatly reduce creation time and give your *VideoWorks* file virtually unlimited space. A hard disk, a megabyte of memory, plus a macro-generating program would add up to a very impressive desktop animation station.

Just as movies run the gamut from *Daffy Duck* to *The Sorrow and the Pity*, applications for 3-D animations are varied. A designer could fly the viewer around a model of a product, giving an idea of its overall look. An animated logo might add extra punch to a presentation. Producers of TV commercials could do mock-ups of animated ads before taking their ideas to the big animation houses that charge \$10,000 per sec-

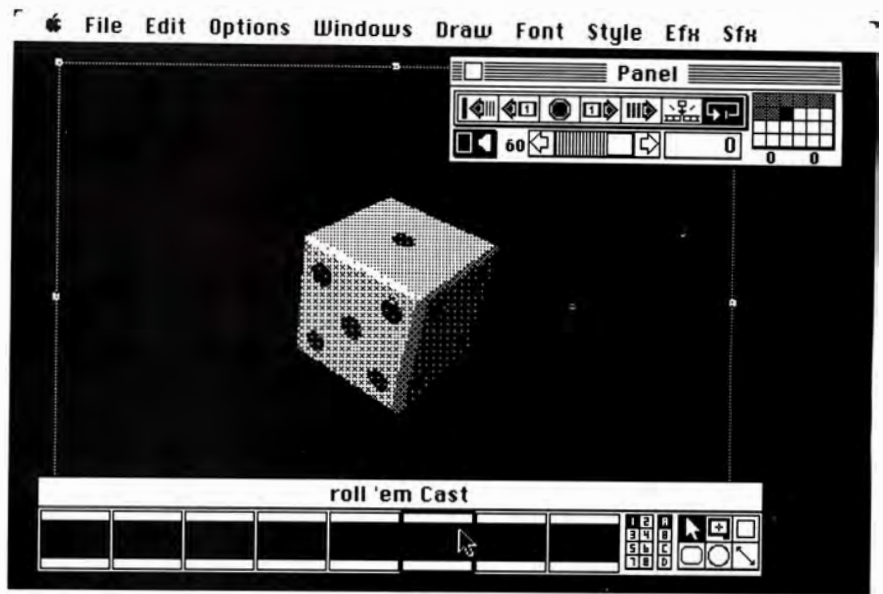


Figure 2

Once you've pasted a Scrapbook full of *Easy3D* images into *VideoWorks*' Cast window, you're ready to put together an animated movie. Since the images were automatically centered in the Scrapbook window, you can simply replace one frame with the next using the Switch command.

ond of finished animation. Or you could just sit back and delight in letting your computer take you flying through three-dimensional worlds of your own creation. □

Mark Stephen

Pierce was one of the founders of Macro-Mind, where he drew, animated, and coauthored his way through *VideoWorks*. He also created the animated artwork for Silicon Beach Software's *Dark Castle* and is currently working on an *Easy3D* art disk for *Enabling Technologies*.

Easy3D, version 1.00

Enabling Technologies, Inc.
600 S. Dearborn St. #1306
Chicago, IL 60605
312/427-0408
List price: \$99

VideoWorks, version 1.0

Hayden Software Co., Inc.
650 Suffolk St.
Lowell, MA 01854
617/937-0200
List price: \$99.95

So You Want to Be a Software Developer

Robert Buderl

On the wall of his office, Trip Hawkins has hung the ten commandments of television production. The founder and president of Electronic Arts, one of the leading software game publishers, Hawkins feels the list has some insights to offer the computer industry. He especially points out the tenth commandment: "And never forget, all hits are flukes." Says he, "It's really true about software."

Few industries have captured the entrepreneurial imagination like the world of computers. Fueled by the fires of such companies as Apple Computer and Televideo, the Silicon Valley and its counterparts around the country became the scene for firebrands looking to ride one idea to glory and fortune. When the bubble burst and many companies went downhill fast, entrepreneurial optimism didn't flag. It simply switched gears: to software.

Today, hundreds of programmers are looking to promote their ideas—the spreadsheet that's better than anything Lotus or Microsoft can muster, the word processor that outperforms *MacWrite* at half the cost. And more programmers are jumping into the game every day. But what is the market really like? What are the chances of success for someone who has come up with a new application idea? For software in general, no matter what machine, the answer is not particularly encouraging.

By nearly all estimates, creation of a moderately sophisticated package—production, manual writing, initial marketing, and so on—takes a full person-year

and costs at least \$150,000 to \$250,000. Some say twice that. Venture capital is increasingly difficult to obtain. Software tends to sell in unpredictable spurts. And there's still Hawkins's fluke factor to contend with.

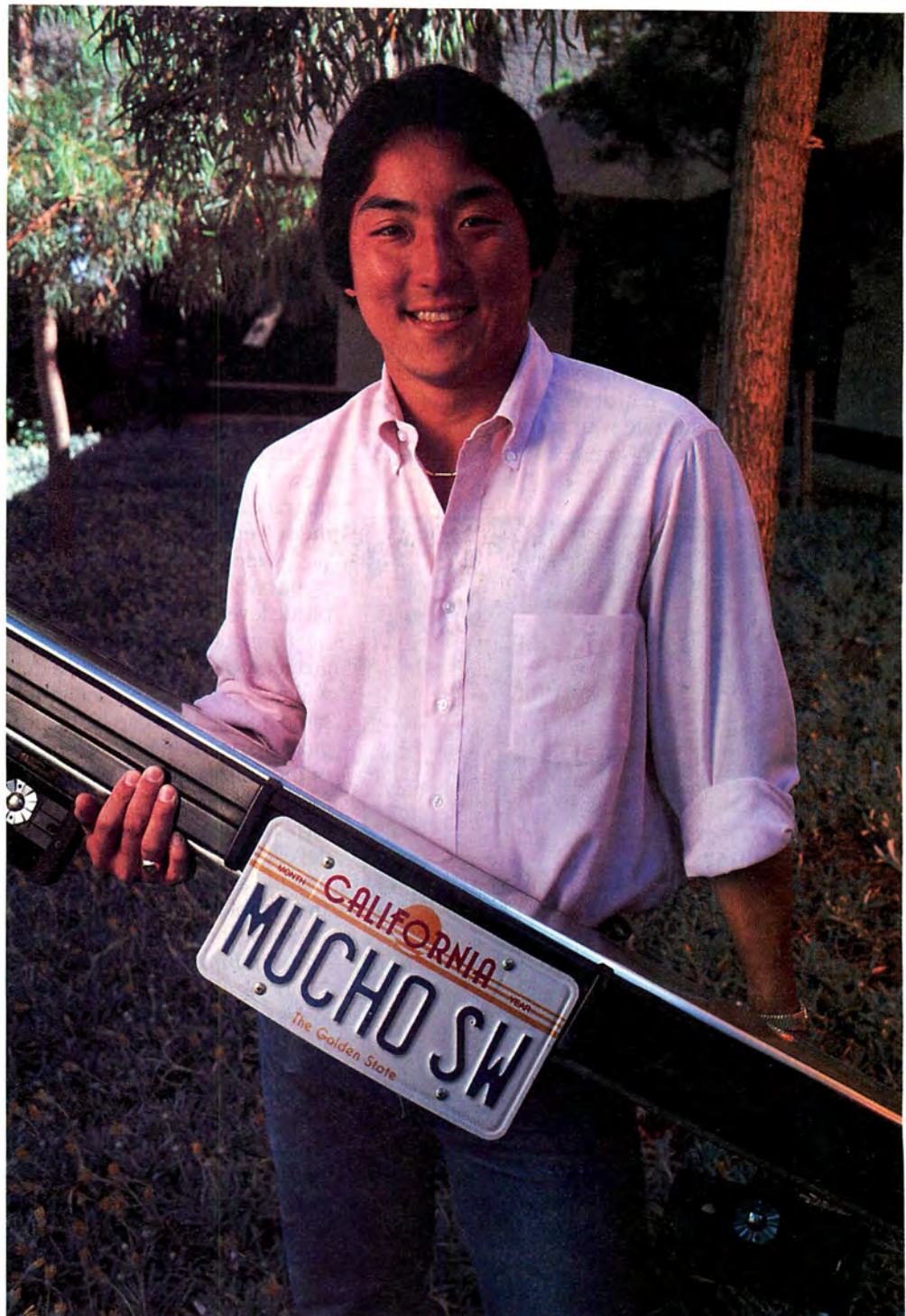
The Mac software market, which by many estimates peaked more than a year ago and was in an extremely precarious situation early this year, perked up significantly with the introduction of the Macintosh Plus. Apple is rumored to have sold about 30,000 of the computers in February—up from the estimated 18,000 of previous months but down from the 50,000 to 60,000 the company thought it would sell monthly by this point. That's the good news. Here's the bad: as in the automotive or consumer electronics industries, a few major players dominate the industry. An InfoCorp survey concludes that the top three Macintosh publishers—Apple, Microsoft, and Lotus—account for 66 percent of Mac software sales.

The Bright Side

Still, there are a few rays of sunshine for small, independent developers. Most people, even those citing the bleak aspects of the market, also feel a good product can't be kept down. But some things have changed since the early days. A runaway hit might still bring in millions, but the total will more likely be \$500,000. And that product will truly have to blaze new trails, either by introducing a radically new and powerful con-

.....

Apple's Guy Kawasaki helped Mac software grow from a handful of programs to over 1200. Kawasaki's group can give a big boost to developers, offering comarketing, referrals, and demos—as long as the product fits in with Apple's marketing plans.



cept to computing or by filling an untapped vertical niche. Daniel Chaifetz, president of Odesta Corporation, which publishes *Helix*, believes that the Macintosh market is saturated in terms of conventional applications. "The only directions left in software are true innovation and continuing to add value to existing products."

Matt Cobb, manager of Apple's developer marketing group, notes that some 1000 Mac programs are now available. "You definitely can't be the fifth- or seventh- or tenth-best product in a category and hope to be successful."

A solid product, combined with a careful study of the potential market, can still be a success without being a hit. Notes David Hindawi, president of Software Ventures in Berkeley, California, and producer of the *MicroPhone* communications package, "If you come out with a superb product and price it reasonably, then you should have a chance of making it." Adds Cobb, "I can't think of a good idea or a good product that's failed miserably. Most of those that failed were just bad products."

You can get a boost by aiming your product to fit in with Apple's own strategic marketing plans, say in desktop publishing or the university market. In that way you might be mentioned at Apple's presentations or be invited to demonstrate your software at events like the Macworld Expo or Comdex. Classic examples

are Aldus's *PageMaker* and Infosphere's *MacServe*, which are featured in many of Apple's presentations. Guy Kawasaki, manager of Apple's software product management group, says, "We comarket, we demo, we refer as much as we can to all the products that fit our marketing plans."

Getting Started

So how do you best go about making your product concept into a reality? When the Macintosh was introduced, just two development languages were available, Lisa Pascal and Microsoft BASIC. Now there's a bewildering array of more than 25 languages; many offer advantages in one area of programming, like speed, at the expense of another area. Kawasaki even recommends an alternative to developing programs from scratch: database application generators like Blyth Software's *Omnis 3* and Odesta's *Helix*. While they assume little technical knowledge and allow you to customize menus and provide dialogboxes, these programs are good at setting up only limited and specific tasks, such as legal billing.

Probably the best advice for selecting a language comes from Apple's manager of tools and languages, Dan Cochran, who has an entire presentation geared to hopeful Macintosh programmers. Cochran suggests talking to user groups and checking the word on the street. Other important ideas to consider are the reviews in Macintosh magazines; the documentation, upgrade, and support policies; the user interface; and the solvency of the company producing the language.

Widely recommended for prototyping is Macintosh Pascal, which allows you to get to know, at a simplistic level, what it's like to write Mac software.

Concurrently with choosing a development language, you should locate the reference resources you will need to pick your way through programming. The same people who can help choose a development language—special interest groups (SIGs) at user groups, or the Software Entrepreneurs' Forum (an educational forum for independent developers in Palo Alto, California)—can provide advice on all phases of software development. On-line services like CompuServe also provide a public forum for exchanging information and troubleshooting technical problems. But first and foremost, a requirement really, is the purchase of *Inside Macintosh*, published by Addison-Wesley. This \$79 book affords the most complete look at the Macintosh's workings as they apply to programming and also provides shell programs to get you started. Kawasaki says, "*Inside Macintosh* is to the Mac what the Bible is to Christianity."

There are other sources, as well, and Apple will send a complete list of available materials to anyone interested in programming for the Macintosh. The company also provides basic marketing information in the form of brief notes dedicated to specific subjects, such as advertising, trademark information, and how to



Veteran programmer Bill Parkhurst: "I've come to rely on my own abilities to solve programming problems, as opposed to having to wait a day or two to get an answer from technical support people."

reach dealers and user groups. Apple has an MCI Mail address for other marketing-oriented questions.

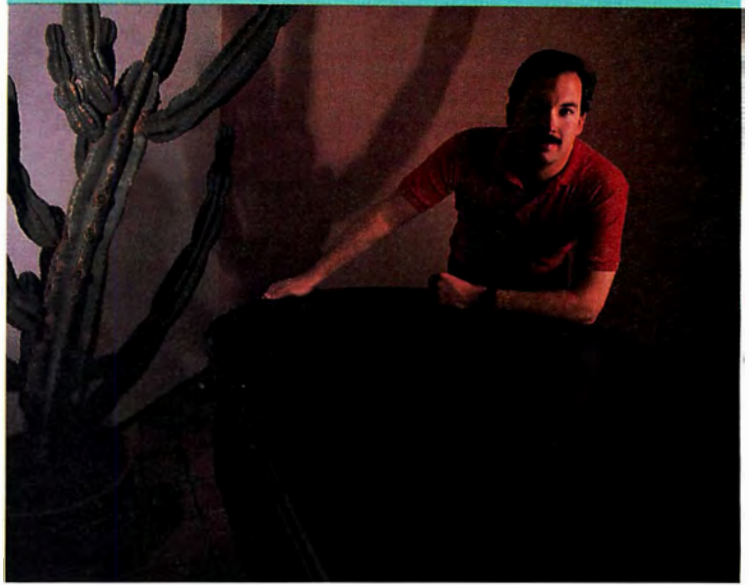
Apple can also help in other ways. If possible, you should become a certified or registered Apple developer. There are some 6000 certified developers for the Apple II series and the Macintosh. Certification costs nothing, but you must submit a detailed business plan and fill out a credit application. Once certified, developers can purchase hardware at 50 percent of the retail cost, and they receive update mailings, invitations to seminars and conferences, plus free technical support through MCI electronic mail.

Registered developers, of which there are about 1200, pay \$595 (\$795 for both Macintosh and Apple II) per year for comprehensive technical support and receive a 50 percent discount on hardware. Apple encourages registered developers to visit and provides a private hot line for quick answers to technical questions. Registered developers also have access to technical notes stored in a database on AppleLink, Apple's on-line communications service. In addition, Apple supports a public bulletin board (called Apple Developer) on MCI and a private one (CRTDEV) for certified developers.

Of course, a 50 percent discount on equipment will help any developer. While many developers feel the company has helped greatly, some are frustrated by the way Apple handles its developer program. Veteran programmer Bill Parkhurst, author of *ClickArt Effects* and coauthor of *ThinkTank 512* for the Mac, couldn't get accepted initially and had to buy his Macintosh at retail price. Registration was still denied after he had two Mac products on the market. Parkhurst and others say the fact that nontechnical clerks handle the applications hurts the process. "Clerks generally aren't good judges of the quality of an application or its viability in the marketplace," he states.

Technical support is also an important issue for software developers. Programmers usually want immediate answers to their technical questions. "It's hard to shift focus when you're working on something and run into a problem," says Parkhurst. Because the most knowledgeable technical support people at Apple are often difficult to reach, most programmers resort to trial and error to troubleshoot problems. "Apple was willing to be extremely helpful, but the people who were providing the help for the most part didn't have as much knowledge as we did," says Tom Firman, president of San Francisco-based Enterset, which produces desk accessories and a spelling checker—*MacGAS*.

A voice of enthusiasm is Dave Winer, president of Living Videotext and producer of one of the Macintosh's most successful programs, *ThinkTank*. He says Apple has been helpful in the past and is getting even better. For instance, the new Mac Plus didn't run *ThinkTank* at first, and when Winer complained, the company made modifications that resolved the problem. Chris Crawford, author of Mindscape's *Balance of Power*, was also impressed with the quality of technical support.



Matt Cobb, manager of Apple's developer marketing group: "You definitely can't be the fifth- or seventh- or tenth-best product in a category and hope to be successful."

Apple manager of developer services Sherri Morningstar says that AppleLink should help to reduce the response time to queries of registered developers. "With such a high volume of requests for information, we have to do as much as possible electronically." The AppleLink system contains the most up-to-date information and an index so you can search for specific entries applicable to a problem; the system also includes electronic mail facilities.

More help comes from Apple's special offerings, like Macintosh seminars and MacCollege. There are two seminars: an introductory affair provides an overview to the structure and design of Macintosh applications, and a programming seminar includes both lectures and hands-on practice. The seminars take place periodically around the country and cost \$325 for the one-day introduction and \$665 for the three-day programming workshop.

MacCollege is a three-day, \$500 lecture and work session—but it's not for everyone. Says Kawasaki, "MacCollege is a college, it's not an elementary or high school. It assumes advanced knowledge. It's for people who're trying to finish a product." He claims three days at the college is like 30 days of on-your-own programming.

With the groundwork laid, you must be prepared to commit time and money to development. Almost no one makes it with venture capitalists any more. "It's really tough," says Bruce Daniels, president of Singular Software, which publishes *Interlace*. "And it's even tougher for the Mac market." David Hindawi compares

the venture capitalists to Hollywood producers overwhelmed with screenplays. "Everybody has an idea, and I think the venture capitalist has become jaded about those ideas," he says. Apple's own Venture Capital Fund—supposedly easier to deal with than a real venture capitalist—is funding only about five companies during this year. And while Microsoft is still committed to high-end Mac products, last October it discontinued its MacLibrary, which published five low-end software packages developed outside the company. (The one exception is *Flight Simulator*, the only low-end program that Microsoft continues to promote.)

Therefore, developers often now have to attract private investors or reach deep into their own pockets. But even with initial funding, problems can arise that require more cash. Rick Barron of Affinity Microsystems, in Boulder, Colorado, originally estimated that his product—*Tempo*—would ship in four months, but it ended up taking more than a year. Twice he had to raise more money to pay for the delays, and he even offered advance purchasers their money back. "I didn't pay myself for months and months," he states. And one time things got particularly desperate. "By the time I got a check in my bank, my water and my electricity were supposed to be turned off the very next day."

Marketing Concerns

Presuming you find the financial resources and actually develop a product, you still have your work cut out for you; without skillful marketing a product will die on the vine. This is a change from a year and a half

ago, when people snatched up nearly anything available; to be successful in the current market requires a deft touch. The first consideration is whether to publish and market software yourself or to work through a publisher. Not surprisingly, the former choice costs a lot more, but the returns are much better—sometimes as much as 100 percent of retail sales versus 10 to 15 percent of wholesale if you work through a publisher.

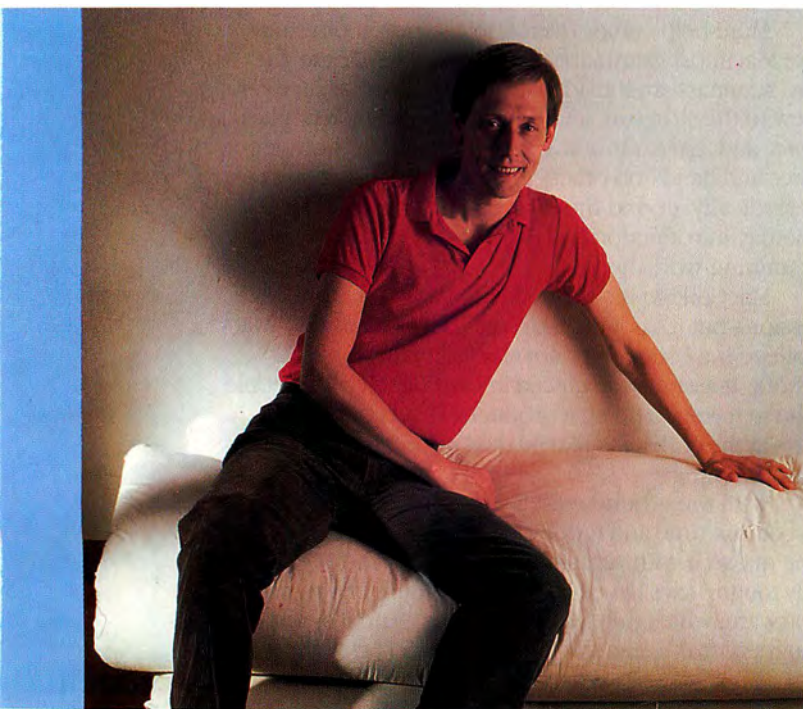
The answer, says Matt Cobb, depends on your product. With a horizontal, or general, product, it's probably best to let someone else have the headache of marketing against Microsoft and Lotus—or maybe you can sell it to one of those two companies directly. But a vertical, or niche, product is a different story. Cobb says, "If you're the world's best expert on dental management, it's probably best to publish that product yourself."

If you do your own marketing, be forewarned that retail channels simply don't work well for a newcomer. Cobb estimates that computer dealers derive only 5 to 7 percent of their revenue from software and therefore don't push software well. Cobb and others haven't heaped praise on software retailers, either. The general conclusion: retail outlets no longer work unless you have one of the most visible, best-selling products—an *Excel* or a *MacDraw*. With self-publishing there's also the decision of whether or not to use a distributor, which presumably has access to the big retail channels. The top three distributors for all software are Softsell, First Software, and Ingram. But they are reluctant to order from newcomers, who offer unproven programs and might not be around if customers want their money back.

But even if you slip through the cracks and work a distribution deal, you may find yourself at an extreme disadvantage. Says Ed Colligan, marketing manager of Assimilation, of Los Gatos, California, "Unless you have an established product and an established reputation, you're going to have a tough sell." In such a climate, to cut a deal with a distributor sometimes means giving up 60 percent of sales revenue. Even then, marketing is left to you. Apple's Matt Cobb concludes, "That whole process, distributor to dealer to customer, is very hard and very expensive, and there isn't room for many new products in that channel."

What is required, then, is an alternate way of self-marketing a product. Nearly everyone who makes it these days does so with some variation of a strategy credited widely to Borland International. The basic premise is to forget initially about retailers and distributors and to build name recognition slowly through vigorous public relations, trade show presentations, direct mail, and well-placed advertisements.

Companies lining up behind such a strategy, at least in part, include Enterset, Affinity, Singular, Software Ventures, and Living Videotext. After trying the



"There's a whole new concept waiting to be discovered," believes Enterset president Tom Firman, "and the person who discovers it is going to do really nicely."

The Shareware Solution

While higher-end products generally require sophisticated marketing, some developers, especially those with games and utilities, have a low-cost alternative known as *shareware* or *payware*.

Under this concept, a program is distributed freely to user groups and on-line services. There is no copy protection, but users are asked to mail a contribution if they like the program and plan to use it. The idea is attractive. But does it work?

The answer, according to Scott Watson, is yes. Watson, author of the communications program *Red Ryder*, claims to have sold more copies of his program via the shareware method than all other Macintosh communication programs combined. A message that appears when you start up the program clearly states that the program is not a freebie and that a fee of \$40 is requested after 45 days if you decide to keep the program. The fee entitles you to the program documentation and information about upgraded versions. "I want people to evaluate my product before they decide to

buy it," says Watson. He views the purchase of his product as a subscription. "The more people who purchase *Red Ryder*, the more I'm inclined to improve it."

Steve Young's experience was not nearly as profitable as Watson's. Young and his wife, Debbie Willrett, developed *Backgammon* for the Macintosh. The program was nifty and generally unflawed. They made about 15 copies and distributed them to user groups and magazines. In the section "About Backgammon" (under the picture of the Apple on the Mac menu), they left their names and address and asked users to please send whatever they thought it was worth.

Young says he received letters from as far away as the Australian outback. The amounts enclosed ranged from \$2 to \$25. One man in India simply mailed him a calendar. All told, however, the financial return was disappointing. Says Young, "In terms of the money, it's a negative. It wasn't really worth the time." However, he adds, the letters were their own re-



Red Ryder author Scott Watson's advice to others considering the shareware path: "Don't be afraid to break the rules."

ward. Says he, "It's been a lot of fun."

As you might expect, people are more inclined to pay for serious software that they use often. And, as Watson says, "Shareware products are not very different from commercial ones—you can't give away a lousy program, and you can't be successful without being a good marketer."

more traditional approach, Enterset, for example, began direct-mail and mail-order campaigns to end users, with the incentive of a money-back guarantee.

Many companies augment this general strategy with their own ideas. For instance, Living Videotext focuses on corporate sales. By visiting companies and offering demonstrations, it hopes to enlist its own corporate sales force operating through word of mouth. President Winer has also identified a group he thinks is vital to Macintosh software sales. "It's the managers and decision makers and, believe it or not, presidents of major companies," he explains. "It's amazing how many of them have Macs. Sell it to the president, and let it trickle down." Rick Barron, who says he got the idea from Regis McKenna, cites a variation of this approach. In McKenna's book *The Regis Touch*, the pub-

lic relations king advocates selling an idea to industry leaders and letting it seep to the masses.

Another Borland strategy—and it, too, is being employed—is to avoid copy protection. Some people resent copy protection. Notes Firman, who has released four Mac products, "We put in copy protection on the first program, and the magazines beat us up." He pulled back but notes, "It's a real dilemma, because I think piracy on the Macintosh is as high as it's ever been in the computer industry." The deciding factor against copy protection: no protection scheme today stands up against a program like *Copy II Mac*, so why annoy people? Even Borland has been hard hit by piracy of its collection of desk accessories, *Sidekick*.

The firms interviewed say such marketing strategies pay off. Once customers start asking for a product, it's much easier to get into distributor channels and retail stores and cut better deals. And after the initial outlay of capital, these firms claim sales income supports them. A really successful product can even, as in the case of Borland, enable you to turn publisher yourself.

Both Hawkins and Campbell, publishers themselves, argue that publishers are worth the money. First, by providing capital, they take the financial worry out of developing software. Second, marketing expertise and access to distributors and retailers make up for sales lost when developers sell applications themselves.

But even getting a publisher is rough in today's climate. "The independent has to seek out the strength of a publisher, so we're seeing the number of submissions go up," says Campbell. As a result, he adds, "We're being excruciatingly selective." Such a bottleneck means fewer cash advances. And royalties have come down from close to 20 percent to 15 percent or lower. Still, that means a runaway hit—200,000 copies at the very high end—can earn a developer as much as \$600,000. To help improve chances of a hit, Hawkins

If you are accepted by a publisher, however, don't jump on the deal. "If they don't absolutely love your product, they're probably not going to sell it very well," says Marc Canter, president of MacroMind, of Chicago. And there are other factors to consider. MacroMind, developer of *MusicWorks* and *VideoWorks*, had its publisher withdraw from the market recently. Canter is still convinced that publishers are a boon to sales, but he has a few words of advice: retain your trademark and the right to review elements such as packaging and manuals. An agent might help in cutting such deals.

Despite problems involved in Macintosh software development, some people see a bright light ahead. The reason for optimism is the soaring sales of the Macintosh Plus and the promise of new hardware from Apple that will create new opportunities for developers.

● ● ● ● ● ● ● ● ● ● Robert Buderl is a reporter for the Time-Life News Service.

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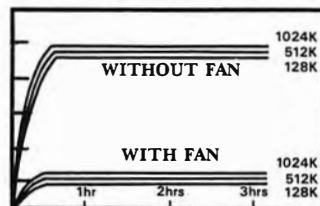
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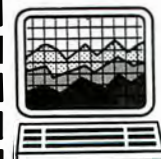


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Gassée Steps into the Limelight

Apple's R&D chief, Jean-Louis Gassée, comments on everything from the open Mac to Steve Jobs's departure to the French reputation for l'amour.

Unlike last year, when the spotlight at Apple was dominated by president John Sculley's reorganization of the company and ouster of Steve Jobs, this year research and development commands center stage—and the star of the show is a newcomer: vice president of product development Jean-Louis Gassée.

Gassée's role at Apple is a critical one. As head of the newly unified Macintosh and Apple II development groups, his job is to forge a strategy that positions both product lines in the market in a coherent fashion. Gassée is also in charge of developing the new products Apple needs to capture a piece of the IBM-dominated business market and repel the incursions of Atari and Commodore into its strongholds in the home and education fields.

In an effort to turn around its less-than-stellar performance of last year, Apple

handed Gassée the largest research and development budget in the company's history—\$122 million, up 70 percent over last year. Between this September and next, Gassée will add a hundred members to his engineering staff.

Before he was cast in his leading role by Sculley last year, Gassée was already something of a star as head of Apple's most successful overseas sales operation, Apple France. Under Gassée, Apple consistently outsold IBM in France, accounting for a fourth of Apple's international sales in 85 countries. Including his time at Apple, Gassée has some 18 years' experience in the European computer industry, working for subsidiaries of such companies as Data General, Hewlett-Packard, and Exxon Office Systems.

Gassée has a master's degree in math from a French technical university. His experience until now, however, was in sales, marketing, and general management, to which he brought a personality and flair for showmanship that, in addition to making the Mac a success, made Gassée a media figure in France. Correctly gauging the French temperament, Gassée promoted the Mac as a chic computer for creative endeavors and cultivated an elegant personal appearance. He appeared in *Vogue*, in the men's magazine *Lui*, on talk shows, and in commercials for French mineral water. Gassée also published a book, *The Third Apple*, to be published next year in the U.S. by Harcourt Brace Jovanovich, about the personal computer's place in human evolution (the first two apples are Eve's and Newton's).

Besides offering a glimpse of Gassée's ebullient personality, the following re-

marks, culled from a series of interviews, provide some previews of Apple's coming attractions over the next few years.

On the planned "open" Mac

Our users will have a choice. If you want to buy an open Mac, you can do that. If not, then you can buy the original. We intend to keep both simplicity and flexibility with our computers.

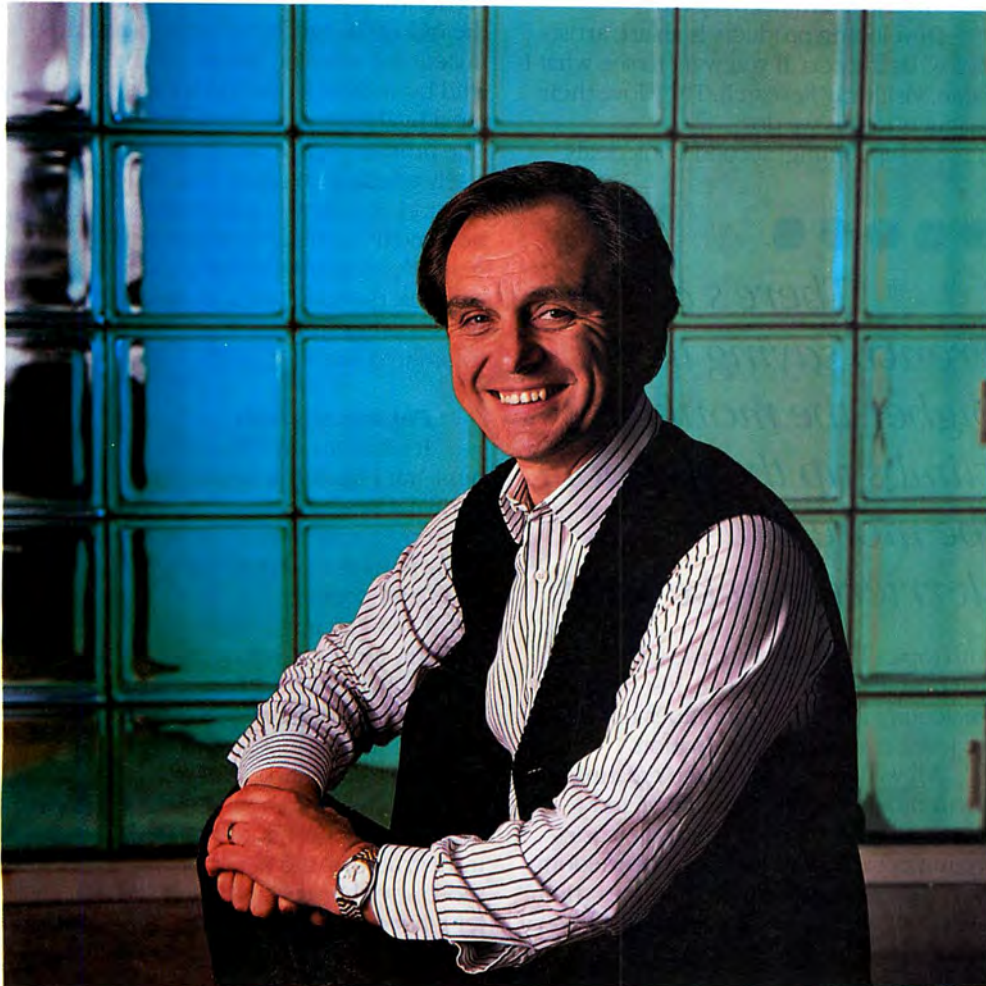
We will continue the product line much as Honda did when it introduced first the Civic and then the Accord into the United States. Each of these is a separate design center. The open Mac will be a new design center of products. We will also emulate Honda's concern for detail—like that saying, "God is into details." Our customers also care for details....

The bus decision has been made—it was made last summer [1985]. We know that we will have to live with our decision for the next ten years. And we know that technology will change much faster over the next ten years than it has over the last ten years. We based our decision on the fact that a bus must have a growth path; it must be stackable and capable of supporting concurrent processors. So we have a bus.

And by the way, there will be UNIX on this product, too, if you want it.

On supporting both the Apple II and Macintosh lines

We have the resources to do this easily. Work on the Apple II usually demands less power, and it is a very effective prod-



As head of product development, Jean-Louis Gassée may hold Apple's near-term future in his hands.

uct, as AppleWorks sales demonstrate. We are going to be providing more power for the II...

It would be too complex to merge the II and Mac product lines. We are not in the business of Swiss Army knives. We know how to trade off flexibility and power, so we will continue to support two levels of operating systems and products.

Competing with IBM

In a competition like that of the personal computer market, going head to head with IBM is a mistake. The lemmings commercial was a mistake. We should worry about taking care of our own users first. A good strategy frees one from the fear of one's competitors; that way you sell

to customers and not to the competition.

I like the approach of the Okura Hotel in Japan. They tell patrons that they are the second-best hotel in the world; they never say who is the best...

MS-DOS windowing software won't drive people out of our market. That's like saying that a woman is interesting because of her physical attributes. The mouse, icons, and windows aren't the only features that make the Macintosh what it is.

On compatibility

The issue is not whether to connect to a mainframe. The real issue is what a personal computer is for. What is the meaning of data communications? The personal computer user wants information—whether it's on mainframes, databases, or other personal computers is not the issue. The

problem is that each time the source of information changes, there are three problems: protocols, physical connections, and the user interface. There must be similar paradigms for accessing all of this data. Menus must list Nexis, Dialog, Dow Jones, CompuServe, and MCI Mail and provide the user with transparent access to each.

Remember: where there is frustration, there is market potential. So we make the investment in research and development. Our development of 327x or other terminal emulation is only phase one. Our goal is to provide access to remotely stored information in a powerful, intuitive way, independent of content, location, means of delivery, and data structure.

On disk drives that read multiple data formats

It's already possible to read both Mac and Apple II disks in our drives with a slight modification, due to the recording method used in Apple products. But to read 3½-inch disks with an MS-DOS format, MFM [the Modified Frequency Modulation recording standard] is needed. This is a less trivial task, but it would be to Apple's advantage to be able to do this—or to read the disks of several computer manufacturers. This is not a tremendous invention, but a nice touch that will make people recognize and appreciate the quality of what we do.

Would Gassée ever work for IBM?

No. I know people that enjoy working there, and I don't want to convey a negative image. It's a great company; I admire them

very much. But I wouldn't work for certain companies—they're too constrained for me; they lack creativity or zest. It's a matter of taste: some like beer, some like wine. I've hired IBM engineers who didn't have blue stripes in the mind.

On the French, love, and technology

The French reputation for love is overrated. There is a confusion between gymnastics and soul—like the confusion between technology and great products. You shouldn't confuse some person, or product, with the technique. If all you have is technique, it wears out eventually. Likewise, if a machine is soulless, you'll feel something is missing.

On Steve Jobs

Steve Jobs is admirable for his way of dealing with impossibilities. He forces you to think two times about what is practical, shaking existing beliefs. That is good; otherwise there is no innovation. Also his love of simplicity and aesthetics.

On Steve Jobs's leaving

Where are the losers in this, in his leaving? He has his riches, his freedom. He has begun again.

His departure was a ritual suicide that he helped to create himself. He could have quit in 1985 and started his company; instead he had to build up to a ritual departure—the founder leaving.

Image problems

Manufacturers shouldn't try for press coverage if they don't want these problems. There is a French saying that the higher the monkey climbs the flagpole, the more of its derriere will be seen.

Regarding Apple's new Cray supercomputer versus its old backer ethic

We have a goal of doing the most broad system simulation possible, so we bought the Cray. Look at Japan, at NTT, Toshiba, and NEC. They simulate DRAM [dynamic RAM] design on Crays and NEC supercomputers, and look where those technologies are today. A simulation engine

allows you to put more parts of a complex problem inside one head, where you have better design decisions, better aesthetics, better architecture—versus design by committee. The Cray is a single-user computer that will allow advanced design.

Developing products is an art; artists love what they do. If you want to see what I mean, visit Cray Research. They love their products just as we do.

My [upcoming] second book deals



'There's a French saying that the higher the monkey climbs up the flagpole, the more of its derriere can be seen.'

with topics like this—with the false belief that business is not creative. Just because we acquire a big computer does not mean we lose creativity or imagination.

All we have to do is keep creating an environment in which discipline and creativity are balanced. When the basics are impeccable, you have a lot of freedom to try things. Constraints sometimes stimulate creativity. Look at Bach: a cantata every week on schedule.

The future of CD ROMs

Where are the disks that the CD ROM machine will use, like the records that sit next to my record player? The encyclopedia is already on one disk, fine, but what's next? There won't be a big market for the technology until you can envision a lot of disks next to your drive. It will be like the proverbial rabbi on the box shouting "I have answers. Who has questions?"

Microsoft, Sony, Philips, and many publishers are trying to solve the problem of what to do with all those megabytes. By my third book I ought to have the writer's toolkit on a CD ROM plugged into my Macintosh. I'll open a window and look up a thesaurus, *The Elements of Style*, synonyms. . .

The true attraction of personal computers

This concentration on productivity is puzzling. Do we really think we can measure productivity in the information age as Frederick Taylor did with manufacturing in the industrial age, by the mile of text produced? Information should not be evaluated by volume alone. Do we evaluate a meal by the number of calories ingested? The point of personal computers is precisely to enhance content as well as production; in that way, personal computers become true intellectual power tools. The real exhilaration of using good personal computers—and there are quite a few good ones—comes from having work and fun rolled into one.

Personal goals

It's hard to say. I'll stay in the PC business, but I have a fantasy of writing. I'd like to own an eighteenth-century home on the Loire river, maybe not to live in, but to own—to have a place that is meaningful to be in on occasion.

I've been immersed in the computer industry for the last 18 years, and I've been doing what I wanted, but there is no way to know about the future. I joined HP in 1968 and said, This is it. Now this is it. The Valley is fascinating: very open, very specialized, full of opportunities, and extremely incestuous. The concentration of people, the infrastructure, the network are unlike those anywhere else in the world. No matter what preachers of doom say about our industry, I think it's still very young; I can smell it.

In summary . . .

My hope is that we will do things that will get us out of our contradictions. On one hand, the sense of possibilities at Apple is great. On the other hand, we've created some problems for ourselves by generating many expectations that we have not yet met. We will dispel that impression. Image is made by deeds, not by words. □

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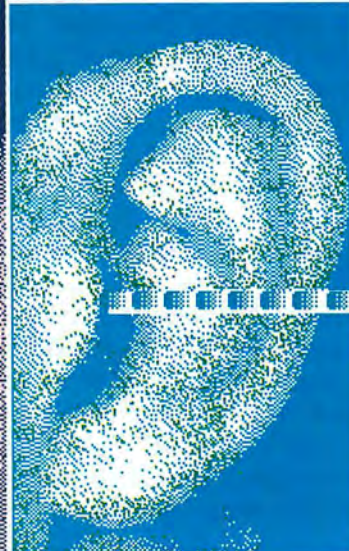
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Is It Live or Is It Mac?

Jim Heid

Among personal computers, the Macintosh has impressive digital sound capability. Its internal four-voice synthesizer and digital-to-analog converter create stunningly realistic sounds. One recently released hardware and software combination lets you digitize and alter sounds directly on the Mac. And when tied into a synthesizer through the Musical Instrument Digital Interface (MIDI), the Mac becomes a controller of concert-quality digitized sound.

Keep in mind that while digital audio equipment samples sound waves 44,100 times each second, the Mac can only make roughly 22,000 samples per second. The Mac's sampling resolution, along with its ability to recognize dynamic variations (changes in loudness) of a sampled sound, also limits sound quality when compared with compact disc equipment.



Digital Delights

Digitized sound is most prevalent in games and music programs, but you can also hear it in presentation programs such as Magnum's *Slide Show Magician* and Hayden's *VideoWorks*. Silicon Beach Software's *Airborne!* game takes full advantage of the Mac's audio technology (see *Macware Reviews*, *Macworld*, September 1985).

Silicon Beach is also venturing into educational software with a spelling program for preschoolers that uses digitized voices. Electronic Arts' *Pinball Construction Set* uses the digitized sounds of bumpers, bells, and flippers when running on a 512K Mac.

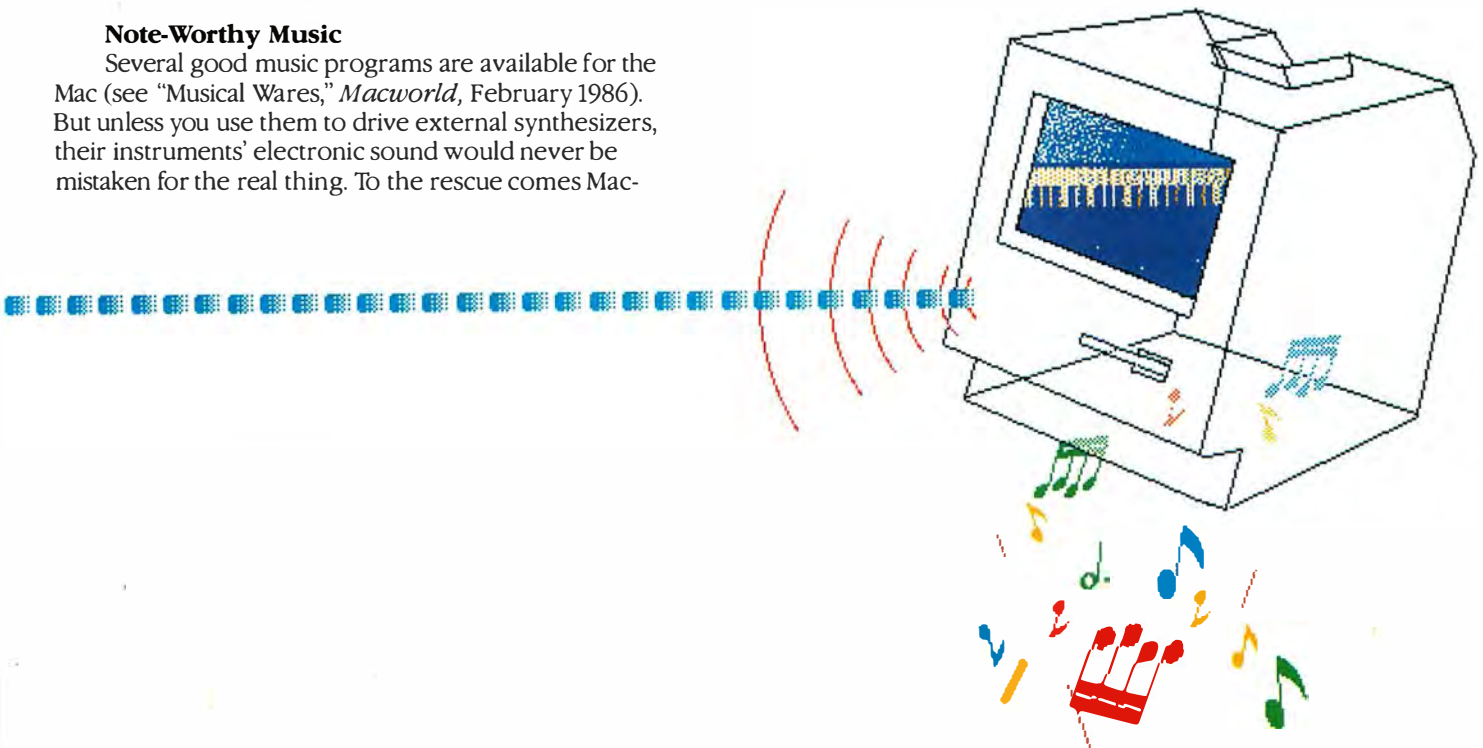
The Mac's internal digital-to-analog converter lets you run programs containing digitized sound with no additional equipment. But since the Mac's speaker isn't designed to reproduce anything more than warning beeps, attaching the Mac to a stereo system or external speakers improves the sound significantly (see *Get Info*, *Macworld*, November 1985).

Note-Worthy Music

Several good music programs are available for the Mac (see "Musical Wares," *Macworld*, February 1986). But unless you use them to drive external synthesizers, their instruments' electronic sound would never be mistaken for the real thing. To the rescue comes Mac-

Nifty Central with *The Studio Session*, the first Mac music program that substitutes digitized instrument sounds for electronically synthesized sounds. In addition to digital realism, programming gymnastics allowed *The Studio Session*'s developers to squeeze six simultaneous voices out of the Mac's sound generator instead of the usual four.

The program's music player turns the Mac screen into a cassette deck complete with Fast Forward and Rewind buttons and six volume meters. *The Studio Session* includes more than 60 digitized instruments, including a horn section, a string quartet, acoustic and electric pianos, a bass, drums, and a guitar. To these you can add your own instruments and sound effects with the MacNifty Audio Digitizer. This combination hardware and software product, which requires a 512K or larger Mac, is available in a package with *The Studio Session*. *The Studio Session*'s music editor fea-



tures a conventional note editor as well as a unique phrase editor that lets you work with musical phrases consisting of any number of measures. The editor provides a large assortment of phrases—various drum beats, bass lines, piano and horn accompaniments—that even those unable to read a note of music can combine to create compositions.

Capturing Sound Digitally

To digitize sound yourself, you need an analog-to-digital converter, which translates sound from a microphone, a tape player, or another source into a stream of bits. You also need a program that stores the bits in the Mac's memory. With the MacNifty Audio Digitizer, which includes both, you can sample a sound and alter it in some fascinating ways.

The MacNifty hardware, which performs the analog-to-digital conversion, is a small box that attaches the Mac's modem or printer connector to an audio source. The software that comes with the digitizer is Fractal Software's *SoundCap*, which captured the sounds for Silicon Beach Software's *Enchanted Scepters* and *The Studio Session*. At its fastest rate—22,000 samples per second—*SoundCap* samples and stores roughly 17 seconds of sound on a 512K Mac with 400K disks. Slower sampling rates let you record up to a minute of sound, but at the price of sound quality.

SoundCap lets you play sampled sounds faster or slower than the original; you can even play sounds backward, add reverberation or echo, cut and paste portions of different sounds together to create new sounds, zoom in on a portion of a waveform to examine its shape closely, or pull out for an overall picture of the sound. *SoundCap*'s oscilloscope displays wave-

forms in real time; attach the digitizer to a microphone or other audio source, and waveforms dance on the screen as the sound changes (see Figure 1).

Besides being an excellent tool for experimenting with sound, the MacNifty digitizer utilities let you substitute sampled sounds for *Studio Session* instruments, create a startup sound that plays when you start your Mac, and replace the Mac's error beep with a digitally sampled sound.

To beef up multimedia presentations, MacroMind offers a utility called *Sound to Video* that lets you add digitally sampled sounds to *VideoWorks* productions. *Sound to Video* is included with the MacNifty digitizer. Magnum Software has also added digital sound capabilities to its *Slide Show Magician* presentation package. Its Natural Sound Cable, which contains the analog-to-digital converter, and *Natural Sound Editor* software let you record sounds and add them to *Slide Show Magician* productions. Magnum also sells disks containing prerecorded sound effects that include fanfares, police sirens, and cash registers.

If you are technically inclined, the Berkeley (California) Macintosh Users Group sells the MacRecorder, a kit consisting of a build-it-yourself digital-to-analog converter and a program that lets you display and modify waveforms. The kit lacks the sound quality and many of the features of the MacNifty Audio Digitizer, but at only \$40 it provides an inexpensive introduction to digitized sound.

A Professional Sampler

The ultimate in Macintosh sound digitizing can be realized by combining Emulator II with *Sound Designer*. The Emulator II is a feature-packed digital sampling keyboard used by professional musicians such as Stevie Wonder, Herbie Hancock, and the Talking Heads' Jerry Harrison. Rather than produce synthesized sounds, the Emulator reproduces the sounds of digitally sampled instruments. You may be playing a keyboard, but you hear a guitar, a horn section, a grand piano, a choir, or whatever sounds the Emulator's memory contains. The Emulator's velocity-sensitive keyboard adds additional realism: by measuring the speed at which keys travel when pressed and adjusting the loudness, timbre, and articulation of the sound accordingly, the Emulator allows you to play with expression. You can split the keyboard into up to 60 ranges and assign, for example, a sampled bass guitar to the lowest octaves and a piano or other instruments to higher octaves.

Once you have sampled a sound and assigned it to a part of the keyboard, you can let the Emulator transpose it, truncate it, or turn it into a continuous loop. Hold a microphone up to a singer, and in a few seconds, you can "play" the singer's voice on the Emulator's keyboard. The unit takes 27,777 samples per second, with 8-bit resolution, but its sound processing provides sound quality equal to that of a compact disc.

Sound Designer software works with the Emulator to let you display and alter the waveforms of sampled sounds and control the Emulator's operation. *Sound Designer*'s sound-editing talents are similar to

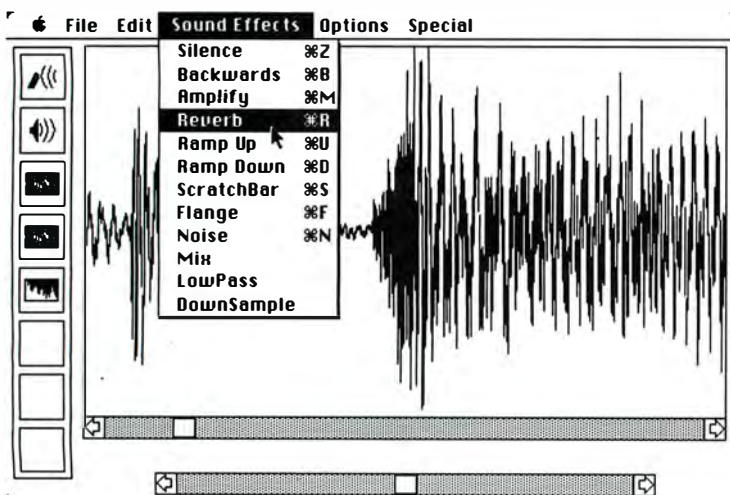


Figure 1

SoundCap lets you sample sounds and alter their waveforms. You can combine sound effects to create new sounds. For example, reverse a sound by selecting *Backwards*, choose *Reverb*, and reverse the sound again. The result: an echo leading up to the original sound.

those of Fractal Software's *SoundCap*, but more sophisticated. *Sound Designer* lets you mix, fade, or loop sounds (see Figure 2).

At about \$9000, the Emulator II and *Sound Designer* combination is a relative bargain, considering that other sampling keyboards with similar features cost from \$13,000 to over \$200,000. MacNifty Central is developing a product that will transfer sampled sounds from the MacNifty Audio Digitizer to popular synthesizers such as Casio's inexpensive CZ-101. This will give amateur musicians Emulator-like features, but probably not the same sound quality, for a fraction of the cost.

An Ear to the Ground

The Mac's digital sound potential depends largely on advances in storage technology. Even the Mac Plus, with a megabyte of memory and an 800K disk drive, can only store a minute or so of sampled sound. The ultimate solution may be compact disks with a capacity of roughly 550 megabytes. You won't be able to save your own sampled sounds on compact disks, but you will be able to choose from massive libraries of sampled sound effects. Optical Media International's digitally sampled sound library, *Universe of Sounds, Volume I*, allows nearly instant access to 536 Emulator II sound files (over 1000 digitized sounds with appropriate Emulator commands) stored on a compact disk. Its files can be edited or processed using Digidesign's *Sound Designer* software. *Universe of Sounds* requires a proprietary CD ROM drive unit with a Macintosh interface, Optical Media's CDS3.

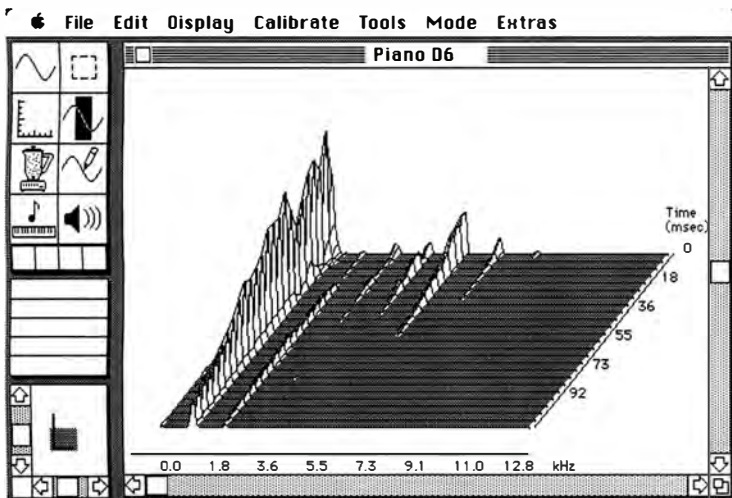


Figure 2

Sound Designer lets you display and alter the waveforms of sampled sounds. This three-dimensional frequency analysis display of a sampled grand piano shows the sound's characteristics over time. The large peak at the upper left represents the sound's initial attack. As the slope of the peak shows, the sound decays with time. The smaller peaks denote harmonics—multiples of the sound's fundamental frequency.

As audio technology makes the transition from analog to digital, computers will play a significant role in the sound reproduction process. With its quick microprocessor and sharp graphics that display detailed waveforms, the Macintosh will be a leader in that evolution. The remarkable sounds that today's products produce are just a hint of what lies ahead. □

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ *Jim Heid is a Contributing Editor of Macworld.*

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Still drawing "Pretty Pictures" with MacProject?

Those in the know have switched from MacProject to MICRO PLANNER PLUS. Apple's own software and hardware engineers have switched to MICRO PLANNER PLUS for mainframe power made easy on the Macintosh™.

From the Venus Orbiter to business startups, managers are switching to MICRO PLANNER PLUS to get projects done on time and on budget.

R.D. Warshawer, his Planning and Scheduling Manager, GTE/Government Systems — from his MICRO PLANNER review:

"My evaluation of the software is that it is a superior package, very user oriented, with good documentation . . . The structure makes the maximum use of the Macintosh™ interface, allowing the user to become adept rather rapidly. Users who are familiar with the networking techniques will find this product falls between MacProject (a low-end planning tool) and Artemis (a super powerful mini/mainframe tool). In fact, this product appears to have similar functionality to the Artemis system . . . **For those who find MacProject inadequate (except for drawing pretty pictures)** and Artemis too much for their needs, MICRO PLANNER PLUS should be an excellent tool . . . One of the most important features . . . is the ability to save the 'plan' and assess progress against the plan as the actual work progresses. The lack of this capability is what makes MacProject's use extremely limited."

From 'Project Management' by Barry Keating, *Macazine*, June 1986

—**"Carl Sanchez, Chief of Planning for the Launch**

Control Systems Divisions of Martin Marietta . . . As an

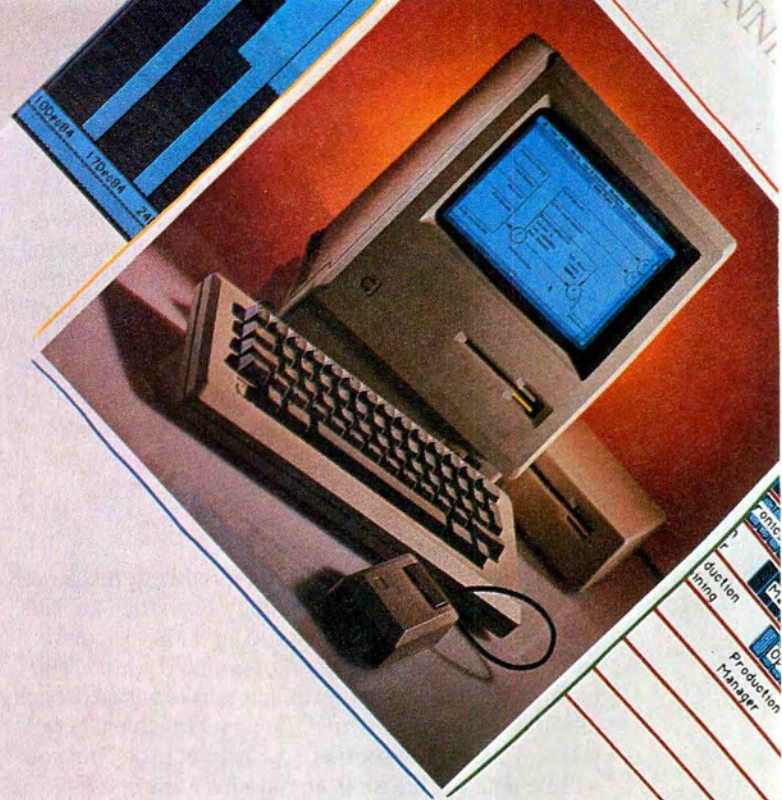
individual who must both plan and control projects, he has used both MacProject and MICRO PLANNER PLUS (as well as mainframe versions of project management software such as Artemis). While he 'cut his teeth' on MacProject . . . Sanchez believes MICRO PLANNER PLUS to be a much more powerful tool for practitioners than MacProject. Many people at Martin Marietta use MICRO PLANNER PLUS not only for its power but because its learning curve is quite short . . . (less than a day for some people) . . . MICRO PLANNER PLUS has the best training curve of the project management software."

Another user who has switched from MacProject to MICRO PLANNER PLUS is Mike Krueger of Natural Intelligence . . . Krueger, like Carl Sanchez, started out using MacProject but soon found that his job required the sophistication found in MICRO PLANNER PLUS. MICRO PLANNER PLUS is . . . being used to develop the schedule for producing Natural Intelligence's first product . . . (software with an expert systems or artificial intelligence capability).

MacProject is a simpler tool . . . not designed to adequately handle . . . reconciling time . . . with resources. **The logic of MacProject is nonstandard** and may cause some early misunderstanding to experienced users.

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Macware Reviews

*Flight Simulator, Slide Show Magician, Calculator
Construction Set, myDiskLabeler, Packer and PacPaint,
MacGolf, Penmouse +, and The Ancient Art of War*

Edited by Erfert Nielson

Flights of Fancy

It's a cold December night. The lights of Port Angeles Fairchild airport appear in the distance. The tower radios that the surface winds are 26 knots and ice is forming on the runway. I check my gauges. The Learjet's tanks are almost empty; there's no time to find a safer strip. I begin my descent, struggling to keep the plane steady against the crosswind. Gusting surface winds push the left wing high into the air, and I'm quickly caught in a clockwise roll. A few moments later, the windshield shatters in a web of shards as the plane plows into the sod.

Fiction? Yes and no. That wasn't a real Learjet I was piloting, it was **Microsoft Flight Simulator**. This all-time classic has finally been released for the Macintosh. Like most things Mac, this version is better than its ancestors. The game lets you choose between a Cessna Turbo Skylane RG II twin-engine prop, a Gates Learjet 25G, and a World War I biplane. The realism is unmatched, thanks to crystal-clear three-dimensional graphics, synthesized sound effects, and an authentically rendered control panel.

Flight Simulator works with all Macs, but 128K machines don't run the World War I flying ace simulation, nor do they provide sound or access to the situation library. The game comes on one copy-protected disk. You can make backups, but you must have the original handy when running the copy. *Flight Simulator* works only from the Mac's internal disk drive and can't be placed on a hard disk.

Fasten Your Seatbelts

Flight Simulator's action takes place in two windows. The bottom window is the control panel, comprising all the instruments required for instrument flight rules flying. The top window, the display view-screen, lets you look out the front, side, or back of the plane (see "Cleared for Take-off"). A zoom feature provides a close-up

of the scenery, as if you were looking through binoculars. Another option displays a bird's-eye map of the area you're flying over. A feature new to the Mac version is the spotting view option, which lets you watch your plane from the airport

(continues)



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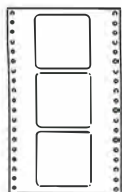
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Macware Reviews

tower, from another plane, or from a ground-based tracking vehicle.

When the game starts, you're at the end of runway 27 at Oakland International Airport. It's winter but the air is warm and the sky is clear. You can select a new season from the Enviro menu, which also establishes environmental conditions such as wind speed, wind direction, turbulence, clouds, and fog. *Flight Simulator* automatically chooses the Cessna prop plane for each new simulation, but you can select the jet or the World War I Ace game at any time. You can also turn down the volume or turn the sound off; however, the realistic sound effects—from the thrum of engines as you fly to the screeching of tires as you land—add drama to the game.

You pilot the plane with the help of the Mac's mouse. Choose menu commands with the pointer, or double-click in the display window to transform the mouse into a control yoke. Pressing the mouse button while dragging the mouse up and down advances or retards the throttle. Moving the mouse without depressing the button controls the ailerons, elevators, and rudder. It took me some time to get used to piloting by mouse, but after a while it became second nature.

The Simulated World

Flight Simulator lets you fly anywhere in the United States, but the game provides only five populated areas equipped with landing strips: New York/Boston, Central and Northern Illinois, Seattle, Los Angeles, and San Francisco/Oakland. All told, there are 118 airports to visit—38 more than in the IBM PC version. Each location is mapped out in a 143-page manual that covers the basic theory of flying and supplies

detailed instructions for piloting the game's planes. The manual includes a glossary, an index, and suggestions for further reading.

Flight Simulator's attention to detail isn't confined to the manual, but extends to the game's scenery. For example, many airport scenes include recognizable landmarks. You can see—and crash into—the Statue of Liberty and the World Trade Center when flying in New York, the Golden Gate Bridge when passing over San Francisco, or the Sears Tower when cruising above Chicago.

Once you've mastered the basics of piloting your aircraft, you'll want to move on to more advanced aspects of the simulator, such as instrument flying. Numerous directional and nondirectional navigational beacons are scattered throughout the populated areas. You may have to rely on instruments when flying at night or through heavy clouds and fog. After some practice, I landed the plane using *Flight Simulator's* VOR, ADF, and ILS instrumentation only—I purposely closed the display window and couldn't see a thing.

Flight Simulator is a game, after all, and like most games it lets you record settings for use later on. You can save any number of situations on a separate disk for future play. One of your situations might be climbing to 5000 feet and stalling out. Or you can set up an approach to one of the airfields and practice landing.

Just Like the Real Thing?

Flight Simulator for the Macintosh is by far the best flight simulator available for a personal computer. But it's not perfect.

(continues)

Cleared for Takeoff

The *Flight Simulator* screen is divided into two sections: display and control panel. This display window shows the view out the front of the plane. You can look out the sides or the rear of the aircraft by tapping a key.



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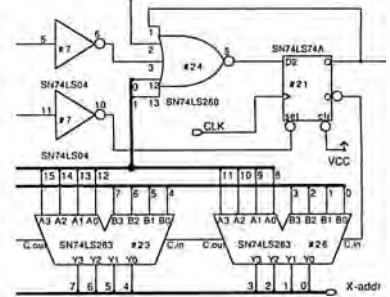
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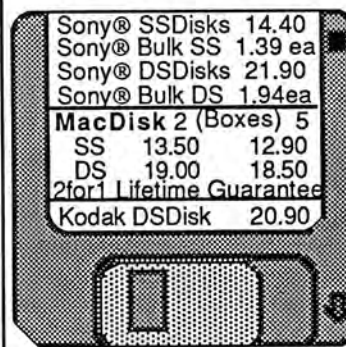
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One of the game's biggest problems is occasional glitches in the scenery. Sometimes the program gets ahead of itself, momentarily forgetting or distorting graphic elements.

Serious fliers will find the Learjet simulation lacking in realism. (Microsoft doesn't deny this.) The Learjet uses many of the same instruments as the prop plane, some of which—like the carburetor heater control and oil temperature gauge—don't apply. Real turbine-powered planes provide separate controls and gauges for each engine, but *Flight Simulator* gives you just one set. However, these minor flaws do little to detract from the excitement of slipping through the skies in an impressive facsimile of flying. In the realm of Macintosh games, *Flight Simulator* is a winner.

—Gordon McComb

Microsoft Flight Simulator

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Show Time!

If one picture is worth a thousand words, then dozens of *MacPaint* documents must be worth a book. Add professional-looking transitions between images, narration, and realistic sound effects, and the result literally speaks volumes.

The latest version of *The Slide Show Magician*, Magnum Software's venerable presentation graphics utility, lets you add sound to full-screen "slide shows" of *MacPaint* drawings, digitized images, or screen dumps from most applications. You can add an impressive array of special effects, insert text into each frame, make a self-running or user-prompted presentation, segue from one show to another, and even draw on the screen while the show is running.

You can add sound to a presentation in three ways. Magnum's *Natural Sound Editor* disk, purchased separately, includes Apple's Speech Lab, a utility for adding narration in *MacinTalk*'s robotlike synthesized voice. Crowd noises, a ringing telephone, a fanfare of trumpets, and other effects come with *Natural Sound Effects*, a three-disk

set of digitized sounds. The combination of Magnum's Natural Sound cable, the *Natural Sound Editor* disk, and a portable tape recorder lets you record a digitized voice-track or a musical accompaniment.

A Sound Investment

These goodies don't come cheap. While the program itself is a reasonable \$59.95, the cable and editor put you back \$129.95 and the sound effects another \$39.95, for a total of \$229.85. You'll also need a portable tape recorder to record sounds directly, or a BCR adapter to use the Natural Sound cable with a tape deck.

A slide presentation complete with sound can take up an enormous amount of disk space, so the more storage you have, the better. While the program works with one drive, two are better and a hard disk is best. Each full-screen picture weighs in at 10 to 14K, so it's best to save the images on a document disk. The real memory eater, however, is digitized sound. The narration for an eight-page children's story I produced took up only 8K using *MacinTalk* sound files; the same story occupied a whopping 116K with digitized sounds.

The Studio

Before you make your first *Slide Show Magician* presentation, it's wise to plan out the entire show, perhaps with storyboards. Draw a thumbnail sketch of each frame in



MacPaint and jot down your plans for special effects, text, timing, and narration or sound effects. Then create the images themselves in *MacPaint*.

Once the drawings are complete, putting a show together is a straightforward process. The program provides six screens: Edit, Special Effects, Buttons, Pointers, Text, and Sound. You add frames to a show on the Edit screen. On the Special Effects screen (see "Wipe Out!") you add effects such as fades, wipes, or dissolves and set the speed at which the effect occurs. The window shade wipe moves from one frame to another like turning the pages of a book. The checkerboard wipe fragments a picture into squares that magically transform into the next picture. Or you can choose the arrowhead, barndoor, iris, jaws, or venetian blind wipes.

The Buttons screen gives the viewer control over a frame. You can make buttons any shape or size, or even make them invisible. With an invisible, full-screen Next button, the viewer clicks the mouse anywhere to segue into the next image. GoTo buttons branch to a different frame, allowing you to set up interactive presentations such as quizzes with multiple-choice answers.

The Pointers screen offers three pointer shapes—arrow, hand, or pencil—in two sizes. The pointers can click buttons or draw on the screen during a presentation.

At the Text screen you choose a font and style, how quickly you want the text to appear, and whether it appears all at once or one word at a time.

Garbo Talks!

The Sound screen lets you add narration or sound effects to a show. Each frame holds up to seven sound files in any combination of *MacinTalk*, digitized sound, and canned sound effects.

The most efficient way to add a sound track is to tape all of the sounds first, create and edit the sound files with the *Natural Sound Editor*, and then add the files to your show. I got the best quality reproduction by taping narration on a stereo tape deck and then playing back the tape on a portable recorder connected to the Mac with the Natural Sound cable.

(continues)

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Natural Sound Editor records in two modes. Hi-Res gives the best fidelity, but the files take up twice as much room as standard files. In standard mode, the digitized narration I created for a talking storybook took a total of 116K. A Hi-Res version would have taken 232K—more than half a disk. Standard mode works fine for narration, but you need Hi-Res for music.

Sound files, once created, can be edited. To shorten a file, for example, you might delete pauses. The program also lets you mix sounds or add reverberation and echoes. If you want to edit minuscule sections of a sound file, the Raw Bits feature works on sound segments 1/20 second long.

The Envelope, Please

Slide Show Magician has many applications. While the program is aimed at commercial and business users, it could also be great for home activities. The program is copy-protected, but you can make bootable, self-running copies of finished shows. Home applications could include extravaganza greeting cards complete with messages in your voice, quiz shows for older kids, and talking storybooks for younger ones. Business applications could include product demos and instructional presentations. Sound and special effects are bound to make any Mac presentation an attention grabber. —Carol Johnson

Slide Show Magician, version 1.3B

Magnum Software

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List price: *Slide Show Magician* \$59.95,

Natural Sound cable and Natural Sound Editor disk \$129.95, *Natural Sound Effects (three disks)* \$39.95

Calculator Under Construction

Remember the golden age of calculators, when there was a model to suit almost every mathematical taste? If you were part of those days of hip pocket sized wonders, you undoubtedly had a favorite make and model. Do you find yourself wishing that you could replace Apple's painfully plain desk accessory calculator with something more closely resembling your trusty old electronic one? If you know what you want in a desk accessory calculator but can't find it, take a look at Dubl-Click Software's **Calculator Construction Set (CCS)**.

You construct a calculator with CCS by moving parts from the nearly bottomless PartsBox onto a calculator shell and then specifying how the parts function. For example, you use two generic key types, A-keys (alphanumeric) and F-keys (function), to represent basic calculator components such as the ten integers; common constants; the decimal point; and various mathematical, data entry, memory, and list functions. Once you place an A- or F-key within a calculator shell, you select the key's function with the Plug tool (see "Build Your Own"). A third generic key, the M-key (macro key), creates new functions by combining two or more A- and F-key functions in a preset sequence. After you assign a key's function, click the Plug tool again to assign the calculator key a convenient keyboard equivalent.

CCS offers predefined keys for things such as toggling output to a printer or disk file, changing a number's sign, calculating annuity and present/future value, displaying the current date or time, and operating

an alarm clock and a stopwatch. You can select single or multiple displays, as well as a scrolling "paper tape" with a 25-line memory. Displays show the current input/output or any of five memory registers, and can be preset to one of a number of formats (decimal, binary, dollars, yen, and so on). You can toggle displays between different registers or formats.

Customized Calculations

If you're looking for something completely different, the rectangular calculator shell stretches or shrinks and fills with a standard or custom pattern. You can select one of ten stock calculator pointers (various hands and arrows), or make your own. CCS lets you create a custom logo, relabel any key with text or graphics, or use the program's uppercase-only Austin Font to type anywhere on the calculator shell.

Each calculator operates in one of two ways. The first, usually called Standard Algebraic Notation, is the same as that used in the Mac's calculator, and is usually favored by casual calculator users. It works much the way you would on paper: you key in the operation to be performed before the operand and find the result with the equal key. The other mode, called Reverse Polish Notation (RPN), is familiar to anyone who has used a Hewlett-Packard calculator and is preferable for performing complex calculations. In RPN, there is no equal key. Instead, you place the initial number of the calculation in memory with an "enter" key and key in operations after the operand. RPN calculators for the Mac have never been easy to find. Thus, for people who prefer RPN, CCS's ability to build a wide variety of RPN calculators adds significantly to the program's appeal.

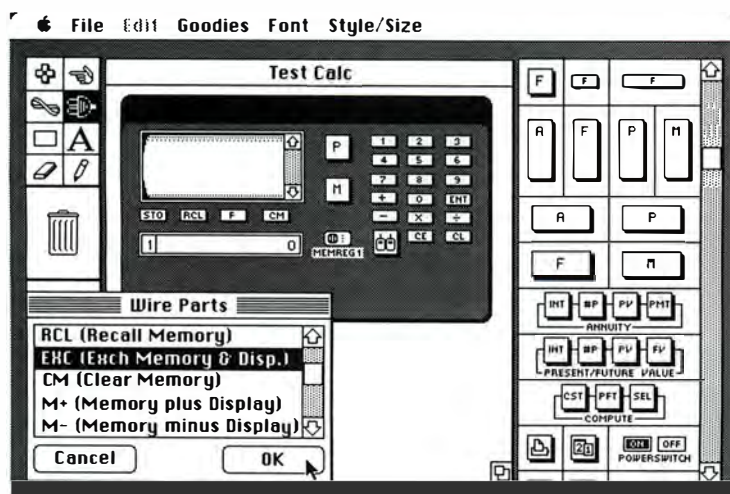
When you have completed a calculator, you can save it either in Apple's Font/DA Mover format or as a self-installing desk accessory file. Calculators can move freely from disk to disk.

Functional but Flawed

Unfortunately, not all the news about CCS is good. The version I tested had a few bugs, and it didn't always work correctly when installed on a HyperDrive. The man-

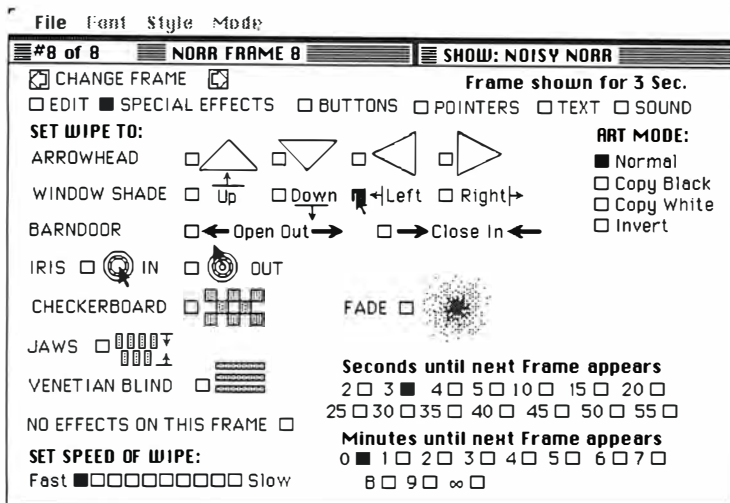
Build Your Own

Calculator Construction Set's program window contains parts on the right, tools on the left, and the calculator shell and work space in the center. Here, a generic function key is being assigned (or "wired") to the exchange memory function with the Wire Parts window.



ual is difficult to use and, despite a detailed errata sheet, still contains errors. There is no grid to help you align keys, and the Clean Up command simply crams your carefully arranged calculator keys into the smallest possible shell. Furthermore, CCS's stack for RPN calculations contains fewer registers than do popular HP calculators, thus making it impossible to duplicate them exactly. Don't get me wrong. Although it has limitations, *Calculator Construction Set* is a unique tool, and many people will find it useful. Perhaps some of the program's limitations will be addressed in future versions. Version 2.0, due out this fall, will allow you to construct HP 12C to 41C and Texas Instruments Business Analyst calculators. —Robert C. Eckhardt

Calculator Construction Set, version 1.03D3
 Dubl-Click Software
 18201 Gresham St.
 Northridge, CA 91325
 818/349-2758
 List price: \$59



Wipe Out!

No, this isn't the key to the Mayan alphabet—it's Slide Show Magician's Special Effects screen. The program lets you add professional-looking video effects, such as fades and wipes, to move from one frame to the next.

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(continues)

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The Desktop Journal, a publication of the Yale Macintosh user group, Winter, 1986

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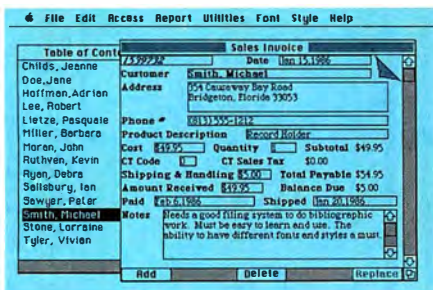
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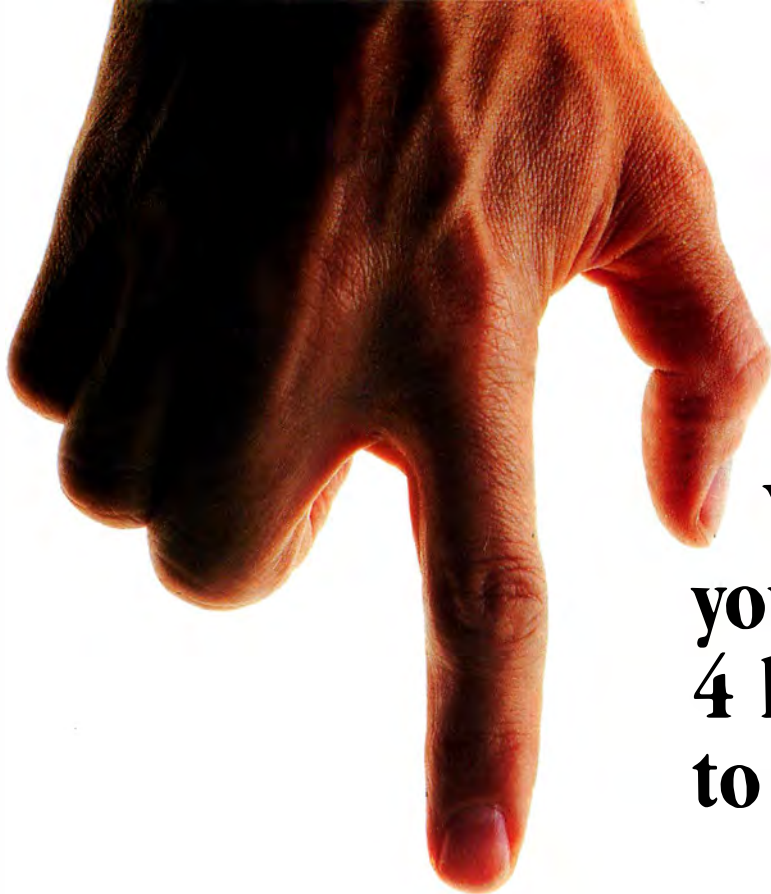
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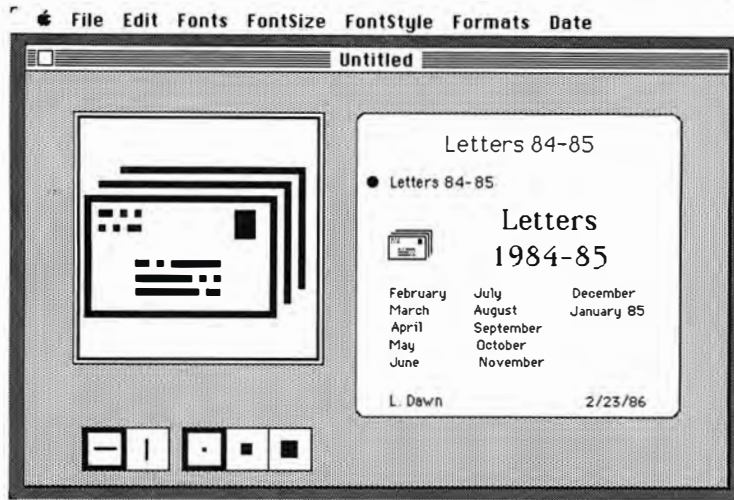


Labor-Saving Labeler

When you open *myDiskLabeler*, an on-screen replica of a wraparound label appears. The label has boxes for the Back Title, Edge Title, Disk Title, Disk Contents, Disk Owner, and Date. The program automatically lists a disk's title and the contents by file or folder. You can also select options that automatically print your name and today's date in the appropriate boxes. *myDiskLabeler* allows you to edit the information in any of the boxes.

Several formats are available. When you select the Simple Label format, the label lists the contents of the disk without an icon or other graphic decoration. The Contents box has room for 18 file or folder names in a 9-point font. You can select any of *myDiskLabeler*'s seven fonts for each of the boxes, but the size of the box may limit you to certain fonts and sizes. With Apple's Font/DA Mover, you can replace the program's fonts with your favorites.

The Large Icon and Small Icon formats provide boxes for creating and editing pictures pixel-by-pixel (see "Label Art"). The tool palette beneath the editing box contains horizontal and vertical con-



straint tools and three pen widths. In addition to drawing an icon or picture free-hand, you can copy an image from the Scrapbook and paste it into the icon-editing box.

A unique feature of *myDiskLabeler* is its ability to grab an icon from an application or an icon library and put it on a label. When you select Grab Icon from the Edit menu, *myDiskLabeler* asks you which application to grab the icon from and presents the available icons in a window. Al-

though the program can't grab an icon from the desktop, it can access icon libraries like the *Icon Switcher Libraries* from PBI Software and the *Icon Collector* from Sofcom.

Although placing icons or pictures on labels personalizes your disks, keep in mind that adding graphics to a label reduces the amount of room available for listing a disk's contents.

(continues)


Label Art

myDiskLabeler lets you add a 32- by 32-pixel or a 64- by 64-pixel illustration to a disk label. You can either draw your own picture or have the program grab an icon from an application.

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When it comes time to print a label, *myDiskLabeler* doesn't make you guess about alignment. The package includes 54 labels that come nine to an 8½- by 11-inch sheet. Crosshairs at the top of each sheet line up with the red ring on the roller shaft and the top of the ImageWriter's print head. When you select Print, a window representing a sheet of labels appears. Click on the first available label, and *myDiskLabeler* prints the label you've designed. A future version will support color printing on the ImageWriter II.

The sheets of labels included with *myDiskLabeler* have an advantage over most commercially available labels in that they are easy to peel off a disk, which is handy when a label's contents become outdated. (Fortunately, the labels aren't so easy to peel off that they come off of their own accord.) This advantage is accompanied by a disadvantage, however: the labels can only be purchased from Williams and Macias.

The King of Labelers?

myDiskLabeler and Ideaform's *MacLabeler* are the only two labeling programs that allow a degree of choice in what appears on the label. *myDiskLabeler* is the more flexible of the two. Like *myDiskLabeler*, *MacLabeler* reads a disk and prints a label, but *MacLabeler* gives you no control over the font or format aside from the ability to choose a border and edit the label's file and folder names.

MacLabeler's distinct advantage is that it sorts and prints a directory of a disk's contents. In addition, *MacLabeler* prints on the label the amount of space remaining on the disk. But if you're looking for a disk-labeling program that lets you incorporate graphics and offers a variety of label styles, then *myDiskLabeler* should be your disk labeler. —Fred Terry

myDiskLabeler, version 2.11

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Spokane, WA 99219

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Ideaform

908 E. Briggs

Fairfield, IA 52556

515/472-7256

List price: \$49.95



Putting the Squeeze on Disk Space

How many times have you tried to save a document and gotten a Disk Full message? Since the Mac's introduction, people have complained about its limited storage space. The advent of hard disks and double-sided floppy disks provided some relief. But the greater amounts of RAM now available inevitably lead to larger applications and larger amounts of data. So we're right back where we started: too much data and not enough storage space.

Salvation has finally arrived. A new type of Macintosh utility compresses data, forcing it to occupy as little disk space as possible. Two such programs, Bobbing Software's **Packer** and Mainstay's **PacPaint**, allow you to pack a data file for disk storage and unpack it when you are ready to use it again.

Data compression saves disk space by rewriting a file and replacing ASCII codes with bit patterns that take up less memory

than the original data. Compression only saves disk space; memory usage remains the same, since a document must be "unpacked" to be used by the original application. Many applications provide some form of data compression, but *Packer* and *PacPaint* often improve on a program's built-in compression scheme.

Packer

Packer works on documents created by a variety of applications, including word processors, *MacPaint*, spreadsheets, and BASIC programs. Compression is most useful on documents that are 10K or larger.

To open *Packer*, you simply select Pack from the File menu and then select the file you wish to compress. As a document is packed, the program provides an animated representation of the shrinking document.

You can either replace the existing document with a packed document of the same name or keep the original document intact and save the packed document under a different name. The second option allows a document to be encrypted and assigned a password. Not even editing utilities will be able to sort out the packed file. This option is valuable for the security-minded user. A word of caution: don't forget your password. You must enter the password, exactly as it was typed originally, to unpack the file.

Packed documents not only save disk space, they save you money when you send the smaller, packed files by modem. However, you must unpack a document to open it with the application in which it was created. To do so, simply select Unpack from the File menu and open the file you wish to restore.

Bobbing Software claims that *Packer* compresses documents to about half of their original size. While this is true in some cases, the amount of space saved varies depending on the type of file. I tested files from a variety of applications and came up with an average reduction of 30 percent.

PacPaint

PacPaint works only with *MacPaint* documents. Like *Packer*, *PacPaint* allows you to keep the original file intact and make a packed copy, or simply replace the original with the packed version.

PacPaint works much like *Packer*. To compress a picture, select Pack Picture from the File menu and open the document you wish to pack. As the picture is packed, the program's Info window constantly updates the size of the new document. The picture scrolls by in the Picture window as the operation proceeds (see "Packing a Picture").

Mainstay claims a 30 to 70 percent reduction in the size of a packed file. I packed a variety of *MacPaint* documents and obtained an average reduction of 47 percent. Since *PacPaint* records patterns of dots in order to compress files, it has little effect on digitized pictures, which are made up of random patterns. A 12K *MacPaint* document created with a Thunder-Scan digitizer was reduced by only 11 percent.

(continues)

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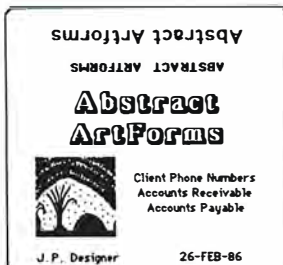
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Circle 374 on reader service card

Once the program completes the packing operation, it saves the new document. You can then select another file to pack or unpack. A handy *PacPaint* feature lets you exit directly to *MacPaint* after unpacking.

Head to Head

Packer is a more useful utility than *PacPaint*, since it compresses different types of documents. If you're only concerned with *MacPaint* documents, however, *PacPaint* is faster and more efficient than *Packer*. When packing a 22K *MacPaint* document composed of various symbols, *Packer* reduced the document 20 percent in 131 seconds, while *PacPaint* reduced it 25 percent in only 32 seconds. Another *MacPaint* document was reduced 49 percent in 127 seconds by *Packer* and 91 percent in 14 seconds by *PacPaint*. This is an extreme example, however; the average difference I encountered was 15 percent in favor of *PacPaint*'s reduction capability.

Both *Packer* and *PacPaint* are useful programs. They are *Switcher*-compatible and small: *Packer* takes up 19K, *PacPaint* 9K. The disks are not copy-protected, so you can copy the utilities to your own disks or to a hard disk. Each one runs on a 128K Macintosh with one drive. I tested both programs on a Macintosh Plus and encountered no problems.

Both utilities do what the manufacturers claim (with significant differences in performance depending on the type of file being packed) and are easy to use. The documentation for both is understandable,

and I encountered no bugs in either program. In my opinion, both utilities would be easier to use and more efficient if they could be installed as desk accessories. *PacPaint*'s speed and greater reduction average make it a better choice if you are dealing only with *MacPaint* documents.

Packer's ability to pack different types of documents as well as its encryption capability make it a good choice for archiving a variety of documents. Both utilities allow you to say good-bye to the cost and inconvenience of too many disks. —Harvey M. K. Lee

Packer, version 1.0
Bobbing Software
67 Country Oaks Dr.
Buda, TX 78610
512/295-5045
List price: \$29

PacPaint, version 1.0
Mainstay Software
28611B Canwood St.
Agoura Hills, CA 91301
818/991-6540
List price: \$39.95

Fore!

The scenic first hole at Shinook Hills is a 363-yard dogleg around a lake. On the tee, the wind is blowing toward the green at 12 miles an hour. Should you play it safe and hit an easy 3 wood down the fairway? Or should you put a fade on a full-powered driver and hope the ball will be carried

around the dogleg and end up much closer to the flag? Such are the decisions facing golfers who tee up with *MacGolf*, from Practical Computer Applications. While it has a few annoying problems, duffers and scratch players alike should enjoy this animated and well-illustrated game.

The beauty of *MacGolf* is its realism. An on-screen golfer swings with a fluid movement. You hear the authentic sound of the club hitting the ball and see the ball bounce, roll, and come to rest. On the greens, the ball curves just as it does in real life—and players will curse themselves for their stupid miscues. Finally, there is the comforting sound of the ball rattling into the cup as you sink a putt, as well as occasional oohs and ahs from the crowd during play.

Teeing Up

The game allows up to four players on the links at any of three levels. Level 1 is the easiest: there is little wind, and the clubs perform less realistically. For instance, the full-powered sand wedge that knocked a ball 60 yards at the first level carries the ball 30 yards at the third level.

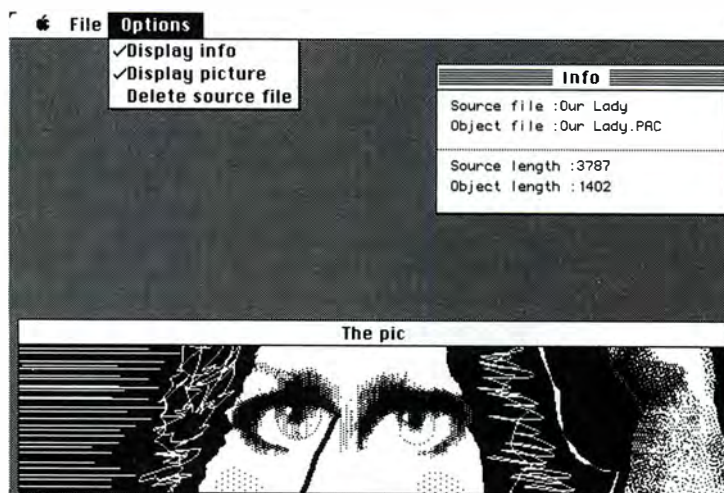
MacGolf offers a choice of two courses, Shinook Hills and Augustina National. Golfers can play the front 9, the back 9, or all 18 holes of either course. In addition to a view of the course, a map of the hole appears on the screen. After a swing, the ball's path is traced on the map, allowing golfers to check their progress and study the overall situation (see "Tee for One").

Before any shot, you must click the View button. If you make no adjustments, the program aims the golfer's swing directly at the hole. If a hazard or a strong wind dictates aiming elsewhere, simple indicators allow you to aim in any direction with a click of the mouse. You can adjust the golfer's stance to put a hook or slice on the ball, as well as control the force of a swing and how far the ball will roll once it hits the ground.

In addition to the adjustments just mentioned, you can make minor changes by moving the angle indicator. This fine-tuning is particularly useful when putting.

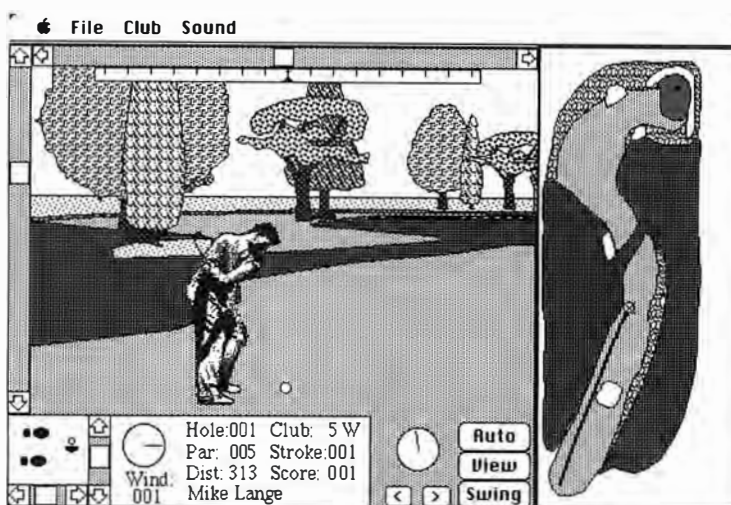
Packing a Picture

PacPaint's Info window shows the size of the original file and the size of the packed version. The *MacPaint* document being compressed scrolls by in the Picture window as the operation proceeds.



As in real golf, you must experiment to get a feel for which adjustments are called for in different situations. For instance, a fully open stance produces a slice strong enough to counteract a 16-mph wind and keep the ball flying straight. However, the ball will roll in the direction of the wind once it hits the ground. On the greens, the wind is no longer a factor. Instead, the wind indicator shows the slope of the putting surface. A full-powered putt travels about 25 feet.

The game offers a choice of 14 clubs: three woods, ten irons, and a putter. As in real life, the ball travels farthest when you use the woods, and distance decreases as you go from the 2 iron down to the sand wedge. Some power clues: a full-powered driver sends the ball more than 250 yards. With the wind at your back, it is possible to approach 300 yards. The standard 7 iron at Level 3 knocks the ball about 160 yards at full power. Put a lot of roll on the ball by moving it closer to the back foot, and it will go a bit farther.



Tee for One

As a matter of course, MacGolf lets you adjust factors such as the golfer's stance, the force of a swing, and which club is used. As in a real game, you must take into account the wind speed and the slope of the putting green. Unlike a real game, you don't have to buy balls to replace those that end up in the lake.

Handicaps

MacGolf's major drawback is that you can't save games. Since a round with two friends can take hours, this limitation is extremely annoying. Nor can you select a particular hole to play; if you like playing the fifth hole at Shinook Hills, you've got to play through the first four holes. Also, golfers can't replay shots, so if you forget to switch clubs and play with the one used on the previous shot, you're stuck. A minor annoyance is the way the program slowly re-

draws the screen each time you change the view—you have to wait while each tree and shrub pops into place on screen. Practical Computer Applications acknowledges such complaints but says it has no plans to resolve the situation.

At \$59.95, MacGolf isn't the best Mac entertainment bargain out there. But for golf fanatics it should provide hours of in-

(continues)

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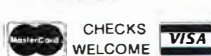
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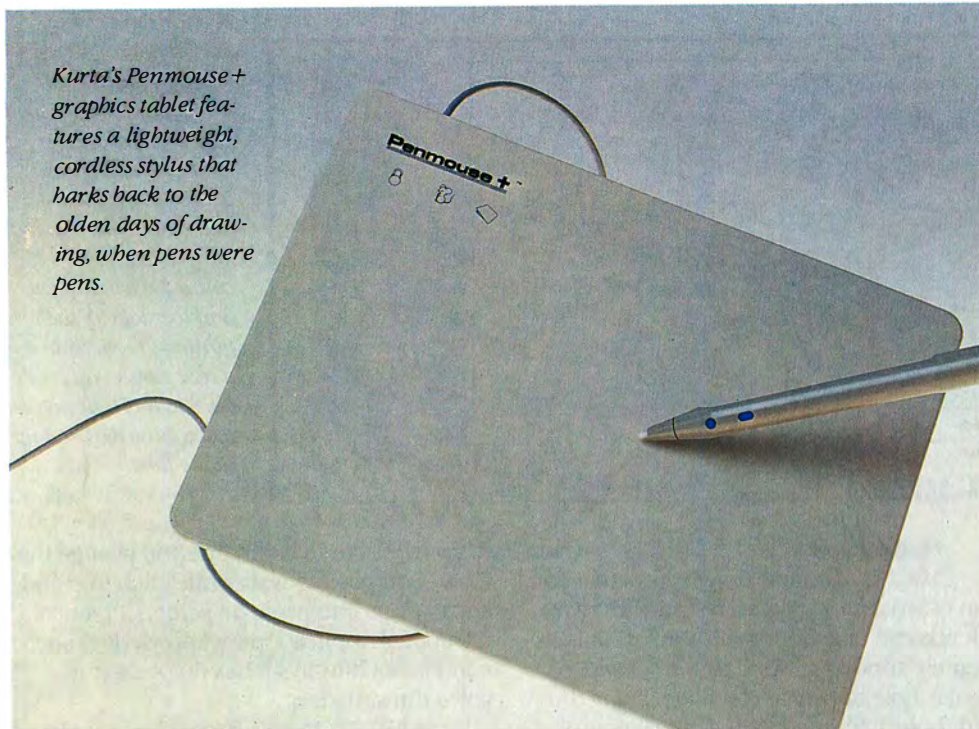
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Kurta's Penmouse+ graphics tablet features a lightweight, cordless stylus that harks back to the olden days of drawing, when pens were pens.

door fun. With the company releasing new courses this summer, you need never be a fair-weather golfer again. —Robert Buder

MacGolf
Practical Computer Applications, Inc.
1305 Jefferson Hwy.
Champlin, MN 55316
612/427-4789
List price: \$59.95

Take One Tablet...

You don't have to be a professional artist to realize that the Macintosh mouse is not the world's greatest drawing tool. As exciting as *MacPaint* or other graphics programs may be, many people have never gotten used to the sensation of drawing with a device that more resembles a brick than a pencil. The mouse's unwieldy design, along with many people's desire for a simple way to trace drawings or diagrams from paper to screen, has created a market for digitizing tablets for the Macintosh.

Digitizing tablets are standard tools in most professional computer-aided design/manufacturing (CAD/CAM) or graphics workstations for engineers, architects, or

animators. The digitizing pad, which is connected to the computer, is usually a plastic or metal tablet that registers the movement of a hand-held stylus across the pad's surface. In most cases, the stylus is also wired to the tablet or computer, a situation that sometimes causes a tugging sensation as you draw.

Kurta Corporation's **Penmouse+** graphics tablet follows these conventions with one significant difference: the Penmouse+ stylus is cordless. The stylus transmits a low-power electronic signal that registers the pen's movement across the tablet surface. The stylus's power is supplied internally by several small batteries, and the tool is relatively light and easy to hold. The absence of wires frees the artist's hand for natural movement.

Simple Installation

With its 6- by 9-inch drawing surface, the Penmouse+ is the smallest Kurta graphics tablet for the Mac. It's also the least expensive, at \$375. (Kurta's more expensive Series One tablets have drawing areas ranging from 8½ by 11 inches to 12 by 17 inches and prices starting at \$545.) Even a low-end model, however, should satisfy some elementary requirements for consistency and ease of use. Apart from a few limitations that I'll note in a moment, the Penmouse+ met those requirements satisfactorily.

Installing the Penmouse+ is easy. The pad itself plugs into the Mac's modem or printer port, and software installation entails simply copying a small program to your system disk, running it once, and turning the Mac off and back on with the disk still in the disk drive. This procedure dedicates the system disk to the Penmouse+, so that disk (or others similarly dedicated) should be used whenever you use the tablet.

With the preliminaries out of the way, the Penmouse+ is activated by clicking the tip of the stylus on the tablet surface. The pointer's movements on the screen now match those of the stylus as it moves on or above the tablet surface. The stylus's signals work from as far away as ½ inch above the tablet's surface, allowing you to trace a drawing from a piece of illustration board or out of a book.

One Mode Fits All

Many digitizing pads have two modes of operation, relative and absolute. Relative mode is familiar to all mouse users: it lets you lift the drawing tool and reposition it without causing the cursor to move on the screen. Absolute mode, on the other hand, works with fixed coordinates: the left side of the pad equals the left side of the screen, and so on. Absolute mode is useful when your task requires precise movements on the tablet, as when you trace an image. It is less ideal for freehand drawing; if your attention is focused on the Mac's screen, you don't want to worry about the location of the stylus on the tablet.

Unfortunately, although the IBM PC version of the Penmouse+ offers both modes, the Mac version provides only absolute mode. The Mac Penmouse+ does offer both a trace mode and a draw mode. Trace mode produces smoother lines than draw mode, at the expense of a noticeable delay between a stylus stroke and the resulting line. However, both of these modes employ absolute coordinates. Just as rolling a mouse around calls for a new set of reflexes, drawing with a stylus on a tablet is not as easy as drawing on paper with a pencil. Your eyes must remain fixed on the screen while your hand moves around out of your field of vision.

If you require the ease of a stylus combined with the relative positioning of a mouse, you'll need to consider products other than the Penmouse+.

The Tracing Challenge

"If you can't beat 'em, join 'em" is sometimes an appropriate policy. Since absolute mode was mandatory and the trace mode was more accurate than the draw mode, I decided to pay particular attention to the tablet's usefulness for tracing. The results were mixed. Since pointer movement is determined by the signal transmitted from the tip of the stylus, the angle of the stylus can cause distortion. The most accurate tracing resulted from holding the stylus nearly perpendicular to the tablet surface, a rather awkward angle.

The Penmouse+ is an attractive product. Its distinguishing features—such as its light, cordless stylus and ability to use the mouse while the tablet is connected—are significant and may satisfy some users' needs. Nevertheless, the absence of a relative (mouselike) mode and the slight time

lag between stylus movement and screen updating in trace mode are factors to weigh before purchase.—*Jay Kinney*

Penmouse+
Kurta Corp.
4610 S. 35th St.
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602/276-5533
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Art of War offers a variety of play options. You can choose from eleven preset campaigns; some resemble historic battles, while others are imaginary. You can adjust the game's level of difficulty by modifying factors such as available food supply, reinforcements, and visibility. In addition, a game generator lets you dream up and play campaigns of your own design.

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(continues)

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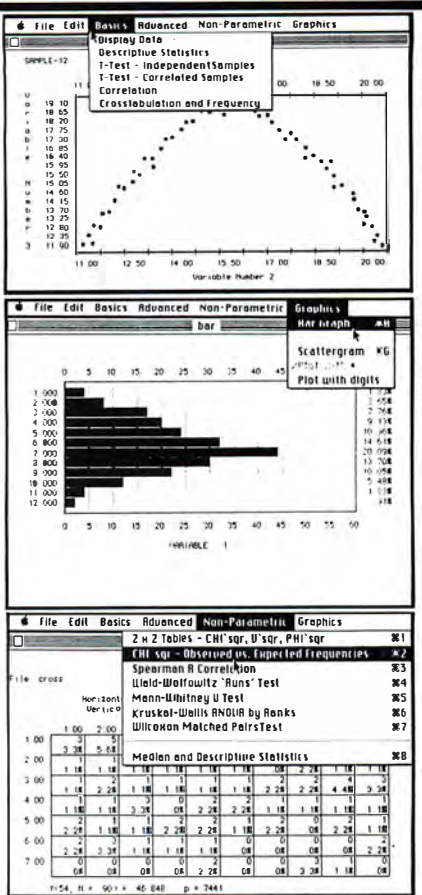
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Macware Reviews

Mapping a Strategy

The action takes place on a map that scrolls across a varied terrain of flatlands, rivers, lakes, seas, forests, mountains, villages, forts, and bridges. At the game's strategic level, you maneuver squads of up to 14 soldiers across the map. When the game begins, friendly squads and opposing squads are deployed in different locations on the map. You decide which squads to move and where to move them to most effectively accomplish the campaign's objective. You can choose the formation the squad will assume before it encounters an opposing squad, detach individual soldiers to form a new squad, or join two adjacent squads into one.

Tactical Control

Unique among strategy games, *Art of War* has a tactical mode that lets you control the action directly during a battle. Instead of merely weighing such factors as numerical strength and a squad's condition and then "rolling a die" to produce an outcome for each battle, the game warns you when a battle is about to start and lets you zoom in on an animated depiction of the battle to take command of your troops. (If you're too busy elsewhere to supervise a battle, the program resolves the conflict automatically.)

The tactical terrain reflects the terrain shown at the strategic level of play but shows greater detail. For example, when you zoom in on a battle taking place on a bridge, the two squads face off on an impressively rendered bridge over a river complete with lily pads and overhanging trees.

You have four types of soldiers under your command: archers, barbarians, knights, and spies. Archers fight with bows and arrows, barbarians with bare hands, and knights with swords and armor. You must consider the different strengths of each type of soldier when you draw up your battle plans: Archers fare best against knights, who provide them with slow-moving targets. Knights fare best against bare-handed barbarians, and barbarians fight most effectively against archers, who are vulnerable at close quarters. During a battle, you can deploy your soldiers only by type, rather than individually.

(continues)



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Unlike the other types of soldiers, spies are completely defenseless and do not participate in battle. Their only advantage is that they can see twice as far as other soldiers, making them useful for reconnaissance. If a squad with a spy in it loses in battle, the spy is captured.

Battle Formations

Art of War lets you choose among 12 battle formations, such as legion, phalanx, rear, wave, wing, and wedge. The game also includes an option for replacing some of these selections with formations of your own design. Many factors affect your choice of formation, including the type of soldiers in the squad and its current objective.

A single campaign should never take more than a few hours to reach its conclusion, so you don't need the superhuman level of patience required in most fantasy role-playing games. The game includes a well-designed manual that leads you through your options as a commander. You can play *Art of War* on a 128K or 512K Macintosh, but the battle scenes are slightly slower on a 128K Mac. You can save games in progress to other disks and save as many campaigns of your own design as disk space permits.

The Ancient Art of War is an engaging game for veteran war-gamers, and its animated battle scenes should amuse players who would not otherwise enjoy strategy games. The game offers so many variations that you can expect it to yield many hours of interest and enjoyment. Long after you have bested Napoleon or Genghis Khan, you can spend hours plotting battle situations of your own or re-creating famous battles with the game generator. I recommend *The Ancient Art of War* as a challenging and unique addition to the Macintosh entertainment software library.

—Armando Lucia

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Open Window

More paper sizes for the ImageWriter driver, shortcuts for navigating the Mac Plus's Hierarchical File System, and more useful tips

Edited by Jim Heid

If your spreadsheets have more columns than a Greek temple, you'll see more of them on a page thanks to a reader's clever use of a modified ImageWriter driver combined with the 50 percent reduction option. Another tip taps the Macintosh Plus's cursor control keys, and two more explore nooks and crannies of Microsoft Word.

But first, a correction and a tip from me on a utility that speeds up LaserWriter printing of MacPaint pictures.

pfs:file to Microsoft File Correction

A bug flew into April's *Open Window* tip "One File to Another," which described how to transfer a *pfs:file* database to *Microsoft File* using *Word* as an intermediary. Instead of typing ^T in *Word*'s Change To box, you should type ^t. *Word* does not recognize the capital T as the code for a tab. We regret any inconvenience caused by this error.

Fast Laser Pictures

MacPaint pictures look great printed on the LaserWriter, but *MacPaint* has some inconvenient shortcomings: you can't specify the number of copies you want to print, and you can't change the page setup to enlarge or reduce images. I recently located a utility on CompuServe's MAUG called *FastPrint* that overcomes these drawbacks. *FastPrint* speeds up the printing of documents containing a great deal of white space, and it provides Page Setup and Print dialog boxes that let you take better advantage of the LaserWriter's capabilities. *FastPrint* is stored as FSTPRT.BIN in MAUG's Data Library 1 (Software).

A Reducing Plan

Lon Poole's instructions for adding custom paper sizes to the ImageWriter driver are valuable (see *Get Info*, *Macworld*, January 1986), but there's more to be said. People who produce large database reports and spreadsheets need some sizes that weren't in his table of definitions. The values in Table 1 define a new paper size of 22 by 8½ inches. Here's how to use it.

- Change the type size of your worksheet or database report to 14-point. (You can't do this in *Multiplan* and many database managers; check your manual.)

- Choose Page Setup, select the 22- by 8½-inch paper size, wide orientation (the icon showing a horizontal figure, if you're using the latest ImageWriter driver), and 50 percent reduction.

When you print, you'll get a remarkably legible 7-point text. If it's too small, however, use 9- or 10-point text with no reduction.

David Wilson
Laguna Beach, California

In case you missed January's Get Info, this trick involves using the ResEd resource editor to alter the PREC 3 resource in the ImageWriter driver. Start ResEd and open the ImageWriter file by double-clicking its name. Locate resource type PREC, open it, and then double-click the line labeled PREC ID = 3. You'll see a hexadecimal display resembling the one in "Custom Sizes." The fourth byte in the first line tells you how many paper-size

(continues)

Wide Paper Dimensions

Text	Hexadecimal code	Height by width	Hexadecimal code
22 × 8.5	08 32 32 20 78 20 38 2E 35	22 by 8½	0A50 03FC

Table 1

To fit more spreadsheet columns on a page, you can modify the ImageWriter driver to define a new paper size of 22 by 8½ inches, change the type size of your worksheet or database report to 14-point, and then print using the 50 percent reduction option.

Open Window

buttons are enabled—five in this case. Next follows a list of six paper sizes, defined in 8-byte chunks; the vertical dimension appears first (in 4 bytes), then the horizontal (4 more). For example, the 4 bytes at the end of the first line and the 4 at the beginning of the second line are 05 78 and 03 DE. In decimal, this equals 1400 and 990, the vertical and horizontal dimensions—in 120ths of an inch—of European A4 paper.

The characters following the list of page dimensions define each button's label (Computer Paper, U.S. Letter, and so on) and its length in characters. You can decode these notations using the ASCII table in the back of your ImageWriter manual.

To add a custom size, change the button-counter value from 5 to 6. Next, edit the size definition for button 6, specifying the vertical dimension first. To determine the appropriate size values, multiply each dimension by 120, then convert the resulting number to hexadecimal (see Table 2). Finally, create a label for the new button. Insert the hexadeci-

mal values corresponding to each character in the label before the values 01 C0 in the last line of the display, and remember to precede the label's text with its length in characters.

Incidentally, some applications override the settings in PREC 3; Jazz, for example, contains a higher-priority PREC 4. To customize paper sizes for one of these programs, edit PREC 4 in the application. The resource's structure is the same.

Button Counter	00 05 05 28	03 FC 05 78
	03 DE 06 90	03 FC 05 80
Paper Sizes	03 DE 05 28	06 90 01 EF
	03 FC 09 55	53 20 4C 65
	74 74 65 72	09 41 34 20
	4C 65 74 74	65 72 08 55
	53 20 4C 65	67 61 6C 15
Button Labels	49 6E 74 65	72 6E 61 74
	69 6F 6E 61	6C 20 46 61
	6E 66 6F 6C	64 0E 43 6F
	6D 70 75 74	65 72 20 50
	61 70 65 72	01 C0

Custom Sizes

When you open the ImageWriter driver's PREC 3 resource, you'll see a hexadecimal display resembling this one. The fourth byte says five paper size buttons are enabled. Next follows a list of six sizes, in 8-byte chunks, then characters for each button's label (Computer Paper, U.S. Letter, and so on) and the label's length.

Finally, if a resource editor is not your cup of tea, check out a program called Page Setup Customizer, available from MAUG's Data Library 1 as PSC2.PIT or from many user groups. It lets you add custom paper sizes without the hassles of hex. —Ed.

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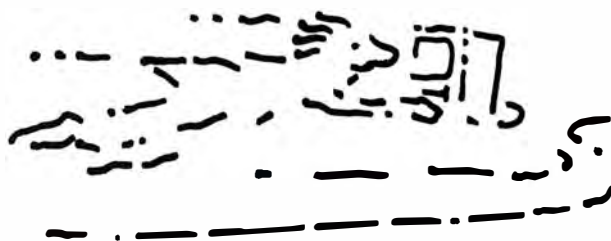
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Decimal	Hexadecimal
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F
16	10
17	11
18	12
19	13
20	14

Table 2
Decimal to hexadecimal conversion

The Keys to Folders

While working with my Mac Plus, which uses the Hierarchical File System, I've found some handy keyboard equivalents for navigating folders and files.

When you choose Open or Save, you see a dialog box containing a menu that lets you access the contents of other folders. I've found that you can move within the hierarchy by pressing **⌘** along with the up or down arrow keys. When you find the folder you want, pressing Return opens it. You can then use the arrow keys without the **⌘** key to select files. The old shortcut of typing the first letter or first few letters of a folder or file name still works, too.

Brian Ripley
Ponca City, Oklahoma

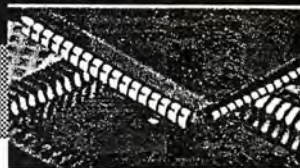
Sizing Up Word

Most *Microsoft Word* users change font sizes by using the Character menu's Formats command. *Word*'s Quick Reference Guide describes another method: pressing **⌘-Shift-<** to decrease the size and **⌘-Shift->** to increase it.

(continues)

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Open Window

What the reference guide doesn't describe is how much more flexible this technique is. Say you have a document with an 18-point headline, 12-point text, and 10-point footnotes. Selecting the entire document, then pressing ⌘-Shift-> enlarges each element by one size, giving you a 24-point headline, 14-point text, and 12-point footnotes. By contrast, changing sizes using the Character menu means altering each size manually.

This trick is especially useful when you're using LaserWriter fonts, which can be hard to read on screen—especially in italic. Simply type everything two or three point sizes larger than what you'll use in the final product. Before printing, use ⌘-Shift-< to bring everything down to size.

*Jonathan Lawton
Riverside, California*

A Search Party

I've discovered some subtleties in *Microsoft Word's* search-and-replace feature that make it extremely versatile. Most *Word* users know that you can find text you specify in the Find or Change windows and then substitute new text you type in. You can also search and replace by selecting the appropriate buttons in the Change window.

What isn't common knowledge, however, is that you can locate particular text using the Find or Change windows and then substitute the contents of the Clipboard by pasting. The value of this technique is that it effectively gives you two Change To boxes. Once *Word* locates and highlights the text, you can change it to the text you specified in the Change To box or to the text on the Clipboard.

This technique is especially handy for changing paragraph formats, which are stored in the paragraph markers (¶) that show up when you choose Show ¶ from the Edit menu. *Word* doesn't let you paste a formatted paragraph marker into the

Change To box, but you can cut or copy one to the Clipboard. You can then search for paragraph markers by typing ^p in the Find What box, and paste the new paragraph marker from the Clipboard.

*Vicky Jo Varner
Los Angeles, California*

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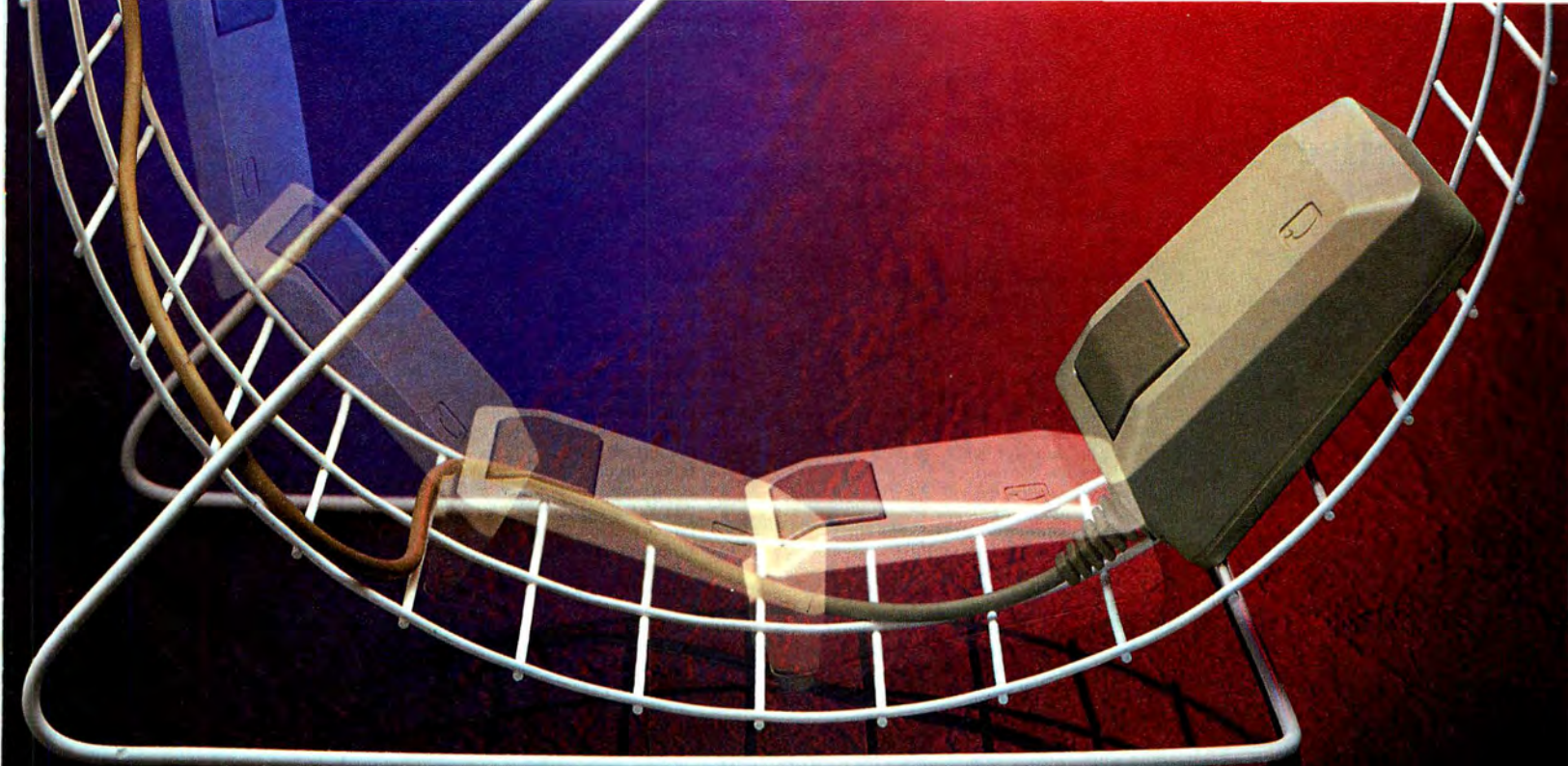
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- produces timing diagram of selected signals

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● 128K version (no user-defined devices) \$79.95 (U.S.)
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Allotype Typographics, 1600 Packard Rd. #5, Ann Arbor, MI 48104, 313/663-1989

○ Games

Quarterstaff

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Simulated Environment Systems, P.O. Box 2152, Ann Arbor, MI 48106, 313/996-3581

○ Graphics

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CompuCRAFT, P.O. Box 3155, Englewood, CO 80155, 303/850-7472

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Devionics, P.O. Box 2126, Covina, CA 91722, 714/779-7193

○ Languages

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Compiled library routines provide fast, flexible, modifiable Mac interface (windows, menus, scrolling, etc.) PLUS graphics printing, text editing, zooming, picture "grabber." 220-pg. manual, demos. Mac Pascal 2.0, TML Pascal versions: \$69.95. Megamax, Aztec C versions: \$129.95. Consulair, Lightspeed C: call.
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MacScheme™—A Mac Lisp

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PD Mac, Dept. T, P.O. Box 5626, Sherman Oaks, CA 91423

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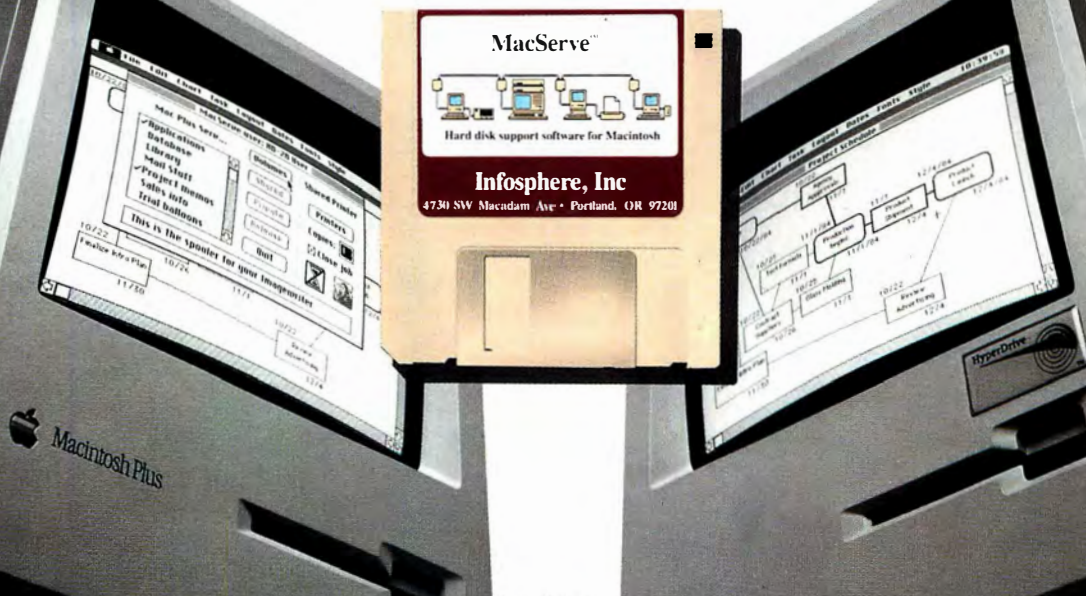
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